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Class: 10
Subject: Chemistry
Topic: Periodic classification of elements
No. of Questions: 20

Q1. What were the criteria used by mendeleev in creating his periodic table?

Sol: Mendelee's periodic table was based on the observation that the properties of elements are a periodic funtion of their masses. This means that if elements are arranged in the increasing order of their atomic masses, then their properties get repeated after regular interval.

Q2. How and why does the atomic size vary as you go :
(i) from left to right across a period? (ii) down a group? [2009, 2011 (T-II)]

Sol: (i) Atomic size decreases on moving from left to right across a period. This is due to the increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of the atom.
(ii) Atomic size increases on moving down a group. This is due to addition of new shells which increases the distance between the outermost electrons and the nucleus even though nuclear charge increases

Q3. Elements in the same vertical group of the periodic table have same
A. Number of valence electrons
B. Atomic number
C. Atomic mass
D. Atomic volume

Sol: A

Q4. Why does silicon is classified as Metalloid?

Sol: Silicon is gray color solid at room temperature with very high melting point and boiling point that lose or gain 4 electrons [3s2, 3p2] having both metallic and non metallic properties so it is classified as Metalloid eg. Sio2

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Q5. Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choic?

Sol: Calcium (Ca) and strontium (Sr) are expected to show chemical reactions similar to magnesium(Mg). This is because the number of valence electrons (2) is same in all these elements. And since chemical properties are due to valence electroans, they show same chemical reactions.

Q6. How will the tendency to gain electrons change as we go from left to right across a period? Why? [2009, 2011 (T-II)]

Sol: On moving from left to right across a period, metallic character decreases and non-metallic Character increases.Since metals tend to lose electrons and non-metals tend to gain electrons, the tendency to gain electrons increases as we move from left to right across a period.

Q7. An element having low value of ionization energy and low value of electron affinity is likely to belong to

A. Group IA
B. Group IB
C. Group VIIA
D. Group VIII

Sol: A

Q8. Why inert gases have zero valencies?

Sol: It is because Inert gases have 2 or 8 electrons in valence shell.

Q9. Name

(a) three elements that have a single electron in their outermost shells.
(b) Magnesium (Mg) and calcium (Ca) have two electrons in their outermost shells.
(c) Neon (Ne), argon (Ar), and xenon (Xe) have filled outemost shells.

Sol:

(a) Lithium (Li), sodium (Na), and potassium (k) have a single electron in their outermost shells.
(b) Magnesium (Mg) and calcium (Ca) have two electrons in their outermost shells.
(c) Neon (Ne), argon (Ar), and xenon (Xe) have filled outemost shells.

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Q10. Lithium, sodium and potassium form a Dobereiner's triad. The atomic masses of lithium and potassium are 7 and 39 respectively. Predict the atomic mass of sodium. [2009]

Sol: Atomic mass of sodium = (At. mass of lithium + At. mass of potassium)/2
=(7+39)/2 =23
State the first limitation of Mendeleev's Periodic Table. [2009]
Ans. Hydrogen was not given a fixed position in Mendeleev's Periodic Table.

Q11. Which set of elements is listed in order of increasing ionization energy?
A. Sb < As < S < P < Cl
B. Cl < Sb < P < As < S
C. As < Cl < P < S < Sb
D. Sb < As < Cl < S < P

Sol: A

Q12. Oxygen (O, 8) and sulphur (S, 16) belong to group 16 of the periodic table :-
(i) Write the electronic configuration and valency of these two elements?
(ii) Which among these will be more electronegative? Why?

Sol: (i) Oxygen (O, 8) = 2,6 ; Vacancy =2
Sulphur (S, 16) = 2,8,6 ; Vacancy =2
(ii) Oxygen will be more electronegative due to electro negativity decreases from top to bottom because atomic size increases.

Q13. Which element has
(a) two shells, both of which are completely filled with electrons?
(b) The electronic configuration 2, 8, 2?
(c) a total of three sheels, with four electrons in its valence shell?
(d) A total of two shells, with three electrons in its valence shell?
(e) Twice as many elecrons in its second shell as in its first shell?

Sol: (a) Neon has two shells, both of which are completely filled with electrons (2 electrons in K shell and 8 electrons in L shell).
(b) Magnesium has the electronic configuration 2, 8, 2.
(c) Silicon has a total of three shells, with four electrons in valence shell (2 electrons in K shell, 8 electrons in L shell and 4 electrons in M shell).
(d) Boron has a total of two shells, with thre electrons in its valence shell (2 electrons in K shell and 3 electrons in shell).

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(e) Carbon has twice as many electrons in its second shell as in its first shell (2 electrons in K shell and 4 electrons in shell).

14. Two elements M and N belong to groups I and II respectively and are in the same period of the periodic table. How do the following properties of M and N vary? [2009, 2011 (T-II)]
(i) Sizes of their atoms (ii) Their metallic characters
(iii) Their valencies in forming oxides (iv) Molecular formulae of their chlorides

Sol: (i) The atomic radii of M is greater than N.
(ii) M is more metallic than N.
(iii) M has a valency of 1 and N has a valency of 2.
(iv) MCl, MCl2

Q15. Which of the following always increases on going from top to bottom in a group?
A. Metallic character
B. Electronegativity
C. Oxidizing power
D. Tendency to get reduced

Sol: A

Q16. Why Chlorine (atomic number 17) is more electronegative than sulphur (atomic number 16)

Sol: The nucleus of chlorine has more tendency to attract an extra electron than the nucleus of sulphur because chlorine needs only one 1 electron to complete its shell. Hence, chlorine is more electronegative than sulphur.

Q17. Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the periodic Table. Write the electronic ocnfiguration of these two elements. Which of these will be more electronegative? Why?

Sol: Element……. K……L…….M
Nitrogen…..2…..5
Phosphorus. 2…..8…..5
Nitrogen is more electronegative than phosphorus. On moving down a group, the number of shell increases. Therefore, the valence electrons move away from the nucleus and the effective nuclear charge decreases. This causes the decrease in the tendency to attarct electron and hence eletronegativity decreases.

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Q18. Which of the p-block elements are not representative elements?
A. Alkali metals (I-A)
B. Group-14 elements (IV-A)
C. Group-18 elements (VIII-A)
D. Halogens (VII-A)

Sol: C

Q19. 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?

Sol: The element with atomic number 12 has same chemical properties as that of calcium. This is because both of them have same number of valecne electrons (2).

Q20. (A)Li,Na,K are all metals that react with water to liberate H2 gas .Is there any similarity in the atoms of these elements.
(b)Helium is an unreactive gas and Neon gas is a gas of extremely low reactivity, what do their atoms have in common.

Sol: (a) there are following similarities.
(1) these atoms have same number of electrons in outermost shell 3Li -2,1 11Na-2,8,1 19K-2,8,8,1
(2) Li,Na,K react with oxygen to form oxide which are basic in nature.
(b) both He and Ne have completely filled shell