

THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

Single Correct Answer Type

- On strongly heating AgNO_3 we get:
a) AgNO_2 b) Silver nitride c) Ag d) Ag_2O
- Transition metals in their compounds show:
a) Ionic bonds
b) Covalent bonds
c) Ionic and covalent bonds
d) Ionic and coordinate bonds
- $4\text{K}_2\text{Cr}_2\text{O}_7 \xrightarrow{\text{Heat}} 4\text{K}_2\text{CrO}_4 + 3\text{O}_2 + X$ In the above reaction, X is
a) CrO_3 b) Cr_2O_7 c) Cr_2O_3 d) CrO_5
- Cynaide process is used for the extraction of
a) Au b) Ag c) Cu d) Both (a) and (b)
- The colour of zinc sulphide is:
a) Yellow b) White c) Brown d) Black
- The metal extracted by cyanide process is
a) Silver b) Copper c) Iron d) Sodium
- Which metal gives hydrogen gas on heating with hot concentrated alkali?
a) Ag b) Ni c) Zn d) Cu
- Which of the following metal ions is not coloured?
a) Ti^{3+} b) Fe^{3+} c) V^{2+} d) Zn^{2+}
- The process of extraction of Au and Ag ores is based on their solubility in:
a) NH_3 b) HCl c) HNO_3 d) KCN
- In the process of extraction of gold, Roasted gold ore
$$+ \text{CN}^- + \text{H}_2\text{O} \xrightarrow{\text{O}_2} [\text{X}] + \text{OH}^-$$
$$[\text{X}] + \text{Zn} \rightarrow [\text{Y}] + \text{Au}$$
Identify the complexes [X] and [Y]
a) $\text{X} = [\text{Au}(\text{CN})_2]^-$, $\text{Y} = [\text{Zn}(\text{CN})_4]^{2-}$ b) $\text{X} = [\text{Au}(\text{CN})_4]^{3-}$, $\text{Y} = [\text{Zn}(\text{CN})_4]^{2-}$
c) $\text{X} = [\text{Au}(\text{CN})_2]^-$, $\text{Y} = [\text{Zn}(\text{CN})_6]^{4-}$ d) $\text{X} = [\text{Au}(\text{CN})_4]^-$, $\text{Y} = [\text{Zn}(\text{CN})_4]^{2-}$
- To dissolve argentite ore which of the following is used?
a) $\text{Na}[\text{Ag}(\text{CN})_2]$ b) NaCN c) NaCl d) HCl
- The magnetic moment μ , of transition metals is related to the number of unpaired electrons n as
a) $\mu = n(n+2)^2$ b) $\mu = n^2(n+2)$ c) $\mu = \frac{n}{(n+2)}$ d) $\mu = \sqrt{n(n+2)}$
- Melting of Zn metal and then pouring it into cold water gives:
a) Zn dust b) Granulated Zn c) Hard Zn metal d) Soft Zn metal
- Percentage of gold in Fool's gold is
a) Zero b) 8 c) 16 d) 30
- Copper sulphate is commercially made from copper scrap by:
a) Dissolving in hot concentrated sulphuric acid
b) Action of dilute sulphuric acid and air
c) Heating with sodium sulphate
d) Heating with sulphur
- Which of the following compounds has colour but no unpaired electrons?

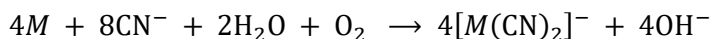
- a) KMnO_4
 b) K_2MnO_4
 c) MnSO_4
 d) MnCl_2
17. Mercury forms amalgams with all except:
 a) Al b) Zn c) Ni d) Fe
18. Granulated Zn is obtained by:
 a) Suddenly cooling molten Zn
 b) Adding molten Zn to water
 c) Heating Zn 100 to 150°C
 d) Dropping molten Zn drop by drop
19. In the first transition series, the differentiating electron enters:
 a) 5*d*-orbital b) 4*d*-orbital c) 3*d*-orbital d) 2*d*-orbital
20. Identity the ore not containing iron.
 a) Limonite b) Siderite c) Carnallite d) Chalcopyrites
21. Purest form of iron is
 a) Cast iron b) Pig form c) Wrought iron d) Steel
22. Which metal adsorbs hydrogen?
 a) Pd b) K c) Al d) Zn
23. The most abundant ore of iron is:
 a) Haematite b) Limonite c) Magnetite d) Siderite
24. Metallic silver may be obtained from AgCl by
 a) Heating it in the current of H_2 b) Fusing it with sand
 c) Treating with carbon monoxide d) Fusing it with Na_2CO_3
25. Choose the correct statement.
 a) Transition elements have low melting points.
 b) Transition elements do not have catalytic activity.
 c) Transition elements exhibit variable oxidation states.
 d) Transition elements show inert pair effect.
26. Bessemer's converter is used in the manufacture of:
 a) Cast iron b) Pig iron c) Steel d) Wrought iron
27. Number of electrons present in the outermost orbit of Fe atom is:
 a) 3 b) 1 c) 2 d) 4
28. Which will reduce acidified potassium dichromate solution?
 a) Potash alum b) Mohr's salt c) Chile saltpetre d) White vitriol
29. The lanthanoids contraction relates to
 a) Atomic radii b) Atomic as well as M^{3+} radii
 c) Valence electrons d) Oxidation states
30. Transition metals show paramagnetism due to
 a) High lattice energy b) Characteristics configuration
 c) Variable oxidation states d) Unpaired electrons
31. 'Mercury' tree can be prepared:
 a) By mixing up mercuric thiocyanate and gum
 b) By adding Nessler's reagent to a ammonium salt solution
 c) By pouring little mercury into AgNO_3 solution
 d) By heating mercuric chloride
32. When excess of SnCl_2 is added to a solution of HgCl_2 , a white ppt. turning to grey is obtained. This grey colour is due to the formation of:
 a) Hg_2Cl_2 b) SnCl_4 c) Sn d) Hg_2
33. Among the following, the compound that is both paramagnetic and coloured is

- a) $(\text{NH}_4)_2(\text{TiCl}_6)$ b) $\text{K}_2\text{Cr}_2\text{O}_7$ c) $\text{K}_3[\text{Cu}(\text{CN})_4]$ d) VOSO_4
34. All the metals form oxides of the type *MO* except
 a) Copper b) Barium c) Silver d) Lead
35. Cinnabar is an ore of:
 a) Lead b) Zinc c) Silver d) Mercury
36. Heating mixture of Cu_2O and Cu_2S will give
 a) Cu_2SO_3 b) $\text{CuO} + \text{CuS}$ c) $\text{Cu} + \text{SO}_3$ d) $\text{Cu} + \text{SO}_2$
37. The substance that sublimes on heating is:
 a) MgCl_2 b) AgCl c) HgCl_2 d) NaCl
38. Actinides
 a) Have variable valency b) Include element 12
 c) Are all synthetic elements d) Have only short lived isotopes
39. The *3d*-transition series contains elements from atomic number:
 a) 22 to 30 b) 21 to 30 c) 21 to 31 d) 21 to 29
40. Which of the following is not a characteristic of transition elements?
 a) Variable oxidation states b) Formation of coloured compounds
 c) Formation of interstitial compounds d) Natural radioactivity
41. An element which is highly toxic for plants and animals is:
 a) Au b) Mn c) Hg d) Ca
42. Native silver metal forms a water soluble complex with a dilute aqueous solution of NaCN in presence of:
 a) Nitrogen b) Oxygen c) CO_2 d) Ar
43. Calamine is
 a) CaCO_3 b) MgCO_3 c) ZnCO_3 d) $\text{CaCO}_3 + \text{CaO}$
44. Which series of elements have nearly the same atomic radii?
 a) F, Cl, Br, I b) Na, K, Rb, Cs c) Li, Be, B, C d) Fe, Co, Ni, Cu
45. Which transition elements exhibit +8 oxidation states?
 a) Cu, Zn b) Ru, Os c) Ag, Au d) Cu, Cr
46. When I^- is oxidized by MnO_4^- in alkaline medium, I^- converts into
 a) IO_3^- b) I_2 c) IO_4^- d) IO^-
47. Which of the following compounds is used as the starting material for the preparation of potassium dichromate?
 a) $\text{K}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ (Chrome alum)
 b) PbCrO_4 (Chrome yellow)
 c) FeCr_2O_4 (Chromite)
 d) $\text{PbCrO}_4 \cdot \text{PbO}$ (Chrome red)
48. Which metal makes steel suitable for cutting purposes by maintaining the cutting edge of the blade?
 a) Mn b) Al c) W d) C
49. Which form of iron is least ductile?
 a) Hard steel b) Cast iron c) Mild steel d) Wrought steel
50. Amalgams are:
 a) Always solid
 b) Highly coloured alloys
 c) Alloys which contain mercury as one of the contents
 d) Compounds of mercury
51. Which of the following is a poison?
 a) Hg_2Cl_2 b) BaSO_4 c) HgCl_2 d) NaHCO_3
52. Addition of high proportions of manganese makes steel useful in making rails of rail roads because manganese ;
 a) Gives hardness to steel and can remove oxygen and sulphur
 b) Helps the formation of oxides of iron
 c) Can show highest oxidation state of +7

- d) None of the above
53. Pick out the correct statements from the following.
- Cobalt (III) is more stable in octahedral complexes.
 - Zinc forms coloured ions or complexes.
 - Most of the *d*-block elements and their compounds are ferromagnetic.
 - Osmium shows (VIII) oxidation state.
 - Cobalt (II) is more stable in octahedral complexes.
- a) 1 and 2 b) 1 and 3 c) 2 and 4 d) 1 and 4
54. Ferrous sulphate on heating gives:
- a) SO₃ b) SO₂ c) Fe₂O₃ d) All of these
55. Hydrometallurgy is based on
- a) Calcination b) Roasting c) Oxidation d) Reduction
56. In context with the transition elements, which of the following statements is incorrect?
- In addition to the normal oxidation state, the zero oxidation state is also shown by these elements in complexes.
 - In the highest oxidation state, the transition metal shows basic character and form cationic complexes.
 - In the highest oxidation state of the first five transition elements (Sc to Mn), all the 4*s* and 4*d* electrons are used for bonding.
 - Once the *d*⁵ configuration is exceeded, the tendency to involve all the 3*d* electrons in bonding decreases.
57. Which one of the following pairs of elements is called 'chemical twins' because of their very similar chemical properties?
- a) Mn and W b) Mo and Tc c) Fe and Re d) Hf and Zr
58. Which one of the following exist in the oxidation state other than +3?
- a) B b) Al c) Ce d) Ga
59. Excess of KI reacts with CuSO₄ solution and then Na₂S₂O₃ solution is added to it. Which of the statement is incorrect for this reaction?
- a) CuI₂ is formed b) Na₂S₂O₃ is oxidised c) Cu₂I₂ is formed d) Evolved I₂ is reduced
60. Which is formed when iron reacts with carbon?
- a) FeC₂ b) Fe₃C c) FeC₃ d) Fe₂C
61. From sodium argentocyanide Na[Ag(CN)₂], silver is precipitated by adding a powder of:
- a) Tin b) Zinc c) Mercury d) Calcium
62. Which is used for electrical purposes?
- a) German silver b) Beryllium bronze c) Constantan d) Fool's gold
63. Monel metal is an alloy of?
- a) Cu, Ni, Fe, Mn b) Cu, Sn, Zn c) Cu, Sn, P d) Cu, Zn
64. Which metal is not used for making coins?
- a) Gold b) Silver c) Nickel d) Tungsten
65. Which is not true?
- ZnS is white solid which turns yellow on exposure to light
 - ZnS is precipitated on passing H₂S to aqueous Na₂ZnO₂
 - Basic zinc carbonate is ZnCO₃·3Zn(OH)₂
 - HgCl₂ reacts with NH₃(g) to give [Hg(NH₃)₄]Cl₂
66. Gold is extracted by hydrometallurgical process, based on its property
- Of being electropositive
 - Of being less reactive
 - To form complexes which are water soluble
 - To form salts which are water soluble
67. Which is less reactive?
- a) Fe b) Ni c) Pt d) Co
68. Thermal decomposition of zinc nitrate gives:
- a) Zn b) ZnO c) Zn(NO₂)₂ d) NO

69. Copper nitrate on strongly heating gives:
 a) Cu b) Cupric oxide c) Cuprous oxide d) cupric nitrate
70. Which compound is used as a purgative in medicine?
 a) HgCl_2 b) Hg_2Cl_2 c) CuCl d) CuCl_2
71. Correct formula of calomel is
 a) HgCl_2 b) $\text{HgCl}_2 \cdot \text{H}_2\text{O}$ c) Hg_2Cl_2 d) HgSO_4
72. The reaction of $\text{K}_2\text{Cr}_2\text{O}_7$ with NaCl and conc H_2SO_4 gives
 a) CrO_2Cl_2 b) Cr_2O_3 c) CrCl_3 d) CrOCl_2
73. A compound in which a metal ion M^{x+} ($Z=25$) has a spin only magnetic moment of $\sqrt{24}\text{BM}$. The number of unpaired electrons in the compound and the oxidation state of the metal ion are respectively.
 a) 4 and 2 b) 5 and 3 c) 3 and 2 d) 4 and 3
74. From an aqueous solution of zinc sulphate, normal zinc carbonate may be precipitated by:
 a) Passing CO_2
 b) Warming with NaHCO_3
 c) Adding Na_2CO_3
 d) Boiling with CaCO_3
75. The catalyst used for the hydrogenation of vegetable oils for making margarine is:
 a) Cu b) Na c) Ni d) Zn
76. Which of the following compound is expected to be coloured?
 a) Ag_2SO_4 b) CuF_2 c) MgF_2 d) CuCl
77. Copper can be extracted from:
 a) Kupfer-nickel b) Dolomite c) Malachite d) Galena
78. Refining of impure copper with zinc impurity is to be done by electrolysis using electrodes as

Cathode	Anode		
a) Pure copper	Pure zinc	b) Pure zinc	Pure copper
c) Pure copper	Impure copper	d) Pure zinc	Impure zinc
79. Molten Ag absorbs about times of O_2 :
 a) 10 b) 20 c) 40 d) 80
80. Which of the following ion is diamagnetic?
 a) Nd^{3+} b) La^{3+} c) Tb^{3+} d) Er^{3+}
81. A red solid is insoluble in water. However, it becomes soluble if some KI is added to water. Heating the red solid in a test tube results in liberation of some violet coloured fumes and droplets of a metal appear on the cooler parts of the test tube. The red solid is
 a) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ b) HgI_2 c) HgO d) Pb_3O_4
82. Of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one of them?
 a) $(n-1)d^8, ns^2$ b) $(n-1)d^5, ns^1$ c) $(n-1)d^3, ns^2$ d) $(n-1)d^5, ns^2$
83. The oxidation number of Mn in the product of alkaline oxidative fusion of MnO_2 is
 a) 2 b) 3 c) 4 d) 6
84. Iron sheets are galvanized mainly to:
 a) Harden the surface
 b) Increase lustre
 c) Prevent action of water
 d) Prevent action of oxygen and water
85. Copper metal is not used:
 a) In taps and water connections
 b) As an alloy in high speed drills
 c) In electric motor coils
 d) In brass utensils
86. In the equation,



Identify the metal M

- a) Copper b) Iron c) Silver d) Zinc
87. Vapour phase refining of nickel is carried out by using
a) I_2 b) Cl_2 c) HCl d) CO
88. Lanthanide contraction is due to increase in
a) Shielding by $4f$ -electrons b) Atomic number
c) Effective nuclear charge d) Size of $4f$ -orbitals
89. Which of the following ions is coloured?
a) Cu^+ b) Cu^{2+} c) V^{5+} d) Ti^{4+}
90. Pig iron:
a) Contains carbon and other impurities
b) Is pure form of iron
c) Is same as wrought iron
d) Is same as steel
91. In aqueous solution Eu^{2+} ion acts as
a) An oxidizing agent b) A reducing agent c) An acid d) All of these
92. Transition elements form complexes because of:
a) Small cation size b) Vacant d -orbitals c) Large ionic charge d) All are correct
93. Philosopher's wool on heating with BaO at $1100^\circ C$ produce
a) $Ba + ZnCl_2$ b) $BaCdO_2$ c) $BaZnO_2$ d) $BaO_2 + Zn$
94. Which of the following trivalent ion has the largest atomic radii in the lanthanide series?
a) Ce b) Pm c) La d) Lu
95. Ferrous ion changes to X ion, on reacting with acidified hydrogen peroxide. The number of d -electrons present in X and its magnetic moment (in BM) are, respectively
a) 6 and 6.93 b) 5 and 5.92 c) 5 and 4.9 d) 4 and 5.92
96. Which of the following is amphoteric oxide?
a) SO_2 b) B_2O_3 c) ZnO d) Na_2O
97. The valence shell electronic configuration of Cr^{2+} ion is
a) $4s^0 3d^4$ b) $3p^6 4s^2$ c) $4s^2 3d^2$ d) $4s^2 3d^0$
98. Which of the following ore is an ore of copper?
a) Argentite b) Haematite c) Malachite d) Calamine
99. Chinese white is:
a) ZnS b) $ZnCO_3$ c) $ZnS + BaSO_4$ d) ZnO
100. Cerium ($Z = 58$) is an important member of the lanthanides. Which of the following statement about cerium is incorrect?
a) The common oxidation states of cerium are +3 and +4
b) Cerium (IV) acts as an oxidizing agent
c) The +4 oxidation state of cerium is not known in solutions
d) The +3 oxidation state of cerium is more stable than the +4 oxidation state
101. If orange-red colour is absorbed from white light, the observed colour is:
a) Yellow b) Orange c) Blue d) Violet
102. Which forms interstitial compounds?
a) Fe b) Ni c) Co d) All of these
103. Steel that is resistant to acids is:
a) Carbon steel b) Molybdenum steel c) Stainless steel d) Nickel alloy steel
104. Hardness of transition elements is due to:
a) Large atomic size
b) Metallic bonding
c) Covalent bonds

126. $\text{Cl}_2 + \text{HgO} \rightarrow ?$
 a) $\text{Cl}_2\text{O} + \text{HgCl}$ b) $\text{Cl}_2\text{O} + \text{HgCl}_2$ c) $\text{ClO} + \text{HgCl}$ d) $\text{ClO} + \text{HgCl}_2$
127. The following two reactions HNO_3 with Zn are given as (equations are not balanced) $\text{Zn} + \text{conc. HNO}_3 \rightarrow \text{Zn}(\text{NO}_3)_2 + \boxed{X} + \text{H}_2\text{O}(A)$
 $\text{Zn} + \text{dil. HNO}_3 \rightarrow \text{Zn}(\text{NO}_3)_2 + \boxed{Y} + \text{H}_2\text{O}(B)$
 In reactions A and B, the compounds X and Y respectively, are
 a) NO_2 and NO b) NO_2 and NO_2 c) NO and NO_2 d) NO_2 and NH_4NO_3
128. Which of the following electronic configurations belong to transition elements?
 a) $\text{KL } 3s^2p^6d^5, 4s^1$
 b) $\text{KL } 3s^2p^6d^{10}, 4s^2p^3$
 c) $\text{KL } 3s^2p^6d^{10}, 4s^24p^1$
 d) $\text{KLM } 4s^2p^6d^{10}, 5s^25p^1$
129. The magnetic moment of a transition metal ion is $\sqrt{15}$ BM. Therefore, the number of unpaired electrons present in it, is
 a) 3 b) 4 c) 1 d) 2
130. Which is not true in case of transition metals?
 a) They are malleable and ductile
 b) They have high melting and boiling points
 c) They crystallise with body centred cubic and hexagonal close packed structure only
 d) They show variable oxidation states although not always
131. Formation of coloured solution is possible when metal ion in the compound contains
 a) Paired electrons b) Lone pair of electrons
 c) Unpaired electrons d) None of these
132. Carbon in wrought iron is present as
 a) Silicon carbide b) Iron carbide
 c) Graphite d) Partly iron carbide and partly as graphite
133. An element is in M^{3+} form. Its electronic configuration is $[\text{Ar}]3d^1$, the ion is
 a) Ca^{2+} b) Sc^+ c) Ti^{4+} d) Ti^{3+}
134. Each transition series contains:
 a) 12 elements b) 10 elements c) 14 elements d) 8 elements
135. Lanthanide contraction is caused due to
 a) The appreciable shielding on outer electrons by $4f$ -electrons from the nuclear charge.
 b) The appreciable shielding on outer electrons by $5d$ -electrons from the nuclear charge.
 c) The same effective nuclear charge from Ce to Lu.
 d) The imperfect shielding on outer electrons by $4f$ -electrons from the nuclear charge.
136. The properties of Zr and Hf are similar because
 a) Both belong to d -block b) Both belong to same group of Periodic Table
 c) Both have similar radii d) Both have same number of electrons
137. In nitroprusside ion, the iron and NO exist as Fe^{11} and NO^+ rather than Fe^{III} and NO. These forms can be differentiated by :
 a) Estimating the concentration of iron
 b) Measuring the concentration of CN^- .
 c) Measuring the solid state magnetic moment
 d) Thermally decomposing the compound
138. Railway wagon axles are made by heating rods of iron embedded in charcoal powder. The process is known as
 a) Case hardening b) Tempering c) Sheradizing d) Annealing
139. A substance which is not paramagnetic is:
 a) $\text{Cr}(\text{ClO}_4)_3$ b) KMnO_4 c) TiCl_3 d) VOBr_2
140. Which pair of compounds is expected to show similar colour in aqueous medium?

- a) FeCl_3 and CuCl_2 b) VOCl_2 and CuCl_2 c) VOCl_2 and FeCl_2 d) FeCl_2 and MnCl_2
141. Lunar caustic is chemically:
 a) Silver chloride b) Silver nitrate c) Sodium hydroxide d) Potassium nitrate
142. Lanthanoids and actinoids resembles in:
 a) Electronic configuration
 b) Oxidation state
 c) Ionisation energy
 d) Formation of complex
143. Horn silver is:
 a) AgCl b) Ag_2S c) SnS d) AgNO_3
144. Silver nitrate solution gives a red precipitate with:
 a) Sodium iodide b) Potassium chloride c) Calcium nitrate d) Sodium chromate
145. Of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one of them?
 a) $(n-1)d^8 ns^2$ b) $(n-1)d^5 ns^1$ c) $(n-1)d^3 ns^2$ d) $(n-1)d^5 ns^2$
146. Powdered silver ore is treated with NaCN solution and air is bubbled through the mixture to give:
 a) AgCN b) Ag c) $\text{Ag}(\text{CN})_2$ d) $\text{Na}[\text{Ag}(\text{CN})_2]$
147. Chromium has most stable oxidation state of:
 a) +5 b) +3 c) +2 d) +4
148. Cuprous salts are generally colourless while cuprous oxide is:
 a) Green b) Blue c) Red d) Yellow
149. Which of the following manganese oxide is amphoteric?
 a) MnO_2 b) Mn_2O_3 c) Mn_2O_7 d) MnO
150. Impurities of Cu and Ag from gold are removed by
 a) Boiling impure gold with $\text{dil. H}_2\text{SO}_4$ b) Boiling impure gold with $\text{conc. H}_2\text{SO}_4$
 c) Electrolytically d) Both (b) and (c)
151. Identify the incorrect statement among the following
 a) *d*-block elements show irregular and erratic chemical properties among themselves. b) La and Lu have partially filled *d*-orbitals and no other partially filled orbital.
 c) The chemistry of various lanthanoids is very similar. d) *4f* and *5f*-orbitals are equally shielded.
152. Which of the following ions form most stable complex compound?
 a) Mn^{2+} b) Ni^{2+} c) Fe^{2+} d) Cu^{2+}
153. Silver halides are used in photography because they are:
 a) Photosensitive
 b) Soluble in hyposolution
 c) Soluble in NH_4OH
 d) Insoluble in acids
154. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ on heating gives a gas which is also given by
 a) Heating NH_4NO_2 b) Heating NH_4NO_3 c) $\text{Mg}_3\text{N}_2 + \text{H}_2\text{O}$ d) $\text{Na}(\text{Comp.}) + \text{H}_2\text{O}_2$
155. Gold dissolves in aqua regia forming:
 a) Auric chloride b) Aurous chloride c) Chloroauric acid d) Aurous nitrate
156. Essential constituent of an amalgam is:
 a) Fe b) An alkali metal c) Silver d) Mercury
157. In blast furnace, iron oxide is reduced by
 a) Hot blast of air b) Carbon monoxide c) Carbon d) Silica
158. In *M* is element of actinoids series, the degree of complex formation decreases in the order
 a) $M^{4+} > M^{3+} > \text{MO}_2^{2+} > \text{MO}_2^+$ b) $\text{MO}_2^+ > \text{MO}_2^{2+} > M^{3+} > M^{4+}$
 c) $M^{4+} > \text{MO}_2^{2+} > M^{3+} > \text{MO}_2^+$ d) $\text{MO}_2^{2+} > \text{MO}_2^+ > M^{4+} > M^{3+}$
159. Stainless steel has iron and

- a) Cr b) Cu c) Co d) Zn
160. The correct statement(s) among the following is/are;
 (i) All the *d* and *f*-block elements are metals
 (ii) All *d* and *f*-block elements form coloured ions
 (iii) All *d* and *f*-block elements are paramagnetic
 a) (i) only b) (i) and (ii) c) (ii) and (iii) d) All of these
161. Which of the following pair will have effective magnetic moment equal?
 a) Ti^{2+} and V^{2+} b) Cr^{2+} and Fe^{2+} c) Cr^{3+} and Mn^{2+} d) V^{2+} and Sc^{3+}
162. Which of the following compounds volatilises on heating?
 a) $FeCl_3$ b) $HgCl_2$ c) $CaCl_2$ d) $MgCl_2$
163. Aufbau law is not valid for:
 a) Cu and Ar b) Cu and Cr c) Cr and Ar d) Fe and Ag
164. Which of the following statements is not true for Mohr's salt?
 a) It decolourises $KMnO_4$ solution
 b) It is a double salt
 c) Oxidation state of iron is +3
 d) It is a primary standard
165. The *3d*-block element that exhibits maximum number of oxidation states is
 a) Sc b) Ti c) Mn d) Zn
166. Number of electrons in *3d*-orbital of V^{2+} , Cr^{2+} , Mn^{2+} , and Fe^{2+} are 3, 4, 5 and 6 respectively. Which of the following ions will have largest value of magnetic moment (μ)?
 a) V^{2+} b) Cr^{2+} c) Mn^{2+} d) Fe^{2+}
167. Identify the reaction that does not take place during the smelting process of copper extraction
 a) $2FeS + 3O_2 \rightarrow 2FeO + 2SO_2 \uparrow$ b) $Cu_2O + FeS \rightarrow Cu_2S + FeO$
 c) $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2 \uparrow$ d) $FeO + SiO_2 \rightarrow FeSiO_3$
168. Which of the following is most stable?
 a) V^{3+} b) Ti^{3+} c) Mn^{3+} d) Cr^{3+}
169. The white anhydrous copper sulphate on heating decomposes to give:
 a) $CuSO_4 \cdot 5H_2O$ b) $CuSO_4 \cdot H_2O$ c) $CuO + SO_3$ d) SO_3
170. NH_3 does not form complex with:
 a) AgI b) AgBr c) AgCl d) None of these
171. Which sulphide has a yellow colour?
 a) CuS b) PbS c) ZnS d) CdS
172. Which of the following is not a property of transition elements?
 a) Fixed valency b) Catalytic property c) Paramagnetism d) Colour
173. Fe^{2+} ion can be distinguished by Fe^{3+} ion by:
 a) $BaCl_2$ b) $AgNO_3$ c) NH_4SCN d) None of these
174. Which one of the following transition metal ions is diamagnetic?
 a) Co^{2+} b) Ni^{2+} c) Cu^{2+} d) Zn^{2+}
175. Elements of group 11 and 12 are:
 a) Normal elements b) Transition elements c) Alkaline earth metals d) Alkali metals
176. Hard steel contains:
 a) No carbon b) 0.6-1.5% carbon c) 5% carbon d) 0.5-0.2% carbon
177. Iron, once dipped in concentrated H_2SO_4 , does not displace copper from sulphate solution, because:
 a) It is less reactive than copper
 b) A layer of sulphate is deposited on it
 c) A layer of oxide is deposited on it
 d) None of the above
178. Which shows a jump in second ionization potential?
 a) Co b) Ni c) Zn d) Cu

179. Manganese steel contains:
 a) Fe + C + Mn b) Fe + C + Al c) Fe + Mn d) Fe + Mn + Cr
180. Which sets are the transition elements?
 a) Ti, Zr, Hf b) V, Nb, Ta c) Rh, Rb, Pd d) All of these
181. The extraction of nickel involves:
 a) The formation of $\text{Ni}(\text{CO})_4$
 b) The decomposition of $\text{Ni}(\text{CO})_4$
 c) The formation and thermal decomposition of $\text{Ni}(\text{CO})_4$
 d) The formation and catalytic decomposition of $\text{Ni}(\text{CO})_4$
182. Cu_2O is:
 a) Black oxide of copper b) Copper(II) oxide c) Red oxide of copper d) Cupric oxide
183. Number of electrons transferred in each case when KMnO_4 acts as an oxidising agent to give MnO_2 , Mn^{2+} , $\text{Mn}(\text{OH})_3$ and MnO_4^{2-} , are respectively :
 a) 3, 5, 4 and 1 b) 4, 3, 1 and 5 c) 1, 3, 4 and 5 d) 5, 4, 3 and 1
184. When metallic copper comes in contact with moisture, a green powder/pasty coating can be seen over it. This is chemically known as
 a) Copper carbonate-copper sulphate b) Copper carbonate-copper hydroxide
 c) Copper sulphate-copper sulphide d) Copper sulphide-copper carbonate
185. German silver is an alloy of:
 a) Copper, zinc and nickel
 b) Copper and silver
 c) Copper and tin
 d) Copper, zinc and silver
186. Incorrect statement is
 a) Atomic radii of Zr and Hf are same because of lanthanide contraction
 b) Zn and Hg do not show variable valency
 c) Across the lanthanides series, the basicity of lanthanide hydroxides decreases
 d) Protactinium is transuranic element
187. -----is the best conductor of electricity among coinage metals:
 a) Ag b) Cu c) Au d) All of these
188. Cu^{2+} ions give precipitate with $\text{K}_4\text{Fe}(\text{CN})_6$. The colour of precipitate is:
 a) Blue b) Green c) Red d) Brown
189. Across the lanthanide series, the basicity of lanthanide hydroxides
 a) Increases b) Decreases
 c) First increases and then decreases d) First decreases and then increases
190. A blue colouration is not obtained when:
 a) Ammonium hydroxide dissolves in copper sulphate
 b) Copper sulphate solution reacts with $\text{K}_4[\text{Fe}(\text{CN})_6]$
 c) Ferric chloride reacts with sodium ferrocyanide
 d) Anhydrous white CuSO_4 is dissolved in water
191. Useful lanthanoid member is:
 a) Cerium b) Lanthanum c) Neodymium d) Lutetium
192. Which of the following has got incompletely filled *f*-subshell?
 a) Gadolinium b) Lutetium c) Lawrencium d) Tantalum
193. Silver nitrate is usually supplied in coloured bottles because it is:
 a) Oxidized in air
 b) Decomposed in sunlight
 c) Explodes in sunlight
 d) Reactive towards air in sunlight
194. Mercury is purified by:

- a) Solidifying
 b) Distillation in vacuum
 c) Treatment with dil. HNO_3
 d) Electrolytic method
195. Pt black is
 a) Pt metal mixed with MnO_2
 b) Velvety black power obtained by reduction of PtCl_4 with glucose or sodium formate
 c) Pt metal coated with black colour
 d) None of the above
196. 'Hydride gap' is referred to which region of the Periodic Table?
 a) Groups 3, 4 and 5 b) Groups 5, 6 and 7 c) Groups 4, 5 and 6 d) Groups 7, 8 and 9
197. Which of the following electronic configuration represents the maximum magnetic moment?
 a) d^3 b) d^2 c) d^8 d) d^6
198. Volatile metals Zn, Cd and Hg are purified by:
 a) Liquation b) Distillation c) Cupellation d) Electrolysis
199. Zinc, cadmium and mercury are:
 a) d -block elements b) p -block elements c) s -block elements d) f -block elements
200. Select the incorrect statement about transition elements
 a) The last electron enters in the d -orbital
 b) Their properties are in between s and p -block elements
 c) Scandium is the transition element with smallest atomic radii
 d) Their common oxidation state is +3
201. Which of the following types of metals form the most efficient catalysts?
 a) Alkali metals b) Alkaline earth metals
 c) Transition metals d) All of these
202. In the reaction $\text{SnCl}_2 + 2\text{HgCl}_2 \rightarrow A + \text{SnCl}_4$, A is:
 a) Hg_2Cl_2 b) Hg c) HgCl d) HgCl_3
203. Mohr salt is made up of which combination of salt?
 a) Ammonium sulphate and potash. b) Ammonium sulphate and ferrous sulphate.
 c) Ammonium sulphate and copper sulphate. d) Ammonium sulphate and magnesium sulphate.
204. Maximum oxidation state is presented by:
 a) CrO_2Cl_2 and MnO_4^- b) MnO_2 c) $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{Co}(\text{CN})_6]^{3-}$
205. Lanthanides are
 a) 14 elements in the sixth period (atomic no. = 90 to 103) that are filling $4f$ sub level.
 b) 14 elements in the seventh period (atomic no. = 90 to 103) that are filling $5f$ sub level.
 c) 14 elements in the sixth period (atomic no. = 58 to 71) that are filling $4f$ sub-level.
 d) 14 elements in the seventh period (atomic no. = 58 to 71) that are filling $4f$ sub-level.
206. By annealing, steel
 a) Becomes soft b) Becomes liquid
 c) Becomes hard and brittle d) Is covered with a thin film of Fe_3O_4
207. Which chromium compound is widely used in tanning of leather?
 a) Cr_2O_3 b) CrO_2Cl_2 c) CrCl_3 d) $\text{K}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$
208. Purple of cassius is
 a) Copper solution b) Platinum solution c) Gold solution d) Copper solution
209. Which is obtained when SO_2 is bubbled through a solution of CuCl_2 ?
 a) Cu b) Cu_2Cl_2 c) CuSO_4 d) CuS
210. Substance which do not react with cold water but react with steam are:
 a) C , Ca , SO_2 b) Fe , Al , Cl_2 c) CO_2 , Na , Mg d) C , Fe , Mg
211. Which metal has the highest melting point?
 a) Pt b) W c) Pd d) Au

212. Choose the correct reaction to prepare mercurous chloride (calomel)
- a) $\text{HgCl}_2 + \text{Hg} \xrightarrow{\Delta}$ b) $\text{Hg} + \text{Cl}_2 \rightarrow$ c) $\text{HgCl}_2 + \text{SnCl}_2 \rightarrow$ d) Both (a) and (c)
213. Density, malleability and ductility in coinage metals increase in the order:
- a) Cu, Ag, Au b) Au, Ag, Cu c) Ag, Au, Cu d) Ag, Cu, Au
214. An acidified solution of KMnO_4 oxidizes:
- a) Sulphates b) Sulphites c) Nitrates d) Ferric salts
215. Magnetite is:
- a) $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ b) FeS_2 c) Fe_3O_4 d) Fe_2O_3
216. Least paramagnetic property is shown by
- a) Fe b) Mn c) Ni d) Cu
217. Platinum, Palladium, irridium, etc., are called noble metals because:
- a) Alfred Nobel discovered them
b) They are inert towards many common reagents
c) They are shining, lustrous and pleasing to look
d) They are found in native state
218. Silver obtained from argentiferous lead is purified by:
- a) Distillation b) Froth floatation c) Cupellation d) Reaction with KCN
219. Paris green is:
- a) $\text{Cu}(\text{CH}_3\text{COO})_2$ b) $\text{Cu}_3(\text{AsO}_3)_2 \cdot 2\text{H}_2\text{O}$ c) $\text{Cu}(\text{CH}_3\text{COO})_2 \cdot 3\text{Cu}(\text{AsO}_4)$ d) $\text{Co}(\text{AlO}_2)_2$
220. Variable valency is shown by
- a) Normal elements b) Transition elements c) Typical elements d) None of these
221. Which statement about Hg is correct?
- a) Hg is the only liquid metal
b) Hg^{2+} salts are more stable than Hg_2^{2+} salts
c) Hg forms no amalgam with iron and platinum
d) All of the above
222. Most abundant transition element is:
- a) Fe b) Sc c) Os d) None of these
223. Which one of the following acts as an oxidizing agent?
- a) Np^{4+} b) Sm^{2+} c) Eu^{2+} d) Yb^{2+}
224. Which of the oxide of manganese is amphoteric?
- a) MnO_2 b) Mn_2O_3 c) Mn_2O_7 d) MnO
225. Which one of the following reactions will occur on heating AgNO_3 above its melting point?
- a) $2\text{AgNO}_3 \rightarrow 2\text{Ag} + 2\text{NO}_2 + \text{O}_2$ b) $2\text{AgNO}_3 \rightarrow 2\text{Ag} + \text{N}_2 + 3\text{O}_2$
c) $2\text{AgNO}_3 \rightarrow 2\text{AgNO}_2 + \text{O}_2$ d) $2\text{AgNO}_3 \rightarrow 2\text{Ag} + 2\text{NO} + 2\text{O}_2$
226. Which of the following is paramagnetic?
- a) CuCl_2 b) CaCl_2 c) CdCl_2 d) None of these
227. Which does not give a precipitate with excess of NaOH ?
- a) HgCl_2 b) HgNO_3 c) FeSO_4 d) ZnSO_4
228. Thermite is a mixture of iron oxide and:
- a) Zn powder b) K metal c) Na-Hg d) Al powder
229. Ruby copper is:
- a) Cu_2O b) $\text{Cu}(\text{OH})_2$ c) CuCl_2 d) Cu_2Cl_2
230. The actinoids showing +7 oxidation state are
- a) U, Np b) Pu, Am c) Np, Pu d) Am, Cm
231. Which match is incorrect?
- a) Ammonia soda process – manufacture of potassium carbonate
b) Bessemer's process – manufacture of steel
c) Mac Arthur and Forest process – extraction of silver
d) Dow's process – manufacture of phenol

232. Carbon content of
- Steel is in between those of cast iron and wrought iron.
 - Cast iron is in between those of steel and wrought iron.
 - Wrought iron is in between those of steel and cast iron.
 - Steel is higher than that of pig iron.
233. Which of the following pair is coloured in aqueous solution?
- $\text{Sc}^{3+}, \text{Co}^{2+}$
 - $\text{Ni}^{2+}, \text{Cu}^+$
 - $\text{Ni}^{2+}, \text{Ti}^{3+}$
 - $\text{Sc}^{3+}, \text{Ti}^{3+}$
234. ZnSO_4 on heating to 800°C gives:
- $\text{ZnO} + \text{SO}_2 + \text{O}_2$
 - $\text{Zn} + \text{SO}_2$
 - $\text{ZnS} + \text{O}_2$
 - $\text{Zn} + \text{SO}_2 + \text{O}_2$
235. The ionization potential of transition metals is than *p*-block elements.
- Less
 - More
 - Equal
 - None of these
236. Spiegeleisen is an alloy of
- Fe, Co and Cr
 - Fe, Co and Mg
 - Fe, Mg and C
 - Fe, C and Mn
237. Which of the following group of transition metals is called coinage metals?
- Cu, Ag, Au
 - Ru, Rh, Pd
 - Fe, CO, Ni
 - Os, Ir, Pt
238. Cadmipone is a mixture of:
- CdS and BaSO_4
 - CaSO_4 and BaS
 - CaS and ZnSO_4
 - CaSO_4 and ZnS
239. Which one of the following does not correctly represent the correct order of the property indicated against it?
- $\text{Ti} < \text{V} < \text{Cr} < \text{Mn}$: increasing number of oxidation states
 - $\text{Ti}^{3+} < \text{V}^{3+} < \text{Cr}^{3+} < \text{Mn}^{3+}$: increasing magnetic moment
 - $\text{Ti} < \text{V} < \text{Cr} < \text{Mn}$: increasing melting points
 - $\text{Ti} < \text{V} < \text{Mn} < \text{Cr}$: increasing 2nd ionization enthalpy
240. In chromite ore, the oxidation number of iron and chromium are respectively.
- +3,+2
 - +3,+6
 - +2,+6
 - +2,+3
241. The compound which gives oxygen on moderate heating is:
- Zinc oxide
 - Mercuric oxide
 - Aluminium oxide
 - Ferric oxide
242. The form of iron having the highest carbon content is
- Cast iron
 - Wrought iron
 - Stainless steel
 - Mild steel
243. An ore of silver is:
- Argentite
 - Stibnite
 - Haematite
 - Bauxite
244. Roasting of HgS in air produces:
- HgO
 - HgSO_3
 - HgSO_4
 - Hg
245. Transuranic elements begins with
- Np
 - Cm
 - Pu
 - U
246. A solution when diluted with H_2O and boiled gives a white ppt. On addition of excess $\text{NH}_4\text{Cl}/\text{NH}_4\text{OH}$, the volume of precipitate decreases due to dissolution leaving behind a white gelatinous precipitate. The precipitate which dissolves in $\text{NH}_4\text{OH}/\text{NH}_4\text{Cl}$ is:
- $\text{Zn}(\text{OH})_2$
 - $\text{Al}(\text{OH})_3$
 - $\text{Mg}(\text{OH})_2$
 - $\text{Ca}(\text{OH})_2$
247. Which of the following is not correct about transition metals?
- Their compounds are generally coloured.
 - They can form ionic or covalent compounds.
 - Their melting and boiling points are high.
 - They do not exhibit variable valency.
248. Which one of the following does not decolourise an acidified KMnO_4 solution?
- SO_2
 - FeCl_3
 - H_2O_2
 - FeSO_4
249. Which of the following pairs of elements cannot form an alloy?
- Zn, Cu
 - Fe, Hg
 - Fe, C
 - Hg, Na
250. Which is known as purple of Cassius?
- Colloidal silver solution
 - Colloidal gold solution
 - Aqueous solution of soap

- d) As_2S_3 colloidal solution
251. Which of the following ionic species will impart colour to an aqueous solution?
 a) Cu^+ b) Zn^{2+} c) Cr^{3+} d) Ti^{4+}
252. The outer electronic configuration of Gd (At. No 64) is
 a) $4f^3 5d^5 6s^2$ b) $4f^8 5d^0 6s^2$ c) $4f^4 5d^4 6s^2$ d) $4f^7 5d^1 6s^2$
253. Mercury is a liquid metal because
 a) It has a completely filled s -orbital.
 b) It has a small atomic size.
 c) It has a completely filled d -orbital that prevents $d - d$ overlapping of orbitals.
 d) It has a completely filled d -orbital that causes $d - d$ overlapping.
254. Composition of azurite mineral is
 a) $\text{CuCO}_3 \cdot \text{CuO}$ b) $\text{Cu}(\text{HCO}_3)_2 \cdot \text{Cu}(\text{OH})_2$ c) $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ d) $\text{CuCO}_3 \cdot 2\text{Cu}(\text{OH})_2$
255. What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid?
 a) Cr^{3+} and $\text{Cr}_2\text{O}_7^{2-}$ are formed
 b) $\text{Cr}_2\text{O}_7^{2-}$ and H_2O are formed
 c) CrO_4^{2-} is reduced to + 3 state of Cr
 d) None of the above
256. Zn gives H_2 gas with H_2SO_4 and HCl but not with HNO_3 because:
 a) Zn acts as an oxidising agent when react with HNO_3
 b) HNO_3 is weaker acid than H_2SO_4 and HCl
 c) In electrochemical series Zn is above hydrogen
 d) NO_3^- ion is reduced in preference to hydronium ion
257. Which of the following is also known as "Fools gold"?
 a) Wurtzite b) Iron pyrites c) Chalcocite d) Silver glance
258. When steam is passed over heated iron, one of the products is:
 a) FeO b) Fe_2O_3 c) Fe_3O_4 d) FeSO_4
259. In the electrolytic refining of zinc
 a) Graphite is at the anode. b) The impure metal is at the cathode.
 c) The metal ion get reduced at the anode. d) Acidified zinc sulphate is the electrolyte.
260. Which pair of lanthanides is used in glass, blowers, goggles?
 a) Np, Pu b) Pu, Gd c) Fm, Ho d) Pr, Ho
261. One of the following metals forms a volatile compound and this property is taken advantage for its extraction. This metal is
 a) Iron b) Nickel c) Cobalt d) Tungsten
262. Pig iron is converted into steel by reducing the amount of carbon contained in it, in a:
 a) Blast furnace b) Pyrite burner c) Bessemer's converter d) None of these
263. Which one of the following forms a complex of coordination number 2 with excess of CN^- ions?
 a) Cu^+ b) Ag^+ c) Ni^{2+} d) Fe^{2+}
264. The radius of La^{3+} (Atomic number of La = 57) is 1.06 \AA . Which one of the following given values will be closest to the radius of Lu^{3+} ?
 (Atomic number of Lu=71)
 a) 1.60 \AA b) 1.40 \AA c) 1.06 \AA d) 0.85 \AA
265. When oxyhaemoglobin changes to deoxyhaemoglobin, Fe^{2+} ion changes from
 a) Diamagnetic to paramagnetic b) Paramagnetic to diamagnetic
 c) Diamagnetic to ferromagnetic d) Paramagnetic to ferromagnetic
266. Which statement is incorrect?
 a) Silver glance mainly contains silver sulphide
 b) Gold is found in native state
 c) Zinc blende mainly contains zinc chloride
 d) Copper pyrites also contain Fe_2S_3

267. Amongst TiF_6^{2-} , CoF_6^{3-} , Cu_2Cl_2 and NiCl_4^{2-}
(atomic no Ti=22, Co=27, Cu=29, Ni=28) the colourless species are
a) CoF_6^{3-} and NiCl_4^{2-} b) TiF_6^{2-} and CoF_6^{3-} , c) Cu_2Cl_2 and NiCl_4^{2-} d) TiF_6^{2-} and Cu_2Cl_2
268. Among the following series of transition metal ions, the one where all metal ions have $3d^2$ electronic configuration is:
a) Ti^{3+} , V^{2+} , Cr^{3+} , Mn^{4+}
b) Ti^+ , V^{4+} , Cr^{6+} , Mn^{7+}
c) Ti^{4+} , V^{3+} , Cr^{2+} , Mn^{3+}
d) Ti^{2+} , V^{3+} , Cr^{4+} , Mn^{5+}
269. Calomel (Hg_2Cl_2) on reaction with ammonium hydroxide gives
a) HgO b) Hg_2O
c) $\text{NH}_2\text{—Hg—Hg—Cl}$ d) HgNH_2Cl
270. Steel resistant to acid is:
a) Carbon steel b) Molybdenum steel c) Stainless steel d) Nickel steel
271. Non-stoichiometric compounds are formed by:
a) Alkali metals
b) Transition elements
c) Noble gases
d) More than one of the above elements
272. *d*-block elements generally form:
a) Covalent hydrides b) Metallic hydrides c) Interstitial hydrides d) Salt-like hydrides
273. The element present in red blood cells of human blood is:
a) Fe b) Ra c) Co d) All of these
274. The element which exhibit both vertical and horizontal similarities are:
a) Inert gas elements
b) Representative elements
c) Rare elements
d) Transition elements
275. Which occurs in nature in free state?
a) Fe b) Co c) Ni d) Pt
276. H_2S is passed in aqueous solution of to give a white precipitate of ZnS .
a) ZnCl_2 b) $\text{Zn}(\text{NO}_3)_2$ c) $(\text{CH}_3\text{COO})_2\text{Zn}$ d) None of these
277. Which of the following are *d*-block elements but not regarded as transition elements?
a) Cu, Ag, Au b) Zn, Cd, Hg c) Fe, Co, Ni d) Ru, Rh, Pd
278. Which is the least soluble in water?
a) AgCl b) Ag_2S c) AgI d) AgBr
279. Which of the following elements is alloyed with copper to form brass?
a) Bismuth b) Zinc c) Lead d) Antimony
280. When KMnO_4 reacts with acidified FeSO_4 :
a) Only FeSO_4 is oxidized
b) Only KMnO_4 is oxidized
c) FeSO_4 is oxidized and KMnO_4 is reduced
d) None of the above
281. The nitrate of which metal leaves metallic globule on heating strongly?
a) $\text{Cu}(\text{NO}_3)_2$ b) AgNO_3 c) NaNO_3 d) $\text{Pb}(\text{NO}_3)_2$
282. Mond process is used in the extraction of:
a) Co b) Ni c) Mo d) Zn
283. Blue colour/precipitate will be obtained when $\text{K}_4[\text{Fe}(\text{CN})_6]$ reacts with:
a) $\text{Fe}(\text{II})$ ions b) $\text{Cu}(\text{II})$ ions c) $\text{Fe}(\text{III})$ ions d) $\text{Cu}(\text{I})$ ions
284. Two of the constituents of German silver are

- a) Ag + Cu b) Ag + Zn c) Cu + Zn d) Cu + Sn
285. A metal is left exposed to air for sometime. It becomes coated with basic green carbonate. The metal is:
a) K b) Cu c) Zn d) Al
286. Zn and Cd do not show variable valency, because:
a) They have only two electrons in outermost subshells
b) Their *d*-subshells are complete
c) Their *d*-subshells are incomplete
d) They are relatively soft metals
287. One of the important uses of ferrous sulphate is in the:
a) Manufacture of blue-black ink
b) Manufacture of chalks
c) Preparation of hydrogen sulphide
d) Preparation of sulphur dioxide
288. Blue vitriol is:
a) $\text{CuSO}_4 \cdot 7\text{H}_2\text{O}$ b) $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ c) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ d) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
289. Zn does not show variable valency because of
a) Complete *d*-subshell b) Inert pair effect c) $4s^2$ -subshell d) None of these
290. Which of the following statement (s) is/are correct with reference to the ferrous and ferric ions?
a) Fe^{3+} given brown colour with ammonium thiocyanate
b) Fe^{3+} gives brown colour with potassium ferricyanide
c) Fe^{3+} gives red colour with potassium thiocyanate
d) Fe^{2+} gives red precipitate with potassium ferricyanide
291. In vapour state $\text{Cu}(\text{NO}_3)_2$ and $\text{Cu}_2(\text{CH}_3\text{COO})_4 \cdot 2\text{H}_2\text{O}$ exist as:
a) Dimer, monomer b) Monomer, dimer c) Monomer, monomer d) Dimer, dimer
292. Which oxide is least stable at room temperature?
a) CuO b) Ag_2O c) ZnO d) Sb_2O_3
293. Which of the following metal is correctly matched with its ore?
- | Metal | Ore | | |
|--------------|-------------|-----------|----------|
| a) Zinc | Calamine | b) Silver | Ilmenite |
| c) Magnesium | Cassiterite | d) Tin | Azurite |
294. Iron is obtained on large scale from haematite(Fe_2O_3):
a) By reduction
b) By oxidation
c) By reduction followed by oxidation
d) By oxidation followed by reduction
295. Which oxide of manganese is amphoteric?
a) MnO b) MnO_2 c) Mn_2O_7 d) Mn_2O_3
296. Which among the following metals does not dissolve in aqua regia?
a) Pt b) Pd c) Au d) Ir
297. The one which has lowest ox. no. of Hg:
a) $\text{Hg}(\text{NO}_2)_2$ b) HgCl_2 c) $\text{Hg}(\text{NO}_3)_2$ d) Hg_2Cl_2
298. The fraction of chlorine precipitated by AgNO_3 solution from $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ is:
a) $1/2$ b) $2/3$ c) $1/3$ d) $1/4$
299. Which statement is correct?
a) Cd rods are used in atomic reactors to slow down nuclear reaction
b) Cd is a good absorber of neutrons
c) CdS is used as pigment
d) All of the above
300. Acidified solution of chromic acid on treatment with hydrogen peroxide yields
a) $\text{CrO}_5 + \text{H}_2\text{O}$ b) $\text{H}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{O} + \text{O}_2$

- d) Strongly magnetic
314. Which has the lowest melting point?
 a) Cs b) Na c) Hg d) Sn
315. The temperature of the slag zone in the metallurgy of iron using blast furnace is
 a) 1200-1500°C b) 1500-1600°C c) 400-700°C d) 800-1000°C
316. Oxygen is absorbed by molten Ag, which is evolved on cooling and the silver particles are scattered; the phenomenon is known as:
 a) Silvering of mirror b) Spitting of silver c) Frosting of silver d) Hairing of silver
317. Which of the following statements regarding copper salts is not true?
 a) Copper(I) Disproportionates into Cu and Cu(II) in aqueous solution
 b) Copper(I) can be stabilised by the formation of insoluble complex compounds such as CuCl_2^- and $\text{Cu}(\text{CN})_2^-$
 c) Copper(I) oxide is red powder
 d) Hydrated CuSO_4 is $[\text{Cu}(\text{H}_2\text{O})_4]\text{SO}_4 \cdot \text{H}_2\text{O}$
318. Which compound cannot be prepared?
 a) $\text{Zn}(\text{OH})_2$ b) $\text{Cd}(\text{OH})_2$ c) $\text{Hg}(\text{OH})_2$ d) HgCl_2
319. The colour of solution obtained by adding excess of KI in the solution of HgCl_2 is:
 a) Orange b) Brown c) Red d) Colourless
320. Which of the following is the correct sequence of atomic weights of given elements?
 a) $\text{Co} > \text{Ni} > \text{Fe}$ b) $\text{Fe} > \text{Co} > \text{Ni}$ c) $\text{Fe} > \text{Ni} > \text{Co}$ d) $\text{Ni} > \text{Co} > \text{Fe}$
321. Which of the following is known as lunar caustic when in the fused state?
 a) Silver nitrate b) Silver sulphate c) Silver chloride d) Sodium sulphate
322. Silver chloride dissolves in a solution of ammonia but not in water because:
 a) Ammonia is a better solvent than water
 b) Silver ion forms a complex ion with ammonia
 c) Ammonia is a stronger base than water
 d) The dipole moment of water molecule is higher than that of ammonia molecule
323. Which metal is ferromagnetic?
 a) Cr b) Fe c) Zn d) Al
324. Which of the following is called white vitriol?
 a) ZnCl_2 b) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ c) $\text{Al}_2(\text{SO}_4)_3$ d) $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
325. The process of heating of steel to temperature much below redness and then slowly cooling is called:
 a) Annealing b) Hardening c) Tempering d) Case hardening
326. "925 fine silver" means an alloy of
 a) 7.5 % of Ag and 92.5 % Cu b) 92.5 % Ag and 7.5% Cu
 c) 80% Ag and 20% Cu d) 90% Ag and 10% Cu
327. The compound used in preservation of wood is:
 a) NaCl b) HgCl_2 c) ZnCl_2 d) CaCl_2
328. In photography we use
 a) AgI b) NH_3 c) AgCl d) AgBr
329. Brass, bronze and German silver have one common metal. This is
 a) Zn b) Fe c) Al d) Cu
330. Transition metal used for making joins in jewellery is
 a) Zn b) Cu c) Ag d) Cd
331. Which of the following elements has the maximum first ionization potential?
 a) V b) Ti c) Mn d) Cr
332. Fulminating gold is:
 a) CuFeS_2
 b) FeS_2
 c) $\text{Au}(\text{NH}_2) = \text{NH}$ or AuN_2H_3
 d) AuCl_3

333. The transition metal present in vitamin B₁₂ is:
 a) Fe b) Co c) Ni d) Na
334. The most convenient method to protect bottom of ship made of iron is
 a) Coating with red lead oxide b) Connecting with 'Pb' block
 c) Connecting with 'Mg' block d) White tin plating
335. The reaction $\text{MnO}_4^- + e \rightarrow \text{MnO}_4^{2-}$ takes place in:
 a) Basic medium
 b) Acidic medium
 c) Neutral medium
 d) Both acidic and basic medium
336. Which metal is used in making cathode containers of dry cell?
 a) Zn b) Bi c) Cr d) Fe
337. Railway wagon axles are made by heating iron rods embedded in charcoal powder. This process is known as
 a) Tempering b) Case hardening c) Sherardising d) Annealing
338. The methods chiefly used for the extraction of lead and tin from their ores are respectively
 a) Self reduction and carbon reduction b) Self reduction and electrolytic reduction
 c) carbon reduction and self reduction d) Cyanide process and carbon reduction
339. The most stable oxidation state of lanthanides is
 a) +2 b) +4 c) 0 d) +3
340. In context of the lanthanoids, which of the following statements is not correct?
 a) There is a gradual decrease in the radii of the members with increasing atomic number in the series.
 b) All the members exhibit +3 oxidation state.
 c) Because of similar properties the separation of lanthanoids is not easy.
 d) A availability of 4*f*-electrons results in the formation of compounds in +4 state for all members of the series.
341. The matte obtained in the extraction of copper contains:
 a) FeSiO₂ b) SiO₂ + FeS c) FeS + Cu₂S d) CuS + SiO₂ + FeO
342. The electronic configuration of actinoids can to be assigned with degree of certainty because of
 a) Overlapping of inner orbitals
 b) Free movement of electrons over all the orbitals
 c) Small energy difference between 5*f* and 6*d* levels
 d) None of the above
343. In Mac Arthur forrest method, silver is extracted from the solution of Na[Ag(CN)₂] by the use of
 a) Fe b) Mg c) Cu d) Zn
344. Transition elements are coloured
 a) Due to unpaired *d*-electrons b) Due to small size
 c) Due to metallic nature d) All of the above
345. Which one of the elements with the following outer orbital configurations may exhibit the largest number of oxidation states?
 a) 3*d*²4*s*² b) 3*d*³4*s*² c) 3*d*⁵4*s*¹ d) 3*d*⁵4*s*²
346. Lanthanide contraction occurs because
 a) *f*-orbitals are incompletely filled
 b) *f*-orbital electrons are easily lost
 c) *f*-orbital do not come out on the surface of atom and are buried inside
 d) *f*-orbital electron are poor shielders of nuclear charge
347. Silver nitrate produces a black stain on skin due to:
 a) Its corrosive action
 b) Its reduction to metallic silver
 c) Its strong reducing action

- d) The formation of a complex compound
348. The most stable ion is:
 a) Mn^{2+} b) Sc^{4+} c) Fe^{2+} d) Mn^{3+}
349. The +3 ion of which one of the following has half-filled 4f sunshell?
 a) La b) Lu c) Gd d) Ce
350. Calomel may be freed from traces of metallic mercury by washing with:
 a) dil. HNO_3 b) dil. H_2SO_4 c) Water d) Aqua regia
351. One of the following is false for Hg:
 a) It can evolve hydrogen from H_2S
 b) It is metal
 c) It has high specific heat
 d) It is less reactive than H_2
352. Brass is an alloy of:
 a) Zn and Cu b) Cu and Sn c) Zn and Sn d) Cu, Zn and sn
353. Maximum paramagnetism in 3d-series is shown by:
 a) Mn b) Co c) Ni d) Fe
354. The metal used for making armoured steel for tanks and domestic safes is:
 a) Manganese b) Aluminium c) Lead d) Chromium
355. Which of the following metals has been used in making boats because it has resistance to corrosion by seawater?
 a) W b) Cu c) Ni d) Ti
356. Which ore contains both iron and copper?
 a) Cuprite b) Chalcocite c) Chalcopyrite d) Malachite
357. $\text{K}_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} \text{K}_2\text{CrO}_4 + \text{O}_2 + X$. In the above reaction X is
 a) CrO_3 b) Cr_2O_7 c) Cr_2O_3 d) CrO_5
358. Blood red colour solution is produced when ferric chloride solution is treated with:
 a) KCN b) KSCN c) KCNO d) $\text{K}_3[\text{Fe}(\text{CN})_6]$
359. The group of metals which is known as ferrous metals is:
 a) Fe, Co, Ni b) Ru, Rh, Pd c) Os, Ir, Pt d) Cr, Mn, Cu
360. In the chemical reaction;
 $\text{Ag}_2\text{O} + \text{H}_2\text{O} + 2e^- \rightarrow 2\text{Ag} + 2\text{OH}^-$
 a) Water is oxidised b) Electrons are reduced c) Silver is oxidised d) Silver is reduced
361. Which is not correct for transition metals?
 a) Variable oxidation states
 b) Complex formation
 c) Partially filled d-orbitals
 d) All the ions are colourless
362. Magnetic moment of $[\text{Ag}(\text{CN})_2]^-$ is zero. How many unpaired electrons are there?
 a) Zero b) 4 c) 3 d) 1
363. The first man-made atom is:
 a) Os b) Na c) Zr d) Tc
364. Amongst the following, the lowest degree of paramagnetism per mole of the compound at 298 K will be shown by
 a) $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$ b) $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ c) $\text{FeSO}_4 \cdot 6\text{H}_2\text{O}$ d) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
365. Which compound does not dissolve in hot, dil. HNO_3 ?
 a) HgS b) PbS c) CuS d) CdS
366. Heteropoly acids are formed by:
 a) Be b) Fe c) Mo d) Cr
367. When mercury (I) chloride is heated and the vapour so evolved are cooled, the substance on sublimation thus collected consists of

- a) Mercury and mercury (II) chloride
c) Mercury (I) and mercury (II) chloride
- b) Mercury (II) chloride
d) Mercury
368. Steel contains:
a) 2.5–4.5%C b) 0.5–1.5%C c) 0.12–0.25%C d) 1–2%C
369. Silver halides are used in photography because they are:
a) Photosensitive
b) Soluble in hypo solution
c) Soluble in NH_4OH
d) Insoluble in acids
370. A lady's 18 carat gold wedding ring has become discoloured with some minute drops of mercury from a broken thermometer. Which of the following treatments would restore it to its original condition?
a) Place it in hot strong nitric acid
b) Place it in cold dilute hydrochloric acid
c) Heat it gently in a sand-bath
d) Heat it in chlorine
371. Oxidation state of Hg in amalgam is:
a) Zero b) One c) Two d) Three
372. In the manufacture of iron from an iron oxide ore, limestone is added because it acts as:
a) An oxidizing agent b) A reducing agent c) A flux d) A precipitating agent
373. The coordination number of copper in the complex formed by adding excess of NH_3 to CuSO_4 solution is:
a) 4 b) 2 c) 6 d) 5
374. In order to refine "blister copper" it is melted in a furnace and is stirred with green logs of wood. The purpose is:
a) To expel the dissolved gases in the blister copper
b) To bring the impurities to surfaces and oxidise them
c) To increase the carbon content of copper
d) To reduce the metallic oxide impurities with hydrocarbon gases liberated from the wood
375. Permanent magnets are generally made of alloys of
a) Mn b) Co c) Pb d) Zn
376. Which metal sulphide is not black?
a) NiS b) CoS c) CuS d) ZnS
377. The white solid that turns black on addition of NH_4OH is:
a) AgCl b) PbCl_2 c) Hg_2Cl_2 d) Hg_2I_2
378. Which of the following represents ammonium molybdate?
a) $(\text{NH}_4)_2\text{MoO}_4$ b) $(\text{NH}_4)\text{MoO}_2$ c) $(\text{NH}_4)_2\text{MoO}_3$ d) $\text{NH}_4 \cdot 12\text{MoO}_3$
379. Gold and silver are called noble metals, because:
a) They do not normally react
b) Even acids cannot dissolve them
c) They are used in jewellery
d) They are worn by noble men
380. The colour of ${}_{62}\text{Sm}^{3+}$ is yellow. The expected colour of ${}_{66}\text{Dy}^{3+}$ is
a) Yellow b) Red c) Blue d) Green
381. Which is not an ore of iron?
a) Haematite b) Magnetite c) Cassiterite d) Limonite
382. On adding excess of NH_3 solution to CuSO_4 solution, the dark blue colour is due to
a) $[\text{Cu}(\text{NH}_3)]^+$ b) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ c) $[\text{Cu}(\text{NH}_3)_2]^{2+}$ d) None of these
383. Other forms of iron can be produced from:
a) Cast iron b) Wrought iron c) Pig iron d) Steel
384. The variety of iron having highest melting point is:
a) Pig iron b) Cast iron c) Wrought iron d) Steel

385. Most of the transition metals are paramagnetic due to the presence of:
 a) Completed *d*-orbitals b) Completed *f*-orbitals c) Unpaired electrons d) None of these
386. Spelter is:
 a) Impure Cu b) Impure zinc c) ZnO d) CuO
387. Which of the following is philosopher's wool?
 a) ZnO b) HgO c) Ag₂O d) CuO
388. The density of transition metals....in a series.
 a) Gradually increases b) Gradually decreases c) Remains constant d) None of these
389. Silver containing lead as impurity is purified by
 a) Poling b) Cupellation c) Lavigation d) Distillation
390. Which of the following elements is present as the impurity to the maximum extent in the pig iron?
 a) Phosphorus b) Manganese c) Carbon d) Silicon
391. The magnetic moment of Cu²⁺ ion is
 a) 2.73 b) Zero c) 1.93 d) 1.73
392. Percentage of nickel in nickel steel is:
 a) 1.5% b) 3.5% c) 6.5% d) 8.5%
393. The formula of mercurous ion is:
 a) Hg⁺ b) Hg₂⁺ c) Hg₂²⁺ d) None of these
394. Which pair consists only acidic oxides?
 a) CrO₃, Mn₂O₇ b) ZnO₂, Al₂O₃ c) CaO, ZnO d) Na₂O, Al₂O₃
395. The extraction of which of the following metals involves bessemerization?
 a) Fe b) Ag c) Al d) Cu
396. Nessler's reagent is:
 a) K₂HgI₄ b) K₂HgI₄ c) K₂HgI₄ + NaOH d) K₂HgI₄ + NaOH
397. Mac Arthur and Forest cyanide process is used in the extraction of:
 a) Cu b) Ag and Au c) Fe d) Cr
398. Which is the chief ore of copper?
 a) Galena b) Copper pyrites c) Sphalerite d) Siderite
399. Spiegeleisen is an alloy of:
 a) Fe and Mn b) Fe, Mn and C c) Fe, Mn and Cr d) Fe and Cr
400. Among the following ions (hydrated), the colourless metal ion is
 a) Cu⁺ b) Cu²⁺ c) Fe²⁺ d) Mn²⁺
401. Transition elements exhibit positive oxidation states only. This is because of:
 a) Their large size of the atoms
 b) Their electropositive nature
 c) Their electronegative nature
 d) Their paramagnetic nature
402. Transition metal with low oxidation number will act as
 a) An oxidizing agent b) A base c) An acid d) None of these
403. The composition of bell metal is
 a) Cu + Sn b) Cu + Ni c) Cu + Zn d) Cu + Ag
404. The most correct statement for transition metals is:
 a) They possess low b.p.
 b) They exhibit inert pair effect
 c) They exhibit variable oxidation states
 d) They do not possess catalytic property
405. During the process of electrolytic refining of copper, some metals present as impurity settle as 'anode mud'.
 These are
 a) Fe and Ni b) Ag and Au c) Pb and Zn d) Se and Ag

406. A compound of a metal ion M^{x+} ($Z = 24$) has a spin only magnetic moment of $\sqrt{15}$ Bohr Magnetons. The number of unpaired electrons in the compound are:
 a) 2 b) 4 c) 5 d) 3
407. Lightest transition element is:
 a) Fe b) Sc c) Os d) Co
408. AuCl_3 when heated in air gives:
 a) Gold oxide b) Gold perchlorate c) Gold nitride d) AuCl
409. White vitriol is:
 a) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ b) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ c) $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ d) $\text{NiSO}_4 \cdot 5\text{H}_2\text{O}$
410. The metal which liberates hydrogen from hot NaOH solution is:
 a) Zn b) Cu c) Ag d) Fe
411. A yellow precipitate will be obtained if AgNO_3 is added to a solution of:
 a) KIO_3 b) KI c) CHI_3 d) CH_2I_2
412. Which form of iron has lowest percentage of carbon?
 a) Cast iron
 b) Wrought iron
 c) Steel
 d) All have same percentage
413. The element that does not form a nitride is:
 a) Al b) Mg c) Ag d) Ca
414. When dil. H_2SO_4 is added to aqueous solution of potassium chromate, yellow colour of solution turns to orange colour. It indicates
 a) Chromate ions are reduced.
 b) Chromate ions are oxidised.
 c) Mono centric complex is converted into dicentric complex.
 d) Oxygen gets removed from chromate ions.
415. Copper exhibits only +2 oxidation state in its stable compounds. Why?
 a) Copper is transition metal in +2 state.
 b) +2 state compounds of copper are formed by exothermic reactions.
 c) Electron configuration of copper in +2 state is $[\text{Ar}]3d^9 4s^0$.
 d) Copper gives coloured compounds in +2 state.
416. In blast furnace the highest temperature is in:
 a) Reduction zone b) Slag zone c) Combustion zone d) Fusion zone
417. Anhydrous ferric chloride is prepared by
 a) Dissolving $\text{Fe}(\text{OH})_3$ in concentrated HCl. b) Dissolving $\text{Fe}(\text{OH})_3$ in dilute HCl.
 c) Passing dry HCl over heated iron scrap. d) Passing dry Cl_2 gas over heated iron scrap.
418. Green vitriol is
 a) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ b) $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ c) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ d) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
419. Photographic films or plates have ... as an essential ingredient.
 a) Silver bromide b) Silver oxide c) Silver thiosulphate d) Silver nitrate
420. During the extraction of gold the following reactions take place

$$\text{Au} + \text{CN}^- + \text{H}_2\text{O} \xrightarrow{\text{O}_2} [\text{X}]$$

$$[\text{X}] + \text{Zn} \rightarrow [\text{Y}] + \text{Au}$$
 X and Y are respectively
 a) $[\text{Au}(\text{CN})_2]^-$ and $[\text{Zn}(\text{CN})_6]^{4-}$ b) $[\text{Au}(\text{CN})_4]^{2-}$ and $[\text{Zn}(\text{CN})_4]^{2-}$
 c) $[\text{Au}(\text{CN})_4]^{3-}$ and $[\text{Zn}(\text{CN})_4]^{2-}$ d) $[\text{Au}(\text{CN})_2]^-$ and $[\text{Zn}(\text{CN})_4]^{2-}$
421. Second series of transition elements starts with:
 a) Yttrium b) Chromium c) Zinc d) Scandium
422. The electronic configuration of chromium is

- a) 3 b) 4 c) 2 d) 1
439. The final step in the metallurgical extraction of Cu metal from Cu pyrites takes place in a Bessemer converter. The reaction taking place is:
- a) $\text{Cu}_2\text{S} + \text{O}_2 \rightarrow 2\text{Cu} + \text{SO}_2$
 b) $4\text{Cu}_2\text{O} + \text{FeS} \rightarrow 8\text{Cu} + \text{FeSO}_4$
 c) $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$
 d) $\text{Cu}_2\text{S} + 2\text{FeO} \rightarrow 2\text{CuO} + 2\text{Fe} + \text{SO}_2$
440. The smelting of iron in a blast furnace involves the following processes:
- a) Combustion b) Reduction c) Slag formation d) All of these
441. The flux used in the smelting of copper is:
- a) Limestone b) Magnesia c) Silica d) Coke
442. The magnetic moment of a salt containing Zn^{2+} ion is
- a) 0 b) 1.87 c) 5.92 d) 2
443. The common metal in brass, bronze and german silver is:
- a) Cu b) Mg c) Al d) Zn
444. Which of the following is not a member of 3d-transition series?
- a) Fe b) Co c) Au d) Cu
445. The formula of azurite is
- a) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ b) $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ c) $\text{CuCO}_3 \cdot 2\text{Cu}(\text{OH})_2$ d) $\text{CuSO}_4 \cdot \text{Cu}(\text{OH})_2$
446. The formula of haematite is :
- a) Fe_3O_4 b) Fe_2O_3 c) FeCO_3 d) FeS_2
447. A substance which turns blue when treated with water is:
- a) CuSO_4 b) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ c) CoSO_4 d) $\text{Au}_2(\text{SO}_4)_3$
448. Which metal does not form amalgam?
- a) Fe b) Cu c) Ag d) Zn
449. Which of the following is correct?
- a) Calomel is mercuric chloride
 b) Calomel is widely used as an antiseptic
 c) Calomel is used medically as purgative
 d) Calomel is freely soluble in water
450. The process used in obtaining metallic silver from argentite is:
- a) Fused mixture of Ag_2S and KCl is electrolysed
 b) Ag_2S is reduced with CO
 c) Ag_2S is roasted to Ag_2O which is reduced with C
 d) Treating with NaCN solution followed by metal displacement with zinc
451. Which one of the following pairs of substances on reaction will not evolve H_2 gas?
- a) Iron and H_2SO_4 (aq)
 b) Iron and steam
 c) Copper and HCl(g)
 d) Sodium and ethyl alcohol
452. Which statement about group 12 elements is wrong?
- a) Zinc forms an alloy with copper
 b) Zn^{2+} is stable
 c) Mercury gives compounds with +1 and +2 valencies
 d) Hg is a liquid element
453. Which of the following is coated over iron articles to protect iron from corrosion?
- a) Paint b) Zinc metal c) Tin metal d) All of these
454. The gas obtained by reactions of $\text{K}_4\text{Fe}(\text{CN})_6$ with conc. H_2SO_4 is
- a) H_2S b) CO c) NO_2 d) CO_2
455. Blister copper is

- a) Impure Cu
c) Pure Cu
- b) Cu alloy
d) Cu having 1% impurity
456. Effective magnetic moment of Sc^{3+} ion is
a) 1.73 b) 0 c) 5.92 d) 2.83
457. ZnS containing minute traces of MnS becomes:
a) Deliquescent b) Phosphorescent c) Hygroscopic d) None of these
458. Platinum metal can be dissolved in:
a) Hot concentrated hydrochloric acid
b) Hot concentrated nitric acid
c) Hot dilute sulphuric acid
d) A mixture of hydrochloric and nitric acids
459. Ruthenium carbonyl is:
a) $\text{Ru}(\text{CO})_4$ b) $\text{Ru}(\text{CO})_5$ c) $\text{Ru}(\text{CO})_8$ d) $\text{Ru}(\text{CO})_6$
460. Preparation of looking mirrors involves the use of:
a) Red lead
b) Ammoniacal silver nitrate
c) Ammoniacal AgNO_3 + red lead
d) Ammoniacal AgNO_3 + red lead + HCHO
461. In the dichromate dianion :
a) 4 Cr—O bonds are equivalent
b) 6 Cr—O bonds are equivalent
c) all Cr—O bonds are equivalent
d) all Cr—O bonds are non-equivalent
462. In the electrolytic purification of copper some gold is found in the:
a) Cathode b) Cathode mud c) Anode mud d) None of these
463. Percentage of gold in 21.6 carat gold is:
a) 21.6 b) 90 c) 10 d) 70
464. An explosion takes place when conc. H_2SO_4 is added to KMnO_4 . Which of the following is formed?
a) Mn_2O_7 b) MnO_2 c) MnSO_4 d) Mn_2O_3
465. Which statement is not correct?
a) $\text{Fe}(\text{CO})_5$ reacts with Br_2Cl_4
b) Carbonyl complexes are usually formed with transition metals
c) All transition metals form mono metallic carbonyls
d) The decomposition of $\text{Ni}(\text{CO})_4$ to give Ni is used in the extraction of Ni by Mond's process
466. Which is the common oxidation state of the first transition series of elements?
a) +2 b) +6 c) +8 d) +4
467. Which of the following is correct?
a) Duralumin : Al + Cu + Mg + Ag b) German silver: Cu + Zn + C
c) Gun metal: Cu + Zn + Sn d) Solder : Pb + Al
468. As percentage of carbon increase in iron, its hardness:
a) Decreases b) Increases c) Remains same d) None of these
469. Which oxide of Mn is acidic in nature?
a) MnO b) Mn_2O_7 c) Mn_2O_3 d) MnO_2
470. Corrosive sublimate (HgCl_2) can be used to distinguish between
a) Formic acid and acetic acid b) Acetaldehyde and butanone
c) Formaldehyde and propanone d) All of the above
471. KMnO_4 in basic medium is used as
a) Strong oxidising agent b) Strong reducing agent
c) Strong hydrogenating agent d) Poor reducing agent
472. *d*-block elements are arranged inof periodic table.

- a) Three series b) Six series c) Two series d) Four series
473. Which one of the following metals is extracted by a carbon reduction process?
 a) Copper b) Iron c) Aluminium d) Magnesium
474. The spin only magnetic moment of Mn^{4+} ion is nearly
 a) 3 BM b) 6 BM c) 4 BM d) 5 BM
475. Coinage alloy has the composition of:
 a) Ag + Cu + Ni b) Au + Ag + Cu c) Au + Zn + Ag d) Ag + Fe + Cu
476. Which of the following is used for sterilization of surgical instruments?
 a) $HgCl_2$ b) $ZnCl_2$ c) Hg_2Cl_2 d) ZnO
477. Rusting of iron in moist air involves:
 a) Loss of electrons by Fe
 b) Gain of electrons by Fe
 c) Neither gain nor loss of electrons
 d) Hydration of Fe
478. A chocolate brown coloured compound with acetic acid and potassium ferrocyanide is obtained from a salt solution containing:
 a) Cu b) Cd c) Sn d) Hg
479. What is the oxidation state of iron in Mohr's salt?
 a) +3 b) 0 c) +2 d) +1
480. Chrome green is
 a) Chromium nitrate b) Chromium sulphate c) Chromium oxide d) Chromium chloride
481. Which lanthanoid compound is used as a most powerful liquid lasers after dissolving it in selenium oxychloride?
 a) Cerium oxide b) Neodymium oxide c) Promethium sulphate d) Ceric sulphate
482. A transition metal ion exists in its highest oxidation state. It is expected to behave as
 a) A chelating agent b) A central metal in a coordination compound
 c) An oxidising agent d) A reducing agent
483. For *d*-block elements the first ionisation potential is of the order
 a) $Zn > Fe > Cu > Cr$ b) $Sc = Ti < V = Cr$
 c) $Zn < Cu < Ni < Co$ d) $V > Cr > Mn > Fe$
484. Metallic bond is stronger in transition metals than alkali and alkaline earth metals because of:
 a) More number of electrons including *d*-electrons
 b) Large size of the atoms
 c) Paramagnetism
 d) Diamagnetism
485. Automobile engine blocks are made up of:
 a) Stainless steel
 b) Nickel-chromium steel
 c) Cast iron
 d) Wrought iron
486. Silver amalgam is used in:
 a) Silvering of mirror b) Filling of teeth c) Both (a) and (b) d) None of these
487. Which statement is not correct?
 a) Potassium dichromate oxidises a secondary alcohol into a ketone
 b) Potassium permanagnate is a weaker oxidising substance than potassium dichromate
 c) Potassium permanganate is a stronger oxidizing substance
 d) All of the above statement are correct
488. The pair of metals which dissolve in $NaOH(aq.)$ is:
 a) Al, Cu b) Zn, Cd c) Pb, Sn d) Zn, Al
489. The catalytic activity of the transition metals and their compounds is ascribed to their

- a) Magnetic behavior
 b) Chemical reactivity
 c) Ability to adopt multiple oxidation states and their complexing ability
 d) Unfilled *d*-orbitals
490. Acidified potassium dichromate is treated with hydrogen sulphide. In the reaction the oxidation number of chromium :
- a) Increases from +3 to +6
 b) Decreases from +6 to +3
 c) Remains unchanged
 d) Decreases from +6 to +2
491. Zinc reacts with conc. H_2SO_4 to produce:
- a) $ZnSO_4$ b) $ZnCO_3$ c) Zn d) None of these
492. In which metal's metallurgical process carbon is used for reduction of metal oxides?
- a) Na b) Ag c) Fe d) Hg
493. A metal which is 'not' affected by conc. H_2SO_4 , HNO_3 or alkalis forms a compound X. This compound X can be used to give a complex which finds its application for toning in photography. The metal is:
- a) Au b) Ag c) Hg d) Cu
494. Lithopone, a white pigment, consists of:
- a) Al_2O_3 and $CaCO_3$ b) BaS and $PbSO_4$ c) ZnS and $BaSO_4$ d) PbS and MgO
495. The aqueous solution containing which one of the following ions will be colourless?
- a) Ti^{3+} b) Mn^{2+} c) Sc^{3+} d) Fe^{2+}
496. Among the lanthanoids which was obtained by synthetic methods?
- a) Lu b) Pm c) Pr d) Gd
497. The tendency to show complex formation is maximum in:
- a) *s*-block elements b) *p*-block elements c) *d*-block elements d) *f*-block elements
498. *5f*-level is successively filled up in:
- a) Lanthanoids b) Actinoids c) Rare gases d) Transition elements
499. Potassium manganate (K_2MnO_4) is formed when:
- a) Cl_2 is passed into an aqueous $KMnO_4$ solution
 b) MnO_2 is fused with KOH in air
 c) Formaldehyde reacts with $KMnO_4$ in presence of strong alkali
 d) $KMnO_4$ reacts with concentrated H_2SO_4
500. The sandstone in some iron ores is removed by:
- a) Carbon filters b) Compressed air c) Limestone d) Sulphuric acid
501. Copper sulphate solution reacts with KCN and gives
- a) $K_3[Cu(CN)_4]$ b) CuCN c) $Cu(CN)_2$ d) $K_2[Cu(CN)_4]$
502. Which of the following ions has the highest magnetic moment?
- a) Ti^{3+} b) Sc^{3+} c) Mn^{2+} d) Zn^{2+}
503. The colour of Mohr's salt, $(NH_4)_2SO_4Fe(SO_4) \cdot 6H_2O$ is:
- a) White b) Green c) Violet d) Blue
504. Of the ions Zn^{2+} , Ni^{2+} and Cr^{3+} , (atomic number of Zn=30, Ni=28, Cr=24)
- a) All three are coloured
 b) All three are colourless
 c) Only Zn^{2+} is colourless and Ni^{2+} and Cr^{3+} are coloured
 d) Only Ni^{2+} is coloured and Zn^{2+} and Cr^{3+} are colourless
505. A reagent that can separate Fe from Zn is:
- a) NaOH b) HCl c) H_2S d) $NaNO_2$
506. $KMnO_4$ in basic medium is reduced to
- a) K_2MnO_4 b) MnO_2 c) $Mn(OH)_2$ d) Mn^{2+}
507. Which of the following elements does not belong to the first transition series?

- a) Ag b) Fe c) Cu d) V
508. Transition metals form complexes in their zero oxidation state. The example of the above fact is:
 a) $\text{Mn}_2(\text{CO})_{10}$ b) $[\text{Cu}(\text{NH}_3)_4]\text{Cl}_2$ c) $\text{Zn}_2[\text{Fe}(\text{CN})_6]$ d) $[\text{Ag}(\text{NH}_3)_2]\text{OH}$
509. Which one of the following properties would you not expect copper to exhibit?
 a) Malleability
 b) High thermal conductivity
 c) Low electrical conductivity
 d) Ductility
510. Calomel is:
 a) Hg_2Cl_2 and Hg b) HgCl_2 c) $\text{Hg} + \text{HgCl}_2$ d) Hg_2Cl_2
511. Which of the following reactions represents developing in photography?
 a) $\text{AgNO}_3 + \text{NaBr} \rightarrow \text{AgBr} + \text{NaNO}_3$
 b) $\text{AgBr} + 2\text{NH}_3 \rightarrow [\text{Ag}(\text{NH}_3)_2]\text{Br}$
 c) $\text{AgBr} + 2\text{Na}_2\text{S}_2\text{O}_3 \rightarrow \text{Na}_3[\text{Ag}(\text{S}_2\text{O}_3)_2] + \text{NaBr}$
 d) $\text{C}_6\text{H}_4(\text{OH})_2 + 2\text{AgBr}^x \rightarrow \text{C}_6\text{H}_4\text{O}_2 + 2\text{HBr} + 2\text{Ag}$
512. Extraction for zinc from zinc blende is achieved by
 a) Electrolytic reduction
 b) Roasting followed by reduction with carbon
 c) Roasting followed by reduction with another metal
 d) Roasting followed by self reduction
513. Chromium compound used in tanning of leather is:
 a) Cr_2O_3 b) CrO_2Cl_2 c) CrCl_3 d) $\text{K}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$
514. $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ is called
 a) Green salt b) Glauber's salt c) Mohr's salt d) Alum
515. When MnO_2 is fused with KOH, a coloured compound formed, the product and its colour is
 a) K_2MnO_4 , purple colour b) KMnO_4 , purple c) Mn_2O_3 , brown d) Mn_3O_4 , black
516. Anhydrous CuCl_2 and CuBr_2 exist as:
 a) Monomer b) Dimer c) Trimer d) polymer
517. From a solution of CuSO_4 , the metal used to recover copper is :
 a) Na b) Ag c) Hg d) Fe
518. When MnO_4 is fused with KOH, a coloured compound is formed. The product and its colour is
 a) K_2MnO_4 , purple colour b) Mn_2O_3 , brown
 c) Mn_2O_4 , black d) KMnO_4 , purple
519. Cerium (Z = 58) is an important member of the lanthanides. Which of the following statements about cerium is incorrect?
 a) The common oxidation state of cerium are +3 and +4.
 b) The +3 oxidation state of cerium is more stable than the +4 oxidation state.
 c) The +4 oxidation state of cerium is not known in solutions.
 d) Cerium (IV) acts as an oxidizing agent.
520. Which metal is used for filament of electric bulb?
 a) Pt b) Fe c) W d) Cu
521. Zinc does not show variable valency like *d*-block elements because
 a) It is low melting
 b) *d*-orbital is complete
 c) It is a soft metal
 d) Two electrons are present in the outermost orbit
522. In haemoglobin the iron shows oxidation state :
 a) +2 b) +3 c) +1 d) +4
523. The term 'fool's gold' is used for a mineral which shines like gold. It is:
 a) Iron pyrite b) Copper glance c) Cinnabar d) Cadmium sulphide
524. An aqueous solution of CuSO_4 and NH_4OH gives a deep blue complex of:

- a) Cuprammonium sulphate
 b) Cuprammonium hydroxide
 c) Sodium hexametaphosphate
 d) None of the above
525. Blow holes of steel are removed by adding:
 a) C b) Ni c) Sand d) Spiegeleisen
526. A mixture of TiO_2 and BaSO_4 is called
 a) Titanox b) Lithopone c) White pigment d) None of these
527. Which of the following has highest b.p.?
 a) Cr b) Ti c) Fe d) Co
528. Which group of metals is known as Pt-metals?
 a) Fe, Co, Ni b) Ag, Au, Cu c) Zn, Cd, Hg d) Ru, Rh, Pd
529. The compound ZnFe_2O_4 is
 a) A normal spinel compound b) Interstitial compound
 c) Coordination compound d) Double salt compound
530. Iron exhibits +2 and +3 oxidation states. Which of the following statements about iron is incorrect?
 a) Ferrous compounds are relatively more ionic than the corresponding ferric compounds.
 b) Ferrous compounds are less volatile than the corresponding ferric compounds.
 c) Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds.
 d) Ferrous oxide is more basic in nature than the ferric oxide.
531. Iron is manufactured from the ore
 a) Haematite b) Cryolite c) Bauxite d) Chalcopyrite
532. After partial roasting the sulphide ore of copper is reduced by:
 a) Reduction by carbon b) Electrolysis c) Self reduction d) Cyanide process
533. The bonds presents in the structure of dichromate ion are
 a) Four equivalent Cr—O bonds only.
 b) Six equivalent Cr—O bonds and one O—O bond.
 c) Six equivalent Cr—O bonds and one Cr—Cr bond.
 d) Six equivalent Cr—O bonds and one Cr—O—Cr bond.
534. Cu^{2+} ions would be reduced to cuprous ion if their solutions are mixed with an aqueous:
 a) KI solution b) KCl solution c) K_2CO_3 solution d) K_2SO_4 solution
535. Which one of the following elements constitutes a major impurity in pig iron?
 a) Silicon b) Oxygen c) Sulphur d) Graphite
536. Percentage of silver in German silver is:
 a) 1.5% b) 2.5% c) 10% d) Zero percent
537. Oxford process is used in extraction of:
 a) Fe b) Co c) Pt d) Ni
538. One of the product formed when $\text{K}_2\text{Cr}_2\text{O}_7$ reacts with conc H_2SO_4 in cold is
 a) CrO_3 b) $\text{Cr}_2(\text{SO}_4)_3$ c) Cr_2O_3 d) CrO_4Cl_2
539. Addition of $\text{K}_4[\text{Fe}(\text{CN})_6]$ solution to FeCl_3 solution gives:
 a) Ferro-ferricyanide b) Ferri - ferrocyanide c) Ferri-ferricyanide d) None of these
540. The reaction between copper and hot concentrated sulphuric acid produces:
 a) SO_2 b) SO_3 c) H_2 d) Cu^+ ions
541. Red hot steel rod on suddenly immersing in water becomes:
 a) Soft and malleable b) Hard and brittle c) Tough and ductile d) Fibrous
542. Which of the following is obtained when auric chloride reacts with sodium chloride?
 a) $\text{Na}[\text{AuCl}]$ b) $\text{Na}[\text{AuCl}_2]$ c) $\text{Na}[\text{AuCl}_3]$ d) $\text{Na}[\text{AuCl}_4]$
543. Lanthanum is grouped with *f*-block elements because
 a) It has partially filled *f*-orbitals
 b) It has both partially filled *f* and *d*-orbitals

- c) The properties of lanthanum are very similar to the elements of $4f$ -block
d) It is just before Ce in the Periodic Table
544. The point of dissimilarity between lanthanides and actinides is
a) Three outermost shells are partially filled b) They show oxidation state of +3 (common)
c) They are called inner transition elements d) They are radioactive in nature
545. Which of the following is called white vitriol?
a) $ZnCl_2$ b) $MgSO_4 \cdot 7H_2O$ c) $Al_2(SO_4)_3$ d) $ZnSO_4 \cdot 7H_2O$
546. Which metal is purified by Pattinson's process?
a) Ag b) Au c) Fe d) Sb
547. Which of the following have highest melting points?
a) p -block elements b) s -block elements c) d -block elements d) None of the above
548. Ferric oxide in furnace is reduced by:
a) C b) H_2 c) CO d) CO_2
549. Which statement is incorrect?
a) Iron belongs to $3d$ -transition series of the periodic table
b) Iron belongs to f -block of the periodic table
c) Iron belongs to first transition series
d) Iron belongs to group VIII of the periodic table
550. In India, iron is obtained from the ore:
a) Cassiterite b) Azurite c) Haematite d) Cryolite
551. The Fe^{2+} ion is:
a) Blue b) Light green c) Very dark green d) Yellow
552. Which ion in aqueous medium has orange colour?
a) $Cr_2O_7^{2-}$ b) Cr^{3+} c) MnO_4^- d) MnO_4^{2-}
553. The compound widely used in making reference electrode is:
a) $ZnCl_2$ b) $CuSO_4$ c) Hg_2Cl_2 d) $HgCl_2$
554. Which statement is incorrect about transition elements
a) All elements form complexes
b) All are paramagnetic
c) All show variable valency
d) All are not coloured ions
555. The magnetic moment of a transition metal ion is 3.87 BM. The number of unpaired electrons present in it is
a) 2 b) 3 c) 4 d) 5
556. Which of the following is a lanthanoid?
a) Ta b) Rh c) Th d) Lu
557. The flux used in soldering is:
a) HgO b) ZnO c) CdO d) None of these
558. Ferric sulphate on heating gives:
a) SO_2 and SO_3 b) SO_2 only c) SO_3 only d) S only
559. The raw materials fed into the blast furnace for making iron are:
a) FeO, $CaCO_3$ and coke
b) Fe_2O_3 , CaO and coke
c) Fe_2O_3 , $CaCO_3$ and coke
d) Fe_3O_4 , $Ca(OH)_2$ and coke
560. Which statement about corrosive sublimate is incorrect?
a) It is prepared by heating mercury in chlorine
b) It reduces stannic chloride
c) It oxidizes stannous chloride
d) It sublimes readily

561. Chalcopyrites is an ore of
 a) Gallium b) Copper c) Calcium d) Magnesium
562. Siderite is an ore of
 a) Cu b) Al c) Ag d) Fe
563. Which one of the following metals, is extracted on smelting of its ore in blast furnace?
 a) Iron b) Sodium c) Potassium d) Magnesium
564. Chromium is used in making:
 a) Bronze b) Brass c) Stainless steel d) Electrodes
565. Which lanthanide compound is used as a pigment?
 a) CeO_2 b) $\text{Ce}(\text{OH})_3$ c) $\text{Lu}(\text{OH})_3$ d) $\text{Tb}(\text{OH})_3$
566. In the extraction of Zn, the formation of blue flame is due to the burning of:
 a) ZnO b) C c) Zn d) CO
567. Among the following the coloured compound is
 a) CuCl b) $\text{K}_3[\text{Cu}(\text{CN})_4]$ c) CuF_2 d) $[\text{Cu}(\text{CH}_3\text{CN})_4]\text{BF}_4$
568. What is the correct order of spin only magnetic moment (in BM) of Mn^{2+} , Cr^{2+} and V^{2+} ?
 a) $\text{Mn}^{2+} > \text{V}^{2+} > \text{Cr}^{2+}$ b) $\text{V}^{2+} > \text{Cr}^{2+} > \text{Mn}^{2+}$ c) $\text{Mn}^{2+} > \text{Cr}^{2+} > \text{V}^{2+}$ d) $\text{Cr}^{2+} > \text{V}^{2+} > \text{Mn}^{2+}$
569. Stainless steel contains:
 a) 50%Cr b) 2.5%Cr c) 14%Cr d) 2%Cr
570. KMnO_4 (acidic/alkaline) is not decolourized by
 a) Mohr salt b) Oxalic acid c) Benzene d) Propene
571. A solution of $\text{Cr}(\text{NO}_3)_2$ slowly turns green when concentrated HCl is added to it. It is due to the formation of:
 a) CrCl_3 b) Cr_2O_3 c) CrO_4^{2-} d) Chloro complexes
572. Which is not an ore of gold?
 a) Svanite b) Calaverite c) Covellite d) Bismuth aurite
573. Silver iodide is used to produce artificial rain because:
 a) It is easily prepared
 b) Its structure is ice-like
 c) It can easily be sprayed at high altitude
 d) It is insoluble in rain water
574. The chemical formula of azurite is:
 a) $\text{Cu}(\text{OH})_2 \cdot 2\text{CuCO}_3$ b) $\text{CuSO}_4 \cdot 3\text{Cu}(\text{OH})_2$ c) $\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$ d) CuFeS_2
575. The magnetic moment (in BM) of Zn^{2+} ion according to spin-only formula is
 a) Zero b) 1.73 c) 2.84 d) 3.87
576. Zinc reacts with very dilute nitric acid to produce:
 a) NO b) NH_4NO_3 c) NO_2 d) H_2
577. Which of the following may be colourless?
 a) Fe^{3+} b) Cr^{3+} c) Cu^{2+} d) Cu^+
578. Fe ore is concentrated by:
 a) Magnetic treatment b) Froth floatation c) Electrolysis d) Roasting
579. In the extraction of copper, the metal formed in the Bessemer's converter is due to the reaction:
 a) $\text{Cu}_2\text{S} \rightarrow 2\text{Cu} + \text{S}$
 b) $2\text{Cu}_2\text{O} \rightarrow 4\text{Cu} + \text{O}_2$
 c) $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$
 d) $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$
580. In the case of *d*-block elements:
 a) Outermost and penultimate shells are incomplete
 b) Both penultimate and prepenultimate shells are incomplete
 c) Outermost shell is incomplete
 d) Innermost shell is incomplete

581. In electrorefining of copper, some gold is deposited as
 a) Cathode b) Electrode c) Cathode mud d) Anode mud
582. What effect is noticed on shaking dilute sulphuric acid with a small quantity of anhydrous copper sulphate?
 a) The white solid dissolves to form a colourless solution
 b) The white solid dissolves to form a green solution
 c) The white solid turns blue but does not dissolve
 d) The white solid dissolves to form a blue solution
583. A magnetic moment of 1.73 BM will be shown by one among the following compounds:
 a) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ b) $[\text{Ni}(\text{CN})_4]^{2-}$ c) TiCl_4 d) $[\text{CoCl}_6]^{4-}$
584. In general, the transition elements exhibit their highest oxidation states in their compounds with elements like:
 a) C b) S c) S and P d) F and O
585. Silver, mercury and lead have been placed in same group of qualitative analysis, because they form:
 a) Carbonates soluble in dilute HNO_3
 b) Nitrates
 c) Insoluble chlorides
 d) Same type of coloured compounds
586. $\text{K}_2\text{Cr}_2\text{O}_7$ on strong heating gives:
 a) K_2CrO_4 b) Cr_2O_3 c) O_2 d) All of these
587. KMnO_4 on heating above 200°C gives:
 a) $\text{K}_2\text{MnO}_3 + \text{O}_2 + \text{MnO}_2$ b) $\text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$ c) $\text{MnO}_2 + \text{O}_2$ d) None of the above
588. The number of ions formed on dissolving one molecule of $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ is:
 a) 4 b) 5 c) 3 d) 6
589. Acidic nature of $\text{Zn}(\text{OH})_2$ is shown from the formation of the following compound with the formula:
 a) Na_2ZnO_2 b) Na_2CO_3 c) NaZnO_2 d) None of these
590. The reason for the stability of Gd^{3+} ion is
 a) Half-filled $4f$ subshell
 b) Completely filled $4f$ subshell
 c) Possesses the general electronic configuration of noble gases
 d) Empty $4f$ subshell
591. Rio Tinto process is used for extraction of:
 a) Cu b) Ag c) Al d) Au
592. An alloy of Co, Ni and Fe used in permanent magnets is:
 a) Invar b) Nichrome c) Alnico d) None of these
593. Bordeaux mixture consists of lime and:
 a) FeSO_4 b) CuSO_4 c) $\text{Cu}(\text{NO}_3)_2$ d) AgNO_3
594. Larger number of oxidation states are exhibited by the actinoides than those by the lanthanoides, the main reason being
 a) $4f$ - orbitals more diffused than the $5f$ -orbitals
 b) Lesser energy difference between $5f$ and $6d$ than between $4f$ and $5d$ -orbitals
 c) More energy difference between $5f$ and $6d$ than between $4f$ and $5d$ -orbitals.
 d) More reactive nature of the actinoides than the lanthanoides
595. F_2 is formed by reacting K_2MnF_6 with
 a) MnF_4 b) SbF_5 c) KSbF_6 d) MnF_3
596. A reducing in atomic size with increase in atomic number is a characteristic of elements of
 a) f -block b) d -block c) High atomic masses d) Radioactive series
597. Which method is based on distribution law?
 a) Mond's process b) Parkes process c) Cupellation process d) Poling process
598. Schweitzer's reagent used for dissolving cellulose in the manufacture of artificial silk is:

- a) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ b) CuI c) $\text{Cu}(\text{NH}_3)_4\text{SO}_4$ d) $\text{Cu}(\text{CH}_3\text{COO})_2 \cdot \text{Cu}(\text{OH})_2$
599. Formation of coloured ions by transition metals signifies
- Absorption of light from UV range
 - Emission of light
 - Presence of unpaired electrons in *s* and *p* orbitals
 - Complimentary colours to the absorbed light
600. Invar steel, which is very little affected by temperature changes, contains 36%:
- Co
 - Ni
 - Cu
 - Al
601. Which of the following pair of transition metal ions, have the same calculated values of magnetic moment?
- Ti^{2+} and V^{2+}
 - Fe^{2+} and Cu^{2+}
 - Cr^{2+} and Fe^{2+}
 - Co^{2+} and Ti^{2+}
602. Which of the following is not an actinide?
- Curium
 - Californium
 - Erbium
 - Americium
603. Philosopher's wool when heated with BaO at 1100°C gives the compound :
- BaZnO_2
 - $\text{Ba} + \text{ZnO}_2$
 - BaCdO_2
 - $\text{BaO}_2 + \text{Zn}$
604. Brass is an alloy of Cu with
- Al
 - Sn
 - Ag
 - Zn
605. Actinides and lanthanides resemble in
- Formation of complexes
 - Oxidation state
 - Ionization energy
 - Electronic configuration
606. Cuprous chloride is obtained from cupric chloride:
- By heating cupric chloride with chlorine
 - By the electrolysis of cupric chloride containing HCl
 - By heating cupric chloride with conc. HCl and copper turnings
 - By passing H_2 over CuCl_2
607. The properties of cast iron, wrought iron and steel are different because they have:
- Different contents of sulphur
 - Different contents of carbon
 - Traces of different elements
 - Traces of different iron oxides
608. Variable valency is a general feature ofelements.
- s*-block
 - p*-block
 - d*-block
 - All of these
609. The inner transition elements are the elements in which the added electrons go to:
- $(n - 1) d$ -orbitals
 - $(n - 2) f$ -orbitals
 - $(n - 1) d$ -orbitals and $(n - 1) f$ -orbitals
 - $(n - 1) d$ -orbitals and ns -orbitals
610. The compound insoluble in water is
- Mercurous nitrate
 - Mercurous chloride
 - Mercuric nitrate
 - Mercurous perchlorate
611. A carbonate ore is
- Carnallite
 - Limonite
 - Siderite
 - Horn silver
612. Near the top of a blast furnace employed for the extraction of iron the metal oxides are reduced to spongy iron by:
- Carbon
 - CO
 - CO_2
 - Limestone
613. Black Jack is an ore of
- Cr
 - Sn
 - Zn
 - Ni
614. Which of the following statements is correct?
- Manganese salt gives violet borax bead test in the reducing flame
 - Ferric ions give a deep green precipitate on adding potassium ferricyanide solution

- c) On boiling a solution having K^+ , Ca^{2+} , HCO_3^- ions, we get a precipitate of $K_2Ca(CO_3)_2$
d) From a mixed precipitate of $AgCl$ and AgI , ammonia solution dissolves only $AgCl$
615. The element showing oxidation states of +2, +3, +4, +6 and +7 is:
a) Cr b) Mn c) Co d) V
616. When H_2S is passed through $HgCl_2$ we get:
a) HgS b) $HgS + Hg_2S$ c) $Hg_2S + Hg$ d) Hg_2S
617. Which gas is absorbed by $CuCl$?
a) CO_2 b) CO c) SO_2 d) SO_3
618. Standard reduction potential of most of the transition elements is generally:
a) Negative b) Positive c) Zero d) None of these
619. Auric chloride on reaction with ferrous sulphate changes to:
a) Au b) $AuCl$ c) Au_2SO_4 d) $Au_3(SO_4)_2$
620. Which of the following is deliquescent?
a) $ZnCl_2$ b) Hg_2Cl_2 c) $HgCl_2$ d) $CdCl_2$
621. Which of the following is correct?
a) Duralumin : $Al + Cu + Mg + Ag$ b) German silver : $Cu + Zn + C$
c) Gun metal : $Cu + Zn + Sn$ d) Solder : $Pb + Al$
622. A certain metal will liberate hydrogen from dilute acids. It will react with water to form hydrogen only when the metal is heated and water is in the form of steam. The metal is probably
a) Iron b) Potassium c) Copper d) Mercury
623. Calomel reacts with ammonium hydroxide to form:
a) $Hg(NH_2)Cl$ b) $H_2N—Hg—Hg—Cl$ c) Hg_2O d) HgO
624. An example of double salt is:
a) Bleaching powder b) $K_4[Fe(CN)_6]$ c) Hypo d) Potash alum
625. Bronze is a mixture of
a) $Pb + Sn$ b) $Cu + Sn$ c) $Cu + Zn$ d) $Pb + Zn$
626. The element present in gun metal is
a) Co b) Cu c) Sc d) Ti
627. Pure conc. HNO_3 makes iron passive as the surface is covered with protective layer of:
a) $Fe(NO_3)_3$ b) Fe_3O_4 c) FeO d) Fe_2O_3
628. Thermite process is used in reduction of
a) Cr_2O_3 b) Al_2O_3 c) PbO_2 d) CuO
629. The slag obtained during the smelting process in the extraction of copper from copper pyrites is composed mainly of:
a) Cu_2S b) $FeSiO_3$ c) $CuSiO_3$ d) SiO_2
630. The mineral from which copper is manufactured is:
a) Galena b) Pyrite c) Malachite d) Chalcopyrite
631. Metal oxides which decomposes on heating is
a) ZnO b) CuO c) Al_2O_3 d) HgO
632. The correct formula for diammine silver (I) chloride is:
a) $[Ag, (NH_3)]Cl$ b) $[Ag, (NH_3)_2]Cl$ c) $[Ag, (NH_2)_2]Cl$ d) $[Ag, (NH_4)_2]Cl$
633. Which metal is used to add to gold to make it hard?
a) Cu b) Ag c) Ni d) Zn
634. On igniting Fe_2O_3 at $14000^\circ C$, the product obtained is
a) Fe_2O_3 melt b) FeO c) Fe_2O_3 d) Metallic iron
635. Cosmetic powders and zinc ointments contain:
a) $ZnCl_2$ b) ZnO c) $ZnCO_3$ d) $ZnSO_4$
636. An aqueous solution of $FeSO_4$, $Al_2(SO_4)_3$ and chrome alum is heated with excess of Na_2O_2 and filtered. The materials obtained are:
a) A colourless filtrate and a green residue

- b) A yellow filtrate and a green residue
 c) A yellow filtrate and a brown residue
 d) A green filtrate and a brown residue
637. A transition element X has the configuration $[Ar]d^4$ in its +3 oxidation state. Its atomic number is
 a) 25 b) 26 c) 22 d) 19
638. The carbon content of:
 a) Cast iron is in between that of steel and wrought iron
 b) Pig iron is in between that of steel and wrought iron
 c) Steel is in between that of cast iron and wrought iron
 d) Wrought iron is in between that of steel and cast iron
639. If a compound absorbs violet colour from light, it will be :
 a) Yellow b) Orange c) Blue d) Green
640. Which of the two have almost similar size?
 a) ${}_{22}\text{Ti}$ and ${}_{40}\text{Zr}$ b) ${}_{41}\text{Nb}$ and ${}_{73}\text{Ta}$ c) ${}_{39}\text{Y}$ and ${}_{57}\text{La}$ d) ${}_{20}\text{Ca}$ and ${}_{31}\text{Ir}$
641. A white precipitate is formed on adding KI to CuSO_4 solution. It is of
 a) Cu_2I_2 b) CuI_2 c) Cu_2S d) Cu_2SO_4
642. Which of the following is coloured compound?
 a) CuF_2 b) CuI c) NaCl d) MgCl_2
643. Addition of NaOH on Zn^{2+} ion gives a white ppt. which on adding excess of NaOH dissolves. In this solution Zn exists in:
 a) Cationic part b) Anionic part c) Both (a) and (b) d) None of these
644. MnO_4^- reacts with bromide ion in alkaline medium to give
 a) MnBr_4 b) MnOBr_2 c) $\text{MnO}_2, \text{BrO}_3^-$ d) MnO, BrO
645. Cyanide process is used to extraction of
 a) Ag b) Ni c) Pt d) Zn
646. Which of the following weights less when weighted in magnetic field?
 a) ScCl_3 b) FeCl_3 c) TiCl_3 d) VCl_3
647. The process of nitriding used in the treatment of steel is:
 a) Heating steel in an atmosphere of ammonia
 b) Heating steel to a bright redness and then cooling
 c) Heating steel to bright redness and then cooling by plunging in air
 d) None of the above
648. Duraluminium is an alloy contains:
 a) $\text{Mg} + \text{Al}$
 b) $\text{Mg} + \text{Cu} + \text{Al} + \text{Mn} + \text{Si}$
 c) $\text{Mg} + \text{Cu}$
 d) $\text{Cu} + \text{Al}$
649. Gun metal is
 a) $\text{Cu} + \text{Zn}$ b) $\text{Cu} + \text{Sn} + \text{Zn}$ c) $\text{Cu} + \text{Sn}$ d) $\text{Zn} + \text{Sn}$
650. The tempering of steel makes it:
 a) Hard b) Soft c) Heavy d) Brittle
651. Copper sulphate solution reacts with KCN to give
 a) CuCN b) $\text{Cu}(\text{CN})_2$ c) $\text{K}_3[\text{Cu}(\text{CN})_4]$ d) $\text{K}_2[\text{Cu}(\text{CN})_4]$
652. The metallic oxide which impart purple colour to pottery is
 a) Copper oxide b) Chromium oxide c) Lead oxide d) Manganese oxide
653. Formation of interstitial compounds makes the transition metal:
 a) More soft b) More ductile c) More metallic d) More brittle
654. The purest zinc is made by
 a) Electrolytic refining b) Zone refining
 c) The van- Arkel method d) The Mond process

655. Which of the following ions has a magnetic moment of 5.93 BM?
(At. no. V=23, Cr=24, Mn=25, Fe=26)
- a) Mn^{2+} b) Fe^{2+} c) Cr^{2+} d) V^{3+}
656. $\text{K}_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} \text{K}_2\text{CrO}_4 + \text{O}_2 + X$
In the above reaction X is
- a) CrO_3 b) Cr_2O_7 c) Cr_2O_3 d) CrO_5
657. Soft and pliable steel is obtained by:
- a) Tempering b) Nitriding c) Annealing d) None of these
658. The highest magnetic moment is shown by the transition metal ion with the outer electronic configuration
- a) $3d^2$ b) $3d^7$ c) $3d^5$ d) $3d^9$
659. Which substance can be used in the preparation of making ink?
- a) Ag b) AgNO_3 c) AgBr d) $\text{PbCO}_3 \cdot \text{Pb(OH)}_2$
660. Which of the following compounds volatilises on heating?
- a) MgCl_2 b) HgCl_2 c) CaCl_2 d) FeCl_3
661. Identify the statement which is not correct regarding copper sulphate
- a) It reacts with NaOH and glucose to give Cu_2O b) It gives CuO on strong heating in air
c) It reacts with KCl to give Cu_2Cl_2 d) It reacts with KI to give iodine
662. In solid $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, copper is coordinated to:
- a) 4 water molecules b) 5 water molecules c) 1 sulphate molecule d) 1 water molecule
663. The grey cast iron contains:
- a) Iron carbide b) Silicon carbide c) Silicon dioxide d) Graphite
664. When excess of sodium thiosulphate is added to dil. AgNO_3 solution a soluble compound X is formed. However, when dil. $\text{Na}_2\text{S}_2\text{O}_3$ solution is added to cone. AgNO_3 solution a white ppt. turning yellow and finally black ppt. of Y is obtained. Which is correct pair?
- a) X is Ag_2S and Y is $\text{Na}_3[\text{Ag}(\text{S}_2\text{O}_3)_2]$
b) X is $\text{Na}_3[\text{Ag}(\text{S}_2\text{O}_3)_2]$ and Y is Ag_2S
c) X is $\text{Ag}_2\text{S}_2\text{O}_3$ and Y is Ag_2S
d) X is $\text{Ag}_2\text{S}_2\text{O}_3$ and Y is $\text{Na}_3[(\text{S}_2\text{O}_3)_2]$
665. Which of the following is an acidic oxide?
- a) Mn_2O_3 b) MnO_2 c) Mn_2O_7 d) MnO
666. A developer used in photography is:
- a) A weak acid b) A weak base c) A mild reducing agent d) An oxidizing agent
667. Potassium permanganate acts as an oxidant in alkaline and acidic media. The final products formed from KMnO_4 in the two conditions are respectively
- a) MnO^{2-} and Mn^{3+} b) Mn^{3+} and Mn^{2+} c) Mn^{2+} and Mn^{3+} d) MnO_2 and Mn^{2+}
668. The general electronic configuration of transition element is :
- a) $(n-1)d^{1-5}$ b) $(n-1)d^{1-10} ns^1$ c) $(n-1)d^{1-10} ns^{0-2}$ d) None of these
669. Mohr's salt is a:
- a) Normal salt b) Acid salt c) Basic salt d) Double salt
670. Gun metal is an alloy of:
- a) Cu and Al b) Cu, Sn and Zn c) Cu, Zn and Ni d) Cu and Sn
671. A metal gives two chlorides 'A' and 'B'. 'A' gives black precipitate with NH_4OH and 'B' gives white. With KI 'B' gives a red precipitate soluble in excess of KI. 'A' and 'B' are respectively:
- a) HgCl_2 and Hg_2Cl_2 b) Hg_2Cl_2 and HgCl_2 c) HgCl_2 and ZnCl_2 d) ZnCl_2 and HgCl_2
672. Which of the following transition metal ions will have definite value of magnetic moment?
- a) Sc^{3+} b) Ti^{3+} c) Cu^{3+} d) Zn^{2+}
673. In comparison to ferrous salts, ferric salts are:
- a) More stable b) Less stable c) Equally stable d) None of these
674. Fool's gold is
- a) CuFeS_2 b) FeS_2 c) CuS_2 d) Cu_2O

675. The material used for the lining of Bessemer's converter in the extraction of copper is:
 a) Silica b) Lime c) Iron d) Cu
676. Articles made of copper and bronze slowly tarnish in air and turn green. The green colour is due to the formation of:
 a) Copper oxide
 b) Copper sulphide
 c) Copper oxalate
 d) Basic copper carbonate
677. Which of the following statements concerning transition elements is false?
 a) They are all metals.
 b) They easily form complex coordination compounds.
 c) Compounds containing their ions are mostly coloured.
 d) They show multiple oxidation states always differing by units of two.
678. Among Sc(III), Ti(IV), Pd(II) and Cu(II) ions
 a) All are paramagnetic
 b) All are diamagnetic
 c) Sc (III), Ti (IV) are paramagnetic and Pd(II), Cu(II) are diamagnetic
 d) Sc (III), Ti (IV) are diamagnetic and Pd(II), Cu(II) are paramagnetic
679. Nessler's reagent is
 a) K_2HgI_4 b) $K_2HgI_4 + KOH$ c) $K_2HgI_4 + Hg$ d) $K_2HgI_2 + KOH$
680. The spin only magnetic moment of Fe^{2+} ion (in BM) is approximately.
 a) 4 b) 7 c) 5 d) 6
681. Which of the following is not correct about transition metals?
 a) Their compounds are generally coloured b) They can form ionic or covalent compounds
 c) Their melting and boiling points are high d) They do not exhibit variable valency
682. In the metallurgy of iron, when limestone is added to the blast furnace, the calcium ion ends up as :
 a) Slag b) Gangue c) Metallic calcium d) Calcium carbonate
683. KI and $CuSO_4$ solutions on mixing produce
 a) $Cu_2I_2 + K_2SO_4$ b) $Cu_2I_2 + I_2 + K_2SO_4$ c) $CuI_2 + K_2SO_4$ d) $CuI_2 + I_2 + K_2SO_4$
684. Which one of the following statements is false?
 a) During roasting, moisture is removed from the ore.
 b) The ore is freed from almost all nonmetallic impurities.
 c) Calcination of ore is carried out in the absence of any blast of air.
 d) The concentrated zinc blend is subjected to calcination during its extraction by pyrometallurgy.
685. Knowing that the chemistry of lanthanoids (Ln) is dominated by its +3 oxidation state, which of the following statements is incorrect?
 a) Because of the large size of the Ln (III) ions the bonding in its compounds is predominantly ionic in character.
 b) The ionic sizes of Ln (III) decrease in general with increasing atomic number.
 c) Ln (III) compounds are generally colourless.
 d) Ln(III) hydroxide are mainly basic in character.
686. Bell metal is an alloy of:
 a) Zinc and copper b) Copper and nickel c) Zinc and lead d) Copper and tin
687. Chemical name of vermilion is:
 a) Mercuric sulphide b) Mercurous sulphide c) Zinc sulphide d) Cadmium sulphide
688. The stainless steel developed in India contains the following special components:
 a) Vanadium and cobalt
 b) Nickel and magnesium
 c) Manganese and chromium
 d) Aluminium and zinc

689. Maximum number of oxidation states of the transition metals is derived from the following configuration:
- ns -electrons
 - $(n - 1)d$ -electrons
 - $(n + 1)d$ -electrons
 - $ns + (n - 1)d$ -electrons
690. It is always advisable not to cover egg yolk or mustard with silver cutlery because:
- Silver reacts with water of egg yolk to form $AgOH$
 - Silver reacts with sulphur of egg yolk forming black Ag_2S
 - Silver reacts with egg yolk forming Ag_2SO_4 which is a poisonous substance
 - Silver attracts UV light of the atmosphere, thereby spoiling the food
691. Which of the following is not oxidized by O_3 ?
- $FeSO_4$
 - $KMnO_4$
 - KI
 - K_2MnO_4
692. Mercury is transported in metal containers made of:
- Silver
 - Lead
 - Iron
 - Aluminium
693. Which may be consumed in the elemental form by human beings?
- Zn
 - Cu
 - Ag and Cu
 - Fe
694. Which one of the elements is a d -block element?
- As
 - Pt
 - Pb
 - Ra
695. Which metal does not react with $CuSO_4$ solution?
- Fe
 - Zn
 - Mg
 - Ag
696. Transition metal ions show colour because
- They absorb light
 - They emit light
 - They are paramagnetic
 - They exhibit $d-d$ transition
697. Rinnmann's green is:
- $ZnO \cdot CoO$
 - A green pigment
 - Both (a) and (b)
 - None of these
698. Which of the following ions is colourless in solution?
- V^{3+}
 - Cr^{3+}
 - Co^{2+}
 - Sc^{3+}
699. Pig iron is manufactured using:
- An electric furnace
 - A blast furnace
 - An open hearth furnace
 - None of the above
700. Blue vitriol is
- $CuSO_4$
 - $CuSO_4 \cdot 5H_2O$
 - Cu_2SO_4
 - $CuSO_4 \cdot H_2O$
701. Each coinage metal has:
- 18 electrons in their penultimate shell
 - 8 electrons in the outermost shell
 - 2 electrons in the outermost shell
 - 8 electrons in penultimate shell
702. Gold exhibits the variable oxidation states of:
- +2, +3
 - +1, +3
 - +2, +4
 - +1, +2
703. Transition metals and their oxides are used in industrial processes as:
- Detergents
 - Insecticides
 - Catalysis
 - None of these
704. Gravity separation process is used for the concentration of
- Calamine
 - Haematite
 - Chalcopyrite
 - Bauxite
705. The composition of malachite is
- $CuFeS_2$
 - $CuCO_3$
 - $CuCO_3 \cdot Cu(OH)_2$
 - $Cu(OH)_2$
706. The atomic numbers of vanadium (V), chromium (Cr), manganese (Mn), and iron (Fe) are respectively 23, 24, 25 and 26. Which one of these may be expected to have the highest second ionisation enthalpy?
- V
 - Cr
 - Mn
 - Fe

707. Zinc white is a better white pigment than lead white because it:
- Has more covering power than lead white
 - Is not blackened by the action of H_2S
 - Is soluble in water
 - Becomes yellow when heated
708. A yellow ppt. is formed when H_2S is passed through an acidified solution of:
- Co^{2+} ions
 - Cd^{2+} ions
 - Cu^{2+} ions
 - Ni^{2+} ions
709. Which metal does not react with water or steam?
- K
 - Na
 - Ca
 - Cu
710. Verdigris is
- Basic lead
 - Basic copper acetate
 - Basic lead acetate
 - None of the above
711. The percentage of carbon is same in:
- Cast iron and pig iron
 - Cast iron and steel
 - Pig iron and steel
 - Pig iron and wrought iron
712. $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ is called:
- Green salt
 - Glauber's salt
 - Mohr's salt
 - Alum
713. Which do not decolourise KMnO_4 aqueous solution?
- $\text{C}_2\text{O}_4^{2-}$
 - HSO_3^-
 - CO_3^{2-}
 - SO_3^{2-}
714. Among the following pair of ions, the lower oxidation state in aqueous solution is more stable in
- $\text{V}^{2+}, \text{VO}^{2+}$
 - $\text{Cr}^{2+}, \text{Cr}^{3+}$
 - $\text{Ti}^+, \text{Ti}^{3+}$
 - $\text{Cu}^+, \text{Cu}^{2+}$
715. Green vitriol is formed by
- $\text{FeS}_2 + \text{H}_2\text{O} + \text{O}_2$
 - $\text{FeS}_2 + \text{H}_2\text{O} + \text{CO}_2$
 - $\text{FeS}_2 + \text{CO} + \text{CO}_2$
 - $\text{FeS}_2 + \text{CO}$
716. Densities of transition metals are:
- Low
 - Very low
 - High
 - Very high
717. Mercury sulphide on heating with aquaregia yields:
- $\text{Hg}(\text{NO}_3)_2$
 - HgCl_2
 - $\text{Hg}(\text{NO}_2)_2$
 - Hg_2Cl_2
718. All metal chlorides are soluble in water except those of:
- Ag, Pb, Hg
 - Na, K, Ca
 - Zn, Cu, Cd
 - Ba, Sr, Li
719. $\text{K}_3[\text{Co}(\text{NO}_2)_6]$ is:
- Fischer's salt
 - Thenard's blue
 - Rinnmann's green
 - Blue vitriol
720. Group 11 or IB elements are commonly known as:
- Coinage metals
 - Transition metals
 - Typical elements
 - Representative elements
721. Most common oxidation states of Ce (cerium) are
- +3, +4
 - +2, +3
 - +2, +4
 - +3, +5
722. The metal present in insulin is:
- Cu
 - Fe
 - Zn
 - Mg
723. Transition elements form alloys easily because they have:
- Same atomic number
 - Same electronic configuration
 - Nearly same atomic size
 - None of the above
724. Muntz metal is an alloy of:
- Cu and Sn
 - Cu and Zn
 - Ag and Zn
 - Zn and Mn
725. A metal forms a volatile carbonyl compound and this property is taken advantages of its extraction. The metal is:

- a) Iron b) Nickel c) Cobalt d) Titanium
726. The temperature of blast furnace to produce iron from its ore Fe_2O_3 varies from 500°C at the top of the furnace to about 1900°C at the bottom of the furnace. The reaction between the ore Fe_2O_3 and CO at the lowest temperature ($\sim 500^\circ\text{C}$) is:
- a) $3\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow 2\text{Fe}_3\text{O}_4 + \text{CO}_2$
 b) $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow 2\text{FeO} + \text{CO}_2$
 c) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
 d) $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow 2\text{Fe} + \text{CO}_2 + \frac{1}{2}\text{O}_2$
727. Adam's catalyst is:
- a) Pt and PtO b) Pt c) Pt and PtO_2 d) Pt_2O and PtO
728. Which one of the following statement is not true with regard to transition elements?
- a) They readily form complex compounds. b) They show variable oxidation states.
 c) All their ions are colourless. d) Their ions contain partially filled *d*-electrons.
729. The element which forms a coloured chloride is:
- a) Sb b) Na c) Zn d) Cr
730. In which of the following metallic bond is strongest?
- a) V b) Fe c) Cr d) Sc
731. Which metal cation forms stronger complex salt?
- a) Zn^{2+} b) Cd^{2+} c) Hg^{2+} d) All of same strength
732. The equilibrium $\text{Cr}_2\text{O}_7^{2-} + 2e \rightleftharpoons 2\text{CrO}_4^{2-}$:
- a) Exists in acidic medium
 b) Exists in basic medium
 c) Exists in neutral medium
 d) Does not exist
733. Atomic radii of Ti, Zr and Hf vary
- a) $\text{Ti} > \text{Zr} > \text{Hf}$ b) $\text{Ti} < \text{Zr} < \text{Hf}$ c) $\text{Ti} < \text{Hf} < \text{Zr}$ d) $\text{Ti} < \text{Zr} = \text{Hf}$
734. The basic character of the transition metal monoxide follows the order (At. no of Ti =22, V=23, Cr=24, Fe=26)
- a) $\text{TiO} > \text{VO} > \text{CrO} > \text{FeO}$ b) $\text{VO} > \text{CrO} > \text{TiO} > \text{FeO}$
 c) $\text{CrO} > \text{VO} > \text{FeO} > \text{TiO}$ d) $\text{TiO} > \text{FeO} > \text{VO} > \text{CrO}$
735. MnO_2 dissolves in water to give an acid. The colour of the acid is
- a) Green b) Blue c) Violet d) Red
736. Which of the following is used as indelible ink?
- a) Aqueous CuSO_4 solution b) Aqueous AgNO_3 solution
 c) Aqueous NaCl solution d) Aqueous NaOH solution
737. Which belongs to the actinides series?
- a) Ce b) Cf c) Ca d) Cs
738. Pudding process is used in the manufacture of:
- a) Steel b) Cast iron c) Wrought iron d) Pig iron
739. Which method is used to remove lead impurities from silver?
- a) Leaching with dilute NaCN solution
 b) Parkes process
 c) Leaching with dilute NaCN in presence of air
 d) Electrolytic purification using AgNO_3
740. Which of the following is the green coloured powder produced when ammonium dichromate is used in fire works?
- a) Cr b) CrO_3 c) Cr_2O_3 d) $\text{CrO}(\text{O}_2)$
741. Which of the following is amphoteric?
- a) V_2O_3 b) CuO c) V_2O_5 d) NiO
742. NH_3 forms complex with:

- a) CuSO_4 b) CdSO_4 c) AgCl d) All of these
743. Transition metals are less reactive because of their:
 a) High ionization potential and low melting point
 b) High ionization potential and high melting point
 c) Low ionization potential and low melting point
 d) Low ionization potential and high melting point
744. The metal that does not displace hydrogen from an acid is:
 a) Hg b) Zn c) Al d) Ca
745. Percentage of gold in 18 carat gold is
 a) 75.0% b) 20.0% c) 80.0% d) 38.67%
746. The correct order of ionic radii of Y^{3+} , La^{3+} , Eu^{3+} and Lu^{3+} is
 a) $\text{Y}^{3+} < \text{La}^{3+} < \text{Eu}^{3+} < \text{Lu}^{3+}$ b) $\text{Lu}^{3+} < \text{Eu}^{3+} < \text{La}^{3+} < \text{Y}^{3+}$
 c) $\text{La}^{3+} < \text{Eu}^{3+} < \text{Lu}^{3+} < \text{Y}^{3+}$ d) $\text{Y}^{3+} < \text{Lu}^{3+} < \text{Eu}^{3+} < \text{La}^{3+}$
747. Coinage metals show the properties of
 a) Inert elements b) Normal elements c) Typical elements d) Transitional elements
748. When steel is heated red hot and then slowly cooled, the process is known as:
 a) Annealing b) Hardening c) Tempering d) Nitriding
749. Which form contains the maximum percentage of carbon?
 a) Wrought iron b) Cast iron c) Malleable iron d) Steel
750. During the extraction of copper, the impurity (FeS) is removed as slag by mixing the contaminated copper ore with silica and coke. The molecular formula of slag is
 a) FeSiO_3 b) Fe_2O_3 c) FeSi (solid) d) FeSi (vapour)
751. The correct order of $E^\circ_{M^{2+}/M}$ values with negative sign for the four successive elements Cr, Mn, Fe and Co is
 a) $\text{Mn} > \text{Cr} > \text{Fe} > \text{Co}$ b) $\text{Cr} > \text{Fe} > \text{Mn} > \text{Co}$
 c) $\text{Fe} > \text{Mn} > \text{Cr} > \text{Co}$ d) $\text{Cr} > \text{Mn} > \text{Fe} > \text{Co}$
752. Which of the following is the chief ore of copper?
 a) Cu_2S b) Cu_2O c) CuFeS_2 d) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
753. The catalytic activity of transition metals and their compounds is ascribed mainly to:
 a) Their magnetic behavior
 b) Their unfilled d -orbitals
 c) Their ability to adopt variable oxidation states
 d) Their chemical reactivity
754. Which is used for stopping bleeding?
 a) Ferric chloride b) Mohr's salt c) Green vitriol d) Sodium nitroprusside
755. On heating $\text{ZnCl}_2 \cdot \text{H}_2\text{O}$ the compound obtained is:
 a) ZnCl_2 b) $\text{Zn}(\text{OH})\text{Cl}$ c) $\text{Zn}(\text{OH})_2$ d) ZnO
756. Yellow mercury (II) oxide is obtained when
 a) Hg is heated in excess of air at 623 K b) HgCl_2 is treated with NaOH solution
 c) HgS is roasted in air d) $\text{Hg}(\text{NO}_3)_2$ is heated in presence of Hg
757. From gold aurocyanide $\text{Na}[\text{Au}(\text{CN})_2]$, gold can be precipitated by adding powder of:
 a) Zn b) Hg c) Ag d) None of these
758. Arrange Ce^{3+} , La^{3+} , Pm^{3+} and Yb^{3+} in increasing order of their ionic radii
 a) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{Ce}^{3+} < \text{La}^{3+}$ b) $\text{Ce}^{3+} < \text{Yb}^{3+} < \text{Pm}^{3+} < \text{La}^{3+}$
 c) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+}$ d) $\text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+} < \text{Yb}^{3+}$
759. Black HgS :
 a) Dissolves in conc. HCl on boiling
 b) Dissolves in boiling HCl + a crystal of KClO_3
 c) Dissolves in NaOH
 d) None of the above

760. The actinoids exhibit more number of oxidation states in general than the lanthanoids. This is because
- The $5f$ -orbitals are more buried than the $4f$ -orbitals.
 - There is a similarity between $4f$ and $5f$ -orbitals in their angular part of the wave function.
 - The actinoids are more reactive than the lanthanoids.
 - The $5f$ -orbitals extend further from the nucleus than the $4f$ -orbitals.
761. Hair dyes contain
- Copper nitrate
 - Gold chloride
 - Silver nitrate
 - Copper sulphate
762. A scarlet red precipitate is obtained on treating mercuric chloride solution with:
- H_2S
 - KI
 - NaOH
 - NH_4OH
763. Which of the following statements is wrong?
- An acidified solution of $K_2Cr_2O_7$ liberates iodine from iodides
 - In acidic solution dichromate ions are converted to chromate ions
 - Ammonium dichromate on heating undergoes exothermic decomposition to give Cr_2O_3
 - Potassium dichromate is used as a titrant for Fe^{2+} ions
764. In the electroplating of gold the electrolyte used is:
- Gold chloride
 - Gold nitrate
 - Gold sulphate
 - Potassium aurocyanide
765. Silver is extracted from argentiferous lead by:
- Mond's process
 - Parkes process
 - Haber's process
 - Bergius process
766. Aqua regia reacts with Pt to yield:
- $Pt(NO_3)_4$
 - H_2PtCl_6
 - $PtCl_4$
 - $PtCl_2$
767. Argentite is an ore of
- Fe
 - Al
 - Cu
 - Ag
768. Transition elements exhibit variable valencies because they release electrons from the following orbits
- ns
 - ns and np
 - $(n-1)d$ and ns
 - $(n-1)d$
769. For making good quality mirrors, plates of float glasses are used. These are obtained by floating molten glass over a liquid metal which does not solidify before glass. The metal can be:
- Na
 - Mg
 - Hg
 - Sn
770. How is limestone used in Fe extraction?
- Oxidation of Fe ore
 - Reduction of Fe ore
 - Formation of slag
 - Purification of Fe formed
771. When copper pyrites is roasted in excess of air, a mixture of $CuO + FeO$ is formed. FeO is present as impurities. This can be removed as slag during reduction of CuO . The flux added to form slag is
- SiO_2 which is an acid flux
 - Lime stone, which is a basic flux
 - SiO_2 , which is a basic flux
 - CaO , which is a basic flux
772. The 'spin -only' magnetic moment [in units of Bohr magneton, (μ_B)] of Ni^{2+} in aqueous solution would be (Atomic number of Ni=28)
- 2.84
 - 4.90
 - 0
 - 1.73
773. Which of the following is used as purgative?
- HgS
 - Hg_2Cl_2
 - $HgCl_2$
 - $ZnSO_4$
774. The formula of sodium nitroprusside is:
- $Na_4[Fe(CN)_5NOS]$
 - $Na_2[Fe(CN)_5NO]$
 - $NaFe[Fe(CN)_6]$
 - $Na_2[Fe(CN)_6NO_2]$
775. Which set represents an example of non typical transition elements?
- Zn, Cd, Hg
 - Sc, Ti, V
 - Cu, Ag, Au
 - Cr, Fe, Mn
776. When calomel reacts with NH_4OH solution, the compound formed is
- $NH_2-Hg-Cl$
 - $Hg_2Cl_2NH_3$
 - $Hg(NH_3)_2Cl_2$
 - $HgCl_2NH_3$
777. The highest magnetic moment is shown by the transition metal ion with the configuration
- $3d^2$
 - $3d^5$
 - $3d^7$
 - $3d^9$

778. Identify the alloy containing a non-metal as a constituent in it:
 a) Bell metal b) Bronze c) Invar d) Steel
779. Chemical name of corrosive sublimate is:
 a) Mercurous chloride b) Zinc chloride c) Mercuric chloride d) Aluminium chloride
780. Excess of KI reacts with CuSO_4 solution and then $\text{Na}_2\text{S}_2\text{O}_3$ solution is added to it. Which of the statements is incorrect for this reaction?
 a) Cu_2I_2 formed b) CuI_2 is formed
 c) $\text{Na}_2\text{S}_2\text{O}_3$ is oxidised d) Evolved I_2 is reduced
781. Cuprous ion is colourless, while cupric ion is coloured because
 a) Both have half-filled p and d -orbitals
 b) Cuprous ion has a completed d -orbital and cupric ion has incomplete d -orbital
 c) Cuprous ion has incomplete d -orbital and cupric ion has a complete d -orbital
 d) Both have unpaired electrons in d -orbital
782. Which one of the following is a diamagnetic ion?
 a) Co^{2+} b) Cu^{2+} c) Mn^{2+} d) Sc^{3+}
783. Which of the following oxides of chromium is amphoteric in nature?
 a) CrO b) Cr_2O_3 c) CrO_3 d) CrO_5
784. Cast iron is manufactured by remelting:
 a) Pig iron and pouring into moulds
 b) Steel and pouring into moulds
 c) Wrought iron and pouring into moulds
 d) Iron ore and pouring into moulds
785. The number of $3d$ -electrons in Cu^+ ion is:
 a) 8 b) 10 c) 6 d) 12
786. In the extraction of Fe from Fe_2O_3 , the reducing agent used is
 a) C b) Al c) Electrolytic reduction d) Cu
787. Transition elements are good conductors of current because:
 a) They are metals
 b) They are all solids
 c) They have free electrons in outer energy orbits
 d) All of the above
788. A compound is yellow when hot and white when cold. The compound is :
 a) Al_2O_3 b) PbO c) CaO d) ZnO
789. A solid (A) which has photographic effect reacts with the solution of a sodium salt (B) to give a pale yellow ppt. (C). Sodium salt on heating gives brown vapours. Identify A , B and C .
 a) AgNO_3 , NaBr , AgBr b) AgNO_3 , NaCl , AgCl_2 c) AgNO_3 , NaBr , AgCl_2 d) AgCl , NaBr , AgBr_2
790. Silver possesses metallic lustre because:
 a) It is a noble metal
 b) It is coated with the oxide of silver
 c) Valency electrons absorb white light completely
 d) Valency electrons absorb and eject white light
791. Magnetic moment of manganese in $(\text{NH}_4)_2\text{MnBr}_2$ is
 a) 3.87 BM b) 5.91 BM c) 4.89 BM d) 2.82 BM
792. Which transition metal is used for the reduction of steam to hydrogen?
 a) Mg b) Fe c) Sc d) Pt
793. The transition elements are more metallic than the representative elements because they have
 a) Electron pairs in d -orbitals b) Availability of d -orbitals for bonding
 c) The electron in d -orbitals d) Unpaired electron in metallic orbitals
794. Cerium can show the oxidation state of +4 because:

- a) It resembles alkali metals
- b) It has very low value of IE
- c) Of its tendency to attain noble gas configuration of xenon
- d) Of its tendency to attain f° configuration

SMART ACHIEVERS LEARNING PVT. LTD.

THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

: ANSWER KEY :

1)	c	2)	c	3)	c	4)	d	177)	c	178)	d	179)	a	180)	d
5)	b	6)	a	7)	c	8)	d	181)	c	182)	c	183)	a	184)	b
9)	d	10)	a	11)	b	12)	d	185)	a	186)	d	187)	a	188)	d
13)	b	14)	a	15)	b	16)	a	189)	b	190)	b	191)	a	192)	a
17)	d	18)	b	19)	c	20)	c	193)	b	194)	b	195)	b	196)	d
21)	c	22)	a	23)	a	24)	d	197)	d	198)	a	199)	a	200)	c
25)	c	26)	c	27)	c	28)	b	201)	c	202)	a	203)	b	204)	a
29)	b	30)	d	31)	c	32)	d	205)	c	206)	a	207)	d	208)	c
33)	d	34)	c	35)	d	36)	d	209)	b	210)	d	211)	b	212)	d
37)	c	38)	a	39)	b	40)	d	213)	a	214)	b	215)	c	216)	d
41)	c	42)	b	43)	c	44)	d	217)	b	218)	c	219)	c	220)	b
45)	b	46)	a	47)	c	48)	c	221)	d	222)	a	223)	a	224)	a
49)	b	50)	c	51)	c	52)	a	225)	c	226)	a	227)	d	228)	d
53)	d	54)	d	55)	d	56)	b	229)	a	230)	c	231)	a	232)	a
57)	d	58)	c	59)	a	60)	b	233)	c	234)	a	235)	a	236)	d
61)	b	62)	c	63)	a	64)	d	237)	a	238)	a	239)	c	240)	d
65)	d	66)	b	67)	c	68)	b	241)	b	242)	a	243)	a	244)	d
69)	b	70)	b	71)	c	72)	a	245)	a	246)	a	247)	d	248)	b
73)	d	74)	b	75)	c	76)	b	249)	b	250)	b	251)	c	252)	d
77)	c	78)	c	79)	b	80)	b	253)	c	254)	c	255)	b	256)	d
81)	b	82)	d	83)	d	84)	d	257)	b	258)	c	259)	d	260)	b
85)	b	86)	c	87)	d	88)	c	261)	b	262)	c	263)	b	264)	d
89)	b	90)	a	91)	b	92)	d	265)	a	266)	c	267)	d	268)	d
93)	c	94)	c	95)	b	96)	c	269)	d	270)	b	271)	b	272)	c
97)	a	98)	c	99)	d	100)	c	273)	a	274)	d	275)	d	276)	c
101)	c	102)	d	103)	b	104)	c	277)	b	278)	b	279)	b	280)	c
105)	c	106)	c	107)	c	108)	a	281)	b	282)	b	283)	c	284)	c
109)	a	110)	d	111)	d	112)	b	285)	b	286)	b	287)	a	288)	c
113)	d	114)	d	115)	a	116)	c	289)	a	290)	c	291)	b	292)	b
117)	d	118)	c	119)	d	120)	a	293)	a	294)	b	295)	b	296)	d
121)	d	122)	b	123)	a	124)	a	297)	d	298)	b	299)	d	300)	a
125)	b	126)	b	127)	d	128)	a	301)	a	302)	a	303)	b	304)	c
129)	a	130)	c	131)	c	132)	d	305)	c	306)	a	307)	a	308)	d
133)	d	134)	b	135)	d	136)	c	309)	a	310)	d	311)	d	312)	b
137)	c	138)	a	139)	b	140)	b	313)	c	314)	c	315)	d	316)	b
141)	b	142)	a	143)	a	144)	d	317)	c	318)	c	319)	d	320)	a
145)	d	146)	d	147)	b	148)	c	321)	a	322)	b	323)	b	324)	d
149)	a	150)	d	151)	d	152)	d	325)	c	326)	b	327)	c	328)	d
153)	a	154)	a	155)	c	156)	d	329)	d	330)	d	331)	c	332)	c
157)	b	158)	b	159)	a	160)	a	333)	b	334)	d	335)	a	336)	a
161)	b	162)	b	163)	b	164)	c	337)	a	338)	a	339)	d	340)	d
165)	c	166)	c	167)	b	168)	d	341)	c	342)	c	343)	d	344)	a
169)	c	170)	a	171)	d	172)	a	345)	d	346)	d	347)	b	348)	a
173)	c	174)	d	175)	b	176)	b	349)	c	350)	a	351)	d	352)	a

353) a	354) a	355) d	356) c	557) c	558) c	559) c	560) b
357) c	358) b	359) a	360) d	561) b	562) d	563) a	564) c
361) d	362) a	363) d	364) d	565) a	566) d	567) c	568) c
365) a	366) c	367) a	368) b	569) c	570) c	571) d	572) c
369) a	370) c	371) a	372) c	573) b	574) a	575) a	576) b
373) a	374) d	375) b	376) d	577) d	578) a	579) d	580) a
377) c	378) a	379) a	380) a	581) d	582) d	583) a	584) d
381) c	382) b	383) c	384) c	585) c	586) d	587) a	588) b
385) c	386) b	387) a	388) a	589) a	590) a	591) a	592) c
389) b	390) c	391) d	392) b	593) b	594) b	595) b	596) a
393) c	394) a	395) d	396) c	597) b	598) c	599) d	600) b
397) b	398) b	399) b	400) a	601) c	602) c	603) a	604) d
401) b	402) a	403) a	404) c	605) d	606) c	607) b	608) c
405) b	406) d	407) b	408) d	609) b	610) b	611) c	612) b
409) c	410) a	411) b	412) b	613) c	614) d	615) b	616) a
413) c	414) c	415) b	416) c	617) b	618) a	619) a	620) a
417) d	418) a	419) a	420) d	621) c	622) a	623) a	624) d
421) a	422) b	423) c	424) c	625) b	626) b	627) b	628) a
425) d	426) b	427) b	428) a	629) b	630) d	631) d	632) b
429) d	430) b	431) b	432) d	633) a	634) d	635) b	636) c
433) b	434) c	435) c	436) c	637) a	638) c	639) b	640) b
437) c	438) a	439) c	440) d	641) a	642) a	643) b	644) c
441) c	442) a	443) a	444) c	645) a	646) a	647) a	648) b
445) b	446) b	447) a	448) a	649) b	650) b	651) c	652) d
449) c	450) d	451) c	452) b	653) d	654) b	655) a	656) c
453) d	454) b	455) d	456) b	657) c	658) c	659) b	660) b
457) b	458) d	459) b	460) d	661) c	662) a	663) d	664) b
461) b	462) c	463) b	464) a	665) c	666) c	667) d	668) c
465) c	466) a	467) c	468) b	669) d	670) b	671) b	672) b
469) b	470) a	471) a	472) d	673) a	674) b	675) b	676) d
473) b	474) c	475) a	476) a	677) d	678) d	679) b	680) b
477) a	478) a	479) c	480) c	681) d	682) a	683) b	684) b
481) b	482) c	483) a	484) a	685) c	686) d	687) a	688) c
485) c	486) c	487) b	488) d	689) d	690) b	691) b	692) c
489) c	490) b	491) a	492) c	693) c	694) b	695) d	696) d
493) a	494) c	495) c	496) b	697) c	698) d	699) b	700) b
497) c	498) b	499) b	500) c	701) a	702) b	703) c	704) b
501) a	502) c	503) b	504) c	705) c	706) b	707) b	708) b
505) a	506) b	507) a	508) a	709) d	710) b	711) a	712) c
509) c	510) d	511) d	512) b	713) c	714) c	715) a	716) d
513) d	514) c	515) a	516) d	717) b	718) a	719) a	720) a
517) d	518) a	519) c	520) c	721) a	722) c	723) c	724) b
521) b	522) b	523) a	524) a	725) b	726) c	727) a	728) c
525) d	526) a	527) b	528) d	729) d	730) c	731) c	732) b
529) a	530) c	531) a	532) c	733) d	734) a	735) c	736) b
533) d	534) a	535) d	536) d	737) b	738) c	739) b	740) c
537) d	538) a	539) b	540) a	741) b	742) d	743) b	744) a
541) b	542) d	543) c	544) d	745) a	746) d	747) d	748) a
545) d	546) a	547) c	548) c	749) b	750) a	751) a	752) c
549) b	550) c	551) b	552) a	753) c	754) a	755) b	756) b
553) c	554) b	555) b	556) d	757) a	758) a	759) b	760) d

761) c	762) b	763) b	764) d	781) b	782) d	783) b	784) a
765) b	766) b	767) d	768) c	785) b	786) a	787) d	788) d
769) c	770) c	771) a	772) a	789) a	790) d	791) b	792) b
773) b	774) b	775) a	776) a	793) b	794) d		
777) b	778) d	779) c	780) b				

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THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

: HINTS AND SOLUTIONS :

- 1 **(c)**

$$\text{AgNO}_3 \rightarrow \text{Ag} + \text{NO}_2 + \frac{1}{2}\text{O}_2$$
- 2 **(c)**
 Transition elements show covalency as well as ionic valency, e. g., Mn^{2+} ionic, Mn^{7+} covalent.
- 3 **(c)**
 Potassium dichromate on heating gives oxygen and chromic oxide (Cr_2O_3).

$$4\text{K}_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} 4\text{K}_2\text{CrO}_4 + 3\text{O}_2 + 2\text{Cr}_2\text{O}_3$$
- 4 **(d)**
 Cyanide process is used for the extraction of silver and gold.
- 5 **(b)**
 ZnS is white in colour.
- 6 **(a)**
 Silver metal is extracted by cyanide process.

$$\text{Ag}_2\text{S} + 4\text{NaCN} \rightleftharpoons 2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Na}_2\text{S}$$
 Argentite sodium argentocyanide

$$2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Zn} \rightarrow \text{Na}_2[\text{Zn}(\text{CN})_4] + 2\text{Ag} \downarrow$$
 Sodium tetracyano ppt.
 Zincate (II)
- 7 **(c)**

$$\text{Zn} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$$
 \therefore Zn liberates hydrogen with hot conc. alkali.
- 8 **(d)**
 Zn^{2+} ion possess $(n-1)d^{10}$ configuration. There are no unpaired electrons in $(n-1)d$ -subshell due to which $d-d$ transitions are not possible. Hence, Zn^{2+} ions are colourless.
- 9 **(d)**
 Au and Ag salts are soluble in KCN due to complex formation others not.
- 10 **(a)**

$$\text{Au} + 4\text{CN}^- + \text{H}_2\text{O} + \frac{1}{2}\text{O}_2 \rightarrow 2[\text{Au}(\text{CN})_2]^- + 2\text{OH}^-$$
From gold ore (X)

$$2[\text{Au}(\text{CN})_2]^- + \text{Zn} \rightarrow [\text{Zn}(\text{CN})_2]^- + 2\text{Au}$$
 (X)
 Hence, $[X] = [\text{Au}(\text{CN})_2]^-$, $Y = [\text{Zn}(\text{CN})_4]^{2-}$
- 11 **(b)**
 Argentite is an ore of Ag having composition Ag_2S . It dissolves in NaCN due to formation of soluble complex.

$$\text{Ag}_2\text{S} + 4\text{NaCN} \rightarrow 2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Na}_2\text{S}$$
 \therefore NaCN is used to dissolve argentite.
- 12 **(d)**
 Magnetic moment of transition metal is

$$\mu = \sqrt{n(n+2)}$$
- 13 **(b)**
 It is a fact.
- 14 **(a)**
 Fool's gold is CuFeS_2 which does not contain Au at all
- 15 **(b)**

$$\text{Cu} + \text{H}_2\text{SO}_4 + \frac{1}{2}\text{O}_2 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$$
- 17 **(d)**
 Hg does not form amalgam with iron.
- 18 **(b)**
 It is a process to get Zn granules.
- 19 **(c)**
 Filling of differentiating electrons takes place in $3d$ in first transition series.
- 20 **(c)**
 Limonite $\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$
 Siderite FeCO_3
 Carnallite $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
 Chalcopyrites CuFeS_2
- 21 **(c)**
 Wrought iron is the purest form of iron and contains carbon and other impurities from 0.2% to 0.5%.
- 22 **(a)**
 Pd, Pt absorb H_2 in considerable amount.
- 23 **(a)**
 It is a fact.
- 24 **(d)**
 On fusing AgCl with Na_2CO_3 , metallic silver is obtained.

$$2\text{AgCl} + \text{Na}_2\text{CO}_3 \xrightarrow{\text{Fuse}} 2\text{Ag} \downarrow + 2\text{NaCl} + \text{CO}_2 + \frac{1}{2}\text{O}_2$$
 metallic silver
- 25 **(c)**
 Transition metals exhibit variable oxidation states

- due to participation of $(n - 1)d$ -electron in bond formation.
- 26 **(c)**
In Bessemer's converter impurities of C, Mn, Si, P in pig iron are oxidized to produce steel.
- 27 **(c)**
 ${}_{26}\text{Fe}$ has the configuration $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^6, 4s^2$.
- 28 **(b)**
 Fe^{2+} gets oxidized to Fe^{3+} and Cr_2^{6+} gets reduced to Cr^{3+} .
- 29 **(b)**
Lanthanide contraction relates to decrease in atomic as well as ionic size of M^{3+} ions
- 31 **(c)**
It is a fact. The idea is used in chemical exhibitions.
- 32 **(d)**
 $\text{SnCl}_2 + 2\text{HgCl}_2 \rightarrow \text{SnCl}_4 + \underset{\text{White}}{\text{Hg}_2\text{Cl}_2}$
 $\text{Hg}_2\text{Cl}_2 + \text{SnCl}_2 \rightarrow \text{SnCl}_4 + \underset{\text{Gray}}{\text{Hg}_2}$
- 33 **(d)**
 $\text{V}^{4+} \rightarrow 3d^1, 4s^0$
One unpaired electron, therefore, it is paramagnetic and coloured compound
- 34 **(c)**
All bivalent metal cations form oxide of type *MO*.
Copper forms two types of oxides *i. e.*, Cu_2O , CuO
Barium forms BaO
Silver forms Ag_2O
Lead forms PbO , PbO_2
Hence, silver cannot form *MO* type of oxide because it forms monovalent cation (Ag^+).
- 35 **(d)**
Cinnabar is HgS .
- 36 **(d)**
Following reaction takes place during bessemerisation
 $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$
- 37 **(c)**
Corrosive sublimate is HgCl_2 because it has corrosion nature and sublimation nature.
- 38 **(a)**
Actinides have variable valency due to very small difference in energies of $5f$, $6d$ and $7s$ orbitals
- 39 **(b)**
 $3d$ -series contains ${}_{21}\text{Sc}$ to ${}_{30}\text{Zn}$ in all 10 elements.
- 40 **(d)**
Natural radioactivity is not a characteristic of transition elements.
- General properties of transition elements are
(i) Formation of coloured salts
(ii) Formation of complex salts
(iii) Magnetic properties
(iv) Formation of interstitial compounds
(v) Formation of alloys etc.
- 41 **(c)**
 HgCl_2 is dangerous poison; the antidote being white of an egg which is coagulated by the salt in the system and is eliminated by the system with salts absorbed in it, also Hg itself is very poisonous.
- 42 **(b)**
 $4\text{Ag} + 8\text{NaCN} + 2\text{H}_2\text{O} + \text{O}_2 \rightarrow 4\text{Na}[\text{Ag}(\text{CN})_2] + 4\text{NaOH}$
- 43 **(c)**
Calamine is the carbonate ore of zinc (ZnCO_3).
- 44 **(d)**
Due to shielding effect.
- 45 **(b)**
Both show +8 oxidation states.
- 46 **(a)**
When I^- is oxidised by MnO_4^- in alkaline medium I^- converts into IO_3^- .
 $2\text{KMnO}_4 + 2\text{KOH} \rightarrow 2\text{K}_2\text{MnO}_4 + \text{H}_2\text{O} + [\text{O}]$
 $2\text{KMnO}_4 + 2\text{H}_2\text{O} \rightarrow 2\text{MnO}_2 + 3\text{KOH} + 2[\text{O}]$
 $2\text{KMnO}_4 + \text{H}_2\text{O} \xrightarrow{\text{alkaline}} 2\text{MnO}_2 + 2\text{KOH} + 3[\text{O}]$
 $\text{KI} + 3[\text{O}] \rightarrow \text{KIO}_3$
Hence,
 $2\text{KMnO}_4 + \text{KI} + \text{H}_2\text{O} \rightarrow 2\text{KOH} + 2\text{MnO}_2 + \text{KIO}_3$
- 47 **(c)**
 $4\text{Fe}(\text{CrO}_2)_2 + 8\text{K}_2\text{CO}_3 + 7\text{O}_2 \rightarrow 8\text{K}_2\text{CrO}_4 + 2\text{Fe}_2\text{O}_3 + 8\text{CO}_2$
 $2\text{K}_2\text{CrO}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{Cr}_2\text{O}_7 + \text{K}_2\text{SO}_4 + \text{H}_2\text{O}$
- 48 **(c)**
Tungsten steel contains 14–20% W, 3–8% Cr; used for high speed tools as well as for cutting purposes and maintain the cutting edge of the blade.
- 49 **(b)**
Cast iron or pig iron contains 2 to 4.5% of carbon. It is least ductile and least pure form of iron. It is brittle and cannot be welded.
- 50 **(c)**
Hg-alloys with other metals are called amalgams.
- 51 **(c)**
 HgCl_2 is dangerous poison, the antidote being white of an egg which is coagulated by the salt in the system and is eliminated by the system with salts absorbed in it, also Hg itself is very poisonous.

- 52 (a) It is characteristic of Mn steel.
- 53 (d) CO^{3+} have higher charge density than CO^{2+} , so CO^{3+} is more stable in octahedral complexes.
(ii) Zn exhibits only +2 oxidation state. So,

$$\text{Zn}^{2+} = [\text{Ar}]3d^{10}, 4s^0$$
Since, it does not contain any unpaired electron, its compounds are colourless.
(iii) *d*-block elements are generally paramagnetic and sometimes diamagnetic, but not ferromagnetic.
(iv) Osmium and ruthenium are VIII group elements, so can exhibit the highest oxidation state +8 in their oxides, *e.g.*, OsO_4 . Hence, statement 1 and 4 are correct.
- 54 (d)
$$2\text{FeSO}_4 \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$$
- 55 (d) Hydrometallurgy is based on reduction. In this process, more electropositive Zn metal is used to precipitate gold, silver etc. from their complex salt solutions.

$$2\text{K Au}(\text{CN})_2 + \text{Zn} \rightarrow \text{K}_2\text{Zn}(\text{CN})_4 + 2\text{Au}$$

$$2\text{Na Ag}(\text{CN})_2 + \text{Zn} \rightarrow \text{Na}_2\text{Zn}(\text{CN})_4 + 2\text{Ag}$$
Alkali metals or aluminium can also reduce complex salts.

$$\text{K}_2\text{TiF}_6 + 4\text{K} \rightarrow 6\text{KF} + \text{Ti}$$

$$\text{K}_2\text{ZrF}_6 + 2\text{Al} \rightarrow 2\text{AlF}_3 + 2\text{K} + \text{Zr}$$
- 56 (b) As oxidation state increases, electronegativity increases thus acidic characteristic increases not basic.
- 57 (d) Zr and Hf possess similar atomic size and hence are called twins of Periodic Table. It is due to lanthanide contraction.
- 58 (c) Boron(B), aluminium(Al) and gallium, (Ga) are present in IIIA group. They show +3 oxidation state. While cerium(Ce) is a lanthanoid. It is present in lanthanide series. It shows +3 and +4 oxidation states.
- 60 (b) Iron carbide or Fe_3C .
- 61 (b)
$$2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Zn} \rightarrow \text{Na}_2\text{Zn}(\text{CN})_4 + 2\text{Ag}$$
This is extraction of Ag by cyanide process.
- 62 (c) Constantan is an alloy of Cu and Ni.
- 63 (a) Monel metal or constantan is an alloy of Cu, Ni, Fe, Mn.
- 64 (d) It is a fact. Rest all are coinage metals.
- 65 (d)
$$\text{HgCl}_2 + 2\text{NH}_3 \rightarrow \text{Hg}(\text{NH}_3)_2\text{Cl}_2$$
- 66 (b) Hydrometallurgy is the process of dissolving the metal or its ore by the action of a suitable chemical reagent followed by recovery of the metal either by electrolysis or by the use of a suitable precipitating agent.

$$4\text{Au} + 8\text{KCN} + 2\text{H}_2\text{O} + \text{O}_2 \xrightarrow{\text{air}} 4\text{K}[\text{Au}(\text{CN})_2] + 4\text{KOH}$$

$$2\text{K}[\text{Au}(\text{CN})_2] + \text{Zn} \rightarrow 2\text{Au} + \text{K}_2[\text{Zn}(\text{CN})_4]$$
- 67 (c) Pt is noble metal.
- 68 (b)
$$\text{Zn}(\text{NO}_3)_2 \rightarrow \text{ZnO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$$
- 69 (b)
$$\text{Cu}(\text{NO}_3)_2 \rightarrow \text{CuO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$$
- 70 (b) It is a property of calomel.
- 72 (a)
$$\text{NaCl} + \text{H}_2\text{SO}_4 + \text{K}_2\text{Cr}_2\text{O}_7 \rightarrow \text{CrO}_2\text{Cl}_2 + \text{K}_2\text{SO}_4 + \text{Na}_2\text{SO}_4$$
chromyl chloride
- 73 (d) Spin only magnetic moment.

$$\mu = \sqrt{n(n+2)} = \sqrt{24}$$

$$\Rightarrow n^2 + 2n - 24 = 0$$

$$(n+6)(n-4) = 0$$

$$\therefore n = 4$$
[$\because n = -6$ not possible.]
Here, *n* is the number of unpaired electrons.
The electronic configuration of the metal ion M^{x+} is

$$Z(25) = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^5$$
Since, four unpaired electrons are present, the oxidation state must be +3.

$$\therefore Z^{3+}(25) = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^4$$
- 74 (b)
$$\text{ZnSO}_4 + 2\text{NaHCO}_3 \rightarrow \text{ZnCO}_3 + \text{CO}_2 + \text{H}_2\text{O} + \text{Na}_2\text{SO}_4$$
- 75 (c)
$$\text{Oil (Unsaturated)} + \text{H}_2 \xrightarrow{\text{Ni}} \text{Ghee (Saturated)}$$

- 76 **(b)**
 Ag_2SO_4 contains Ag^+ ($4d^{10}$) and is colourless.
 CuF_2 contains Cu^{2+} ($3d^9$) and is coloured due to the presence of one unpaired electron in d -orbital of Cu^{2+} .
 MgF_2 contains Mg^{2+} and is colourless $n/2$ CuCl contains Cu^+ ($3d^{10}$) and is colourless.
- 77 **(c)**
 Malachite is an ore of Cu containing $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ (green colour)
- 78 **(c)**
 Pure copper as a cathode and impure copper as anode is used in refining of impure copper.
- 79 **(b)**
 It is a fact.
- 80 **(b)**
 Paramagnetism is shown by the positive ions of lanthanides except La^{3+} ($4f^0$) and Lu^{3+} ($4f^{14}$). These ions are diamagnetic
- 81 **(b)**
 $\text{HgI}_2 + 2\text{KI} \rightarrow \text{K}_2\text{HgI}_4$
 soluble
- $\text{HgI}_2 \xrightarrow{\Delta} \text{Hg} + \text{I}_2$
- 82 **(d)**
 Maximum oxidation state exhibited by d -block elements (O.S.) = no of ns electrons + no. of $(n-1)d$ electrons.
 (a) O.S. = $2+2=4$ (b) O.S. = $5+1=6$
 (c) O.S. = $3+2=5$ (d) O.S. = $5+2=7$
 $(n-1)d^5 ns^2$ configuration will achieve the highest oxidation state.
- 83 **(d)**
 $2\text{MnO}_2 + 4\text{KOH} + \text{O}_2 \xrightarrow{\text{Fusion}} 2\text{K}_2\text{MnO}_4 + 2\text{H}_2\text{O}$
 Oxidation number of Mn in K_2MnO_4 is
 $2 \times (1) + x + 4(-2) = 0$
 $x = +6$
- 84 **(d)**
 The process is called galvanisation and it protects iron from corrosion against the action of water and O_2 .
- 85 **(b)**
 Rest all are uses of Cu and its alloys.
- 86 **(c)**
 $4\text{Ag} + 8\text{CN}^- + 2\text{H}_2\text{O} + \text{O}_2 \rightarrow 4[\text{Ag}(\text{CN})_2]^- + 4\text{OH}^-$
 This process is called cyanide process. It is used in the extraction of silver from argentite (Ag_2S).
- 87 **(d)**
 The refining of nickel is carried out by using CO.

This process is called Mond's process.

- 88 **(c)**
 Lanthanide contraction is due to the imperfect shielding of f -electrons due to the diffused shape of f -orbitals. Therefore, as the atomic number increases effective nuclear charge increases and this results in contraction of size of the $4f$ -subshell."
- 90 **(a)**
 In Bessemer's converter impurities of C, Mn, Si, P in pig iron are oxidized to produce steel.
- 92 **(d)**
 These are reasons for the given fact.
- 93 **(c)**
 Philosopher's wool on heating with BaO at 1100°C C produce BaZnO_2 .
- $$\text{BaO} + \text{ZnO} \xrightarrow{1100^\circ\text{C}} \text{Ba ZnO}_2$$
- 95 **(b)**
 Ferrous ion (Fe^{2+}) changes to ferric ion Fe^{3+} on reacting with acidified H_2O_2 as.
 $2\text{K}_4[\text{Fe}(\text{CN})_6] + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}_2 \rightarrow 2\text{K}_3[\text{Fe}(\text{CN})_6] + \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$
 Electronic configuration of $\text{Fe}^{3+} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5$
 Number of d -electrons = 5
 Magnetic moment = $\sqrt{n(n+2)}$
 $= \sqrt{5(5+2)} = 5.92\text{BM}$
- 96 **(c)**
 It reacts with alkalis and acids both.
- 98 **(c)**

Argentite	Ag_2S
Haematite	Fe_2O_3
Malachite	$\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$
Calamine	ZnCO_3
- 99 **(d)**
 ZnO is also called Chinese white.
- 101 **(c)**
 —do—
- 102 **(d)**
 The transition metals form a large number of interstitial compounds in which small atoms like hydrogen, carbon, boron and nitrogen occupy interstitial sites in their lattices
- 103 **(b)**
 It is a fact.
- 104 **(c)**
 The presence of unfilled d -orbitals favours covalent bonding.
- 105 **(c)**
 Fe does not show allotropy.

- 106 (c) Acidified potassium dichromate is oxidized to unstable blue chromium peroxide, which is soluble in ether and produces blue coloured solution.
- $$\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 + 4\text{H}_2\text{O}_2 \rightarrow 2\text{CrO}_5 + \text{K}_2\text{SO}_4 + 5\text{H}_2\text{O}$$
- blue colour
- 107 (c) $\text{Ag}_2\text{S} + 4\text{KCN}(aq.) \rightarrow 2\text{K}[\text{Ag}(\text{CN})_2](aq.) + \text{K}_2\text{S}(aq.)$
- 108 (a) It is a fact.
- 109 (a) It is a fact.
- 110 (d) Strength of metallic bond depends upon number of unpaired electrons. As number of unpaired electrons increase, the bond strength also increases. So, Cr, Mo, show stronger bonding due to maximum number of unpaired electrons.
- 111 (d) German silver contains Cu, Zn and Ni.
- 112 (b) It is a fact.
- 113 (d) The extraction to Cu metal involves bessemerisation. In this process, copper matte obtained from smelting transferred to a Bessemer converter (lined with silica) and a hot air blast is brown to obtain blister copper.
- 114 (d) $\text{CuCl} + \text{CO} \rightarrow \text{CuClCO}$
- 115 (a) CrO_3 dissolves in aqueous NaOH to give sodium chromate.
- $$\text{CrO}_3 + 2\text{NaOH} \rightarrow \text{Na}_2\text{CrO}_4 + \text{H}_2\text{O}$$
- Sodium chromate
- 116 (c) Silver metal is obtained by Mac-Arthur Forrest process which is called cyanide process. The concentrated ore of argentite is treated with dilute NaCN solution and a current of O_2 is continuously passed. Silver sulphide goes into solution in the form of soluble complex sodium argentocyanide.
- $$2\text{Ag}_2\text{S} + 8\text{NaCN} + \text{O}_2 + 2\text{H}_2\text{O} \rightarrow 4\text{Na}[\text{Ag}(\text{CN})_2] + 4\text{NaOH} + 2\text{S}$$
- The soluble complex is treated with zinc dust, when silver gets precipitated.
- $$2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Zn} \rightarrow \text{Na}_2[\text{Zn}(\text{CN})_4] + 2\text{Ag} \downarrow$$
- 117 (d) German silver alloy contains zinc, copper and nickel.
- 118 (c) Follow electrorefining of Cu to get 100% pure Cu.
- 119 (d) $\text{AgBr} + 2\text{Na}_2\text{S}_2\text{O}_3 \rightarrow \text{Na}_3[\text{Ag}(\text{S}_2\text{O}_3)_2] + \text{NaBr}$
Soluble
- 120 (a) Invar is Ni-Fe alloy used in clock pendulum.
- 121 (d) The basic character of hydroxides decreases from $\text{La}(\text{OH})_3$ to $\text{Lu}(\text{OH})_3$. Due to smaller size of Lu, the Lu—OH bond attains more covalent character.
- 122 (b) It is called iodide of Millon's base.
- 123 (a) It is a fact.
- 124 (a) It is a fact.
- 125 (b) Maximum oxidation state of transition metals = number of electrons in $(n - 1)d$ orbitals + number of electrons in ns orbital.
The electronic configuration of $\text{Os} = [\text{Xe}]4f^{14}, 5d^6, 6s^2$
 \therefore Maximum oxidation state $6 + 2 = 8$
 \therefore The highest oxidation state exhibited by transition metal is $+8$ e. g., OsO_4 .
- 126 (b) $2\text{Cl}_2 + \text{HgO} \rightarrow \text{Cl}_2\text{O} + \text{HgCl}_2$
mercuric oxide mercuric chloride
- 128 (a) $3d$ is partially filled.
- 129 (a) $\mu = \sqrt{n(n + 2)}$
 $\Rightarrow \sqrt{15} = \sqrt{n(n + 2)}$
 $\therefore n = 3$
- 130 (c) These show fcc, hep and bcc structures.
- 131 (c) Formation of coloured solution is possible when metal ion in the compound contains unpaired electrons e. g.,
 $\text{Cu}^+ : 3d^{10} 4s^0$ colourless
 $\text{Cu}^{2+} : 3d^9 4s^0$ blue
- 132 (d) In wrought iron, carbon is present as Fe_3C (cementite) i.e., iron carbide and graphite
- 133 (d)

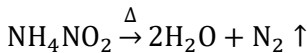
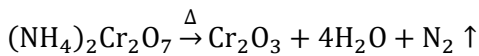
- [Ar]3s¹ + 3 = Ti, it means M³⁺ from Ti³⁺ ion
- 134 (b)
From (n - 1)d¹ to (n - 1)d¹⁰.
- 135 (d)
Lanthanoid contraction is due to ineffective shielding produced by larger f-subshell.
- 136 (c)
Zr and Hf have similar radii, therefore they show similar properties
- 137 (c)
Fe²⁺ (3d⁶) and Fe³⁺ (3d⁵) will show different magnetic moment.
- 138 (a)
The process of hardening the surface of wrought iron by depositing a surface layer of steel on it is called case-hardening. It is done by heating wrought iron in contact with potassium ferricyanide
Alternatively, case hardening can also be done by heating wrought iron with charcoal and then plunging it in a suitable oil
- 139 (b)
KMnO₄ has no unpaired electron. Rest all have unpaired electrons.
- 140 (b)
Colour of transition metal ion salt is due to d - d transition of unpaired electrons of d-orbital. Metal ion salt having similar number of unpaired electrons in d-orbitals shows similar colour in aqueous medium.
In VOCl₂ vanadium is present as V⁴⁺ and in CuCl₂, copper is present as Cu²⁺.
So, ${}_{23}\text{V} = 1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^3, 4s^2$
 $\text{V}^{4+} = 1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^1$
- | | | | | |
|---|--|--|--|--|
| 1 | | | | |
|---|--|--|--|--|
- Number of unpaired electrons = 1
and ${}_{29}\text{Cu} = 1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^1$
 $\text{Cu}^{2+} = 1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^9$
- | | | | | |
|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|
- Number of unpaired electron = 1
Hence, VOCl₂ and CuCl₂ show similar colour.
- 141 (b)
 $\text{Ag}^+ + e \rightarrow \text{Ag}$; finely divided Ag is black in colour and thus AgNO₃ causes black stain on skin. It is therefore, called lunar caustic.
- 142 (a)
Rest all properties are different.
- 143 (a)

- AgCl is called in ore form as horn silver.
- 144 (d)
 $\text{Na}_2\text{CrO}_4 + 2\text{AgNO}_3 \rightarrow \text{Ag}_2\text{CrO}_4 + 2\text{NaNO}_3$
- 145 (d)
 $(n - 1)d^8 ns^2$
- | | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|
- (n - 1)d⁸ ns²
- 4(as in Ni)
- $(n - 1)d^5 ns^1$
- | | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|
- (n - 1)d⁵ ns¹
- 6(as in Cr)
- $(n - 1)d^3 ns^2$
- | | | | | | | |
|---|---|---|--|--|--|---|
| 1 | 1 | 1 | | | | 1 |
|---|---|---|--|--|--|---|
- (n - 1)d³ ns²
- 5(as in V)
- $(n - 1)d^5 ns^2$
- | | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|
- (n - 1)d⁵ ns²
- 7(as in Mn)
- 146 (d)
 $4\text{NaCN} + \text{Ag}_2\text{S} \rightarrow 2\text{NaAg}(\text{CN})_2 + \text{Na}_2\text{S}$
- 147 (b)
Cr³⁺ is a more stable state (3d³-configuration).
- 148 (c)
Cu₂O is red oxide.
- 149 (a)
MnO and Mn₂O₃ are basic, MnO₂ is amphoteric, Mn₂O₇ basic.
- 150 (d)
Impurities of Cu and Ag from gold are removed by boiling impure gold with conc. H₂SO₄ and also by electrolytic method.
- $\text{Cu} + 2\text{H}_2\text{SO}_4 \xrightarrow{\text{Heat}} \text{CuSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
 $2\text{Ag} + 2\text{H}_2\text{SO}_4 \xrightarrow{\text{Heat}} \text{Ag}_2\text{SO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
This method is called parting. Conc. HNO₃ can also be used for this purpose.
- 151 (d)
4f and 5f-belong to different shell, experience different amount of shielding.
- 152 (d)
The magnitude of stability constants for some divalent metal ions of the first transition series with oxygen or nitrogen donor ligands increases in the order
 $\text{Mn}^{2+} < \text{Fe}^{2+} < \text{Co}^{2+} < \text{Ni}^{2+} < \text{Cu}^{2+} < \text{Zn}^{2+}$
- 153 (a)
Silver halides are photosensitive and are easily

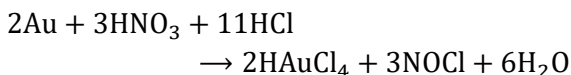
reduced to Ag by mild reducing agent (hydroquinone, ferrous oxalate, etc.)

154 (a)

Ammonium dichromate on heating gives N₂ gas which is also given by heating of NH₄NO₂.



155 (c)

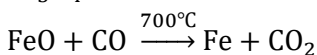
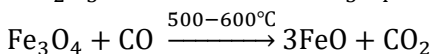
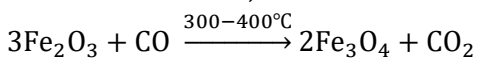


156 (d)

Hg-alloys with other metals are called amalgams.

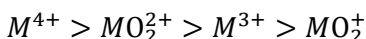
157 (b)

In the blast furnace, iron oxide is reduced by



158 (b)

The higher the charge on the metal ion, smaller is the ionic size and more is the complex forming ability. Thus, the degree of complex formation decreases in the order



The higher tendency of complex formation of MO₂²⁺ as compared to M³⁺ is due to high concentration of charge on metal atom M in MO₂²⁺

159 (a)

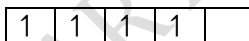
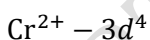
Stainless steel is an alloy of iron with chromium and nickel. Its composition is 82% Fe and 18% Cr + Ni. It resists corrosion and used for making automobile parts and utensils.

160 (a)

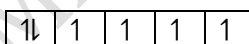
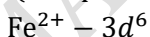
It is a fact.

161 (b)

Cr²⁺ and Fe²⁺



(4 unpaired electrons)



(4 unpaired electrons)

162 (b)

HgCl₂ is easily volatile. It is insoluble in water and soluble in acids

163 (b)

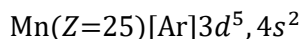
In Cu configuration is 3d¹⁰, 4s¹ and not 3d⁹, 4s².
In Cr configuration is 3d⁵, 4s¹ and not 3d⁴, 4s².

164 (c)

Fe is in +2 oxidation state in Mohr's salt.

165 (c)

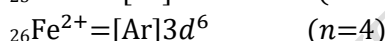
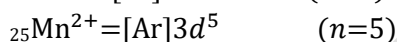
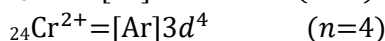
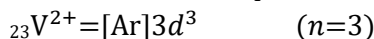
Mn exhibits the maximum number of oxidation states.



It can show +2, +3, +4, +5, +6 and +7 oxidation states.

166 (c)

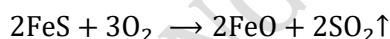
Magnetic moment (μ) = $\sqrt{n(n+2)}$ BM where, 'n' is the number of unpaired electrons.



Hence magnetic moment will be maximum for Mn²⁺ (equal to 5.92 BM).

167 (b)

The reaction,

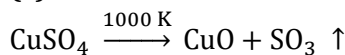


Occurs during roasting of pyrites ore. Roasting is the process of heating concentrated ore in the stream of air to convert it into oxide.

168 (d)

Mn²⁺, V⁴⁺, Ti⁴⁺ and Cr³⁺ are stable oxidation state of respective elements.

169 (c)



170 (a)

AgI is insoluble in NH₃.

171 (d)

CdS is yellow in colour (Follow II gp qualitative analysis).

173 (c)

Fe(CNS)₃ is a red-coloured substance.

174 (d)

Zn²⁺ ions have all paired electrons so, it is diamagnetic.

175 (b)

Elements belonging to gp.3 to gp.12 are d-block elements.

176 (b)

It is a fact.

177 (c)

The formation of thin layer of oxide makes it passive.

178 (d)

Cu; Removal of next electron takes place from 4s-subshell and the removal of next electron takes place from completely filled 3d¹⁰.

179 (a)

It is a fact.

- 180 (d)
All are transition elements.
- 181 (c)
Mond's process involves extraction of Ni.

$$\text{Ni} + 4\text{CO} \xrightarrow{335\text{K}} \text{Ni}(\text{CO})_4 \text{ (Volatile);}$$

$$\text{Ni}(\text{CO})_4 \xrightarrow{450\text{K}} \text{Ni} + 4\text{CO}$$
- 182 (c)
Cu₂O is red oxide of Cu. CuO is black oxide of Cu.
- 183 (a)

$$\text{Mn}^{7+} + 3e \rightarrow \text{Mn}^{4+}$$

$$\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+}$$

$$\text{Mn}^{7+} + 4e \rightarrow \text{Mn}^{3+}$$

$$\text{Mn}^{7+} + e \rightarrow \text{Mn}^{6+}$$
- 184 (b)

$$\text{Cu} + \text{O}_2 + \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$$
- 185 (a)
German silver is an alloy of Cu + Zn + Ni (2:1:1 respectively).
- 187 (a)
Ag is best conductor of electricity among all metals.
- 188 (d)

$$\text{Cu}^{2+} + \text{Fe}(\text{CN})_6^{4-} \rightarrow \text{Cu}_2[\text{Fe}(\text{CN})_6]$$
 Reddish brown ppt.
- 189 (b)
Basicity of lanthanide hydroxides decreases along the lanthanides series from left to right
- 190 (b)

$$\text{CuSO}_4 + 4\text{NH}_4\text{OH} \rightarrow \text{Cu}(\text{NH}_3)_4\text{SO}_4 + 4\text{H}_2\text{O}$$
 Blue

$$4\text{FeCl}_3 + 3\text{Na}_4\text{Fe}(\text{CN})_6 \rightarrow \text{Fe}_4[\text{Fe}(\text{CN})_6]_3 + 12\text{NaCl}$$
 Blue

$$\text{CuSO}_4 + aq. \rightarrow \text{CuSO}_4 \cdot 5\text{H}_2\text{O}$$
 White Hydrated(blue)

$$2\text{CuSO}_4 + \text{K}_4\text{Fe}(\text{CN})_6 \rightarrow \text{Cu}_2\text{Fe}(\text{CN})_6 + 2\text{K}_2\text{SO}_4$$
 Brown
- 191 (a)
Cerium is used in gas mantles, glass polishing and in pyrophasic alloys for lighter flints.
- 192 (a)
Gadolinium (Z=64) [Xe] 4f⁷, 5d¹, 6s²
 Lutetium(Z=71)[Xe] 4f¹⁴, 5d¹, 6s²
 Lawrencium(Z=103)[Rn] 5f¹⁴, 6d¹, 7s²
 Tantalum(Z=73) [Xe]4f¹⁴, 5d³, 6s²
 Hence, gadolinium has got incompletely filled f-subshell.
- 193 (b)

$$\text{AgNO}_3 \xrightarrow{h\nu} \text{Ag} + \text{NO}_2 + \frac{1}{2}\text{O}_2;$$
 brown coloured bottles cut the passage of light through it.
- 194 (b)

- Hg has low b.p. like other members of gp. 12.
- 196 (d)
Elements having electronegativity in the range of 1.35 – 1.82 do not form stable hydride. Thus, leads to hydride gap. These are present in the middle of the Periodic Table *i.e.*, belongs to groups 7, 8 and 9.
- 197 (d)
Magnetic moment depends upon the number of unpaired electron.
 d³: 3 Unpaired electron
 d²: 2 Unpaired electron
 d⁸: 2 Unpaired electron
 d⁶: 4 Unpaired electron
- 198 (a)
The b.p. of Zn, Cd, Hg are 1193, 1040, 1129.7K, comparatively lower values, and are called volatile metals. These are therefore, purified by distillation.
- 199 (a)
The differentiating electrons enter the ns-orbital but they have configuration (n – 1)d¹⁰ns².
- 201 (c)
Many of the d-block (transition) elements and their compounds act as catalyst. Catalytic property is probably due to the utilisation of (n – 1) d-orbitals or formation of interstitial compounds.
- 202 (a)

$$2\text{HgCl}_2 + \text{SnCl}_2 \rightarrow \text{SnCl}_4 + \text{Hg}_2\text{Cl}_2 \text{ (white)}$$

$$\text{Hg}_2\text{Cl}_2 + \text{SnCl}_2 \rightarrow \text{SnCl}_4 + \text{Hg}_2 \text{ (Grey)}$$
- 203 (b)
Mohr salt is FeSO₄ · (NH₄)₂SO₄ · 6H₂O
 ∴ It is double salt having FeSO₄ and (NH₄)₂SO₄.
- 204 (a)
Mn in MnO₄⁻ has +7 and Cr in CrO₂Cl₂ has +6 oxidation state, the highest for Mn and Cr respectively.
- 205 (c)
Lanthanides are the 14 elements of IIIB group and sixth period (At. no.=58 to 71) that are filling 4f-subshell of antipenultimate shell from 1 to 14. Actually, they are placed below the Periodic Table in horizontal row as lanthanide series.
- 206 (a)
When the quenched steel is heated to temperature below red hot and then allowed to cool slowly. It becomes soft. This process is known as annealing
- 207 (d)

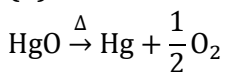
- It is a use of chrome alum.
- 208 (c) We know that by reducing auric chloride by stannous chloride, the colloidal solution of gold is obtained. It is known as purple of cassius
- 209 (b) $2\text{CuCl}_2 + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow \text{Cu}_2\text{Cl}_2 + 2\text{HCl} + \text{H}_2\text{SO}_4$
- 210 (d) C, Fe, Mg react with hot water to give H_2 .
- 211 (b) Tungsten is the highest m.p. metal (3410°C).
- 212 (d) Mercurous chloride (calomel) is prepared by heating HgCl_2 and Hg in iron vessel.
 $\text{HgCl}_2 + \text{Hg} \xrightarrow{\Delta} \text{Hg}_2\text{Cl}_2$
 It can also be prepared by the reduction of mercury (II) chloride by tin (II) chloride in a limited quantity.
 $2\text{HgCl}_2 + \text{SnCl}_2 \xrightarrow{\Delta} \text{Hg}_2\text{Cl}_2 + \text{SnCl}_4$
- 213 (a) It is a fact.
- 214 (b) $\text{SO}_3^{2-} + \text{H}_2\text{O} \rightarrow \text{SO}_4^{2-} + 2\text{H}^+ + 2e$
 $\text{MnO}_4^- + 8\text{H}^+ + 5e \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$
- 215 (c) It is a fact.
- 216 (d) The element having unpaired electron is paramagnetic. More the number of unpaired electrons, more will be paramagnetic character.
 Mn (25) = $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^5$
 \therefore 5 unpaired electrons
 Fe (26) = $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^6$
 \therefore 4 unpaired electrons
 Ni (28) = $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^8$
 \therefore 2 unpaired electrons
 Cu (29) = $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}$
 \therefore 1 unpaired electrons
 \therefore Mn has maximum and Cu has least paramagnetic property.
- 217 (b) It is a reason for the given fact.
- 218 (c) The cupellation step in Parke's process is used to purify Ag from lead.
- 219 (c) It is a fact.
- 221 (d) All are facts about Hg.
- 222 (a) The most abundant transition metal is Fe.
- 223 (a) All those inner-transition elements having +2 oxidation state, changes to +3, and act as reducing agents. While those having +4 tend to change to +3 and act as oxidizing agents. Therefore, Np^{4+} acts as an oxidizing agent
- 224 (a) Oxide of Mn in its intermediate oxidation state *i.e.*, +4 is MnO_2 . This is amphoteric in character.
- 225 (c) Silver nitrate decomposes to silver nitrite on heating above its melting point (212°C).
 $2\text{AgNO}_3 \xrightarrow{>212^\circ\text{C}} 2\text{AgNO}_2 + \text{O}_2$
 On heating above 450°C (red hot), silver nitrate decomposes to metallic silver, oxide of nitrogen and oxygen.
 $2\text{AgNO}_3 \xrightarrow{>450^\circ\text{C}} 2\text{Ag} + 2\text{NO}_2 + \text{O}_2$
- 226 (a) Cu^{2+} has one unpaired electron.
- 227 (d) ZnSO_4 forms soluble zincates.
- 228 (d) Thermite is $\text{Fe}_2\text{O}_3 + \text{Al}$ used for welding.
- 229 (a) Cu_2O is called ruby copper.
- 230 (c) Np and Pu in NpO_3^+ and PuO_3^+ oxocations show +7 oxidation state which are not so stable
- 231 (a) Ammonia soda process is for manufacture of Na_2CO_3 .
- 232 (a) Steel is the most important commercial variety of iron having percentage of carbon 0.25 – 2 (between cast iron wrought iron).
- 233 (c) ${}_{28}\text{Ni}^{2+}$ has two unpaired electrons, ${}_{22}\text{Ti}^{3+}$, has one unpaired electron.
- 235 (a) Ionization energy increases along the period and therefore, they have lesser values than *p*-block and more value of *IE* than *s*-block elements.
- 237 (a) Cu, Ag, Au group of element are called coinage metals as these are used in minting coins.
- 238 (a) Cadmipone is $\text{CdS} + \text{BaSO}_4$.
- 239 (c) Correct order of melting points is

Mn(1246° C) < Ti(1668° C) < V ≈ Cr(1907° C)

240 (d)

Actual composition of chromite ore (FeCr₂O₄) is FeO.Cr₂O₃. In FeO, the oxidation state of Fe is +2 while in Cr₂O₃, the oxidation state of Cr is +3.

241 (b)



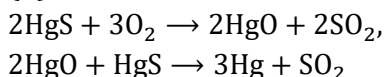
242 (a)

Cast iron has the highest percentage of carbon. It contains 2 to 4.5 % of carbon along with impurities such as sulphur, silicon, phosphorus etc. It is the least pure form of iron.

243 (a)

Argentite is Ag₂S.

244 (d)

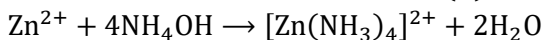


245 (a)

Transuranic elements start after uranium and begin with Np (Neptunium)

246 (a)

All these compounds are less soluble in water and only Zn(OH)₂ is soluble in NH₄Cl + NH₄OH due to formation of tetramine zinc (II) complex.



247 (d)

Transition metals can form ionic or covalent compounds and their melting and boiling points are high. Their compounds are generally coloured and they usually exhibit variable valency.

248 (b)

Both KMnO₄ and FeCl₃ are oxidant and thus, no reaction.

249 (b)

Alloy is a homogeneous mixture of two or more metals. Mercury forms amalgams (alloy) with gold, silver and tin. But it does not react with iron or platinum.

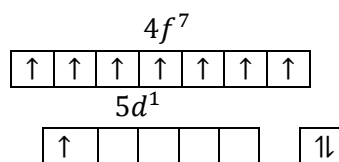
250 (b)

Purple of Cassius is the trade name for gold sol. in water.

252 (d)

Gd(64)

[Xe]₅₄



All the electrons of 4f-orbital are unpaired, hence stable.

Thus, Gd(64) has EC as [Xe]₅₄ 4f⁷ 5d¹ 6s²

Instead of [Xe]₅₄ 4f⁸ 6s²

253 (c)

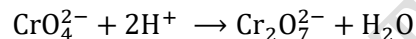
The electronic configuration of mercury (80) is [Xe]4f¹⁰, 5d¹⁰, 6s². Its d-subshell is completely filled, thus it prevents the overlapping of d-orbitals (d – d overlapping).

Hence, it is liquid metal at room temperature.

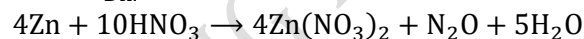
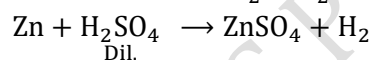
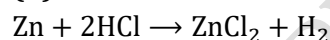
254 (c)

Azurite is the ore of copper, its molecular formula is Cu(OH)₂. 2CuCO₃.

255 (b)



256 (d)

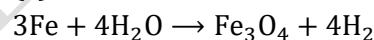


Thus, NO₃⁻ ions are reduced to N₂O whereas in first two reactions H⁺ is reduced to H₂.

257 (b)

Siderite —FeCO₃, calcite (or limestone) — CaCO₃, silver glance(or argentite) —Ag₂S, fool's gold (or iron pyrites) —FeS₂.

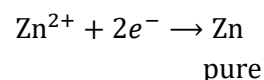
258 (c)



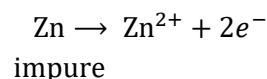
259 (d)

In the electrolytic refining of zinc, anode is made up of impure zinc while a strip of pure zinc acts as cathode. An acidified solution of zinc sulphate acts as electrolyte. When electricity is passed, following reactions occur.

At cathode

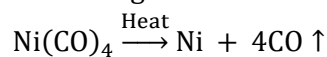


At anode



261 (b)

Ni combines with CO to form volatile Ni(CO)₄ which decomposes to give pure Ni metal and CO on heating.



Volatile metal

262 (c)

In Bessemer's converter impurities of C, Mn, Si, P in pig iron are oxidized to produce steel.

263 (b)



264 (d)

Due to lanthanide contraction there occurs net

- decrease in size. Only one 0.85 Å is smaller one.
- 265 (a) When oxyhaemoglobin changes to deoxyhaemoglobin, Fe^{2+} ion changes from diamagnetic to paramagnetic.
- 266 (c) Zn blende is ZnS .
- 267 (d) Transitional metal ion having unpaired electrons are coloured while those which have no unpaired electron are colourless.
 TiF_6^{2-}
 $\text{Ti}^{4+}:[\text{Ar}]3d^0$; 0 unpaired electrons; colourless
 Cu_2Cl_2
 $\text{Cu}^+:[\text{Ar}]3d^{10}$; 0 unpaired electrons; colourless
 CoF_6^{3-} ,
 $\text{CO}^{3+}:[\text{Ar}]3d^6$; 4 unpaired electrons; coloured
 NiCl_4^{2-}
 $\text{Ni}^{2+}:[\text{Ar}]3d^8$; 2 unpaired electrons; coloured
- 268 (d)
 $\text{Ti} : 3d^2 4s^2$; $\text{V} : 3d^3 4s^2$; $\text{Cr} : 3d^5 4s^1$;
 $\text{Mn} : 3d^5 4s^2$;
 $\text{Ti}^{2+} : 3d^2$; $\text{V}^{3+} : 3d^2$; $\text{Cr}^{4+} : 3d^2$;
 $\text{Mn}^{5+} : 3d^2$
- 269 (d)
 $\text{Hg}_2\text{Cl}_2 + 2\text{NH}_3 \rightarrow \text{HgNH}_2\text{Cl} + \text{Hg} + \text{NH}_4\text{Cl}$
white black
- 270 (b) Molybdenum steel is resistant to acid.
- 271 (b) A characteristic of transition elements.
- 272 (c) A characteristic hydride formation by d -block elements.
- 273 (a) RBCs contain Fe in haemoglobin.
- 275 (d) Pt is a noble metal.
- 276 (c) ZnS (white), is precipitated in weak acidic medium ZnCl_2 (aq.) and $\text{Zn}(\text{NO}_3)_2$ (aq.) give strongly acidic solution.
- 277 (b) Zn, Cd, Hg are d -block elements but not regarded as transition elements because these do not have partially filled d -orbitals in their most common oxidation states
- 278 (b) The solubility order is $\text{AgF} > \text{AgCl} > \text{AgBr} > \text{AgI} > \text{Ag}_2\text{S}$
- 279 (b) Brass is an alloy of copper and zinc (60–80% Cu and 40–20% Zn).
- 280 (c)
 $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + e$; $\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+}$
- 281 (b) Ag salts on strong heating form Ag.
- 282 (b) Mond's process involves extraction of Ni.
 $\text{Ni} + 4\text{CO} \xrightarrow{335\text{K}} \text{Ni}(\text{CO})_4$ (Volatile);
 $\text{Ni}(\text{CO})_4 \xrightarrow{450\text{K}} \text{Ni} + 4\text{CO}$
- 283 (c)
 $2\text{Fe}_2(\text{SO}_4)_3 + 3\text{K}_4[\text{Fe}(\text{CN})_6] \rightarrow \text{Fe}_4[\text{Fe}(\text{CN})_6]_3 + 6\text{K}_2\text{SO}_4$
(Pussian blue)
- 284 (c) German silver is an alloy of copper, zinc and nickel. It is used in utensils and resistance wire.
- 285 (b) Due to the formation of $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$; green
- 286 (b) It is a reason for the given fact.
- 287 (a) FeSO_4 is mostly used in manufacture of blue-black ink, as a mordant in dyeing and tanning industries.
- 288 (c) It is a trade name for $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.
- 289 (a) The elements having incomplete d -orbital can show variable oxidation state (because the electrons move the two levels of d itself)
 $\therefore \text{Zn}$ has completely filled d -orbital.
 \therefore It does not show variable oxidation state. It always show +2 oxidation state.
- 291 (b) It is a fact.
- 292 (b)
 $\text{Ag}_2\text{O} \xrightarrow{\Delta} 2\text{Ag} + \frac{1}{2}\text{O}_2$
- 293 (a) Calamine (ZnCO_3) is an ore of zinc.
- 294 (b) Haematite (Fe_2O_3) having FeO is first oxidized to Fe_2O_3 and then reduced to Fe by Co.
- 295 (b) MnO_2 forms amphoteric oxide due to intermediate oxidation state
- 296 (d) It does not dissolve in aqua regia as it is much

- more noble than Au and Pt
- 297 **(d)**
Hg has +1 oxidation state in Hg_2Cl_2 .
- 298 **(b)**
 $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ ionizes to $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$ and Cl^- . These 2Cl^- react with Ag^+ to form white ppt. of AgCl .
- 299 **(d)**
All are facts.
- 300 **(a)**
 $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 + 4\text{H}_2\text{O}_2 \rightarrow \text{K}_2\text{SO}_4 + 2\text{CrO}_5 + 5\text{H}_2\text{O}$
- 301 **(a)**
White vitriol is $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$.
- 302 **(a)**
No in iron complex has +1 oxidation number.
- 303 **(b)**
 Mn^{2+} is most stable as it has half-filled d -orbitals.
- 304 **(c)**
 $\text{ZnCl}_2 \cdot 2\text{H}_2\text{O} \xrightarrow{\Delta} \text{Zn}(\text{OH})\text{Cl} + \text{HCl} + \text{H}_2\text{O}$
 $\text{Zn}(\text{OH})\text{Cl} \rightarrow \text{ZnO} + \text{HCl}$
- 305 **(c)**
 $3\text{Fe}(\text{CN})_2 + 4\text{Fe}(\text{CN})_3 \rightarrow \text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ or $\text{Fe}_7\text{C}_{18}\text{N}_{18}$
Prussian blue
- 306 **(a)**
 CrO_4^{2-} has no unpaired d -electron.
- 307 **(a)**
 $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$. This is because ionic size of La^{3+} ion is more than Lu^{3+} ion
- 308 **(d)**
Cerium is commonly used in manufacture of alloys of lanthanide. It is also used in dyeing cotton or fabrics, for scavenging oxygen and sulphur from other metals and also used as catalyst.
- 309 **(a)**
—do—
- 310 **(d)**
It is a reason for the given fact.
- 311 **(d)**
It is a fact.
- 312 **(b)**
Zn does not show corrosion.
- 313 **(c)**
The process is called hardening of steel and it develops hard and brittle nature in steel.
- 314 **(c)**
Lowest m.p. among all metals is of Hg (-38.9°C).
- 315 **(d)**
The temperature of the slag zone in the metallurgy of iron using blast furnace is $800-1000^\circ\text{C}$.
- 316 **(b)**
The phenomenon is called spitting of Ag.
- 317 **(c)**
 Cu_2O has completely filled d -orbitals in Cu^+ and thus, does not show ($d-d$) transition.
- 318 **(c)**
 $\text{Hg}(\text{OH})_2$ does not exist.
- 319 **(d)**
 K_2HgI_4 , a colourless complex, is formed,
 $4\text{KI} + \text{HgCl}_2 \rightarrow \text{K}_2\text{HgI}_4 + 2\text{KCl}$
- 320 **(a)**
The atomic weight of Co, Ni and Fe are 59.90, 58.60, 55.85 respectively. Therefore, $\text{Co} > \text{Ni} > \text{Fe}$ is the correct sequence of atomic weights
- 321 **(a)**
Silver nitrate is commercially known as lunar caustic.
- 322 **(b)**
The complex formed is $\text{Ag}(\text{NH}_3)_2\text{Cl}$ which ionizes in $\text{Ag}(\text{NH}_3)_2^+$ and Cl^- .
- 323 **(b)**
Fe is ferromagnetic, *i. e.*, retains magnetic properties if field is removed
- 324 **(d)**
Zinc sulphate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$) is called white vitriol. It when heated with barium sulphide, forms a white pigment lithopone
- 325 **(c)**
This is definition of tempering of steel. The product obtained is neither so hard nor so brittle. It is softer than steel.
- 326 **(b)**
“925 fine silver” means 925, parts of pure Ag in 1000 parts of an alloy. Therefore, in percentage it will be 92.5% Ag and 7.5% Cu
- 327 **(c)**
It is a property of ZnCl_2 .
- 328 **(d)**
 AgBr , silver bromide is used in photography.
- 329 **(d)**
Brass is an alloy of Cu and Zn.
Bronze is an alloy of Cu and Sn.
German silver is an alloy of Cu, Zn and Ni.
Hence, Cu is the common metal in brass, bronze and German silver.
- 331 **(c)**
Among the given, manganese has the most stable electronic configuration, thus it is very hard to

remove an electron from its outer shell. Hence, a large amount of energy is required. Therefore, manganese has the maximum first ionization potential

332 (c)

It is a fact.

333 (b)

Vitamin B₁₂ is C₆₃H₈₈CoN₁₄O₁₄P.

334 (d)

By white tin plating, iron can be protected by water

335 (a)

$2\text{KMnO}_4 + 2\text{KOH} \rightarrow 2\text{K}_2\text{MnO}_4 + \text{H}_2\text{O} + \text{O}$
or $\text{MnO}_4^- + e \rightarrow \text{MnO}_4^{2-}$.

336 (a)

Zn acts as cathode and carbon as anode in dry cells.

337 (a)

Annealing is the process of cooling a hot molten metal slowly. Railway wagon axles are made by heating iron rods embedded in charcoal powder (annealing) so that those might not break due to sudden change in temperature.

338 (a)

The methods chiefly used for the extraction of lead and tin from their ores are respectively self reduction and carbon reduction. (Because the process of heating the ore strongly in the presence of excess of air is called roasting. It is mainly used in case of sulphide ores and the process of extracting a metal by fusion of the oxide ore with carbon is known as smelting.)

339 (d)

The general electronic configuration for lanthanides is

$[\text{Xe}](n-2)f^{1-14}(n-1)d^1ns^2$.

∴ After the loss of both of the 6s-electrons and also the solitary d-electrons, the lanthanoids gain stable configurations.

∴ (+3) oxidation state is most common among lanthanides.

340 (d)

A) There is gradual decrease in the radii of the lanthanoids with increasing atomic number—a case of lanthanide contraction, thus true.

B) Ionization potential for the formation of Lu³⁺ is comparatively low, hence +3 state is favourable, thus true.

C) Due to lanthanide contraction—Zr and Hf; Nb and Ta, Mo and W have the same size and thus

similar properties and thus separation is not easy, thus true.

D) Formation of +4 state requires very high energy, thus incorrect.

341 (c)

After smelting in blast furnace, the slag is removed from slag hole of the furnace while a molten mass containing mostly Cu₂S + little FeS is called matte; it contains 80% metal.

342 (c)

There is very small difference in energies of 5f, 6d and 7s orbitals of actinoids, therefore their electronic configuration cannot be assigned with a degree of certainty

343 (d)

In Mac-Arthur-Forrest method silver is extracted from the solution of sodium argentocyanide by using zinc.

$2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Zn} \rightarrow \text{Na}_2[\text{Zn}(\text{CN})_4] + 2\text{Ag} \downarrow$

345 (d)

It is Mn and exhibits +7 oxidation state.

346 (d)

The size of lanthanides are smaller than expected. This is associated with the filling of 4f orbitals which must be filled before the 5d orbitals. The electrons in f-orbitals are not effective in screening other electrons from the nuclear charge

347 (b)

$\text{Ag}^+ + e \rightarrow \text{Ag}$; finely divided Ag is black in colour and thus AgNO₃ causes black stain on skin. It is therefore, called lunar caustic.

348 (a)

Due to 3d⁵ configuration.

349 (c)

Gd = $[\text{Xe}]4f^75d^16s^2$,

Gd³⁺ = $[\text{Xe}]4f^7$ (half-filled)

350 (a)

$3\text{Hg} + 8\text{HNO}_3(\text{dil.}) \rightarrow 3\text{Hg}(\text{NO}_3)_2 + 2\text{NO} + 4\text{H}_2\text{O}$
Soluble and washed away

351 (d)

$E^\circ_{\text{OP of Hg}} > E^\circ_{\text{OP of H}}$. Thus, Hg is less reactive than H₂.

352 (a)

Brass is an alloy of Cu + Zn (60-80% + 40-20% respectively).

353 (a)

Maximum number of unpaired electrons are in Mn.

355 (d)

It is a use of Ti alloys.

356 (c)

Ore Chemical composition

Cuprite Cu_2O

Chalcocite Cu_2S

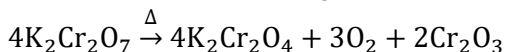
Chalcopyrite CuFeS_2

Malachite $\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$

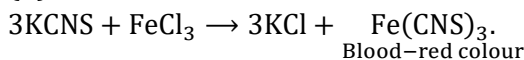
In these ores, chalcopyrite (CuFeS_2) Contains both iron and copper.

357 (c)

Potassium dichromate, on heating give oxygen and chromic oxide (Cr_2O_3)



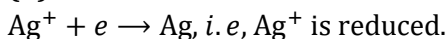
358 (b)



359 (a)

Fe, Co, Ni are called ferrous metals.

360 (d)



361 (d)

Most of the transition metal cations are coloured.

362 (a)

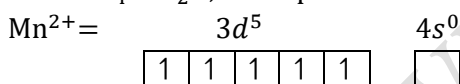
$\text{Ag}(\text{CN})_2^-$ does not contain unpaired electrons.

363 (d)

It is a fact.

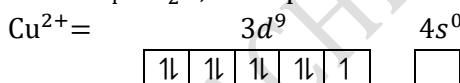
364 (d)

In $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$, Mn is present as Mn^{2+}



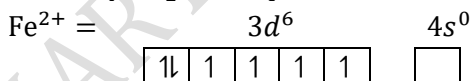
(Unpaired electrons = 5)

In $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, Cu is present as Cu^{2+}



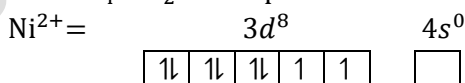
(Unpaired electrons = 1)

In $\text{FeSO}_4 \cdot 6\text{H}_2\text{O}$, Fe is present as Fe^{2+}



(Unpaired electrons = 4)

In $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ Ni is present as Ni^{2+}



(Unpaired electrons = 2)

Since, paramagnetic character \propto unpaired electrons.

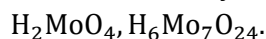
Thus, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ has the lowest degree of paramagnetism among the given at 298 K.

365 (a)

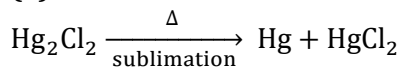
HgS is insoluble in hot dil. HNO_3 .

366 (c)

A number of molybdic acids are known



367 (a)



368 (b)

It is a fact.

369 (a)

AgBr decomposes on exposure to light.

370 (c)

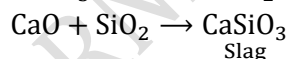
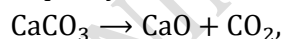
Hg is volatile metal.

371 (a)

In amalgam, Hg has zero oxidation state.

372 (c)

Haematite contains SiO_2 (acidic) non-fusible impurity and this basic flux CaCO_3 is used.



373 (a)

Cu forms $\text{Cu}(\text{NH}_3)_4^{2+}$ complex.

374 (d)

It is a reason for given fact.

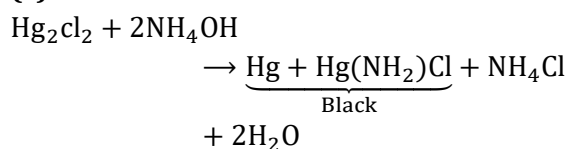
375 (b)

Permanent magnets are generally made up of alloys of Al, Ni and Co

376 (d)

ZnS is white. (Follow II gp. qualitative analysis).

377 (c)



378 (a)

The chemical formula for ammonium molybdate is $(\text{NH}_4)_2\text{MoO}_4$.

379 (a)

It is a reason for the given fact.

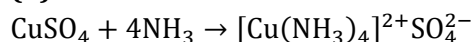
380 (a)

The electronic configuration of ${}_{62}\text{Sm}^{3+}$ is $4f^4$ and that of ${}_{66}\text{Dy}^{3+}$ is $4f^9$. The colour of f^n and f^{14-n} are often identical

381 (c)

Cassiterite is an ore of Sn.

382 (b)



383 (c)

Pig iron is formed during metallurgical

- operations. All other forms are then prepared by using it.
- 384 (c) —do—
- 385 (c) An element is paramagnetic if it has unpaired electron.
- 386 (b) Commercial zinc, about 97% pure containing lead and other impurities is called spelter.
- 387 (a) ZnO is known as philosopher's wool because it is very light, white, soft wooly powder.
- 388 (a) The density of transition elements gradually increases along the period or in a series, e. g., 3d-series: ${}_{21}\text{Sc}$ (3.0g/mL) to ${}_{29}\text{Cu}$ (8.9g/mL). ${}_{30}\text{Zn}$ has 7.1 g/mL.
- 389 (b) Silver containing lead as impurity is purified by cupellation process.
- 390 (c) Pig iron contains about 4% carbon. P, Mn and Si are in less percentage.
- 391 (d) The electronic configurations of Cu^{2+} is $\text{Cu}^{2+}:[\text{Ar}] 3d^9$
Hence, it has one unpaired electron.
Magnetic moment(μ)= $\sqrt{n(n+2)}$
 $\sqrt{1(1+2)}$
 $=1.73$
- 392 (b) Ni-steel contains 3.5% Ni and is used in making cables, automobiles and aeroplane parts, armour plates, propeller shafts, etc.
- 393 (c) Hg exists as Hg_2^{2+} and not Hg^+ .
- 394 (a) CrO_3 and Mn_2O_7 are acidic oxide. Since, they react with water and form the acids.
e. g., $\text{CrO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CrO}_4$
chromic acid
 $\text{Mn}_2\text{O}_7 + \text{H}_2\text{O} \rightarrow 2\text{HMnO}_4$
permanganic acid
- 395 (d) Copper metallurgy involves bessemerization. In Bessemer convertor, the impurities of ferric oxide forms slag with silica and copper oxide is reduced to give blister copper.
 $\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3$

slag

- $\text{Cu}_2\text{S} + 2\text{Cu}_2\text{O} \rightarrow 6\text{Cu} + \text{SO}_2$
- 396 (c) It is a fact.
- 397 (b) It is a fact
 $4\text{Au} + 8\text{KCN} + 2\text{H}_2\text{O} + \text{O}_2 \rightarrow 4\text{K}[\text{Au}(\text{CN})_2] + 4\text{KOH}$
 $2\text{K}[\text{Au}(\text{CN})_2] + \text{Zn} \rightarrow \text{K}_2[\text{Zn}(\text{CN})_4] + 2\text{Au}$]
- 398 (b) The chief ore of copper is copper pyrite, CuFeS_2 .
- 400 (a) Transitional metal ions having electronic configuration $(n-1)d^0$ or $(n-1)d^{10}$ are colourless while those have $(n-1)d^{1-9}$ are coloured.
 $\text{Cu}^+ : [\text{Ar}] 3d^{10}$: colourless
 $\text{Cu}^{2+} : [\text{Ar}] 3d^9$: coloured
 $\text{Fe}^{2+} : [\text{Ar}] 3d^6$: coloured
 $\text{Mn}^{2+} : [\text{Ar}] 3d^5$: coloured
- 401 (b) It is a reason for the given fact.
- 402 (a) Transition metal which have low oxidation number acts as reducing agent because of greater tendency to lose the electron. Moreover, they behave like a base
- 403 (a) The composition of bell metal is Cu (80%) and Sn (20%).
- 404 (c) The main characteristic feature of transition elements.
- 406 (d) $\mu = \sqrt{n(n+2)} = \sqrt{15}$
 $\therefore n = 3$
Thus, 3 unpaired electron in ${}_{24}\text{M}$, i. e., ${}_{24}\text{M}^{3+}$, or $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^3$ for Cr^{3+} .
- 407 (b) Density of transition elements increases along the period.
- 408 (d) $\text{AuCl}_3 \xrightarrow{h\nu \text{ or } \Delta} \text{AuCl} + \text{Cl}_2$
- 409 (c) White vitriol is $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$.
- 410 (a) $\text{Zn} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$
- 411 (b) $\text{KI} + \text{AgNO}_3 \rightarrow \text{AgI} + \text{KNO}_3$

- 412 (b)
Wrought iron is the purest form of iron.
- 413 (c)
Rest all form nitrides as AlN, Mg₃N₂, Ca₃N₂.
- 414 (c)
Yellow colour of the potassium chromate changes to orange on acidification. It is due to the formation of dichromate ions
- $$2\text{CrO}_4^{2-} + 2\text{H}^+ \xrightleftharpoons[\text{alkali}]{\text{acid}} \text{Cr}_2\text{O}_7^{2-} + 2\text{H}_2\text{O}$$
- yellow orange
- 415 (b)
The Stability of Cu²⁺ (aq) rather than Cu⁺ (aq) is due to much more negative Δ_{hyd}H⁰ of Cu²⁺ (aq) than Cu⁺, which more than compensates for 2nd ionization enthalpy of Cu.
- 416 (c)
At the bottom: 1775K.
- 417 (d)
$$2\text{Fe} + 3\text{Cl}_2 \xrightarrow{\Delta} 2\text{FeCl}_3$$
- 418 (a)
Green vitriol is FeSO₄ · 7H₂O.
- 419 (a)
It is a fact.
- 420 (d)
$$4\text{Au} + 8\text{CN}^- + 2\text{H}_2\text{O} + \text{O}_2 \rightarrow 4[\text{Au}(\text{CN})_2]^- + 4\text{OH}^-$$

soluble

$$2[\text{Au}(\text{CN})_2]^- + \text{Zn} \rightarrow 2\text{Au}(s) + [\text{Zn}(\text{CN})_4]^{2-}$$
- 421 (a)
3d-series contains ₂₁Sc to ₃₀Zn; 4d-series contains ₃₉Y to ₄₈Cd and 5d-series contains ₅₇La and ₇₂Hg to ₈₀Hg; 6d-series contains ₈₉Ac, ₁₀₄Ku and ₁₀₅Ha.
- 423 (c)
₉₂U is a member of actinoid series (90 to 103).
- 424 (c)
"All their ions are colourless" this sentence is false because they are 90% coloured and only few are colourless
- 425 (d)
These are facts about sterling silver.
- 426 (b)
Steel or iron containing excessive quantities of S is brittle while hot (hot or red short), whereas excessive quantities of phosphorus make it brittle white cold (cold short).
- 427 (b)
₂₉Cu: 1s², 2s²2p⁶, 3s²3p⁶3d¹⁰, 4s¹ i. e., 14

electrons have spin in one direction and 15 in other direction.

- 428 (a)
Fe²⁺ = [Ar] 3d⁶4s⁰ ⇒ 4 unpaired electrons
Cu⁺ = [Ar] 3d¹⁰4s⁰ ⇒ 0 unpaired electrons
Zn = [Ar] 3d¹⁰4s² ⇒ 0 unpaired electrons
Ni³⁺ = [Ar] 3d⁷4s⁰ ⇒ 3 unpaired electrons
- 429 (d)
 $E^\circ_{\text{OP of Na}} > E^\circ_{\text{OP of Zn}}$
- 430 (b)
Lanthanide contraction, cancels almost exactly the normal size increase on descending a group of transition elements, thus Nb and Ta, Zr and Hf have same covalent and ionic radii.
- 431 (b)
$$2\text{Fe}_2(\text{SO}_4)_3 + 3\text{K}_4[\text{Fe}(\text{CN})_6] \rightarrow \text{Fe}_4[\text{Fe}(\text{CN})_6]_3 + 6\text{K}_2\text{SO}_4$$

(Prussian blue)
- 432 (d)
In the iron silica is present as impurity, so for the removal of impurity of silica limestone is used.
$$\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$$

$$\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$$

slag
- 433 (b)
Cu²⁺ is discharged at cathode.
- 434 (c)
HCOOH is a reducing agent.
$$\text{HCOOH} + 2\text{HgCl}_2 \rightarrow \text{Hg}_2\text{Cl}_2 + 2\text{HCl} + \text{CO}_2$$
- 435 (c)
VOSO₄ is paramagnetic as well as coloured compound.
The oxidation state of vanadium in VOSO₄ is +4.
$$\text{V} [Z=23] = [\text{Ar}] 3d^3 4s^2$$

$$\text{V}^{4+} [Z=23] = [\text{Ar}] 3d^1 4s^0$$

It has one unpaired electron hence, it is paramagnetic in nature.
- 436 (c)
Ferrous sulphate (FeSO₄ · 7H₂O) is known as green vitriol.
- 437 (c)
The reaction takes place in blast furnace are
$$3\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow 2\text{Fe}_3\text{O}_4 + \text{CO}_2$$

$$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$$

$$\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$$

$$\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$$

$$2\text{C} + \text{O}_2 \rightarrow 2\text{CO}$$

Hence, the reaction 2Fe₂O₃ + 3C → 4Fe + 3CO₂ does not take place in blast furnace.
- 438 (a)

Inner transition elements or *f*-block elements have 3 incomplete shells,
i. e., $(n-2)s^2p^6d^{10}f^{1-14}, (n-1)s^2p^6, ns^{1-2}$.

439 (c)

This involves auto reduction.

440 (d)

Follow extraction of iron.

441 (c)

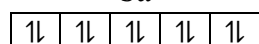
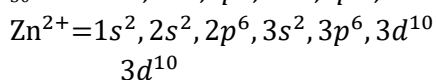
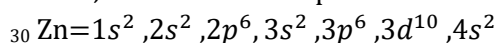
The gangue of FeO comes out as slag with acidic flux SiO₂.

442 (a)

Magnetic moment of

$$\text{Zn}^{2+} \mu_{\text{effective}} = \sqrt{n(n+2)} \text{ BM}$$

Where, *n* = number of unpaired electrons



$$n = 0$$

So, magnetic moment of Zn²⁺ = zero.

443 (a)

Cu is present in all these alloys.

444 (c)

Au is a member of 5*d*-series. Fe, Co and Cu all are the members of 3*d*-series.

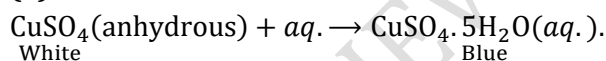
445 (b)

Azurite [2CuCO₃ · Cu(OH)₂] is an ore of copper.

446 (b)

It is a fact.

447 (a)



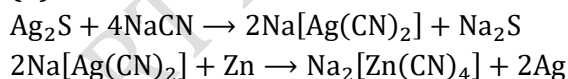
448 (a)

Fe and Pt do not form amalgam with Hg.

449 (c)

Rest all are wrong reporting.

450 (d)



451 (c)

Cu is placed below H in electrochemical series.

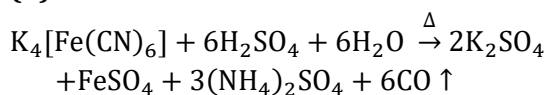
452 (b)

Zn forms only Zn²⁺ ion.

453 (d)

All these protect iron against corrosion.

454 (b)



455 (d)

Blister copper is obtained by the process of

bessemerisation from the copper matte in the metallurgy of Cu. It is impure. Blister copper contains about 98 to 99% pure copper and 1 to 2% impurities like Ag, Au, Zn, Ni etc.

456 (b)

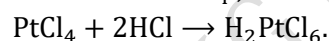
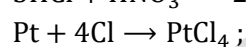
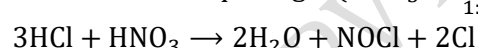
Magnetic moment depends upon number of unpaired electrons. In Sc³⁺, there is no unpaired electron. So, its effective magnetic moment is zero.

457 (b)

An impure sample of ZnS containing traces of MnS, CuS or Ag₂S, etc., is phosphorescent.

458 (d)

Pt dissolves in aqua regia (HNO₃ + HCl)

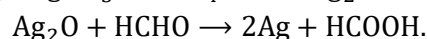
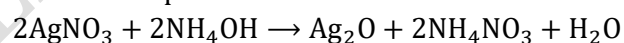


459 (b)

Ru forms penta carbonyl.

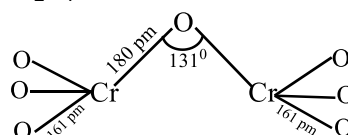
460 (d)

The process of depositing a thin uniform layer of silver on clean glass surface is called silvering of mirror. The thin film is protected by coating of red lead and turpentine mixture.



461 (b)

Cr₂O₇²⁻ has the structures.



462 (c)

Anode mud left during electrolytic purification of Cu contains Au and Ag.

463 (b)

24 carat gold means 100% Au.

464 (a)



465 (c)

Polymetallic carbonyls are also known for transition metals, . g., Co₂(CO)₃.

466 (a)

Due to loss of *ns*²-electrons.

467 (c)

Gun metal has a composition of Cu=88%
 Sn=10%, Zn=2%

468 (b)

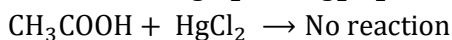
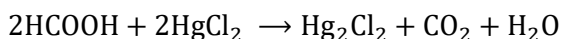
It is a fact.

469 (b)

In water it gives HMnO_4 (an acid).

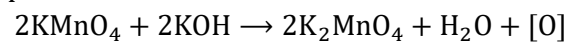
470 (a)

Corrosive sublimate gives black ppt. of calomel with formic acid but it does not react with acetic acid.



471 (a)

In basic medium, the following reaction takes place



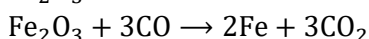
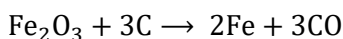
Due to the presence of nascent oxygen $[\text{O}]$, KMnO_4 (in basic medium) behaves like a strong oxidizing agent.

472 (d)

$3d$, $4d$ and $5d$ -series are complete and $6d$ -series incomplete.

473 (b)

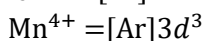
The less electropositive metals such as Fe, Zn, Sn etc are extracted from their oxides by reduction with carbon or coal.



iron

474 (c)

The electronic configuration of Mn is



Thus, three unpaired electrons are present.

Spin only magnetic moment, $\mu = \sqrt{n(n+2)}$

$$n=3$$

$$\mu = \sqrt{3(3+2)}$$

$$= \sqrt{15} = 3.87$$

$$\approx 4 \text{ BM}$$

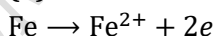
475 (a)

It is a fact.

476 (a)

Due to poisonous nature of HgCl_2 , its 0.1% solution is used as antiseptic for sterilizing hands and instruments in surgery.

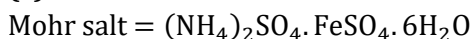
477 (a)



478 (a)

Cu^{2+} salts form chocolate brown ppt. of $\text{Cu}_2\text{Fe}(\text{CN})_6$ with $\text{K}_4\text{Fe}(\text{CN})_6$.

479 (c)



Here, Fe is present as FeSO_4 . Therefore, its oxidation state can be calculated with in only FeSO_4 .

$$x + (-2) = 0$$

$$x = +2$$

481 (b)

Neodymium oxide (Nd_2O_3) dissolved in selenium oxychloride is one of the most powerful liquid lasers known so far

482 (c)

A transition metal ion exists in its highest oxidation state. It is expected to behave as an oxidizing agent.

483 (a)

The ionisation energies increase with increasing atomic number. The trend is irregular among d -block elements.

Element	S	T	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
IE (kJ/mol)	63	65	66	67	71	76	77	77	75	91

$\therefore \text{Zn} > \text{Fe} > \text{Cu} > \text{Cr}$ is correct order.

484 (a)

It is a reason for the given fact.

485 (c)

—do—

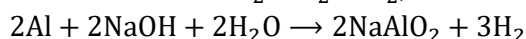
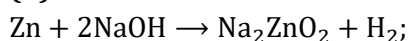
486 (c)

These are uses of Ag.

487 (b)

In acidic medium, KMnO_4 gives 5 oxygen while, acidic $\text{K}_2\text{Cr}_2\text{O}_7$ gives 3 oxygen

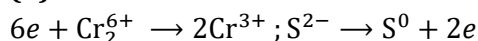
488 (d)



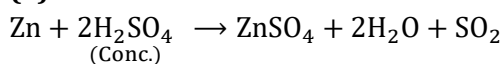
489 (c)

The ability of transition elements to adopt multiple oxidation states and complexing ascribed their catalytic activity

490 (b)

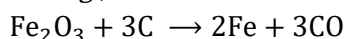


491 (a)



492 (c)

Carbon is generally used for the reduction of oxides of moderately reactive metals like Fe, Zn, etc. *e.g.*,



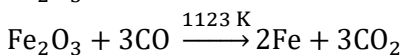
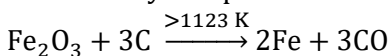
Note Highly reactive metals like Na are produced by electrolytic reduction while less reactive metals like Ag and Hg are obtained by

- 520 (c) Tungsten filaments are used in bulbs.
- 522 (b) It is a fact.
- 523 (a) Fool's gold is CuFeS_2 or FeS_2 .
- 524 (a) $\text{Cu}(\text{NH}_3)_4\text{SO}_4$
- 525 (d) Follow Bessemer's process in Fe extraction.
- 526 (a) A mixture of TiO_2 and BaSO_4 is called titanox
- 527 (b) The b.p. of Ti, Cr, Fe and Co are 3260, 2665, 3000 and 2900 K respectively.
- 528 (d) It is a fact.
- 530 (c) Ferric compounds are more easily hydrolysed than ferrous salts.
- 531 (a) The important ores of iron are haematite (Fe_2O_3), magnetite (Fe_3O_4) and iron pyrites (FeS_2). Iron is manufactured from haematite ore.
- 532 (c) The process is called auto reduction.
- 534 (a) $2\text{Cu}^{2+} + 4\text{KI} \rightarrow \text{Cu}_2\text{I}_2 + \text{I}_2 + 4\text{K}^+$
- 535 (d) It is a fact.
- 536 (d) German silver is an alloy of Cu + Zn + Ni (2:1:1 respectively).
- 537 (d) It is a method for extraction of Ni.
- 538 (a) $\text{K}_2\text{Cr}_2\text{O}_7 + 2\text{H}_2\text{SO}_4 \xrightarrow{\text{Cold}} 2\text{CrO}_3 + 2\text{KHSO}_4 + \text{H}_2\text{O}$
 CrO_3 is highly acidic and oxidising and is called chromic acid
- 539 (b) $4\text{FeCl}_3 + 3\text{K}_4[\text{Fe}(\text{CN})_6] \rightarrow \text{Fe}_4[\text{Fe}(\text{CN})_6]_3 + 12\text{KCl}$
 Ferri-ferrocyanide (Prussian blue)
- 540 (a) $\text{Cu} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
- 541 (b) The process is called hardening of steel and it develops hard and brittle nature in steel.
- 542 (d) $\text{AuCl}_3 + \text{NaCl} \rightarrow \text{Na}[\text{AuCl}_4]$
- sodium chloroaurate
- 545 (d) Zinc sulphate hepta hydrate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$) is called white vitriol. When it is heated with barium sulphide, it forms a white pigment lithopone.
- 546 (a) Silver (Ag) metal is purified by Pattinson's process.
- 547 (c) *d*-block elements have higher melting point due to greater forces of attraction between two atoms.
- 548 (c) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$.
- 549 (b) Iron is *d*-block element ($3d^6, 4s^2$).
- 550 (c) It is a fact.
- 551 (b) Fe^{2+} is light green in colour.
- 552 (a) $\text{Cr}_2\text{O}_7^{2-}$ has orange colour in aq. Medium.
- 553 (c) Reference electrodes are calomel electrodes.
- 554 (b) All cations formed by transition metals are not coloured and are not paramagnetic, .g., Zn^{2+} .
- 555 (b) $3.87 = \sqrt{n(n+2)}$, where, *n* is the number of unpaired electron
 $(3.87)^2 = n(n+2)$
 $15 = n^2 + 2n$
 $n^2 + 2n - 15 = 0$
 $\therefore n \cong 3$
- 556 (d) Lutetium-71 belongs to lanthanoids, the elements from 58 to 71.
- 557 (c) It is a fact.
- 558 (c) $\text{Fe}_2(\text{SO}_4)_3 \rightarrow \text{Fe}_2\text{O}_3 + 3\text{SO}_3$.
- 559 (c) It is a fact.
- 560 (b) $2\text{SnCl}_2 + 2\text{HgCl}_2 \rightarrow 2\text{SnCl}_4 + \text{Hg}_2$; SnCl_2 is oxidized.
- 561 (b) Chalcopyrite or copper pyrite is CuFeS_2 .
 \therefore It is ore of copper and iron.
- 562 (d)

Siderite (FeCO_3) is an ore of iron.

563 (a)

The process of extraction of metal by heating roasted ore with coke in the presence of a flux is called smelting. It is done in blast furnace. Iron is extracted by this process.



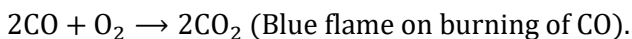
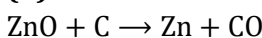
564 (c)

Stainless steel contains 11.5% Cr.

565 (a)

Ceria or cerium oxide, CeO_2 , a lanthanide compound is used as a pigment and as a polishing agent for glass.

566 (d)

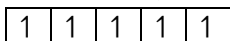
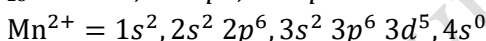
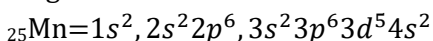


567 (c)

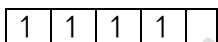
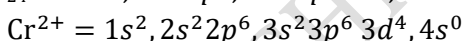
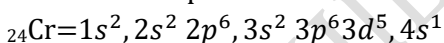
In CuF_2 , Cu^{2+} ion exist, having d^9 configuration. Unpaired electron causes colour ($d-d$ transition). In the crystalline form, CuF_2 is blue coloured.

568 (c)

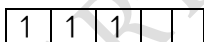
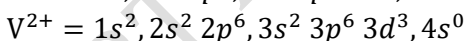
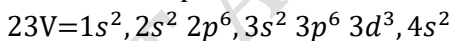
Spin only magnetic moments depend upon the number of unpaired electrons, more the number of unpaired electron, greater will be the spin only magnetic moment.



Number of unpaired electrons = 5

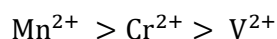


Number of unpaired electron = 4



Number of unpaired electrons = 3

So, the correct order of spin only magnetic moment is



569 (c)

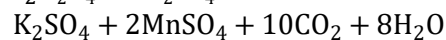
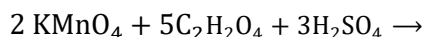
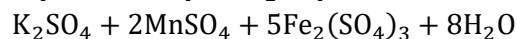
Stainless steel contains 11-15% Cr.

570 (c)

Aromatic compounds which have = or \equiv bond in the side chain decolourise acidic/alkaline KMnO_4 . Benzene does not delcolourise the acidic/alkaline KMnO_4 due to the delocalization of π -electrons. While propene decolourized the alkaline KMnO_4

due to the presence of = bond. Ferrous

ammonium sulphate and oxalic acid decolourized the KMnO_4 in acidic medium.



571 (d)

The complex formation imparts colour.

572 (c)

Syvanite (AuAgTe_4); calaverite (AuTe_2), bismuth aurite (BiAu_2).

573 (b)

It is a reason for the given fact.

574 (a)

Azurite is $\text{Cu}(\text{OH})_2 \cdot 2\text{CuCO}_3$.

575 (a)

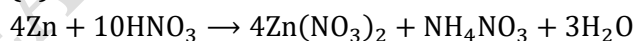
Zn^{2+} ($Z=30$): $[\text{Ar}] 3d^{10} 4s^0$; zero unpaired electron.

Hence, its magnetic moment is zero.

$$\mu = \sqrt{n(n+2)} = \sqrt{0(0+2)}$$

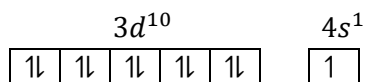
$$\mu = 0$$

576 (b)

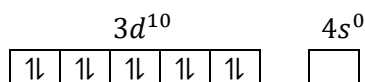


577 (d)

Cu



Cu^+



Cu^+ is colourless due to the absence of unpaired electron

578 (a)

Fe ores possess magnetic nature.

579 (d)

The process is called auto reduction.

580 (a)

Transition elements have $(n-1)d$ and ns -shell incomplete.

581 (d)

In electrorefining of copper, some gold is deposited as anode mud.

582 (d)

Cu^{2+} (aq.) is blue in colour.

583 (a)

The magnetic moment = $\sqrt{n(n+2)}$ BM where n is no. of unpaired electron. Thus, $n = 1$.

- 584 (d) The highest oxidation state of transition elements is exhibited in their compounds with F and O, the most electronegative elements.
- 585 (c) I gp. reagent is dil. HCl. The chlorides of Ag, Pb, Hg being insoluble are precipitated out.
- 586 (d)
$$4\text{K}_2\text{Cr}_2\text{O}_7 \xrightarrow{>671^\circ\text{C}} 4\text{K}_2\text{CrO}_4 + 2\text{Cr}_2\text{O}_3 + 3\text{O}_2.$$
- 587 (a)
$$2\text{KMnO}_4 \xrightarrow{200^\circ\text{C}} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$$

$$2\text{K}_2\text{MnO}_4 \xrightarrow{\text{Above } 200^\circ\text{C}} 2\text{K}_2\text{MnO}_3 + \text{O}_2$$
- 588 (b) $\text{Fe}^{2+}, 2\text{SO}_4^{2-}, 2\text{NH}_4^+.$
- 589 (a)
$$2\underset{\text{Alkali}}{\text{NaOH}} + \underset{\text{Acid}}{\text{Zn(OH)}_2} \rightarrow \underset{\text{Salt}}{\text{Na}_2\text{ZnO}_2} + 2\text{H}_2\text{O}$$
- 591 (a) It is a fact.
- 592 (c) Alnico is a series of alloys based on iron containing Ni, Al, Co and Cu. They are used to make permanent magnets.
- 593 (b) Bordeaux mixture is $\text{CaO} + \text{CuSO}_4.$
- 594 (b) Lanthanoids $[\text{Xe}]4f^{1-14}5d^{0-1}6s^2$
 Actinoides $[\text{Rn}]5f^{1-14}6d^{0-1}7s^2$
 Lanthanoides and actinoides use core *d* and *f*-orbitals also to show higher oxidation state. As actinoides have comparatively low energy difference between *f* and *d*-orbitals, show more oxidation states.
- 595 (b)
$$\text{K}_2\text{MnF}_6 + 2\text{SbF}_5 \rightarrow 2\text{KSbF}_6 + \text{MnF}_3 + \frac{1}{2}\text{F}_2$$

 In this reaction, the stronger Lewis acid SbF_6 displaces the weaker one, MnF_4 from its salt. MnF_4 is unstable and readily decomposes to give MnF_3 and fluorine
- 596 (a) A reduction in atomic size with increase in atomic number is a characteristics of elements of *f*-block. This is due to lanthanide contraction
- 597 (b) Parke's process is based on the fact that molten lead and zinc are nearly immiscible. Zinc being lighter forms the upper layer and molten lead forms the lower layer. Ag is more soluble in molten Zn than molten Pb.
- 598 (c) It is a use of this reagent.
- 599 (d) Transition metals due to the presence of partially, filled *d*-orbitals, are coloured.
 The unpaired electron present in partially filled *d*-orbital is excited to the higher energy *d*-orbital by absorbing energy from visible light and thus exhibits the complementary colour. Due to which the transition metal ions appear coloured.
- 600 (b) It contains 36% Ni.
- 601 (c) Cr^{2+} ($Z=24$): $[\text{Ar}]3d^4 4s^0$; four unpaired electrons
 Fe^{2+} ($Z=26$): $[\text{Ar}]3d^6 4s^0$; four unpaired electrons. Cr^{2+} and Fe^{2+} have same number of unpaired electrons, hence they have the same value of magnetic moment.
- 602 (c) Erbium is a lanthanide
- 603 (a) $\text{BaO} + \text{ZnO} \rightarrow \text{BaZnO}_2$
- 604 (d) Brass is an alloy of copper with zinc.
- 606 (c)
$$\text{CuCl}_2 + \text{Cu} \xrightarrow{\text{HCl}} \text{Cu}_2\text{Cl}_2$$
- 607 (b) Cast iron or pig iron (2–5% C); wrought iron (0.1 to 0.5% C), steel (0.1 to 1.5% C).
- 608 (c) *d*-block elements invariably show variable valence.
- 609 (b) This is characteristic of inner transition elements.
- 610 (b) Mercurous chloride is insoluble in water while rest are soluble in water
- 611 (c) Carnallite $\text{KCl}, \text{MgCl}_2, 6\text{H}_2\text{O}$
 Limonite $2\text{Fe}_2\text{O}_3, 3\text{H}_2\text{O}$
 Siderite FeCO_3
 Horn silver AgCl
 \therefore Siderite is carbonate ore.
- 612 (b) It is a facts, $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2.$
- 613 (c) Black Jack is an ore of zinc. Other ores of zinc are zincite (ZnO), calamine (ZnCO_3), zinc blende or black jack (ZnS).
- 614 (d)

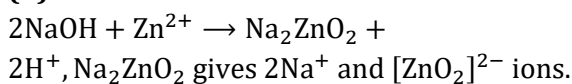
- AgI is insoluble in NH_4OH but AgCl is soluble in NH_4OH due to the formation of $[\text{Ag}(\text{NH}_3)_2]\text{Cl}$
- 615 (b)
e. g.,
 $\text{MnCl}_2, \text{Mn}(\text{OH})_3, \text{MnO}_2, \text{K}_2\text{MnO}_4, \text{KMnO}_4,$
+2 +3 +4 +6 +7
- 616 (a)
 $\text{HgCl}_2 + \text{H}_2\text{S} \rightarrow \text{HgS} + 2\text{HCl}$
- 617 (b)
CuCl forms coordinated product with CO.
 $\text{CuCl} + \text{CO} \rightarrow \text{CuCl} \cdot \text{CO}$
- 618 (a)
Except Cu, Hg, Ag, Pt and Au, where E_{RP}° are + ve.
- 619 (a)
 $\text{AuCl}_3 + 3\text{FeSO}_4 \rightarrow \text{Au} + \text{Fe}_2(\text{SO}_4)_3 + \text{FeCl}_3$
- 620 (a)
ZnCl₂ is deliquescent.
- 622 (a)
 $\text{Fe} + \text{H}_2\text{SO}_4 \rightarrow \text{FeSO}_4 + \text{H}_2 \uparrow$
dil.
 $3\text{Fe} + 4\text{H}_2\text{O} \rightarrow 4\text{H}_2 \uparrow + \text{Fe}_3\text{O}_4$
hot steam
- 623 (a)
 $\text{Hg}_2\text{Cl}_2 + 2\text{NH}_4\text{OH} \rightarrow \text{Hg} + \text{Hg}(\text{NH}_2)\text{Cl} + \text{NH}_4\text{Cl} + 2\text{H}_2\text{O}$
Black
- 624 (d)
Bleaching powder is mixed salt, $\text{K}_4\text{Fe}(\text{CN})_6$ is complex salt, hypo is normal salt.
- 625 (b)
Bronze is a mixture of Cu and Sn.
- 626 (b)
Gun metal is an alloy of Cu, Sn and Zn. It is used to make cartridge of rifles and pistols.
- 627 (b)
 μ_{eff} value of 1.73 BM corresponds to one unpaired electron.
 $\text{Ti}^{3+} = 3d^1$ ($\text{Ti} = [\text{Ar}]3d^2 4s^2$)
- 628 (a)
Thermite process is used for the reduction of oxides of less electropositive metals. Oxides of less electropositive metals such as $\text{Cr}_2\text{O}_3, \text{Mn}_3\text{O}_4$ etc are reduced by using Al. This process is called thermite process.
 $\text{Cr}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Cr} + \text{Heat}$
- 629 (b)
Copper ores contain FeO as non-fusible mass.
Thus, $\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3$.
Acidic flux Slag
- 630 (d)
Chalcopyrite is CuFeS_2
- 632 (b)
It is $\text{Ag}(\text{NH}_3)_2\text{Cl}$.
- 633 (a)
Cu is added in Au to prepare ornaments.
- 634 (d)
On igniting at 1400°C . Fe_2O_3 get reduced to metallic Fe.
 $3\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow 3\text{Fe}_3\text{O}_4 + \text{CO}$
 $\text{FeO} + \text{CO} \rightarrow \text{Fe} + \text{O}$
- 635 (b)
These are uses of ZnO. It is also used for glazing purposes.
- 636 (c)
 $\text{Fe}(\text{OH})_3$ is formed as brown residue. Also colourless or light yellow solution will be left.
- 637 (a)
Given, $X = [\text{Ar}]d^4$
 \therefore The complete configuration of the ion,
 $X^{3+} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^4$
 $\therefore X = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5, 4s^2$
 \therefore The atomic number of the element is 25 and the element is Mn.
- 638 (c)
Cast iron or pig iron (2–5% C); wrought iron (0.1 to 0.5% C), steel (0.1 to 1.5% C).
- 639 (b)
Follow complementary colour concept.
- 640 (b)
 $_{41}\text{Nb}$ and $_{73}\text{Ta}$ have similar atomic size.
- 641 (a)
A white precipitate of cuprous iodide is formed on adding KI to CuSO_4 solution.
 $2\text{CuSO}_4 + 4\text{KI} \rightarrow 2\text{CuI} + \text{I}_2$
white ppt.
- 642 (a)
The d -block elements form coloured compounds. These compounds have ions with unpaired electron in d -subshell.
i) Na and Mg belong to s -block, so NaCl and MgCl_2 are colourless compounds.
ii) CuF_2
Oxidation state of Cu in CuF_2 is +2
 $\text{Cu}^{2+} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^0, 3d^9$

↑↓	↑↓	↑↓	↑↓	↑
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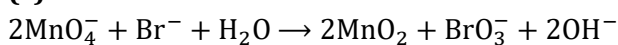
 $\therefore \text{CuF}_2$ in which Cu has one unpaired electron is coloured.
iii) CuI
Oxidation state of Cu in CuI = +1
 $\text{Cu}^+ = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^0, 3d^{10}$

It has no unpaired electron. So, CuI is colourless.
 \therefore Only CuF₂ is coloured among given choices.

643 (b)

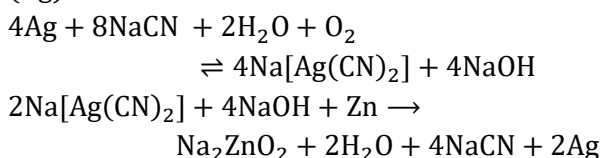


644 (c)

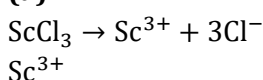


645 (a)

Cyanide process is used for extraction of silver (Ag).



646 (a)



No unpaired electron, so will show diamagnetic character so, will weightless in magnetic field

647 (a)

It is the definition of nitriding of steel.

648 (b)

A light hard aluminium alloy containing 4% Cu and small amounts of Mg, Mn and Si.

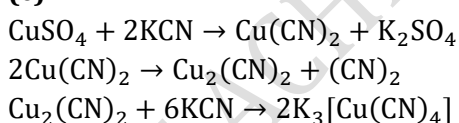
649 (b)

Gun metal is an alloy of Cu + Sn + Zn.

650 (b)

This is definition of tempering of steel. The product obtained is neither so hard nor so brittle. It is softer than steel.

651 (c)



652 (d)

MnO₂ imparts purple colour to pottery

653 (d)

It is a fact.

654 (b)

Purest zinc is made by zone refining method.

655 (a)

$$\text{Magnetic moment} = \sqrt{n(n+2)} \text{ BM}$$

Where, n = number of unpaired electrons

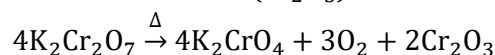
$$5.93 = \sqrt{n(n+2)}$$

$$n = 5$$

Mn²⁺ ion (3d⁵) has 5 unpaired electrons and magnetic moment is 5.93 BM.

656 (c)

Potassium dichromate, on heating gives oxygen and chromic oxide (Cr₂O₃).



657 (c)

Annealing is the process of heating steel to bright red and then cooling it slowly. Steel thus, becomes soft and pliable.

659 (b)

It is a fact.

660 (b)

HgCl₂ compound is easily volatile. They are insoluble in water and soluble in acids.

661 (c)

Among all the given reactions, CuSO₄ does not react with KCl to give Cu₂Cl₂

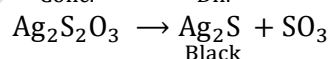
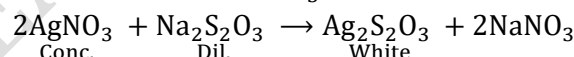
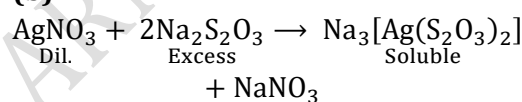
662 (a)

It is [Cu(H₂O)₄]SO₄·H₂O; one H₂O is held by sulphate ion by H-bonding.

663 (d)

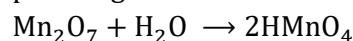
It is a fact.

664 (b)



665 (c)

Mn₂O₇ is an acidic oxide of manganese. It dissolve in water to give violet coloured solution of permanganic acid.

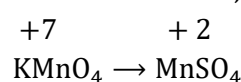


666 (c)

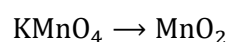
A developer is a weak reducing agent, e. g. Ferrous oxalate; the parts affected by light on photographic plate are reduced to the maximum extent whereas part not affected by light remains unaffected.

667 (d)

In acidic medium,



In weak basic medium



668 (c)

Transition metals are d-block elements.

669 (d)

It is FeSO₄·(NH₄)₂SO₄·6H₂O. Gives test of each ion in solution.

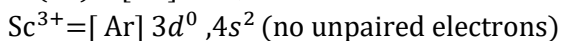
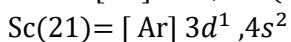
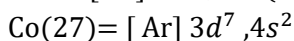
670 (b)

Gun metal is an alloy of Cu + Sn + Zn (87:10:3

697 (c)

These are facts.

698 (d)



Thus, in Sc^{3+} no unpaired d -electron is present.

Hence, no $d-d$ transition is possible and it is colourless ion.

699 (b)

Follow metallurgy of iron.

701 (a)

Follow electronic configuration ($n-1$) $s^2p^6d^{10}ns^1$ of coinage family.

702 (b)

It is a fact.

703 (c)

Transition metals and their compounds are very good catalysts, e. g., CuCl_2 in Deacon's process, Ni in hydrogenation of oils.

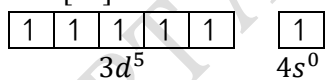
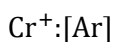
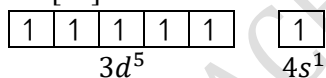
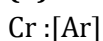
704 (b)

Gravity separation process is used for the concentration of haematite.

705 (c)

Malachite is an ore of copper. Its composition is $\text{CuCO}_3 \cdot \text{Cu(OH)}_2$.

706 (b)



This is stable EC, hence formation of Cr^{2+} by second IP requires maximum enthalpy.

707 (b)

It is a reason for the given fact.

708 (b)

CdS is yellow solid.

709 (d)

—do—

710 (b)

Basic copper acetate (verdigris - $(\text{CH}_3\text{COO})_2\text{Cu} \cdot \text{Cu(OH)}_2$) is blue green powder used in green pigment and in dyes. Also in manufacture of

insecticides and fungicides

711 (a)

Pig iron on heating in a vertical furnace and then pouring into moulds gives cast iron. Both contain 2–5% carbon.

713 (c)

Potassium permanganate is a powerful oxidizing agent in neutral, alkaline or acidic solution because it liberates nascent oxygen. The aqueous solutions of KMnO_4 can be decolourized by $\text{C}_2\text{O}_4^{2-}$, HSO_3^- and SO_3^{2-} while CO_3^{2-} cannot decolourise KMnO_4 aqueous solution.

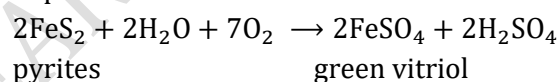
714 (c)

Ti^+ ions are more stable than Ti^{3+} and thus Ti^{3+} ions charge to Ti^+ ions thereby acting as oxidizing agents

Ti^{3+} compounds + $2e^- \rightarrow \text{Ti}^+$ compounds (less stable oxidizing agent) (More stable oxidising agent)

715 (a)

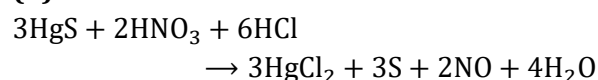
Green vitriol is formed by oxidation of iron pyrite in presence of air and water.



716 (d)

Transition elements have high densities.

717 (b)



718 (a)

Chlorides of Ag, Pb and Hg are insoluble in water.

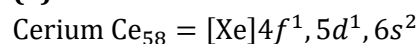
719 (a)

Fischer's salt is $\text{K}_3[\text{Co}(\text{NO}_2)_6]$.

720 (a)

Cu, Ag and Au have been used in coins since ancient times.

721 (a)



Its most stable oxidation state is +3 but +4 is also existing.

722 (c)

The hormone insulin excreted from pancreas contains Zn.

723 (c)

It is a reason for the given fact.

724 (b)

Muntz metal is Cu + Zn alloy (3:2) respectively more stronger than brass.

725 (b)

$\text{Ni}(\text{CO})_4$ is a gas which decomposes to Ni and CO

- on strong heating.
- 726 (c)
At 500°C Fe₂O₃ is reduced by CO to Fe and CO₂.
- 727 (a)
It is a fact.
- 728 (c)
Most of the transition metal ions due to presence of unpaired *d*-electrons are coloured.
- 729 (d)
Cr ions are coloured.
- 730 (c)
Strength of metallic bond depends upon number of unpaired electron. As number of unpaired electron increases, the bond strength increases. So, Cr, Mo, W show stronger bonding due to maximum number of unpaired electrons
- 731 (c)
Hg²⁺ complex salts are more stable.
- 732 (b)
 $2e + Cr_2O_7^{2-} \rightleftharpoons 2CrO_4^{2-}$ exists in basic medium.
- 733 (d)
Ti, Zr and Hf belong to IV B group of Periodic Table and in a group atomic radii increases on moving down. However, the transition metals of 4*d*-series have nearly the same radii as metals of 5*d*-series. Hence the order of atomic radii is Ti < Zr ≈ Hf
Due to nearly equal atomic radii, Zr and Hf are called chemical twins.
- 734 (a)
Basic character of oxides decreases from left to right in a period of Periodic Table
- 735 (c)
 $Mn_2O_7 + H_2O \rightarrow 2HMnO_4$
HMnO₄ is permanganic acid, which is violet in colour
- 736 (b)
Aqueous silver nitrate solution is used as indelible ink.
- 737 (b)
The fourteen elements which follow actinium from thorium (*Z*=90) to lawrencium (*Z*=103) are called actinoids. They involve the filling of 5*f*-subshell. Californium (Cf) has the atomic number 98 and its configuration is as Cf (*Z* = 98): [Rn]5*f*¹⁰, 6*d*⁰, 7*s*²
Hence, it is a member of actinide series.
- 738 (c)
Wrought iron is obtained from pig iron by removing its impurities by puddling process in which cast iron is heated on the hearth of reverberatory furnace.
- 739 (b)
Follow text.
- 740 (c)
Ammonium dichromate on heating gives green coloured powder of Cr₂O₃.
 $2(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} 2(NH_4)_2CrO_4 + Cr_2O_3 + 3O_2$
chromic oxide
- 741 (b)
CuO is amphoteric.
- 742 (d)
All these form soluble complexes with NH₃.
- 743 (b)
It is a reason for the low reactivity of transition elements.
- 744 (a)
 $E^{\circ}_{OP \text{ of H}} > E^{\circ}_{OP \text{ of Hg}}$
- 745 (a)
∴ 24 carat gold = 100%
∴ 18 carat gold = $\frac{100 \times 18}{24} = 75\%$
- 746 (d)
Ionic radii of lanthanide (La³⁺) decreases with increase in atomic number.
Y³⁺ < Lu³⁺ < Eu³⁺ < La³⁺
Because Eu and Lu are the members of lanthanide series (so they show lanthanide contraction) and La is the representative element. Y³⁺ ion has lower ionic radii as comparison to La³⁺ because it lies immediately above in Periodic Table.
- 747 (d)
Coinage metals (Cu, Ag, Au) shows the properties of transitional elements as in their common oxidation states they possess partially filled *d*-subshells
- 748 (a)
Annealing is the process of heating steel to bright red and then cooling it slowly. Steel thus, becomes soft and pliable.
- 749 (b)
Cast iron or pig iron (2-5% C); wrought iron (0.1 to 0.5% C), steel (0.1 to 1.5% C).
- 750 (a)
During the extraction of copper, the impurity (FeS) is removed as slag by mixing the contaminated copper ore with silica and coke.
 $2FeS + 3O_2 \rightarrow 2FeO + 2SO_2$
 $FeO + SiO_2 \rightarrow FeSiO_3$
silica ferrous silicate

(slag)

751 (a)

Usually across the first transition series, the negative values for standard electrode potential decrease except for Mn due to stable d^5 - configuration.

So, correct order : Mn > Cr > Fe > Co

752 (c)

Copper pyrite (CuFeS_2) is the chief ore of copper.

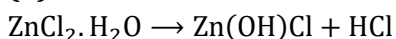
753 (c)

It is a fact.

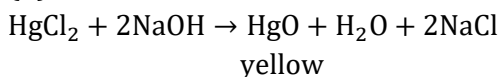
754 (a)

FeCl_3 acts as coagulating agent for blood.

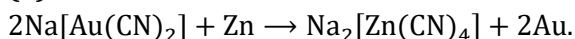
755 (b)



756 (b)



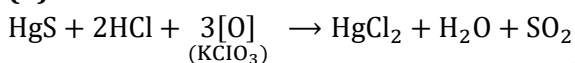
757 (a)



758 (a)

Due to lanthanoid contraction order will be $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{Ce}^{3+} < \text{La}^{3+}$

759 (b)



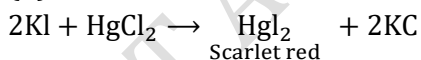
760 (d)

The actinoids ($5f$ -elements) exhibits more number of oxidation states in general than the lanthanoid because $5f$ -orbitals extend farther from the nucleus than the $4f$ -orbitals.

761 (c)

Silver nitrate is used in making hair dyes because it reduced to metallic silver and finely divided silver is black in colour.

762 (b)



763 (b)

$\text{Cr}_2\text{O}_7^{2-}$ changes to CrO_4^{2-} in basic medium .

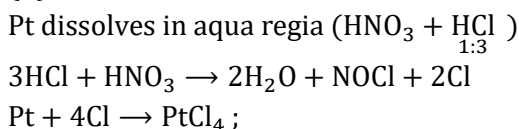
764 (d)

For electroplating of gold, electrolyte used is a mixture of 3.4% AuCN , 19% KCN and Na_3PO_4 a buffer or $\text{K[Au(CN)}_2]$.

765 (b)

Parke's process for desilverisation of lead involves extraction of Ag from Ag-Pb mixture.

766 (b)



767 (d)

Argentite is Ag_2S , an ore of silver.

768 (c)

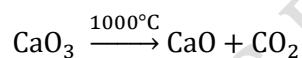
Variable valency is due to the participation of electron from $(n - 1)d$ and ns levels in bond formation

769 (c)

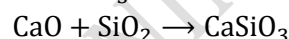
Hg is liquid at room temperature.

770 (c)

In Fe extraction limestone is used for the formation of slag. The central zone where the temperature varies from 800-1000°C; the limestone present in the charge decomposes into calcium oxide and carbon dioxide.



The calcium oxide acts as flux and combines with silica present as an impurity to form a fusible slag of CaSiO_3 .



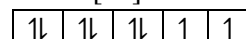
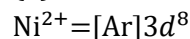
771 (a)

The compounds which combine with impurities present in ore (at high temperature) and remove them as a fusible substance (slag), are known as flux. When basic impurities are present, an acidic flux is used and *vice-versa*.



basic impurity acidic flux slag

772 (a)



Number of unpaired electrons=2

$$\text{Hence, magnetic moment} = \sqrt{n(n + 2)}$$
$$= \sqrt{8} = 2.84$$

773 (b)

HgS is used in ayurvedic medicine as makardhwaja.

HgCl_2 is poisonous and its antidote is egg white.

ZnSO_4 is used in eye lotion.

Hg_2Cl_2 is used as purgative in medicine and in making standard calomel electrode.

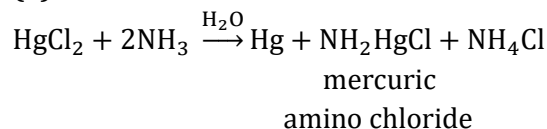
774 (b)

It is the desired chemical formula.

775 (a)

The differentiating electrons enter the ns -orbital but they have configuration $(n - 1)d^{10} ns^2$.

776 (a)



∴ HgCl₂ on reaction with NH₄OH (or NH₃ + H₂O) forms mercuric amino chloride.

777 (b)

Magnetic moment = $\sqrt{n(n+2)}$ BM

Where, n is the number of unpaired electrons.

Maximum the value of unpaired electron, greater the value of magnetic moment. So, 3d⁵ has highest value of magnetic moment.

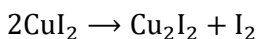
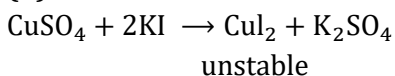
778 (d)

Carbon (non-metal) is present in steel.

779 (c)

Corrosive sublimate is HgCl₂ because it has corrosion nature and sublimation nature.

780 (b)

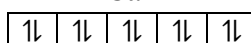


Thus, CuI₂ is not formed.

781 (b)

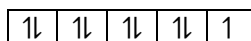
Cuprous ion (Cu⁺)3d¹⁰ (completely filled d -subshell)

3d¹⁰



Cupric ion (Cu²⁺)3d⁹ (one unpaired electron)

3d⁹



783 (b)

Cr₂O₃ is amphoteric as it reacts with acid and alkalis both.

784 (a)

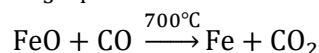
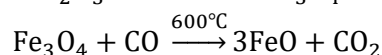
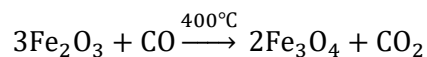
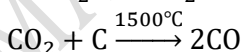
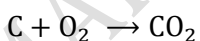
Pig iron on heating in a vertical furnace and then pouring into moulds gives cast iron. Both contain 2–5% carbon.

785 (b)

²⁹Cu⁺ has configuration 1s², 2s²2p⁶, 3s²3p⁶3d¹⁰.

786 (a)

In the blast furnace, iron ore is reduced by coke and carbon monoxide at different temperatures.



787 (d)

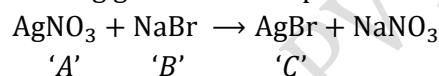
These are reasons for the given fact.

788 (d)

ZnO possess this characteristics.

789 (a)

A solid [AgNO₃(A)]silver nitrate which has photographic effects reacts with the solution of NaBr(B) to give a pale yellow ppt. of AgBr which is difficulty soluble in NH₄OH. NaBr (B) on heating gives brown vapours of bromine.

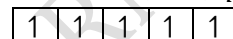
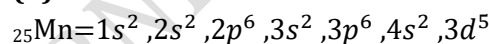


light yellow ppt.

790 (d)

It is a reason for the given fact.

791 (b)

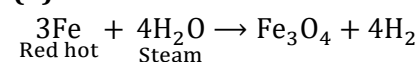


∴ Number of unpaired electrons in Mn = 5

∴ Magnetic moment of Mn = $\sqrt{n(n+2)}$

$$= \sqrt{5(5+2)} = \sqrt{35} = 5.91 \text{ BM}$$

792 (b)



793 (b)

Transition elements are more metallic than representative elements due to the availability of d -orbitals for bonding

794 (d)

Cerium can attain +4 oxidation state by losing ns and $(n-2)f$ -electrons to have f^0 configuration.

THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

Assertion - Reasoning Type

This section contain(s) 0 questions numbered 1 to 0. Each question contains STATEMENT 1(Assertion) and STATEMENT 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

- a) Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1
- b) Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1
- c) Statement 1 is True, Statement 2 is False
- d) Statement 1 is False, Statement 2 is True

1

Statement 1: The free gaseous Cr atom has six unpaired electrons.

Statement 2: Half filled s- orbital has greater stability.

2

Statement 1: Magnetic moments values of actinides are lesser than the theoretically predicted values.

Statement 2: Actinide elements are strongly paramagnetic.

3

Statement 1: Tungsten has the highest melting point

Statement 2: Tungsten is a covalent compound

4

Statement 1: Oxalates and carbonates of lanthanides are almost insoluble in water

Statement 2: Salts of lanthanides usually contains water of crystallisation

5

Statement 1: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ on heating to 250°C loses all the five H_2O molecules and becomes anhydrous

Statement 2: All the five H_2O molecules are coordinated to the central Cu^{2+} ion

6

Statement 1: Mercury vapour is shining silvery in appearance.

Statement 2: Mercury is a metal with shining silvery appearance.

7

Statement 1: Chromium is hard but mercury is soft.

Statement 2: Chromium is a 3d transition elements.

8

Statement 1: Mercury is liquid at room temperature

Statement 2: In mercury, there is no unpaired *d*-electron and thus, metallic bonding is weakest

9

Statement 1: Europium(II) is more stable than cerium(II).

Statement 2: Cerium salts are used as a catalyst in petroleum cracking.

10

Statement 1: Equivalent mass of KMnO_4 is equal to one third of its molecular mass when it acts as an oxidising agent in an alkaline medium

Statement 2: Oxidation number of Mn is +7 in KMnO_4

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THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

: ANSWER KEY :

- | | | | | | | | | | | | |
|----|---|----|---|----|---|----|---|----|---|-----|---|
| 1) | c | 2) | b | 3) | c | 4) | a | 9) | b | 10) | b |
| 5) | c | 6) | d | 7) | b | 8) | a | | | | |

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THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

: HINTS AND SOLUTIONS :

- | | |
|--|---|
| <p>1 (c)
The free gaseous Cr atom has six unpaired electrons due to following electronic configuration $(Ar)3d^5 4s^1$. This is because half filled d-orbitals are more stable than incompletely filled d-orbitals. So, one electron jumps from $4s^2$ to $3d$ orbital.</p> <p>2 (b)
The magnetic moments are lesser than the theoretically predicted values. This is due to the fact that 5f electrons of actinides are less effectively shielded which results in quenching of orbital contribution.</p> <p>4 (a)
The solubility of many salts of lanthanides follows the pattern of group II elements</p> <p>5 (c)</p> $ \begin{array}{c} \text{CuSO}_4 \cdot 5\text{H}_2\text{O} \xrightarrow[\text{efflorescence}]{\text{Air}} \text{CuSO}_4 \cdot 3\text{H}_2\text{O} \xrightarrow{100^\circ\text{C}} \text{CuSO}_4 \\ \text{CuSO}_4 \xleftarrow{250^\circ\text{C}} \text{CuSO}_4 \cdot \text{H}_2\text{O} \end{array} $ <p>One water molecular is hydrogen bonded to coordinated water molecules and SO_4^{2-} ion and remaining four are coordinated to the central Cu^{2+} ion</p> <p>6 (d)
Both assertion and reason are false. Mercury</p> | <p>vapour are visible as no metallic bonding is possible in vapour state.</p> <p>7 (b)
Chromium has maximum number of unpaired d-electrons. While Hg does not have any unpaired d-electron.</p> <p>8 (a)
Statement II is the correct explanation of statement I</p> <p>9 (b)
$\text{Eu}^{2+}[\text{Xe}]4f^7 5d^{10}$ (more stable)
$\text{Ce}^{2+}[\text{Xe}]4f^1 5d^1$</p> <p>10 (b)
In alkaline medium, KMnO_4 is reduced to MnO_2 which involves $3e^-$
Thus, its eq. wt = $\frac{M}{3}$</p> |
|--|---|

THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

Matrix-Match Type

This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**.

1. Match List I with List II and select the correct answer using the codes given below the lists.

Column-I		Column- II	
(A) Cr^{3+}		(p) $\sqrt{35}$	
(B) Fe^{2+}		(q) $\sqrt{30}$	
(C) Ni^{2+}		(r) $\sqrt{24}$	
(D) Mn^{2+}		(s) $\sqrt{15}$	
		(t) $\sqrt{8}$	

CODES :

	A	B	C	D
a)	p	r	t	s
b)	q	r	t	p
c)	s	r	t	p
d)	s	t	r	p

THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

: ANSWER KEY :

1) c

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THE D-AND F-BLOCK ELEMENTS

CHEMISTRY

: HINTS AND SOLUTIONS :

1 (c)

$$\therefore \mu = \sqrt{n(n+2)}$$

$$\text{Cr}^{3+} (Z = 24): 3d^3 4s^0, \mu = \sqrt{3(3+2)} = \sqrt{15}$$

$$\text{Fe}^{2+} (Z = 26): 3d^6 4s^0, \mu = \sqrt{4(4+2)} = \sqrt{24}$$

$$\text{Ni}^{2+} (Z = 28): 3d^8 4s^0, \mu = \sqrt{2(2+2)} = \sqrt{8}$$

$$\text{Mn}^{2+} (Z = 25): 3d^5 4s^0, \mu = \sqrt{5(5+2)} = \sqrt{35}$$

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