

PT-2/HALF YEARLY EXAMINATION, 2022-23
CHEMISTRY

Time – 3 hrs.

Class – XI

M.M. : 70

Date – 12.09.2022 (Monday)

Name of the student _____ Section _____

GENERAL INSTRUCTIONS:

- All questions are compulsory.
- Question nos. 1 to 21 are MCQs with one correct option and carrying 1 mark each.
- Question nos. 22 to 24 are objective/short answer type questions.
- Question nos. 25 to 28 are of 2 marks each.
- Question nos. 29 to 32 is of 3 marks each.
- Question nos. 33 to 35 is of 5 marks each.

SECTION - A

Q. 1 to 21 is of 1 mark each.

Q1. The electron present in 5th orbit in excited hydrogen atoms returned back to ground state. The no. of lines which appear in Lyman series of hydrogen spectrum

- 1) 5 2) 10 3) 4 4) 6

Q2. The bond lengths and bond angles in the molecules of methane, ammonia, and water are given below: This variation in bond angle is a result of

- (i) the increasing repulsion between H atoms as the bond length decreases
(ii) the number of nonbonding electron pairs in the molecule
(iii) a nonbonding electron pair having a greater repulsive force than a bonding electron pair

- A. (i), (ii), and (iii) are correct B. (i) and (ii) are correct
C. (ii) and (iii) are correct D. only (i) is correct

Q3. Molecular shapes of SF₄, CF₄ and XeF₄ are

- (a) the same with 1, 1 and 1 lone pair of electrons respectively on the central atom
(b) the same with 1, 0 and 2 lone pairs of electrons respectively on the central atom
(c) different with 0, 1 and 2 lone pairs of electrons respectively on the central atom
(d) different with 2, 0 and 1 lone pairs of electrons respectively on the central atom
(e) different with 1, 0 and 2 lone pairs of electrons respectively on the central atom

Q4. Which of the following is a correct set?

- (a) NH₃ sp³ pyramidal (b) H₂O sp² linear
(c) NH₄⁺ dsp² square planar (d) CH₄ dsp² tetrahedral

- Q5. The strength of sigma bonds formed by axial overlap of s or p - orbitals of 2nd shell of participating atoms decreases as.
 (a) s-s > p-s > p-p (b) s-s > p-p > s-p (c) p-s > s-s > p-p (d) p-p > s-p > s-s
- Q6. Which of the following statements is not true about covalent compounds?
 (a) They may exhibit space isomerism (b) They have low melting and boiling points
 (c) They show ionic reactions (d) They show molecular reactions
- Q7. Which one of the following ions is paramagnetic?
 (a) Ag⁺ (Z= 47) (b) Fe²⁺ (c) K⁺ (d) Mg²⁺
- Q8. Which of the following statements is incorrect?
 (a) Among all the elements, fluorine has the highest electron gain enthalpy
 (b) Among all the elements, helium has the highest ionisation enthalpy
 (c) Elements of groups 1,2, 13, 14, 15, 16 and 17 are called representative elements
 (d) All the d-block elements are metallic in nature
- Q9. The significant figures in 0.00051 are _____
 (a) 5 (b) 3 (c) 2 (d) 6
- Q10. Select the correct option for increasing order of number of atoms.
 (I) 2 g of hydrogen (II) 16 g of sulphur (S = 32)
 (III) 4 g of oxygen (IV) 31 g of phosphorus (P= 31)
 (a) II > III > IV > I (b) IV > II > III > I (c) I > IV > II > III (d) I = IV > II > III
- Q11. Select the correct statement(s) for the following reaction:
 $2 A(s) + B(g) \rightarrow 3 C (g) + 4 D (l)$
 (a) 2 moles of A always produce 3 moles of C and 4 moles of D
 (b) 22.4 L of B (g) produces 3 moles of C at 1 atm and 273 K in excess of A.
 (c) B will always remain in excess because volume of gas is very high than solid.
 (d) Moles of D produced is always less than C because volume of liquid is less than gas.
- Q12. The mole fraction of solute in one molal aqueous solution is
 (a) 0.009 (b) 0.018 (c) 0.027 (d) 0
- Q13. The ratio of masses of Dioxygen and Dinitrogen in a particular gaseous mixture is 1 : 4.
 The ratio of number of their molecule is
 (a) 1 : 4 (b) 1 : 8 (c) 7 : 32 (d) 3 : 16
- Q14. For the reaction, $7 A + 13 B + 15 C \rightarrow 17 P$ if 15 moles of A, 26 moles of B and 30.5 moles of C are taken initially then limiting reactant is
 (a) A (b) B (c) C (d) None of these
- Q15. The explanation for the presence of three unpaired electrons in the nitrogen atom can be given by
 (a) Pauli's exclusions principle (b) Hund's rule
 (c) Aufbau's principle (d) Uncertainty principle

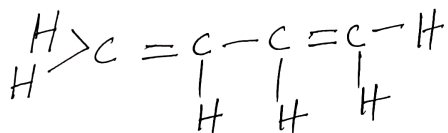
- Q16. The shortest wavelength of He^+ in Balmer series is x . Then longest wavelength in the Paschene series of Li^{+2} is
 (a) $36x/5$ (b) $16x/7$ (c) $9x/5$ (d) $5x/9$
- Q17. The ratio of the radii of the first three Bohr orbits is
 (a) $1 : 0.5 : 0.33$ (b) $1 : 2 : 3$ (c) $1 : 4 : 9$ (d) $1 : 8 : 27$
- Q18. The decreasing order of energy of the 3d, 4s, 3p, 3s orbitals is
 (a) $3d > 3s > 4s > 3p$ (b) $3s > 4s > 3p > 3d$
 (c) $3d > 4s > 3p > 3s$ (d) $4s > 3d > 3s > 3p$
- Q19. The value l and m for the last electron in the Cl^- ion are
 (a) 1 and 2 (b) 2 and +1 (c) 3 and -1 (d) 1 and -1
- Q20. The ratio of the energies of photons of 2000 \AA^0 to that of 4000 \AA^0 is
 (a) 2 (b) 4 (c) $1/2$ (d) $1/4$
- Q21. Ionisation energy of nitrogen is more than oxygen because:
 (a) nucleus has more attraction for electrons (b) half-filled p-orbitals are more stable
 (c) nitrogen atom is small (d) more penetration effect
- Q.22 Answer the following. (1x5=5)
 a) Define molality?
 b) 1 femtometer is equals _____m.
 c) State the law of multiple proportions.
 d) Round off 3.45895 upto two significant figures.
 e) Find the number of radial and angular nodes present in 4p orbital.
- Q.23 Match the following. (1x5=5)
- | A | B |
|--------------------------|----------------------------|
| i. Uncertainty principle | a) Hund |
| ii. Exclusion principle | b) Heisenberg |
| iii. Vanderwaals radius | c) Pauli |
| iv. Acidic oxide | d) Hydrogen |
| v. Amphoteric oxide | e) CO |
| | f) CO_2 |
| | g) Al_2O_3 |
| | h) Argon |

Q.24 Answer the following.

(1x4=4)

a) Write the IUPAC name of element with atomic number 107.

b) How many sigma and π -bonds are there in



c) The shape of PCl_5 molecule is _____.

d) The dipole moment of CO_2 molecule is _____.

Section - B

Q.25 to 28 is of 2 marks each.

Q.25 40 kg of N_2 and 15 kg of H_2 are mixed to produce $\text{NH}_3(\text{g})$. Calculate the mass of NH_3 gas formed.

Q.26 Write two differences between sigma and pie bond.

Q.27 Write the electronic configuration and find the group and period of element with atomic number 80.

Q.28 Write the electronic configuration of -

a) Fe^{2+} (Z=26) b) Cr (Z=24)

Section - C

Q.29 to 32 is of 3 marks each.

Q.29 A solution is 25% water, 25% ethanol ($\text{C}_2\text{H}_5\text{OH}$) and 50% acetic acid (CH_3COOH). Calculate the mole fraction of each component.

Q.30 How much energy is required to ionise a H-atom if the electron occupies $n=5$ orbit. Compare your answer with the ionisation enthalpy of H-atom. (Energy required to remove the electron from $n=1$ orbit)

Q.31 What is ionisation enthalpy? How it varies across the 2nd period in periodic table. Justify your answer.

Q.32 What is electron gain enthalpy? How it varies down the group in group 17. Give reason for your answer.

Section - D

Q. 33 to 35 is of 5 marks each.

Q.33 Answer the following.

a) Between NH_3 and NF_3 which has higher dipole moment and why ?

(2)

b) Show the hybridisation of H₂O molecule indicating bond angle and shape. (2)

c) Draw the Lewis dot structure of O₃ molecule. (1)

OR

a) Define the term – (i) Bond order (ii) Bond enthalpy.

b) Show the hybridisation in CO₂ molecule indicating bond angle and shape.

c) Between LiCl and LiI which is more covalent and why.

Q.34 a) Electrons are emitted with zero velocity from a metal surface when it is exposed to radiation of wavelength 7000 Å. Calculate threshold frequency (V_0) and work function (W_0) of the metal. (2)

b) Write short notes on the following : (3)

i) Absorption spectrum ii) Azimuthal quantum number iii) Balmer series

OR

a) What is the energy in joules required to shift the electron of the H-atom from 1st Bohr orbit to 6th Bohr orbit and what is the wave length of light emitted when electron returns to ground state ? The ground state electron energy is -2.18×10^{-11} ergs. (2)

b) Write any two drawback of Bohr's atomic model. (1)

c) Draw the shape of following orbitals - (i) d_{xy} (ii) P_z (1)

d) State Aufbau's principle. (1)

Q.35 a) A compound contains C, H and O only. A 4.24 mg of sample of the compound completely burnt to produce 8.45 mg of CO₂ and 3.46 mg of H₂O. If the molecular mass of the compound is 88 u then determine its molecular formula ? (3)

b) What volume of 10 M HCl and 4 M HCl should be mixed to get 1 L of 6 M HCl solution? (2)

OR

a) A solution of sulphuric acid is 65% by mass. Its density is 1.76 gm/cm³. Find out the molarity and molality of the solution. (The MW of H₂SO₄ = 98)

b) Pressure is defined as force per unit area of the surface. the SI unit of pressure is pascal is shown below

$$1 \text{ pa} = 1 \text{ N m}^{-2}$$

If mass of air at sea level is 1034 gm/cm². Calculate the pressure in pascal.

