CBSE Important Questions for Class 10 Science Chapter 5: In Chapter 5 of Class 10 Science focuses on the periodic classification of elements which is important for understanding the arrangement of elements in the periodic table.

By practicing the important questions from Chapter 5 on Periodic Classification of Elements, students can deepen their understanding of important concepts, such as the arrangement of elements in the periodic table, the significance of groups and periods and the trends in properties like atomic size and electronegativity.

These questions also help students recognize the practical implications of periodicity in predicting element behavior and reactivity. Solving these questions familiarizes students with the exam pattern, sharpens their analytical skills and boosts their confidence for the actual examination.

CBSE Important Questions for Class 10 Science Chapter 5 Overview

The important questions for Class 10 Science Chapter 5 are created by subject experts of Physics Wallah, provide a detailed overview of the periodic classification of elements. These questions help students understand key ideas, such as how the periodic table is organized, the properties of different elements, and the importance of various groups and periods.

By practicing these questions students can strengthen their knowledge of periodicity, improve their problem-solving skills and learn how these concepts apply in everyday life. Working through these questions will help them do better in this chapter and prepare for their exams.

CBSE Important Questions for Class 10 Science Chapter 5 PDF

CBSE Important Questions for Class 10 Science Chapter 5 are available in a PDF format, which provides students with a detailed set of questions focused on the periodic classification of elements.

By accessing the PDF students can practice a variety of questions that cover key ideas such as the organization of the periodic table, the properties of elements and trends across different groups. This study material will help in reinforcing their knowledge and preparing effectively for exams. The PDF link is available below for easy access.

CBSE Important Questions for Class 10 Science Chapter 5 PDF

CBSE Important Questions for Class 10 Science Chapter 5 Periodic Classification of Elements

Here we have provided CBSE Important Questions for Class 10 Science Chapter 5 Periodic Classification of Elements-

Short Answer Type Questions

Q1. The three elements A, B and C with similar properties have atomic masses X, Y and Z, respectively. The mass of Y is approximately equal to the average mass of X and Z. What is such an arrangement of elements called? Give one example of such a set of elements.

Answer:

The arrangement of elements described is known as a triad, as proposed by Dobereiner. In this arrangement, the atomic mass of the middle element (Y) is approximately equal to the average of the atomic masses of the other two elements (X and Z).

For example, consider the elements Lithium (Li), Sodium (Na), and Potassium (K), with atomic masses of 6.9, 23.0, and 39.0, respectively. The average mass of Lithium and Potassium is approximately 23.0, which is equal to the atomic mass of Sodium. Thus, Lithium, Sodium, and Potassium form a triad.

Q2. Elements have been arranged in the following sequence based on their increasing atomic masses.

F, Na, Mg, Al, Si, P, S, Cl, Ar, K.

(a) Pick two sets of elements with similar properties.

(b) The given sequence represents which law of classification of elements?

Answer:

(a) (i) F and Cl (ii) Na and K have similar properties.

(b) It represents Newland's law of octaves.

Q3. Can the following groups of elements be classified as Dobereiner's triad?

(a) Na, Si, Cl

(b) Be, Mg, Ca

Atomic mass of Be 9; Na 23; Mg 24; Si 28; C| 35; Ca 40

Explain by giving a suitable reason.

Answer:

(a) Na, Si, and Cl are not a Dobereiner's triad. Although the atomic mass of silicon (Si) is the average of atomic masses of sodium (Na) and chlorine (Cl), but these elements do not possess similar properties. Hence, it can't be classified as a Dobereiner's triad.

23 (Na) + 35 (Cl) / 2 = 29 (Si)

(b) Be, Mg, and Ca is a Dobereiner's triad. They have similar properties, and the atomic masses of magnesium (Mg) is approximately the average of the atomic mass of Be and Ca.

9 (Be) + 40 (Ca) / 2 = 24.5 (Si)

Q4. In Mendeleev's Periodic Table, the elements were arranged in the increasing order of their atomic masses. However, cobalt with an atomic mass of 58.93 amu was placed before nickel, having an atomic mass of 58.71 amu. Give a reason for the same.

Answer:

In Mendeleev's Periodic Table, elements were organized in increasing order of their atomic masses. However, cobalt (Co), with an atomic mass of 58.93 amu, was placed before nickel (Ni), which has an atomic mass of 58.71 amu. This placement was done to maintain the arrangement of elements within the same group that exhibit similar chemical properties. Mendeleev prioritized chemical properties over atomic mass, which is why cobalt was positioned before nickel, even though cobalt has a higher atomic mass. This decision illustrates Mendeleev's understanding that the properties of elements are fundamental in their classification.

Q5. Hydrogen occupies a unique position in Modern Periodic Table". Justify the statement.

Answer:

Hydrogen occupies a unique position in the Modern Periodic Table due to its distinctive properties. With an electron configuration of $1s^1$, hydrogen can either lose its single electron to form a positive ion (H^+) or gain an electron to achieve a stable configuration similar to helium. This dual ability allows hydrogen to exhibit characteristics of both metals and nonmetals. As a result, it is challenging to categorize hydrogen definitively, as it can be placed in the alkali metals group (due to its ability to donate an electron) or with the nonmetals (because it can accept an electron). Therefore, hydrogen's unique properties justify its special position in the periodic table, setting it apart from other elements.

Q6. Write the formulae of chlorides of Eka-silicon and Eka-aluminium, the elements predicted by Mendeleev.

Answer:

The formulae of chlorides of Eka-silicon and Eka-aluminium are XC_4 and XCl_3, respectively.

Q7. Three elements A, B and C have 3, 4 and 2 electrons, respectively, in their outermost shell. Give the group number to which they belong in the Modern Periodic Table. Also, give their valencies.

Answer:

A belongs to Group 13, B belongs to Group 14, and C belongs to Group 2. A valency is 3, B valency is 4, and C valency is 2.

Q8. If an element X is placed in group 14, what will be the formula and the nature of bonding

of its chloride?

Answer:

If an element is placed in group 14, it has 4 electrons in its outermost orbit. Hence, the formula of its chloride is XCl_4 . It makes compounds by sharing electrons, so its compound will have a covalent bond.

Q9. Compare the radii of two species, X and Y. Give reasons for your answer.

(a) X has 12 protons and 12 electrons

(b) Y has 12 protons and 10 electrons

Answer:

To compare the radii of the two species X and Y:

(a) Species X has 12 protons and 12 electrons, making it neutral magnesium (Mg).

(b) Species Y has 12 protons and only 10 electrons, resulting in a positively charged ion, specifically a magnesium ion (Mg^{2+}).

Since both species have the same number of protons (12), they have the same nuclear charge. However, species Y has fewer electrons (10) than species X. This means that the positive charge from the nucleus exerts a stronger attraction on the fewer electrons in Y compared to the electrons in X.

As a result, the electrons in Y are drawn closer to the nucleus, leading to a smaller ionic radius for Y compared to the atomic radius of X. Thus, the radius of species Y is smaller than that of species X due to the increased effective nuclear charge experienced by the electrons in Y.

Q10. Arrange the following elements in increasing order of their atomic radii.

(a) Li, Be, F, N

(b) Cl, At, Br, I

Answer:

(a) Li, Be, N, and F are in the same period, and atomic radii decrease from left to right. Thus, the order will be: F < N < Be < Li.

(b) Cl, Br, I, and At are in the same group, and the atomic radii increase from top to bottom. Thus, the order will be: Cl < Br < I < At.

Q11. Identify and name the metals from the following elements whose electronic configurations are given below.

(a) 2, 8, 2

(b) 2, 8, 1

(c) 2, 8,7

(d) 2, 1

Answer:

(a) Magnesium; It is a metal.

(b) Sodium; It is a metal.

(c) Chlorine; It is a nonmetal.

(d) Lithium; It is a metal.

Q12. Write the formula of the product formed when element A (atomic number 19) combines with element B (atomic number 17). Draw its electronic dot structure. What is the nature of the bond formed?

Answer:

The product's formula when element A (atomic number 19) combines with element B (atomic number 17) is KCl.

The nature of the bond between KCl is ionic.

Electron Dot Structure of KCl:

Q13. Arrange the following elements in the increasing order of their metallic character: Mg, Ca, K, Ge, Ga

Answer:

Metallic character increases as we move down the group because there is an increase in atomic size.

Thus, the order will be: Ge< Ga < Mg < Ca < K.

Q14. Identify the elements with the following property and arrange them in increasing order of their reactivity

(a) An element which is a soft and reactive metal

(b) The metal which is an important constituent of limestone

(c) The metal which exists in a liquid state at room temperature

Answer:

(a) Sodium is soft and reactive.

(b) Calcium is an important constituent of limestone.

(c) Mercury exists in a liquid state at room temperature.

The increasing order of reactivity will be: Hg < Ca < Na.

Q15. Properties of the elements are given below. Where would you locate the following elements in the periodic table?

(a) A soft metal stored under kerosene.

(b) An element with variable (more than one) valency stored underwater.

(c) An element which is tetravalent and forms the basis of organic chemistry.

(d) An element which is an inert gas with atomic number 2.

(e) An element whose thin oxide layer is used to make other elements corrosion-resistant by anodising.

Answer:

(a) Sodium is soft metal stored under kerosene.

(b) Phosphorous shows variable (more than one) valency and is stored underwater.

(c) Carbon is a tetravalent element and forms the basis of organic chemistry.

(d) Helium is an element which is an inert gas with atomic number 2.

(e) Aluminium is an element whose thin oxide layer is used to make other elements corrosion-resistant by anodising.

Long Answer Type Questions

Q1. An element is placed in the 2nd Group and 3rd Period of the Periodic Table. It burns in the presence of oxygen to form a basic oxide.

(a) Identify the element

(b) Write the electronic configuration

(c) Write the balanced equation when it burns in the presence of air

(d) Write a balanced equation when this oxide is dissolved in water

(e) Draw the electron dot structure for the formation of this oxide

Answer:

(a) Magnesium

(b) The electronic configuration of magnesium is 2, 8, 2.

(c) $2\ Mg + O_2 \rightarrow 2\ MgO$

(d) $MgO + H_2O \rightarrow Mg(OH)_2$

(e) Electron Dot Structure of magnesium oxide:

Q2. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

(a) Where in the periodic table are elements X and Y placed?

(b) Classify X and Y as metal (s), non-metal (s) or metalloid (s).

(c) What will be the nature of the oxide of element Y? Identify the nature of bonding in the compound formed.

(d) Draw the electron dot structure of the divalent halide.

Answer:

(a) X belongs to Group 17 and 3rd periods, while Y belongs to Group 2 and 4th.

(b) X is a Nonmetal, while Y is a metal.

(c) Y will form a basic oxide, and it will have an ionic bonding.

(d) Electron dot structure of the divalent halide.

Q3. The atomic number of a few elements are given below

10, 20, 7, 14

(a) Identify the elements

(b) Identify the Group number of these elements in the Periodic Table

(c) Identify the Periods of these elements in the Periodic Table

(d) What would be the electronic configuration for each of these elements?

(e) Determine the valency of these elements

Answer:

(a) 10 is the atomic number of neon.

20 is the atomic number of calcium.

7 is the atomic number of nitrogen.

14 is the atomic number of silicon.

(b) Neon belongs to group 18.

Calcium belongs to group 2.

Nitrogen belongs to group 15.

Silicon belongs to group 14.

(c) Neon belongs to period 2.

Calcium belongs to period 4.

Nitrogen belongs to period 2.

Silicon belongs to period 3.

(d) The electronic configuration of neon is 2, 8.

The electronic configuration of calcium is 2, 8, 8, 2.

The electronic configuration of nitrogen is 2, 5.

The electronic configuration of silicon is 2, 8, 4.

(e) The valency of neon is equivalent to 8 – no of valence electrons, i.e. 8 – 8 = 0.

The valency of calcium is equivalent to the no of valence electrons, i.e. equal to 2.

The valency of nitrogen is equivalent to 8 – no of valence electrons, i.e. 8 – 5 = 3.

The valency of silicon is equivalent to 8 – no of valence electrons, i.e. 8 – 4 = 4.

Q4. Complete the following crossword puzzle (Figure 5.1)

Across:

(1) An element with atomic number 12.

(3) Metal used in making cans and member of Group 14.

(4) A lustrous non-metal with 7 electrons in its outermost shell.

Down:

(2) Highly reactive and soft metal which imparts yellow colour when subjected to flame and is kept in kerosene.

(5) The first element of the second Period

(6) An element which is used in making fluorescent bulbs and is the second member of Group 18 in the Modem Periodic Table

(7) A radioactive element which is the last member of the halogen family.

(8) Metal is an important constituent of steel and forms rust when exposed to moist air.

(9) The first metalloid in Modem Periodic Table whose fibres are used to make bullet-proof vests

Answer:

(1) Magnesium has 12 atomic numbers.

(2) Sodium is a highly reactive and soft metal which imparts yellow colour when subjected to flame and is kept in kerosene.

(3) Tin is used in making cans and is a member of Group 14.

(4) Iodine is a lustrous non-metal with 7 electrons in its outermost shell.

(5) Lithium is the first element of the second Period.

(6) Neon is used in making fluorescent bulbs and is the second member of Group 18 in the Modem Periodic Table.

(7) Astatine is a radioactive element which is the last member of the halogen family.

(8) Iron is an important constituent of steel and forms rust when exposed to moist air.

(9) Boron is the first metalloid in Modem Periodic Table whose fibres are used to make bullet-proof vests.

Q5. (a) In this ladder (Figure 5.2), symbols of elements are jumbled up. Rearrange these symbols of elements in the increasing order of their atomic number in the Periodic Table.

(b) Arrange them in the order of their group also.

Answer:

(a) The arrangement of elements in the increasing order of their atomic number in the Periodic Table.

H, He, Li, Be, B, C, N, O, F, Ne, Na, Mg, Al, Si, P, S, Cl, Ar, K, Ca.

(b) The arrangement of elements in groups.

Group 1: H, Li, Na, K

Group 2: Be, Mg, Ca

Group 13: B, Al

Group 14: C, Si

Group 15: N, P

Group 16: O, S

Group 17: F. Cl

Group 18: He, Ne, Ar

Q6. Mendeleev predicted the existence of certain elements not known at that time and named two of them Eka-silicon and Eka-aluminium.

(a) Name the elements which have taken the place of these elements.

(b) Mention the group and the period of these elements in the Modern Periodic Table.

(c) Classify these elements as metals, non-metals or metalloids.

(d) How many valence electrons are present in each of them?

Answer:

(a) Eka-silicon was replaced by Germanium, while Gallium replaced Eka-aluminium.

(b) Gallium belongs to Group 13 and Period 5 of the periodic table, while Germanium belongs to Group 14 and Period 4.

(c) Gallium is metal, while Germanium is metalloid.

(d) Gallium has three valence electrons, while Germanium has 4.

Q7. a) Electropositive nature of the element(s) increases down the group and decreases across the period.

(b) Electronegativity of the element decreases down the group and increases across the period.

(c) Atomic size increases down the group and decreases across a period (left to right).

(d) Metallic character increases down the group and decreases across a period.

Based on the above trends of the Periodic Table, answer the following about the elements with atomic numbers 3 to 9.

(a) Name the most electropositive element among them.

(b) Name the most electronegative element among them.

(c) Name the element with the smallest atomic size

(d) Name the element which is a metalloid

(e) Name the element that shows maximum valency.

Answer:

(a) The most electropositive element among them is Lithium.

(b) The most electronegative element among them is Fluorine.

(c) The element with the smallest atomic size is Fluorine.

(d) Boron (5) is a metalloid.

(e) Carbon shows maximum valency.

Q8. An element X, a yellow solid at room temperature, shows catenation and allotropy. X forms two oxides formed during the thermal decomposition of ferrous sulphate crystals and are the major air pollutants.

(a) Identify the element X

(b) Write the electronic configuration of X

(c) Write the balanced chemical equation for the thermal decomposition of ferrous sulphate crystals?

(d) What would be the nature (acidic/ basic) of oxides formed?

(e) Locate the position of the element in the Modem Periodic Table.

Answer:

(a) The element X is Sulphur.

(b) The electronic configuration of X is 2, 8, 6.

(c) Thermal decomposition of ferrous sulphate:

$2\ FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$

(d) Oxides of Sulphur are acidic.

(e) Sulphur belongs to Group 16 and the third period of the periodic table.

Q9. An element X of group 15 exists as a diatomic molecule and combines with hydrogen at 773 K in the presence of the catalyst to form a compound, ammonia, which has a characteristic pungent smell.

(a) Identify the element X. How many valence electrons does it have?

(b) Draw the electron dot structure of the diatomic molecule of X. What type of bond is formed in it?

(c) Draw the electron dot structure for ammonia, and what type of bond is formed in it?

Answer:

(a) The element X is Nitrogen. It has five valence electrons.

(b) The electron dot structure of the diatomic molecule of X.

Dinitrogen forms a covalent bond.

(c) The electron dot structure of the ammonia.

Ammonia forms a covalent bond.

Q10. Which group of elements could be placed in Mendeleev's Table without disturbing the original order? Give reason.

Answer:

The group of elements that could be placed in Mendeleev's Table without disturbing the original order is the noble gases.

Noble gases, such as helium, neon, argon, krypton, xenon, and radon, have completely filled valence electron shells, making them chemically inert. They do not readily react with other elements and exist in very low concentrations in the atmosphere. At the time Mendeleev developed his periodic table, noble gases were not known. Once discovered, they were added as a separate group because their properties did not resemble those of any other group in the periodic table.

Since noble gases do not form compounds and do not fit into the patterns of reactivity exhibited by other groups, their inclusion would not disturb the existing order of Mendeleev's periodic table. Therefore, they could be integrated without affecting the arrangement of elements based on their atomic masses and properties.

Q11. Give an account of the process adopted by Mendeleev for the classification of elements. How did he arrive at Periodic Law?

Answer:

Mendeleev's process for classifying elements was a significant step in the development of the periodic table. He aimed to organize elements in a way that reflected their chemical properties, which would facilitate their study and understanding.

Data Collection: Mendeleev gathered information about the known elements, which amounted to 63 at the time, including their atomic masses and properties.

Card System: He wrote the properties of each element on individual cards. This allowed him to manipulate and arrange the elements flexibly.

Arrangement by Atomic Mass: Mendeleev arranged the elements in increasing order of their atomic masses in horizontal rows, which he called periods. He observed that elements with similar chemical properties tended to group together, so he placed these elements in vertical columns, which he referred to as groups.

Observation of Patterns: Through this arrangement, Mendeleev noticed that certain properties of elements would repeat at regular intervals, a pattern he termed periodicity. For instance, elements with similar properties would appear every eighth, eighteenth, or thirty-second position in the table.

Periodic Law: Based on his observations, Mendeleev formulated the periodic law, stating that "the properties of elements are a periodic function of their atomic masses." This law established the foundation for understanding the relationship between an element's atomic mass and its properties.

Predictive Power: Mendeleev's classification allowed him to predict the existence and properties of undiscovered elements by leaving gaps in the table for them, reinforcing the validity of his periodic law.

Benefits of CBSE Important Questions for Class 10 Science Chapter 5

- **Focused Revision**: Important questions allow students to concentrate on key topics, ensuring that they cover the most critical areas for the exam.
- **Enhanced Exam Readiness**: By familiarizing themselves with frequently asked questions, students can feel more prepared and confident when facing the actual exam.
- **Better Understanding of Marking Scheme**: Practicing these questions helps students understand how marks are allocated guiding them on how to structure their answers effectively.
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