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Q1. Besides gallium, which other elements have since been discovered that were left by Mendeléev in this Periodic Table? (Any two)

Q2. In the Modern Periodic Table, which are the metals among the first ten elements?

Q3. Which of the following statements is not a correct statement about the trends when going left to right across the periods of Periodic Table?

(a) The elements become less metallic in nature (b) The number of valence electrons increases

(c) The atoms lose their electrons more easily (d) The oxides become more acidic

Q4. Element X forms a chloride with the formula XCl_2, which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as

(a) Na (b) Mg (c) Al (d) Si

Q5. Did Döberreiner's triads also exist in the columns of Newlands' octaves? Compare and find out.

Q6. What were the limitations of Döberreiner's classification?

Q7. Use Mendeléev's Periodic Table to predict the formulae for the oxides of the following elements:

K, C, Al, Si, Ba.

Q8. What were the criteria used by Mendeléev in creating his Periodic Table?

Q9. Why do you think the noble gases are placed in a separate group?

Q10. Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?

Q11. How could the modern Periodic Table remove various anomalies of Mendeléev's Periodic Table?

Q12. (a) Lithium, sodium and potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?

(b) Hellium is an unreactive gas and neon is a gas of extermely low reactivity. What, if anything, do their atoms have in common?

Q13. By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristic?

Ga, Ge, As, Se, Be

Q14. Which element has

(a) two shells, both of which are completerly filled with electrons?

(b) the electronic configuration 2, 8, 2?

(c) a total to three shells, with four electrons in its valence shell?

(d) twice as many electrons in its second shell as in its first shell?

Q15. (a) What property do all elements in the same column of the Periodic Table as boron have in common?

(b) What property do all elements in the same column of the Periodic Table as fluorine have in common?

Q16. An atom has electronic configuration 2, 8, 7.

(a) What is the atomic number of this element?

(b) To which of the following elements would it be chemically similar?
(Atomic numbers are given in parentheses)

N(7), F(9), P(15), Ar(18).

Q17. The position of three elements A, B and C in the Periodic Table are shown below:

Group 16	Group 17
–	–
–	A
–	–
B	C

(a) State whether A is a metal or non-metal.

(b) State whether C is more reactive or less reactive than A.

(c) Will C be larger or smaller in size than B?

(d) Which type of ion, cation or anion, will be formed by element A?

Q18. In the Modern Periodic Table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these have physical and chemical properties resembling calcium?

Q19. Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will be more electronegative? Why?

Q20. Compare and contrast the arrangement of elements is Mendeléev's Periodic Table and the Modern Periodic Table.

Q21. Name: (a) three elements that have a single electron in their outermost shells, (b) two elements that have two electron in their outermost shells, (c) three elements with filled outermost shells.

Q22. What were the limitations of Newlands' Law of Octaves?

Q23. How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?

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S1. Scandium, germanium.

S2. Lithium and beryllium are the metals among the first ten elements in the Modern Periodic Table.

S3. Statement (c) is not correct. In fact, the atoms lose their electrons with greater difficulty as we move from left to right in a period. Other statements are correct.

S4. As X forms the chloride with the formula XCl_2, it indicates that the element X is divalent. Further XCl_2 is solid with high melting point, it shows that the chloride is ionic in nature.

That further means that the element X is metallic in nature, such that is gives away electrons to chlorine to form the ionic chloride. These conditions are fulfilled if X is taken as Mg.

Thus, option (b) is correct.

S5. Yes, we can identify the following triads:

H, F, Cl

Li, Na, K

Be, Mg, Ca

B, Al, Cr

The atomic mass of the middle atom in the above triads is approximately equal to the average mass of the elements on the left and right hand side.

S6. Döberreiner's could identify only three triads from the elements known at that time. Hence, this classification of elements was not found to be useful.

S7. K_2O, CO_2, SiO_2, BaO.

S8. Mendeléev created his Periodic Table on the basis of their fundamental property of the atomic mass and also on the similarity of chemical properties. Among the chemical properties, Mendeléev concentrated on the compounds formed by elements with oxygen and hydrogen.

S9. Noble gases are inert. They have no tendency to react with other elements (with some exceptions). Hence, they are placed in a separate group.

S10. Calcium and strontium would show chemical reactions similar to magnesium. They have the same number of electrons in the outermost (valence) shell.

S11. (a) Modern Periodic Table settled the controversial position of hydrogen.

(b) The question of placement of isotopes of an element in the Periodic Table was answered by Modern Periodic Table.

S12. (a) Lithium, sodium and potassium have the same number of electrons (*i.e.*, 1) in the outermost shell.

(b) Hellium and neon have completed outermost shells, 2 electrons in case of helium (completed duplet) and 8 electrons in case of argon (completed octet).

S13. Metallic character of an element increases down a group and decreases from left to right in a period. On this basis Be is expected to have maximum metallic character.

S14. (a) Neon, It has two shells with configuration 2, 8. Thus, both these shells are completely filled.

(b) Magnesium. It has the atomic mass 24 and atomic number 12. Electronic configuration is 2, 8, 2.

(c) The element has three shells in all, with four electrons in the outermost shell. Thus, the electronic configuration is 2, 8, 4. It corresponds to silicon.

(d) Maximum capacity of first shell is 2. Thus, the second shell contains $2 \times 2 = 4$ electrons. Thus, the electronic configuration is 2, 4. This configuration corresponds to carbon.

S15. (a) All the elements in the same column as boron have three electrons in the valance shell. That is all the elements are trivalent.

(b) All the elements in the same column as fluorine have one electron in the valance shell. That is all the elements are monovalent.

S16. Chlorine has the electronic configuration 2, 8, 7.

(a) Atomic number of an element is the sum of number of electrons or protons in the element. Therefore, atomic number of the element is 2 + 8 + 7 = 17.

(b) Chlorine is a halogen. Another halogen present in the group is F(9).

Therefore, chlorine is chemically similar to F(9).

S17. (a) Elements on the right hand side of the Periodic Table are non-metals. Thus, A is a non-metal.

(b) As we move down the group 17, reactivity decreases. Therefore, C is less reactive than A.

(c) As we move from left to right in a period, atomic radius decreases. Therefore, C will be small than B.

(d) Non-metals have a tendency to gain electrons. Therefore, A will form anion.

S18. Elements in a group have similar properties. Elements with atomic numbers 12 and 28 lie in the same group as calcium. Therefore, they will have properties resembling calcium.

S19. Nitrogen with atomic number 7 has got 7 electrons with electronic configuration 2, 5 *i.e.*, 2 electrons in K-shell and 5 electrons in L-shell.

Phosphorus with atomic number 15 has got 15 electrons with electronic configuration 2, 8, 5 i.e., 2 electrons in K-shell, 8 electrons in L-shel and 5 electrons in M-shell.

Non-metallic character decreases as we move down the group. Therefore, nitrogen will be more electronegative than phosporus.

S20.

Similarities	Dissimilarities
1. In both tables, similarity in physical and chemical properties has been taken as the basis for classification. Elements with similar physical and chemical properties have been kept in the same group. 2. The formulae of the hydrides and oxides formed by an element were treated as one of the criteria for classification of elements.	1. While Mendeléev's Table was based on the atomic mass of the element, Modern Periodic Table is based on atomic number. 2. Mendeléev's Periodic Table is in short form containing Groups I to VIII divided into A and B sub groups. On the other hand, Modern Periodic Table is in long form containing Groups 1 to 18 with no sub groups. 3. Transition series has been placed at the end in Mandeléev's classification while it is in the middle in Modern Periodic Table.

S21. (a) Lithium, sodium and potassium have a single electron in their outermost shells.

(b) Magnesium and calcium have two electrons in their outermost shells.

(c) Helium, neon and argon have filled outermost shells.

S22. The limitations of Newlands' Law of Octaves:

(a) It was found that Law of Octaves was applicable only upto calcium. After calcium, every eighth element did not possess properties similar to that of first.

(b) Newlands assumed that only 56 elements existed in nature and no more elements would be discovered in future. But later several new elements were discovered.

(c) To fit the elements into his table, Newlands adjusted two elements in the same slot but also put some unlike elements under the same note.

S23. Group number of an element can be predicted from the number of electrons in the outermost (valance) shell. For example:

No. of electrons in the valence shell	Group No.
1	1
1	2
3	13
4	14
5	15
6	16
7	17
8	18

Peroid number of an element can be predicted from the number of shells with filled electrons.For example:

No. of shells with filled electrons	Period No.
1	1
1	2
3	3
4	4
5	5 and so on

Knowing the electronic configuration, we can find the number of electrons in the outermost shell and the number of shells with filled electrons. This can help to relate its position in the Periodic Table.