SAMPLE PAPER TEST 02 FOR BOARD EXAM 2025

SUBJECT: SCIENCE
CLASS : X

MAX. MARKS: 80
DURATION: 3 HRS

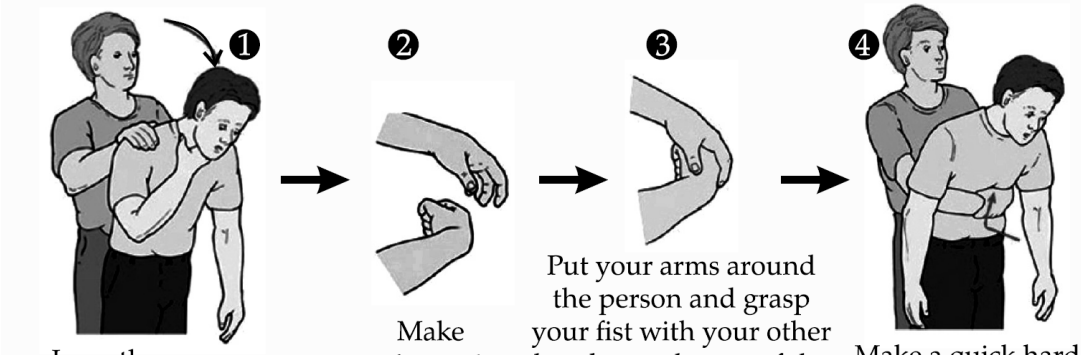
General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

Questions 1 to 20 carry 1 mark each.

1. A person can choke when a piece of food becomes lodged in the windpipe, blocking the flow of air. A first aid procedure to remove the blockage is the Heimlich manoeuvre described below:



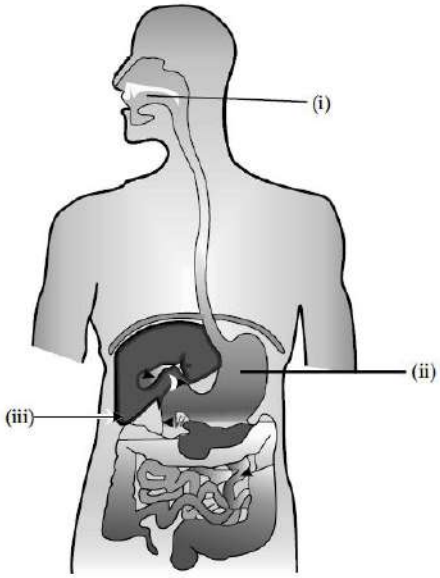
By performing this procedure, the piece of food is pushed out of the windpipe. Which of the following causes this to happen?
(a) The expansion of the chest
(b) The air pressed out of the chest
(c) The food pressed out of the stomach
(d) The upward movement of the wall of the food pipe

2. The composition of aqua regia is:
(a) Dil. HCl : Conc. HNO_3 = 3 : 1 (b) Conc. HCl : Dil. HNO_3 = 3 : 1
(c) Conc. HCl : Conc. HNO_3 = 3 : 1 (d) Dil. HCl : Dil. HNO_3 = 3 : 1

3. The name of the salt used to remove permanent hardness of water is:
(a) Sodium hydrogen carbonate ($NaHCO_3$)
(b) Sodium chloride (NaCl)
(c) Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$)
(d) Calcium sulphate hemihydrate ($CaSO_4.1/2\ H_2O$)

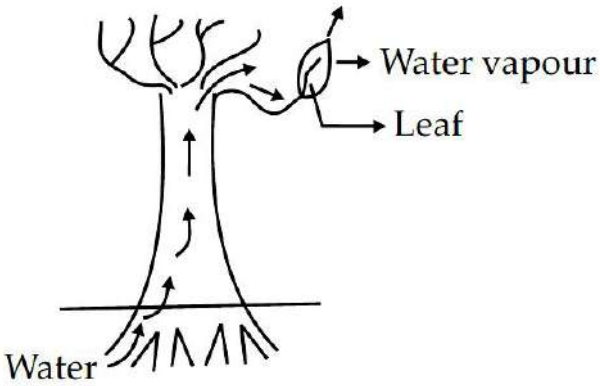
4. A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?
(a) Lemon juice (b) Vinegar (c) Common salt (d) An antacid

5. Identify the option that indicates the correct enzyme that is secreted in location i, ii and iii.



(a) (i)-lipase, (ii)-trypsin, (iii)-pepsin (b) (i)-amylase, (ii)-pepsin, (iii)-trypsin
(c) (i)-trypsin, (ii)-amylase, (iii)-carboxylase (d) (i)-permease, (ii)-carboxylase, (iii)-oxidase

6. Observe the following diagram and identify the process and its significance from the following options:



(a) Evaporation: maintains water contents in leaf cells.
(b) Transpiration: creates a suction force which pulls water inside the plant.
(c) Excretion: helps in excreting out waste water from the plant.
(d) Translocation: helps in transporting materials from one cell to another.

7. If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?
(a) Wash the hand with saline solution.
(b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate.
(c) After washing with plenty of water, apply solution of sodium hydroxide on the hand.
(d) Neutralise the acid with a strong alkali.

8. Choose the incorrect match.

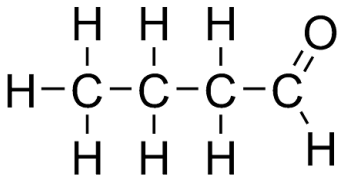
(a) A metal used in joining electric wires	-	Magnesium
(b) A metal whose oxide is soluble in both acids and bases	-	Zinc
(c) A metal unreactive towards oxygen and dilute acids	-	Gold
(d) A metal extracted by using electrolytic reduction	-	Aluminium

9. Choose the balanced equation (s) from the given options.
I. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
II. $Fe + CuSO4 \rightarrow FeSO_4 + Cu$
III. $KClO_4^- \rightarrow KCl + 2O_2$
IV. $Cu + 2HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + H_2O$
(a) I and II only (b) I, II, and III only (c) I, III and IV only (d) All of these

10. In a neuron, conversion of electrical signal to a chemical signal occurs at/in:
(a) cell body (b) axonal end (c) dendritic end (d) axon

11. At the time of short circuit, the electric current in the circuit
(a) very continuously (b) does not change
(c) reduces substantially (d) increases heavily

12. Identify the name of the given compound.



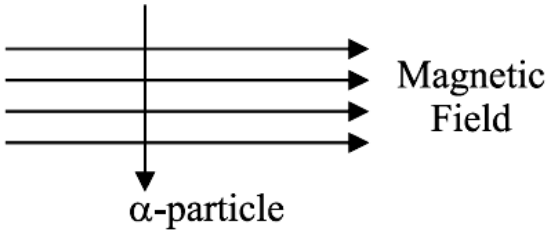
(a) Butanal (b) Butanone (c) Propanol (d) Propanal

13. The most important safety method used for protecting home appliances from short-circuiting or overloading is
(a) earthing (b) use of fuse (c) use of stabilizers (d) use of electric meter

14. Two LED bulbs of 12W and 6W are connected in series. If the current through 12W bulb is 0.06A the current through 6W bulb will be:
(a) 0.04A (b) 0.06A (c) 0.08A (d) 0.12A

15. A zygote which has an X-chromosome inherited from the father will develop into a
(a) Boy (b) Girl
(c) X-chromosome does not determine the sex of a child (d) either boy or girl

16. An alpha particle enters a uniform magnetic field as shown. The direction of force experienced by the alpha particle is:



(a) towards right (b) towards left (c) into the page (d) out of the page

DIRECTION: In the question number 17 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

17. Assertion (A): In humans, if gene (B) is responsible for black eyes and gene (b) is responsible for brown eyes, then the colour of eyes of the progeny having gene combination Bb, bb or BB will be black only.
Reason (R): The black colour of the eyes is a dominant trait.

18. Assertion (A): A current carrying straight conductor experiences a force when placed perpendicular to the direction of magnetic field.
Reason (R): The net charge on a current carrying conductor is always zero.

19. Assertion (A): Copper sulphate crystals are wet because it contains water of crystallisation.
Reason (R): Water of crystallisation is the fixed number of molecules of water present in one formula unit of salt.

20. Assertion (A): Insulin regulates blood sugar level.
Reason (R): Insufficient secretion of insulin will cause diabetes.

SECTION – B

Questions 21 to 25 carry 2 marks each.

21. What are the differences between the transport of materials in xylem and phloem?

22. List two differences in tabular form between dominant trait and recessive trait. What percentage/proportion of the plants in the F_2 generation/progeny were round, in Mendel's cross between round and wrinkled pea plants?

23. A student needs spectacles of power – 0.5 D for the correction of his vision.
(a) Name the defect in vision the student is suffering from.
(b) Find the nature and focal length of the corrective lens.

OR

How does the refractive index of earth's atmosphere vary with height?

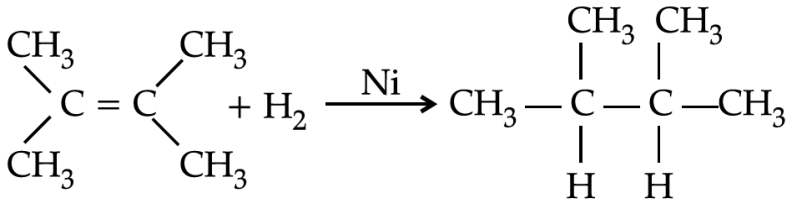
24. Use of several pesticides which results in excessive accumulation of pesticides in rivers or ponds, is a matter of deep concern. Justify this statement.

OR

What is an ecosystem? Name the organisms belonging to the second and fourth trophic levels in the food chain comprising the following:
Frogs, Plants, Snakes, Hawks, Insects

25. Two green plants are kept separately in oxygen free containers, one in the dark and the other in continuous light. Which one will live longer? Give reasons.

26. What is the role of metal or reagents written on arrow's in the given chemical reactions?

(a) 

(b) $CH_3COOH + CH_3CH_2OH \xrightarrow{Conc.H_2SO_4} CH_3COOC_2H_5 + H_2O$

OR

The molecular formula of an organic compound X is $C_2H_4O_2$ which has vinegar - like smell.
(a) Identify the compound.
(b) Write its chemical formula and name.

SECTION – C

Questions 27 to 33 carry 3 marks each.

27. What are covalent compounds? How are they different from ionic compounds? List any two properties of covalent compounds.

28. A squirrel is in a scary situation. Its body has to prepare for either fighting or running away. State the immediate changes that take place in its body so that the squirrel is able to either fight or run?

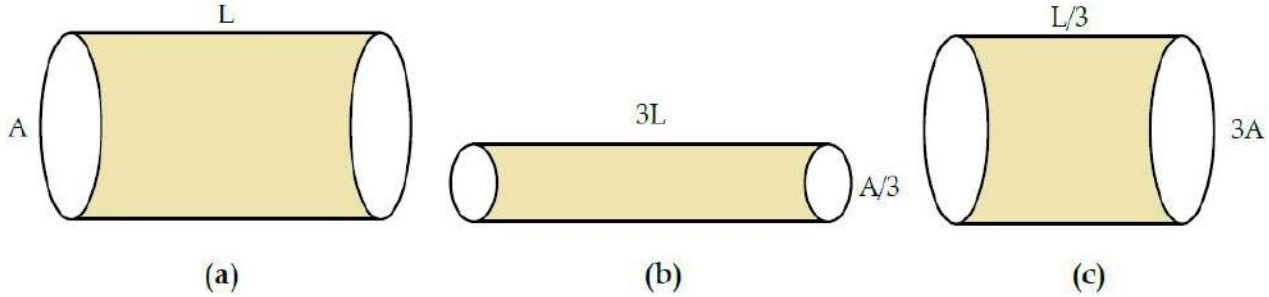
OR

Write in tabular form the location and function of the hormones secreted by each of the following glands present in the human body:
(i) Pituitary gland
(ii) Thyroid gland
(iii) Pancreas

29. Define the following terms in the context of a diverging mirror :
(i) Principal focus
(ii) Focal length
Draw a labelled ray diagram to illustrate your answer.

30. A 10 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 12 cm. The distance of the object from the lens is 18 cm. Find the nature, position and size of the image formed.

31. The figure below shows three cylindrical copper conductors along with their face areas and lengths. Compare the resistance and the resistivity of the three conductors. Justify your answer.



OR

State any three differences between Resistance and Resistivity.

32. Write one difference between biodegradable and non-biodegradable wastes. List two impacts of each type of the accumulated waste on environment if not disposed off properly.

33. A compound 'A' is used in the manufacture of cement. When dissolved in water, it evolves a large amount of heat and forms compound 'B'.
(i) Identify A and B.
(ii) Write chemical equation for the reaction of A with water.
(iii) List two types of reaction in which this reaction may be classified.

SECTION – D

Questions 34 to 36 carry 5 marks each.

34. (i) Name and explain the two modes of asexual reproduction observed in hydra.
(ii) What is vegetative propagation ? List two advantages of using this technique.

OR

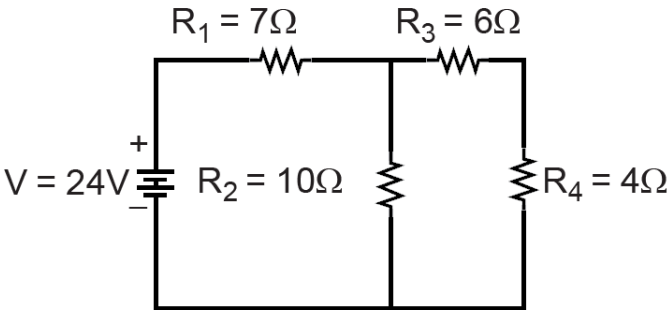
Give reasons:
(a) Ventricles have thicker muscular walls than atria.
(b) Transport system in plants is slow.
(c) Circulation of blood in aquatic vertebrates differs from that in terrestrial vertebrates.
(d) During the daytime, water and minerals travel faster through xylem as compared to the night.
(e) Veins have valves whereas arteries do not.

35. (a) Write chemical equations for the following reactions:
(i) Calcium metal reacts with water.
(ii) Cinnabar is heated in the presence of air.
(iii) Manganese dioxide is heated with aluminium powder.
(b) What are alloys? List two properties of alloys.

OR

Define a chemical reaction. State four observations which help us to determine that a chemical reaction has taken place. Write one example of each observation with a balanced chemical equation.

36. Calculate the total resistance of the circuit and find the total current in the circuit.



SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. Case Study – 1

The melting points and boiling points of some ionic compounds are given below:

Compound	Melting Point (K)	Boiling Point (K)
NaCl	1074	1686
LiCl	887	1600
$CaCl_2$	1045	1900
CaO	2850	3120
$MgCl_2$	981	1685

These compounds are termed ionic because they are formed by the transfer of electrons from a metal to a non-metal. The electron transfer in such compounds is controlled by the electronic configuration of the elements involved. Every element tends to attain a completely filled valence shell of its nearest noble gas or a stable octet.

(i) Show the electron transfer in the formation of magnesium chloride. [1]

(ii) List two properties of ionic compounds other than their high melting and boiling points. [1]

(iii) (A) While forming an ionic compound say sodium chloride how does sodium atom attain its stable configuration ? [2]

OR

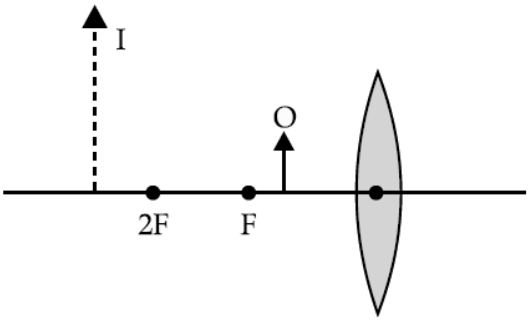
(iii) (B) Give reasons : [2]

(i) Why do ionic compounds in the solid state not conduct electricity ?

(ii) What happens at the cathode when electricity is passed through an aqueous solution of sodium chloride ?

38. Case Study – 2

The diagram given below shows an object O and its image I. Without actually drawing the ray diagram state the following:



(a) Type of lens (Converging / Diverging) [1]

(b) Name two optical instruments where such an image is obtained. [1]

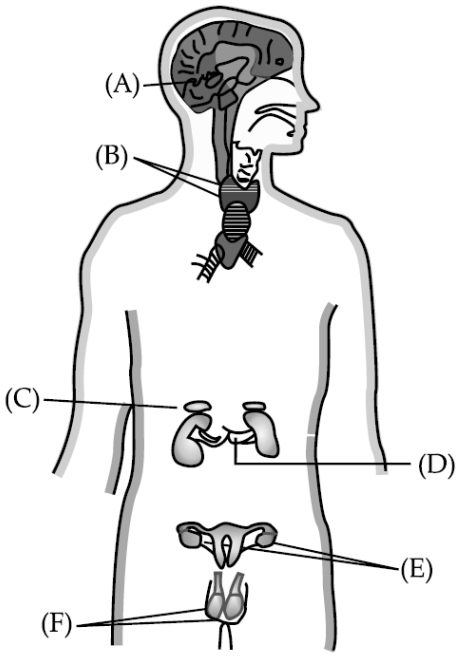
(c) List three characteristic of the image formed if this lens is replaced by a concave mirror of focal length f and an object is placed at a distance f/2 in front of the mirror. [2]

OR

List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen. [2]

39. Case Study – 3

The given diagram represents the human endocrine system. Study the diagram and answer any four questions from Q. 1 to Q. 5.



(a) Identify the endocrine glands A, B, C, D, E and F in the given diagram.
(b) Which gland secretes digestive enzymes as well as hormones?
(c) What is the effect of chemical produced by gland F?

OR

(c) Name the endocrine glands which is unpaired? Explain

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CLASS : X **DURATION: 3 HRS**

General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
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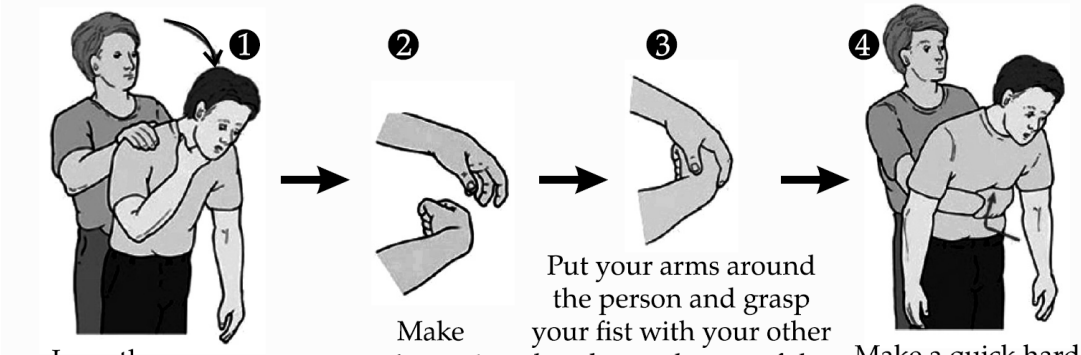
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

Questions 1 to 20 carry 1 mark each.

1. A person can choke when a piece of food becomes lodged in the windpipe, blocking the flow of air. A first aid procedure to remove the blockage is the Heimlich manoeuvre described below:



By performing this procedure, the piece of food is pushed out of the windpipe. Which of the following causes this to happen?
(a) The expansion of the chest
(b) The air pressed out of the chest
(c) The food pressed out of the stomach
(d) The upward movement of the wall of the food pipe
Ans: (b) The air pressed out of the chest

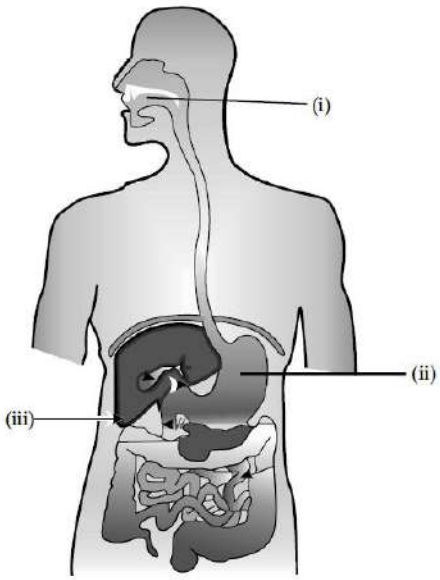
2. The composition of aqua regia is:
(a) Dil. HCl : Conc. HNO_3 = 3 : 1 (b) Conc. HCl : Dil. HNO_3 = 3 : 1
(c) Conc. HCl : Conc. HNO_3 = 3 : 1 (d) Dil. HCl : Dil. HNO_3 = 3 : 1
Ans: (c)
Aqua regia or nitro-hydrochloric acid is a highly corrosive mixture of acids, a fuming yellow or red solution. The mixture is formed by freshly mixing concentrated nitric acid and hydrochloric acid, optimally in a volume ratio of 1 : 3. Aqua regia is highly corrosive that it can dissolve metals, such as gold and platinum.

3. The name of the salt used to remove permanent hardness of water is:
(a) Sodium hydrogen carbonate ($NaHCO_3$)
(b) Sodium chloride (NaCl)
(c) Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$)

(d) Calcium sulphate hemihydrate ($CaSO_4.1/2\ H_2O$)
Ans: (c) Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$)

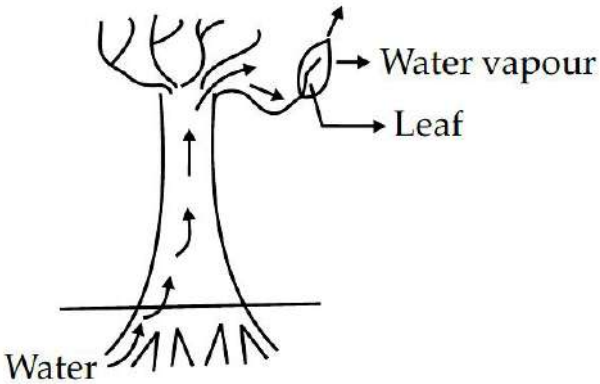
4. A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?
(a) Lemon juice (b) Vinegar (c) Common salt (d) An antacid
Ans: (d) An antacid
Sample solution turn pH paper yellowish-orange which confirms the acidic nature of the sample. To make the colour to greenish-blue, we have to add an antacid.

5. Identify the option that indicates the correct enzyme that is secreted in location i, ii and iii.



(a) (i)-lipase, (ii)-trypsin, (iii)-pepsin (b) (i)-amylase, (ii)-pepsin, (iii)-trypsin
(c) (i)-trypsin, (ii)-amylase, (iii)-carboxylase (d) (i)-permease, (ii)-carboxylase, (iii)-oxidase
Ans: (b) (i)-amylase, (ii)-pepsin, (iii)-trypsin

6. Observe the following diagram and identify the process and its significance from the following options:



(a) Evaporation: maintains water contents in leaf cells.
(b) Transpiration: creates a suction force which pulls water inside the plant.
(c) Excretion: helps in excreting out waste water from the plant.
(d) Translocation: helps in transporting materials from one cell to another.
Ans: (b) Transpiration: creates a suction force which pulls water inside the plant.

7. If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?
(a) Wash the hand with saline solution.
(b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate.
(c) After washing with plenty of water, apply solution of sodium hydroxide on the hand.

(d) Neutralise the acid with a strong alkali.
Ans: (b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate.

8. Choose the incorrect match.

(a) A metal used in joining electric wires	-	Magnesium
(b) A metal whose oxide is soluble in both acids and bases	-	Zinc
(c) A metal unreactive towards oxygen and dilute acids	-	Gold
(d) A metal extracted by using electrolytic reduction	-	Aluminium

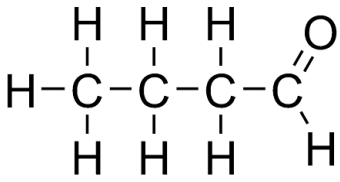
Ans: (a)
Copper metal is used in joining electric wires due to its high electrical conductivity, enough tensile strength and ductility.

9. Choose the balanced equation (s) from the given options.
I. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
II. $Fe + CuSO4 \rightarrow FeSO_4 + Cu$
III. $KClO_4^- \rightarrow KCl + 2O_2$
IV. $Cu + 2HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + H_2O$
(a) I and II only (b) I, II, and III only (c) I, III and IV only (d) All of these
Ans: (b) I, II, and III only

10. In a neuron, conversion of electrical signal to a chemical signal occurs at/in:
(a) cell body (b) axonal end (c) dendritic end (d) axon
Ans: (b) axonal end

11. At the time of short circuit, the electric current in the circuit
(a) very continuously (b) does not change
(c) reduces substantially (d) increases heavily
Ans: (d) increases heavily

12. Identify the name of the given compound.



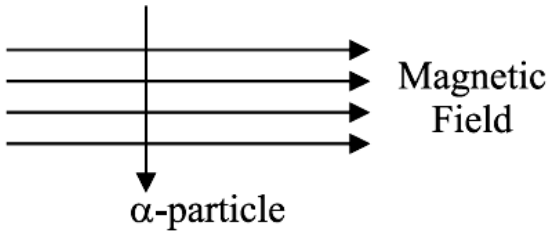
(a) Butanal (b) Butanone (c) Propanol (d) Propanal
Ans: (a) Butanal

13. The most important safety method used for protecting home appliances from short-circuiting or overloading is
(a) earthing (b) use of fuse (c) use of stabilizers (d) use of electric meter
Ans: (b) use of fuse
Fuse has have thin wire of short length made of tin and lead in the ratio of 75: 25%. When current exceeds specified limit fuse melts and breaks the circuits thereby protecting home appliances.

14. Two LED bulbs of 12W and 6W are connected in series. If the current through 12W bulb is 0.06A the current through 6W bulb will be:
(a) 0.04A (b) 0.06A (c) 0.08A (d) 0.12A
Ans: (b) 0.06A

15. A zygote which has an X-chromosome inherited from the father will develop into a
(a) Boy (b) Girl
(c) X-chromosome does not determine the sex of a child (d) either boy or girl
Ans: (b) Girl

16. An alpha particle enters a uniform magnetic field as shown. The direction of force experienced by the alpha particle is:



(a) towards right (b) towards left (c) into the page (d) out of the page
Ans: (d) out of the page

DIRECTION: In the question number 17 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
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17. Assertion (A): In humans, if gene (B) is responsible for black eyes and gene (b) is responsible for brown eyes, then the colour of eyes of the progeny having gene combination Bb, bb or BB will be black only.
Reason (R): The black colour of the eyes is a dominant trait.
Ans: (d) Assertion (A) is false but reason (R) is true.

18. Assertion (A): A current carrying straight conductor experiences a force when placed perpendicular to the direction of magnetic field.
Reason (R): The net charge on a current carrying conductor is always zero.
Ans: (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

19. Assertion (A): Copper sulphate crystals are wet because it contains water of crystallisation.
Reason (R): Water of crystallisation is the fixed number of molecules of water present in one formula unit of salt.
Ans: (d) A is false but R is true.

20. Assertion (A): Insulin regulates blood sugar level.
Reason (R): Insufficient secretion of insulin will cause diabetes.
Ans: (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

SECTION – B

Questions 21 to 25 carry 2 marks each.

21. What are the differences between the transport of materials in xylem and phloem?
Ans. Xylem:
(1) Xylem tissue helps in the transport of water and minerals.
(2) Water is transported upwards from roots to all other plant parts.
(3) Transport in Xylem occurs with the help of simple physical forces such as transpiration 3 pull.
Phloem:
(1) Phloem tissue helps in the transport of food.
(2) Food is transported in both upward and downward directions.
(3) Transport (of food) in Phloem requires energy in the form of ATP.

22. List two differences in tabular form between dominant trait and recessive trait. What percentage/proportion of the plants in the F_2 generation/progeny were round, in Mendel's cross between round and wrinkled pea plants?

Ans:

Dominant trait	Recessive trait
1. The trait which appears in the F_1 progeny is dominant.	1. The trait which remains hidden or which does not appear in the F_1 progeny is the recessive trait.
2. It appears in more numbers.	2. It appears in less number.

75% of the plants were with round seeds.

23. A student needs spectacles of power – 0.5 D for the correction of his vision.

(a) Name the defect in vision the student is suffering from.

(b) Find the nature and focal length of the corrective lens.

Ans: (a) Myopia

(b) Concave / diverging lens

$P = 1/f$

$\Rightarrow -0.5 = 1/f$

$\Rightarrow f = -1/0.5$

$\Rightarrow$ f = 2 m and Concave lens = 200 cm and Concave lens.

OR

How does the refractive index of earth's atmosphere vary with height?

Ans. The hotter air in the atmosphere is lighter than the cooler air and has a refractive index slightly less than that of the cooler air. The refractive index of the upper hotter atmosphere is therefore less than the cooler layers of atmosphere below it

24. Use of several pesticides which results in excessive accumulation of pesticides in rivers or ponds, is a matter of deep concern. Justify this statement.

Ans: Pesticides are toxic, non-biodegradable substances that often run off into water bodies. Once, the toxin enters the body of living organisms, it is not metabolized or excreted, leading to its accumulation inside the body. The accumulation increases the concentration of toxin with each successive trophic level of the food chain, leading to a phenomenon called biological magnification.

The topmost trophic level accumulates the maximum amount of toxin, leading to severe health issues and sometimes the death of the individual.

OR

What is an ecosystem? Name the organisms belonging to the second and fourth trophic levels in the food chain comprising the following:

Frogs, Plants, Snakes, Hawks, Insects

Ans. An ecosystem is a self-sustained unit which comprises of all the interacting living things together with their non-living environment.

Plants → Insects → Frogs → Snakes → Hawks

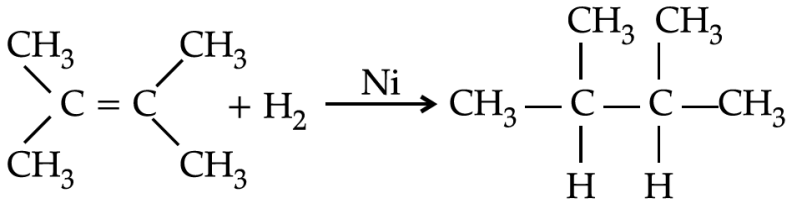
The organism belonging to the second and fourth trophic levels are insects and snakes respectively.

25. Two green plants are kept separately in oxygen free containers, one in the dark and the other in continuous light. Which one will live longer? Give reasons.

Ans: Plant kept in continuous light will perform photosynthesis and release oxygen for its respiration.

Hence, it will live longer than the plant kept in the dark.

26. What is the role of metal or reagents written on arrow's in the given chemical reactions?

(a) 

(b) $CH_3COOH + CH_3CH_2OH \xrightarrow{Conc.H_2SO_4} CH_3COOC_2H_5 + H_2O$

Ans: (a) Ni acts as a catalyst.
(b) Concentrated H_2SO_4 acts as a catalyst.

OR

The molecular formula of an organic compound X is $C_2H_4O_2$ which has vinegar - like smell.
(a) Identify the compound.
(b) Write its chemical formula and name.
Ans: (a) The organic compound X is acetic acid.
(b) Chemical formula: CH_3COOH
IUPAC name: Ethanoic acid

SECTION – C

Questions 27 to 33 carry 3 marks each.

27. What are covalent compounds? How are they different from ionic compounds? List any two properties of covalent compounds.
Ans: The compounds that are formed due to sharing of electrons between two atoms /compounds having covalent bonds.
Ionic compounds are formed due to transfer of electrons from one atom to another /compounds having ionic bonds/compounds having attraction between oppositely charged ions.
Properties of covalent compounds:
(i) They are poor conductors of electricity.
(ii) They have low melting and boiling point.

28. A squirrel is in a scary situation. Its body has to prepare for either fighting or running away. State the immediate changes that take place in its body so that the squirrel is able to either fight or run?
Ans: • The adrenaline hormone is secreted into the blood.
• The heart beats faster resulting in supply of more oxygen to the muscles.
• Blood is diverted to skeletal muscles.
• The breathing rate increases.
• The blood supply to digestive systems and skin is reduced.

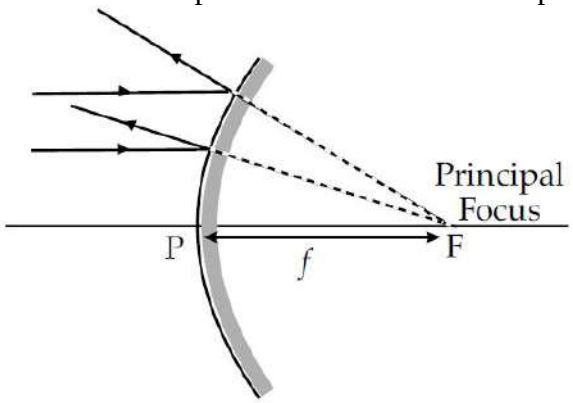
OR

Write in tabular form the location and function of the hormones secreted by each of the following glands present in the human body:
(i) Pituitary gland
(ii) Thyroid gland
(iii) Pancreas
Ans:

Glands	Location	Function
(i) Pituitary gland	Brain	Stimulates growth in all organs.
(ii) Thyroid	Neck/ Larynx	Regulates metabolism of fats, proteins & carbohydrates.
(iii) Pancreas	Below Stomach	Regulates blood sugar

29. Define the following terms in the context of a diverging mirror :
(i) Principal focus
(ii) Focal length
Draw a labelled ray diagram to illustrate your answer.

Ans: (i) Principal focus: It is the point on the axis of a mirror to which parallel rays of light appear to diverge after reflection from diverging mirror.
(ii) Focal length: The distance between pole of convex mirror and principal focus.



$f \rightarrow$focal length

30. A 10 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 12 cm. The distance of the object from the lens is 18 cm. Find the nature, position and size of the image formed.

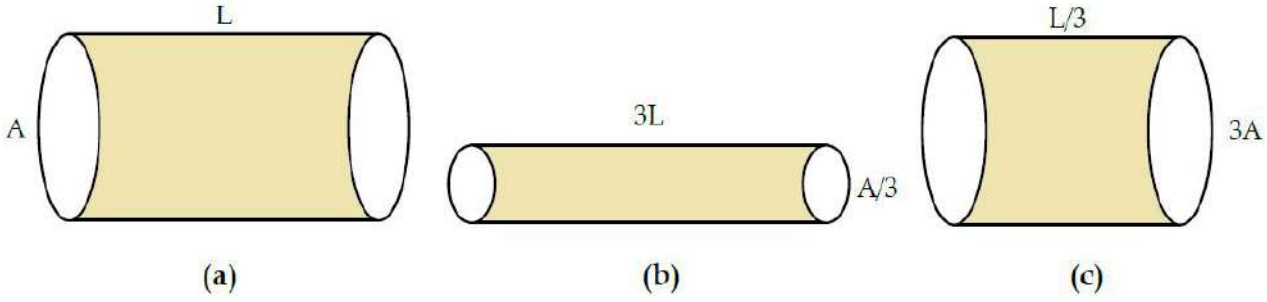
Ans: $\frac{1}{v}-\frac{1}{u}=\frac{1}{f} \Rightarrow \frac{1}{v}=\frac{1}{u}+\frac{1}{f}$

$\Rightarrow \frac{1}{v}=\frac{1}{12}+\frac{1}{(-18)} \Rightarrow v=36cm$

Now, $m=\frac{v}{u}=\frac{h'}{h} \Rightarrow \frac{36}{-18}=\frac{h'}{10} \Rightarrow h'=-20cm$

Nature of image – Real and inverted.

31. The figure below shows three cylindrical copper conductors along with their face areas and lengths. Compare the resistance and the resistivity of the three conductors. Justify your answer.



Ans: Resistance of a material, $R=\frac{\rho L}{A}$, where ρ is the resistivity of the material, L is the length of the material and A is the area of cross-section of material.

Now, $R_a : R_b : R_c = \frac{\rho_a L_a}{A_a} : \frac{\rho_b L_b}{A_b} : \frac{\rho_c L_c}{A_c}$; where a, b, c denotes physical quantity for respective conductor.

$\Rightarrow R_a : R_b : R_c = \frac{\rho L}{A} : \frac{\rho(3L)}{(\frac{A}{3})} : \frac{\rho(\frac{L}{3})}{3A}$

$\Rightarrow R_a : R_b : R_c = \frac{\rho L}{A} : \frac{9\rho L}{A} : \frac{\rho L}{9A} \Rightarrow R_a : R_b : R_c = 1 : 9 : \frac{1}{9} \therefore R_b > R_a > R_c$

Resistivity depends only on the material of the conductor.

Here material (Cu) is same for all three conductors, so $\rho_a = \rho_b = \rho_c$

OR

State any three differences between Resistance and Resistivity.

Ans: Resistance:

(i) It is the opposition provided by the atoms of a conductor to the flow of electrons.
(ii) SI unit of resistance is Ω (Ohm).
(iii) Resistance depends on length, area of cross section, material and temperature of conductor.
Resistivity:
(i) It is the resistance of the conductor of that substance of unit length and unit area of cross section.
(ii) SI unit of resistivity of Ωm (Ohm-meter).
(iii) Resistivity of substance depends only on the material of substance.

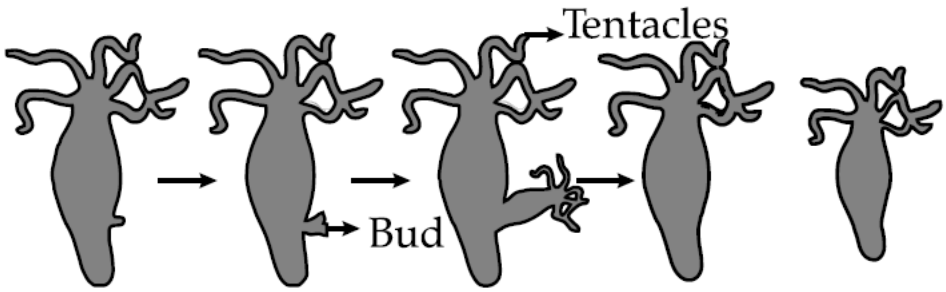
32. Write one difference between biodegradable and non-biodegradable wastes. List two impacts of each type of the accumulated waste on environment if not disposed off properly.
Ans: Biodegradable Substances: Substances that can be decomposed naturally by the action of microorganisms. It is environment friendly.
Non-biodegradable substances: Substances that cannot be decomposed naturally. It is harmful to the environment and causes pollution.
Effects of biodegradable substances on environment: (i) Decomposition of biodegradable wastes is accompanied by foul smell which spreads in the environment and affects the people of nearby areas.
(ii) It act as breeding grounds for houseflies, etc. which act as vectors of various diseases.
Effects of non-biodegradable substances on environment: (i) Excessive use of non-biodegradable pesticides increases the soil pollution and also affects the soil fertility.
(ii) Certain non-biodegradable wastes enter the food chains and affects the various biotic components of the environment.

33. A compound 'A' is used in the manufacture of cement. When dissolved in water, it evolves a large amount of heat and forms compound 'B'.
(i) Identify A and B.
(ii) Write chemical equation for the reaction of A with water.
(iii) List two types of reaction in which this reaction may be classified.
Ans: (i) A = CaO/Quick lime/Calcium oxide
B = $Ca(OH)_2$/Slaked lime/Calcium hydroxide
(ii) $CaO + H_2O \longrightarrow Ca(OH)_2$ + heat or energy
(iii) Combination reaction
Exothermic reaction.

SECTION – D

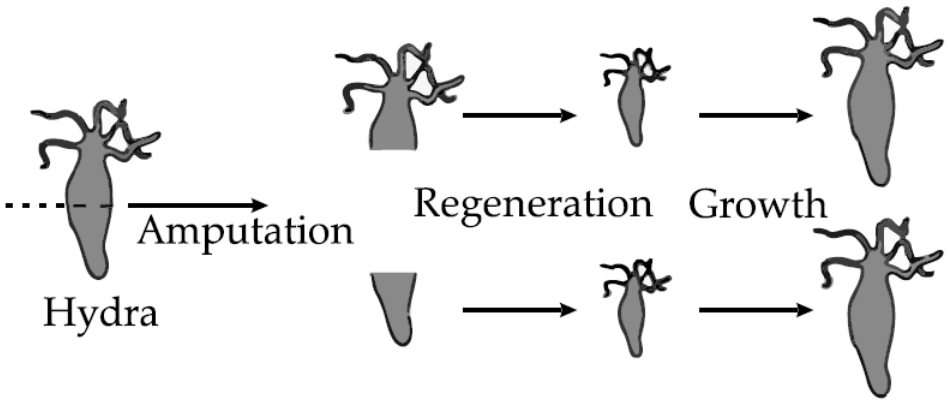
Questions 34 to 36 carry 5 marks each.

34. (i) Name and explain the two modes of asexual reproduction observed in hydra.
(ii) What is vegetative propagation ? List two advantages of using this technique.
Ans: (i) The two modes of asexual reproduction observed in Hydra are : Budding and Regeneration.
Budding in Hydra: In Budding, a small part of the body of the parents grows out as a 'bud' which then detaches and becomes a new organism. Hydra reproduces by budding using the regenerative cells. A bud develops as an outgrowth in Hydra due to repeated cell division at one specific site. When fully mature, the bud detaches itself from the parent body and develops into new independent individuals.



Regeneration in Hydra: In this method, small cut or broken parts of the organisms' body grow or regenerate into separate individuals. Regeneration of Hydra from the body parts is carried out by specialized cells, which proliferate and make a large number of cells.

(ii) Vegetative propagation is the development of a new plant from the vegetative parts (roots, stem and leaves) of a plant.



Advantages:

(i) Such plants can bear flowers and fruits earlier than those produced from seeds.

(ii) Allows propagation of plants (banana, orange etc) that have lost capacity to produce seeds.

(iii) All plants produced are genetically similar to the parent plant and hence have all its characters.

OR

Give reasons:

(a) Ventricles have thicker muscular walls than atria.

(b) Transport system in plants is slow.

(c) Circulation of blood in aquatic vertebrates differs from that in terrestrial vertebrates.

(d) During the daytime, water and minerals travel faster through xylem as compared to the night.

(e) Veins have valves whereas arteries do not.

Ans. (a) Ventricles have thicker muscular walls than atria because they have to pump blood into various organs.

(b) Transport system in plants is slow because:

(i) Plants have low energy needs as

(ii) Plant bodies have a large proportion of dead cells in many tissue.

(iii) Plants do not move

(c) Aquatic vertebrates like fish have a two chambered heart (which consists of one atrium and one ventricle). The heart pumps deoxygenated to the gills and it gets oxygenated in the gills. The oxygenated blood from the gills is supplied to the body parts. Thus, blood goes only once through the heart in the fish during one cycle of passage through the body. But in terrestrial organisms, heart may be 3 or 4 chambered, blood gets oxygenated in the lungs and most of them have double circulation.

(d) During the daytime, water and minerals travel faster through xylem as compared to the night. The water column in the xylem tracheids and vessels moves upwards due to pull generated by transpiration. (loss of water in the form of vapours from living tissues of aerial parts of plants.) The water is lost from the tiny pores called stomata present on the surface of leaves of plant. Stomata are open during day time, so transpiration process is faster and water along with mineral moves faster through xylem during day time as compared to night time.

(e) Veins have valves that ensure that the blood flows only in one direction. Values allow the blood to flow only towards the heart and prevent backflow but arteries do not have values.

35. (a) Write chemical equations for the following reactions:

(i) Calcium metal reacts with water.

(ii) Cinnabar is heated in the presence of air.

(iii) Manganese dioxide is heated with aluminium powder.

(b) What are alloys? List two properties of alloys.

Ans: (a) (i) $Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2$

(ii) $2HgS + 3O_2 \xrightarrow{Heat} 2HgO + 2SO_2$

(iii) $3MnO_2 + 4Al \longrightarrow 2Al_2O_3 + 3Mn$

(b) Alloys are homogeneous mixture of two or more metals or a metal and a non metal

Properties:

Alloys are stronger / harder / have low melting point / more resistant to corrosion / some are magnetic in nature.

OR

Define a chemical reaction. State four observations which help us to determine that a chemical reaction has taken place. Write one example of each observation with a balanced chemical equation.

Ans: Process in which new substances with new properties are formed by the rearrangement of atoms.

(i) Evolution of gas: The chemical reaction between zinc and dilute H2SO4.

$Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(g) \uparrow$

(ii) Change in colour: The chemical reaction between potassium iodide and lead nitrate.

$Pb(NO_3)_2(aq) + 2KI(s) \longrightarrow 2KNO_3(aq) + PbI_2(s)$

Colourless Yellow

(iii) Formation of precipitate: The chemical reaction between sulphuric acid and barium chloride.

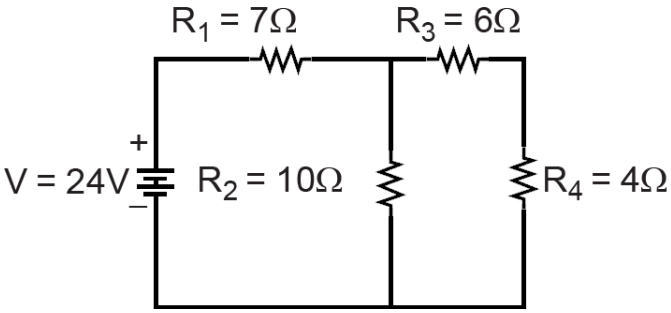
$BaCl_2(aq) + H_2SO_4(aq) \longrightarrow 2HCl(aq) + BaSO_4(s) \downarrow$

White precipitate

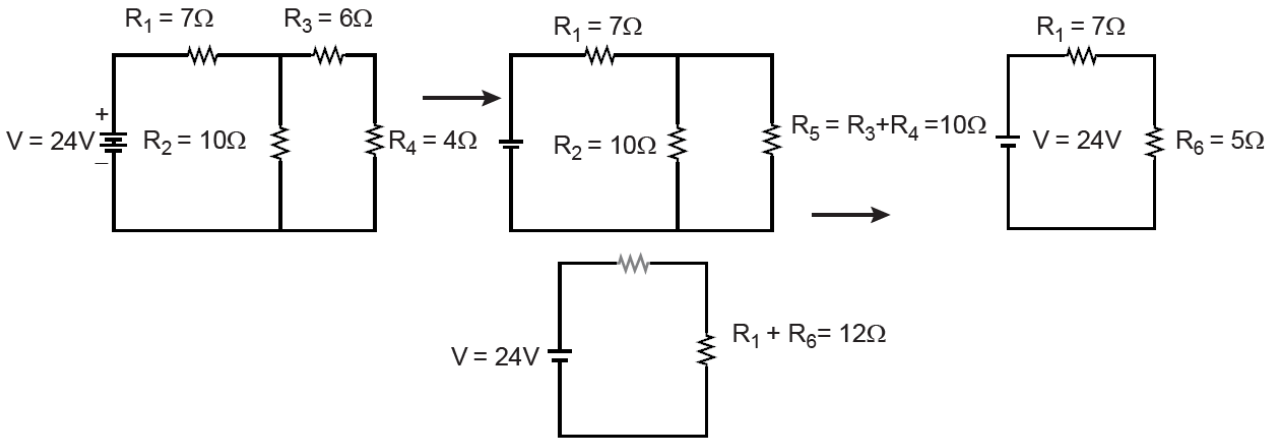
(iv) Change in temperature: The chemical reaction between quick lime and water.

$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + Heat$

36. Calculate the total resistance of the circuit and find the total current in the circuit.



Ans:



R_3 and R_4 are in series, hence the equivalent resistance of those two = $R_5 = R_3 + R_4 = 10$ ohms.

R_5 and R_2 are in parallel. Let R_6 be the equivalent resistance for them.

Hence, $R_6 = \dfrac{R_5 \times R_2}{R_5 + R_2} = \dfrac{100}{20} = 5\Omega$

Now R_1 and R_6 are in series and hence the final equivalent resistance of the entire circuit is R = $R_1 + R_6 = 12$ ohms

By Ohm's Law we know that V = IR, hence

Hence the current in the circuit is 24/12 A = 2A

SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. Case Study – 3

The melting points and boiling points of some ionic compounds are given below:

Compound	Melting Point (K)	Boiling Point (K)
NaCl	1074	1686
LiCl	887	1600
$CaCl_2$	1045	1900
CaO	2850	3120
$MgCl_2$	981	1685

These compounds are termed ionic because they are formed by the transfer of electrons from a metal to a non-metal. The electron transfer in such compounds is controlled by the electronic configuration of the elements involved. Every element tends to attain a completely filled valence shell of its nearest noble gas or a stable octet.

(i) Show the electron transfer in the formation of magnesium chloride. [1]

(ii) List two properties of ionic compounds other than their high melting and boiling points. [1]

(iii) (A) While forming an ionic compound say sodium chloride how does sodium atom attain its stable configuration ? [2]

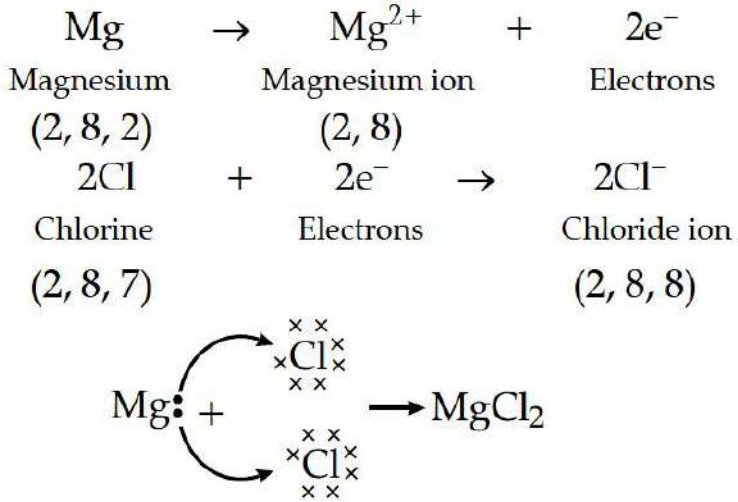
OR

(iii) (B) Give reasons : [2]

(i) Why do ionic compounds in the solid state not conduct electricity ?

(ii) What happens at the cathode when electricity is passed through an aqueous solution of sodium chloride ?

Ans: (i) Electron transfer in the formation of magnesium chloride:

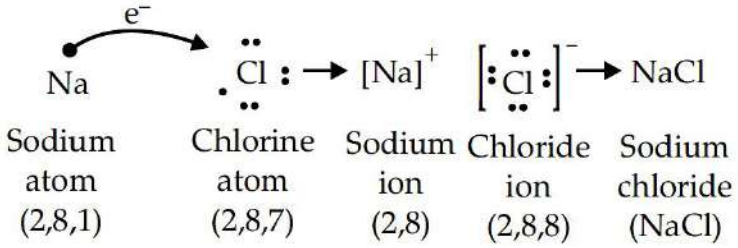


(ii) Two properties of ionic compounds are:

(a) They conduct electricity in solution or molten state.

(b) They are hard and brittle crystalline solids.

(iii) (A) Sodium chloride is formed by the combination of sodium and chloride ions. Sodium loses one electron from valence shell to attain stable noble gas configuration.



OR

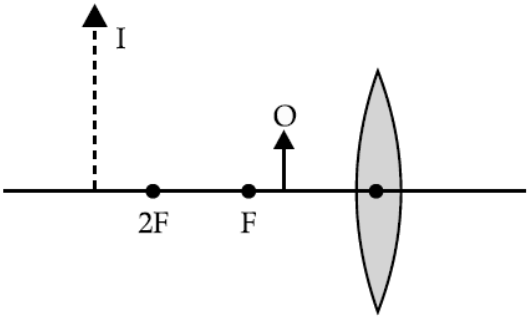
(B) (i) Ionic compounds do not conduct electricity in solid state due to the absence of free ions but they conduct electricity in molten and aqueous state due to presence of free ions.

(ii) Reduction takes place at cathode. Therefore, during electrolysis of aqueous solution of sodium chloride, hydrogen gas is evolved at cathode due to reduction of H+ ions.

$$2H^+ + 2e^- \rightarrow H_2 \uparrow$$

38. Case Study – 2

The diagram given below shows an object O and its image I. Without actually drawing the ray diagram state the following:



(a) Type of lens (Converging / Diverging) [1]

(b) Name two optical instruments where such an image is obtained. [1]

(c) List three characteristic of the image formed if this lens is replaced by a concave mirror of focal length f and an object is placed at a distance f/2 in front of the mirror. [2]

OR

List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen. [2]

Ans: (a) Converging lens

(b) Microscope and Telescope

(c) Characteristic of the image formed are:

(1) Virtual image

(2) Magnified image

(3) Image behind the mirror

OR

Precautions:

(1) Lens should be held in vertical position with its faces parallel to the screen.

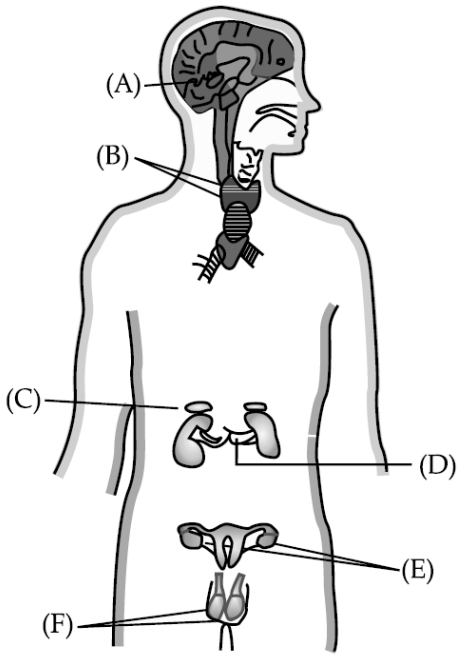
(2) Clear and sharpest image should be obtained by adjusting the position of lens.

(3) Three observations should be taken at least.

(4) Base of lens, screen and measuring scale should be in straight line. (or any other)

39. Case Study – 3

The given diagram represents the human endocrine system. Study the diagram and answer any four questions from Q. 1 to Q. 5.



(a) Identify the endocrine glands A, B, C, D, E and F in the given diagram.
(b) Which gland secretes digestive enzymes as well as hormones?
(c) What is the effect of chemical produced by gland F?

OR

(c) Name the endocrine glands which is unpaired? Explain

Ans: (a) In the given diagram, A — Pituitary B — Thyroid C — Adrenal D — Pancreas E — Ovary F — Testis

(b) Gland D is pancreas. It secretes both digestive enzymes as well as hormones.

(c) Gland F is Testis. It secretes testosterone which controls sperm production/ secondary sexual character.

OR

(c) There are two adrenal glands, one on top of each kidney that make adrenaline hormone. Testes are paired glands presents in males, secretes male sex hormone. Pituitary gland is present just below the brain and is unpaired. It is also called master gland as it secretes a number of hormones. Ovaries are paired glands present in females that secrete female sex hormones. 2