

Class: XI
Subject: Chemistry
Topic: Classification of Elements and Periodicity in Properties
No. of Questions: 27

Q1. Which of the following representations of electronic configuration is incorrect?

- A. $1s^2 2s^2 2p^4$
- B. $1s^2 2s^2 2p^6 3p^2$
- C. $1s^2 2s^2 2p^6$
- D. $1s^2 2s^2 2p^6 3s^2$

Right Answer Explanation: B

$1s^2 2s^2 2p^6 3p^2$ is incorrect electronic configuration, because 3p will come after filling of 3s orbital. In this 3s orbital is not there. Thus it is incorrect.

Q2. Which of the following has the largest size?

- A. Al
- B. Al^+
- C. Al^{2+}
- D. Al^{3+}

Right Answer Explanation: A

A cation is always smaller than the parent atom. Therefore, size of Al will be larger than their ions.

Q3. Which among the following is the largest in size?

- A. Cl^-
- B. S^{2-}
- C. Na^+
- D. F^-

Right Answer Explanation: (b)

Anions are always larger than their parent atoms. Moreover, atomic radius increases as we go down the group and decrease along the period. In option (b), there are 16 protons who have to hold 18 electrons, thus the size increases.

Q4. Which of the following statements is correct?

- A. X^- ion is larger in size than X atom.
- B. X^+ ion is larger in size than X atom.
- C. X^+ ion is larger in size than X^- ion.
- D. X^+ and X^- ions are equal in size.

Right Answer Explanation: A

Anions are always larger than their parent atoms and also from their cations.

Q5. The number of periods and groups in the long form of periodic table is, respectively

- A. 7 and 9
- B. 8 and 18
- C. 7 and 18
- D. 6 and 10

Right Answer Explanation: C

The number of periods and groups in the long form of periodic table is 7 and 18 respectively.

Q6. Which set contains pair of elements that do not belong to same group?

- A. Li, Na
- B. Be, Mg
- C. C, N
- D. H, Li

Right Answer Explanation: C

Element carbon and nitrogen do not belong to the same group of periodic table. They are members of group 14 and 15 respectively.

Q7. The elements of the same group of the periodic table have the same

- A. number of protons
- B. valence shell
- C. valence electrons
- D. electron affinity

Right Answer Explanation: C

The elements of same group of the periodic table have the same valence electrons.

Q8. Alkali metals belong to

- A. s-block
- B. p-block
- C. d-block
- D. f-block

Right Answer Explanation: A

Alkali metals belong to s-block.

Q9. The element with electronic configuration is $1s^2 2s^2 2p^6 3s^2$ is a

- A. metal
- B. non metal
- C. metalloid
- D. noble gas

Right Answer Explanation: A

The element with electronic configuration is $1s^2 2s^2 2p^6 3s^2$ is a metal i.e. Mg.

Q10. Modern periodic law states that the periodic properties of elements are the periodic function of

- A. ionization potential
- B. atomic mass
- C. atomic number
- D. atomic volume

Right Answer Explanation: C

Modern periodic law states that the periodic properties of elements are the periodic function of atomic number.

Q11. Which one of the following is not a property of a metal?

- A. Lustre
- B. Brittle
- C. Malleability
- D. Ductility

Right Answer Explanation: B

Metals are not brittle. All metals are hard except sodium and potassium, which are soft and can be cut, with a knife.

Q12. Among 3rd row elements, atomic size is the maximum for

- A. sodium
- B. argon
- C. magnesium
- D. chlorine

Right Answer Explanation: A

Size of atom decreases on moving left to right in a period.

∴ First member of each period has largest size.
∴ Na (the first member of 3rd row) has maximum atomic size.

Q13. The electronic configuration 2, 8, 7 belongs to which period of the periodic table?

- A. Second
- B. Third
- C. Fourth
- D. None of these

Right Answer Explanation: B

In this electronic configuration, 3rd energy shell is the highest energy level. So this element belongs to 3rd period of the periodic table.

Q14. The order of ionization energy is

- A. $s < p < d < f$
- B. $s > p > d > f$
- C. $s < d < p < f$
- D. $s > d > p > f$

Right Answer Explanation: B

Ionization energy increases with decrease in the distance of particular cell from the nucleus. So the correct order of ionization energy is $s > p > d > f$

Q15. Mendeleev classified the elements on the basis of their _____.

- A. increasing atomic numbers
- B. increasing atomic masses
- C. decreasing atomic numbers
- D. decreasing atomic masses

Right Answer Explanation: B

Mendeleev classified the elements on the basis of their increasing atomic masses.

Q16. Which of the following became the reason for the failure of Mendeleev's periodic law?

- A. Alkali metals
- B. Alkaline earth metals
- C. Halogens
- D. Isotopes

Right Answer Explanation: D

Isotopes

Q17. Man made elements belong to _____ series.

- A. actinide
- B. lanthanide
- C. halides
- D. inert gases

Right Answer Explanation: A

Of the actinides, thorium and uranium occur naturally in substantial, primordial, quantities and small amounts of persisting natural plutonium have also been identified. The radioactive decay of uranium produces transient amounts of actinium and protactinium, and atoms of neptunium, americium, curium, berkelium and californium are occasionally produced from transmutation reactions in uranium ores. The other actinides are purely synthetic elements.

Q18. Which of the following series of elements is correct in terms of increasing atomic radii?

- A. $F < Cl < Br$
- B. $Li < K < Na$
- C. $Ca < Mg < Be$
- D. $N < As < P$

Right Answer Explanation: A

As we move down a group, atomic radii increase. Only option 1 is in correct order.

Q19. Which of the following elements is a metalloid?

- A. Si
- B. C
- C. Bi
- D. Sn

Right Answer Explanation: A

silicon is classified as a semi-metal or metalloid because it exhibits some properties of both metals and non-metals.

Q20. Which of the following statements is true?

- A. Atomic radii of elements decrease gradually from left to right.
- B. Metallic character increases across a period.
- C. Chemical reactivity increases and then decreases across a period.
- D. Chemical reactivity increases across a period.

Right Answer Explanation: A

Only statement in option (1) is the correct one, while all others are incorrect.

Q21. The first ($\Delta_i H_1$) and the second ($\Delta_i H_2$) ionization enthalpies (kJ mol^{-1}) of the three elements are given below:

	I	II	III
$\Delta_i H_1$	403	549	1142
$\Delta_i H_2$	2640	1060	2080

Identify the element which is likely to be :

- (a) A non-metal.
- (b) An alkaline earth metal.

Ans: II – alkaline earth metal, III – non- metal

Q22. Identify the elements having the following description and write their electronic configuration also :

- (a) Group 14, period 3
- (b) Group 18, period 2
- (c) Group 1, period 6

Ans: (a) Si, (b) Ne, (c) Cs

Q23. What is the basic difference in approach between the Mendeleev's Periodic Law and the Modern Periodic Law ?

Ans: Mendeleev's Periodic law states that the physical and chemical properties of elements are periodic functions of their atomic weights. On the other hand, the modern periodic law states that the physical and chemical properties of elements are periodic functions of their atomic numbers.

Q24. Why do elements in the same group have similar physical and chemical properties?

Ans: The physical and chemical properties of elements depend on the number of valence electrons. Elements present in the same group have the same number of valence electrons. Therefore, elements present in the same group have similar physical and chemical properties.

Q25. How does atomic radius vary in a period and in a group ? How do you explain the variation?

Ans: Atomic radius generally decreases from left to right across a period. This is because within a period, the outer electrons are present in the same valence shell and the atomic number increases from left to right across a period, resulting in an increased effective nuclear charge. As a result, the attraction of electrons to the nucleus increases. On the other hand, the atomic radius generally increases down a group. This is because down a group, the principal quantum number (n) increases which results in an increase of the distance between the nucleus and valence electrons.

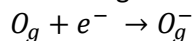
Q26. What are the various factors due to which the ionization enthalpy of the main group elements tends to decrease down a group?

Ans: The factors responsible for the ionization enthalpy of the main group elements to decrease down a group are listed below:

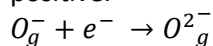
- (i) Increase in the atomic size of elements: As we down a group, the number of shells increases. As a result, the atomic size also increases gradually on moving down a group. As the distance of the valence electrons from the nucleus increases, the electrons are not held very strongly. Thus, they can be removed easily. Hence, on moving down a group, ionization energy decreases.
- (ii) Increase in the shielding effects: The number of inner shells of electrons increases on moving down a group. Therefore, the shielding of the valence electrons from the nucleus are not held very tightly by the nucleus. Hence, the energy required to remove a valence electron decreases down a group.

27. Would you expect the second electron gain enthalpy of O as positive, more negative or less negative than the first? Justify your answer.

Ans: When an electron is added to O atom to form O^- ion, energy is released. Thus, the first electron gain enthalpy of O is negative.



On the other hand, when an electron is added to O^- ion, energy has to be given out in order to overcome the strong electronic repulsions. Thus, the second electron gain enthalpy of O is positive.



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