

KENDRIYA VIDYALAYA SANGATHAN, LUCKNOW REGION

MONTHLY TEST (OCTOBER - 2024 -25)

CLASS XI

TIME: 90 MIN

SUB : CHEMISTRY

M.M 40

General Instructions

1. Section A contains Q.No 1 to 4 as MCQ carrying 1 mark each and Q.No 5 to 8 as assertion reason type questions carrying 1 mark each
2. Section B contains Q.No 9 to 12 as short answer questions carrying 2 marks each and Q. No. 13 to 17 as three marks.
3. Section C contains case based study question of 4 marks
4. Section D contains 5 mark question.

SECTION A

1. Which of the following electronic configurations of an atom has the lowest ionisation enthalpy?
(a) $1s^2 2s^2 2p^3$
(b) $1s^2 2s^2 2p^6 3s^1$
(c) $1s^2 2s^2 2p^6$
(d) $1s^2 2s^2 2p^5$
2. Total number of angular nodes and radial nodes present in 3p orbital is
(a) 1 and 2
(b) 2 and 1
(c) 1 and 1
(d) 2 and 2
3. The ion which is iso-electronic with CO is _____
(a) CN^-
(b) O_2^-
(c) N_2^+
(d) O_2^+
4. In the resonating structures of benzene, the number of sigma and pi bonds are
(a) 3π and 12σ
(b) 3σ and 3π
(c) 6σ and 6π
(d) 12σ and 12π

The questions below consist of Assertion (A) and Reason (R). Use the following keys to select the correct answer.

(i) Both A and R are true and R is the correct explanation of A.

(ii) Both A and R are true but R is not the explanation of A.

(iii) A is true and R is false.

(iv) Both A and R are false.

5.Assertion (A): The black body is an ideal body that emits and absorbs radiations of all frequencies.

Reason (R): The frequency of radiation emitted by a body goes from a lower frequency to higher frequency with an increase in temperature.

6. Assertion (A): Electron gain enthalpy becomes less negative as we go down a group.

Reason (R): Size of the atom increases on going down the group and the added electron would be farther from the nucleus.

7.Assertion (A): Smaller the size of an atom, greater is the electronegativity.

Reason (R): Electronegativity refers to tendency of an atom to share electrons with other atoms

8. Assertion (A): Though the central atom of both NH_3 and H_2O molecules are sp^3 hybridised, yet $\text{H}-\text{N}-\text{H}$ bond angle is greater than that of $\text{H}-\text{O}-\text{H}$.

Reason (R): This is because nitrogen atom has one lone pair and oxygen atom has two lone pairs.

SECTION B

9. Calculate the wavelength of an electron moving with a velocity of $2.05 \times 10^7 \text{ m s}^{-1}$.

10. Among the second period elements, the actual ionization enthalpies are in the order: $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$

Explain why

(i) Be has higher $\Delta_i H_1$ than B ?

(ii) O has lower $\Delta_i H_1$ than N and F?

11. Elements A, B, C and D have atomic numbers 12, 19, 29, and 36 respectively. On the basis of electronic configuration, write to which period and group of the periodic table each element belongs.

12. Draw the Lewis structures for the following molecules and find their hybridisation.



13. From the following sets of quantum numbers, state which are possible. Explain why the others are not possible.

(i) $n = 0, l = 0, m_l = 0, m_s = +1/2$

(ii) $n = 1, l = 0, m_l = 0, m_s = -1/2$

(iii) $n = 1, l = 1, m_l = 0, m_s = +1/2$

(iv) $n = 1, l = 0, m_l = +1, m_s = +1/2$

(v) $n = 3, l = 3, m_l = -3, m_s = +1/2$

(vi) $n = 3, l = 1, m_l = 0, m_s = +1/2$

14. The uncertainty in the position and velocity of a particle are 10^{-10} m and 5.27×10^{-24} ms^{-1} respectively. Calculate the mass of the particle. Also state the principle related.

15. Arrange the following as stated:

(i) $\text{N}_2, \text{O}_2, \text{F}_2, \text{Cl}_2$ (Increasing order of bond dissociation energy)

(ii) $\text{F}, \text{Cl}, \text{Br}, \text{I}$ (Increasing order of electron gain enthalpy)

(iii) $\text{F}_2, \text{N}_2, \text{Cl}_2, \text{O}_2$ (Increasing order of bond length)

16. Although geometries of NH_3 and H_2O molecules are distorted tetrahedral, bond angle in water is less than that of ammonia. Discuss. Also draw the structure of NH_3 .

17. Compare the relative stability and the magnetic behaviour of the following species: $\text{N}_2, \text{N}_2^-, \text{N}_2^{2+}$

SECTION C

18. Read the given passage and answer the questions that follow based on passage and related studied concepts.

Orbitals are region or space where there is maximum probability of finding electrons. qualitatively, these orbitals can be distinguished by their size, shape and orientation. An orbital of small size means there is more chance of finding the electron near the nucleus. Shape and orientation means the direction in which probability of finding electron is maximum. Atomic orbitals can be distinguished by quantum numbers. Each orbital is designated by three quantum numbers n, l and m_l (magnetic quantum number) which define energy, shape and orientation but these are not sufficient to explain spectra of multi-electrons atoms. Spin quantum number (m_s) determines the spin of electron. Spin angular momentum of electron has two orientations relative to chosen axis which are distinguished by spin quantum numbers m_s which can take values $+1/2$ and $-1/2$

Value of 'l'	0	1	2	3	4
Notation for subshell	s	p	d	f	g

(a) Describe the orbitals represented by (i) $n = 2, l = 1$ (ii) $n = 4, l = 0$.

(b) How many electrons are possible in an orbital? Which principle explains this?

(c) What is shape of 's' and 'p' orbitals?

(d) Name two d-orbitals which are on axis.

19. Account for the following

(i) BeH_2 molecule has a zero dipole moment although the $\text{Be}-\text{H}$ bonds are polar.

(ii) N_2 is more stable than O_2 (on the basis of molecular orbital theory).

(iii) Water is a liquid while H_2S is a gas

(iv) B_2 is paramagnetic in nature while C_2 is not

(v) Be_2 molecule does not exist

