

**APEEJAY SCHOOL, SAKET**  
**FIRST TERM EXAMINATION (2018-19)**  
**CHEMISTRY**  
**CLASS-XI**

**TIME-3Hrs**

**M.M.-70**

**GENERAL INSTRUCTIONS:**

- All questions are compulsory.
- Question numbers 1 to 5 are very short answer questions and carry 1 marks each.
- Questions numbers 6 to 12 are short answer questions and carry 2 marks each.
- Question numbers 13 to 24 are short answer questions and carry 3 marks each.
- Question numbers 25 to 27 are long answer questions and carry 5 marks each.
- Use log tables if necessary.

1. Why molality is preferred over molarity in expressing the concentration of a solution? 1
2. Which out of  $\text{Cu}^{2+}$ ,  $\text{Fe}^{2+}$  and  $\text{Cr}^{3+}$  has highest paramagnetism and why? 1
3. Define electronegativity. 1
4. Define the term bond order. 1
5. Gases possess characteristic critical temperatures which depend upon the magnitude of intermolecular forces between the gas particles. Critical temperature of ammonia and carbon dioxide are 405.5 K and 304.10 K. Which of these gases will liquefy first when you start cooling from 500 K to their critical temperature? 1
6. Commercially available concentrated hydrochloric acid contains 38% HCl by mass. What is the molarity of this solution? The density is  $1.10 \text{ g/cm}^3$ . 2
7. Carbon is found to form two oxides, which contain 42.9% and 27.3% of carbon respectively. Show that these figures illustrate the law of multiple proportion. 2

OR

Determine the molecular formula of an oxide of iron in which the mass percentage of iron and oxygen are 69.9 % and 30.1 % respectively, Given that the molar mass of oxide is  $159.89 \text{ g mol}^{-1}$ .

(Atomic mass of Fe =  $55.85 \text{ g mol}^{-1}$ )

8. Account the following : 2
  - i) Cations are smaller and anions are larger in radii than their parent atoms.
  - ii) Cl has more negative electron gain enthalpy than F.
9. Explain why- 2
  - i) Be has higher ionization enthalpy than B?
  - ii) First electron gain enthalpy of O is negative but second is positive?
10. Draw the box structure with orbital representation of the following molecules: 2
  - i.  $\text{SF}_4$
  - ii.  $\text{PCl}_5$

Predict the hybridization of the central metal atom and shape of the molecule.

11. How many  $\sigma$  and  $\pi$  bonds are present in the following? 2  
 i)  $\text{CH}_2=\text{C}=\text{CH}_2$   
 ii)  $\text{CH}_3-\text{CH}=\text{CH}-\text{C}\equiv\text{CH}$
12. Differentiate between bonding and anti-bonding molecular orbital. 2
13. a) State Dalton's law of partial pressure. 3  
 b) Derive relationship between partial pressure of a gas and its mole fraction in a mixture of two non reacting gases.

OR

- a) Explain why during fire polishing of glass the sharp edges become smooth.  
 b) Derive relationship between molar mass and density of a gas.
14. a) Discuss the shape of  $\text{BrF}_3$  on the basis of VSEPR theory. 3  
 b) On the basis of Molecular orbital theory explain, why is there an increase in bond order in going from  $\text{O}_2$  to  $\text{O}_2^+$  while a decrease in going from  $\text{N}_2$  to  $\text{N}_2^+$ ?
15. 3 g of  $\text{H}_2$  reacts with 29g of  $\text{O}_2$  to form  $\text{H}_2\text{O}$ . 3  
 a) Which is the limiting reagent?  
 b) Calculate the maximum amount of  $\text{H}_2\text{O}$  that can be formed.  
 c) Calculate the amount of the reactant that is left unreacted.
16. a) Calculate the mole fraction of ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ) and water in a solution 3  
 containing 20% of  $\text{C}_2\text{H}_6\text{O}_2$  by mass.  
 b) What is Gay Lussacs's law of gaseous volumes?
17. i) State and explain Heisenberg's uncertainty principle. 3  
 ii) A golf ball has mass 40 g and speed  $45 \text{ m s}^{-1}$ . If the speed can be measured with accuracy of 2%. Calculate the uncertainty in position of the golf ball.
18. An atom has 2K, 8L and 3M electrons. Write down its electronic configurations and 3  
 indicate in it.  
 i) no. of subshells  
 ii) no. of orbitals  
 iii) no. of s electrons  
 iv) no. of unpaired electrons.
19. Amongst the elements of the third period (Na to Ar), Identify the element 3  
 i. with highest ionization enthalpy  
 ii. with largest atomic radii  
 iii. most reactive non metal  
 iv. most reactive metal  
 v. an element that shows characteristic properties of metals as well as non-metal.  
 vi. an element whose oxide is amphoteric in nature.
20. Give reasons: 3  
 i) Successive ionisation enthalpies are higher.  
 ii) Halogens have the highest negative electron gain enthalpy.  
 iii) Electron gain enthalpy values of noble gases are positive while those of Be, Mg, N and P are almost zero.
21. i) Differentiate between Schottky & Frenkel defects. 3  
 ii) Calculate the packing efficiency of a face centred cubic unit cell.
22. a) Write the half cell reaction and the overall cell reaction for the electrochemical cell 3



Calculate the standard E.M.F. for the cell if the standard electrode potentials (reduction) for  $\text{Pb}^{2+}/\text{Pb}$  and  $\text{Zn}^{2+}/\text{Zn}$  electrodes are  $-0.126\text{V}$  and  $-0.763\text{V}$  respectively.

- b) Give two main functions of the salt bridge in an electrochemical cell.
23. a) Assign oxidation numbers to the underlined elements in each of the following species: 3
- (i)  $\text{Na}_3\underline{\text{P}}\text{O}_4$
  - (ii)  $\text{K}_2\underline{\text{C}}\underline{\text{r}}_2\underline{\text{O}}_7$

b) Balance the following redox reactions:

- $\text{MnO}_4^- (\text{aq}) + \text{Br}^- (\text{aq}) \rightarrow \text{MnO}_2 (\text{s}) + \text{BrO}_3^- (\text{aq})$  (In basic medium)
24. i) What is meant by PCBs? 3
- ii) What is SMOG? How is classical smog different from photochemical smog?
25. (i) Explain Hund's rule of maximum multiplicity with an example. 5
- (ii) The work function for Caesium atom is  $1.9\text{ eV}$ . Calculate (a) threshold wavelength and (b) the threshold frequency of the radiation. If the Caesium element is irradiated with a wavelength  $500\text{ nm}$ , calculate the kinetic energy of the ejected photoelectron.

OR

- (i) Explain-
- (a) Photoelectric effect
  - (b) Pauli's exclusion principle
- (ii) Using s, p, d, f notations, describe the orbital with the following quantum number
- (a)  $n = 4, l = 0$ , (b)  $n = 3, l = 2$
- (ii) Emission transition in the Paschen series ends at orbit  $n=3$  and start from an orbit  $n$  and can be represented as  $\nu = 3.29 \times 10^{15} (1/3^2 - 1/n^2)\text{ Hz}$ . Calculate the value of  $n$  if its transition is obtained at  $1285\text{ nm}$ .
26. (a) Describe in brief how  $sp, sp^2, sp^3$  hybrid orbitals are formed using suitable examples. 5
- (b) What do you mean by hydrogen bond? Explain with suitable example. What is the difference between intermolecular and intramolecular hydrogen bonding?

OR

- (a) Distinguish between a sigma ( $\sigma$ ) and a pi ( $\pi$ ) bond.
- (b) Use the molecular orbital theory to explain why  $\text{Be}_2$  molecule does not exist.
- (c) Define resonance with a suitable example.
27. a) Calculate the total pressure in a mixture of  $8\text{ g}$  of dioxygen and  $4\text{ g}$  of dihydrogen confined in a vessel of  $1\text{ dm}^3$  at  $27^\circ\text{C}$ . ( $R = 0.083\text{ bar dm}^3\text{ K}^{-1}\text{ mol}^{-1}$ ) 5
- b) Explain the following :-
- i. Ferromagnetic substances
  - ii. Ferrimagnetic substances

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