

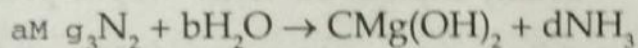
Time : 3 Hours

M.M. : 70

*General Instructions:*

1. All questions are compulsory.
2. Question number 1 to 5 carry 1 mark each.
3. Question number 6 to 10 carry 2 marks each.
4. Question number 11 to 22 carry 3 marks each.
5. Question number 23 is a value based question carrying 4 marks.
6. Question number 24 to 26 carry 5 marks each.
7. Use log tables, if necessary, use of calculator is not allowed.

Q1. Calculate coefficient a and b in the following equation:



Q2. What is the difference between the notation l and L?

Q3. Why electron gain enthalpy of Fluorine is less negative than that of Chlorine?

Q4. Draw lewis dot structure of  $\text{NO}_3^-$ .

Q5. Out of sigma and pi bonds which one is stronger and why?

Q6. a) What shell would be the first to have a g-subshell? How many orbitals will be possible in a g-subshell?

- Q7. Why the number of lines observed in Hydrogen spectrum is very large?
- Q8. On the basis of quantum numbers justify that the sixth period of the periodic table should have 32 elements.
- Q8. a) Write 2 differences between bonding and anti bonding orbitals?
- b) Explain why HF is more viscous than water.
- Q9. Calculate the total pressure in a mixture of 8 g of oxygen and 4g of hydrogen confined in a vessel of 1 dm<sup>3</sup> at 27 degrees Celsius.  $R = 0.083 \text{ bar dm}^3 \text{ K}^{-1} \text{ mol}^{-1}$ .
- Q10. a) On the basis of Boyle's law explain why mountaineers carry oxygen cylinders with them.
- b) Briefly explain the term "Vapor pressure".
- Q11. Gastric juice contains about 3 g of HCl per litre. If a person produces about 2.5 L of gastric juice per day, how many antacid tablets each containing 400 mg of  $\text{Al}(\text{OH})_3$  are needed to neutralize all HCl produced in one day.

OR

- Q11. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38g  $\text{CO}_2$ , 0.690g of water and no other products. A volume of 10 L (measured at STP) of this welding

gas is found to weigh 11.6g. Calculate empirical formula.

- Q12. a) Explain why atoms with half filled and completely filled orbitals have extra stability.
- b) Write the electronic configuration of :  
 i)  $\text{Cu}^+$   
 ii) Element with atomic number 99.
- Q13. a) Would you expect the first ionization enthalpies of two isotopes of same elements to be same or different? Give reasons.
- b) Explain the fact that first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium.
- Q14. a) What is resonance?
- b) Explain why  $\text{CO}_3^{2-}$  ion cannot be represented by single lewis structure. How it can be best represented?
- Q15. Why do real gases deviate from ideal behavior? Write Van der Waals equation for n moles of a gas.
- Q16. Define molarity and molality. How are they dependent upon temperature?
- Q17. Write differences between the following :  
 a) Particle and wave

- b) Emission and absorption spectrum
- c) Electromagnetic wave theory and Plank's quantum theory.

Q18. a) Which of the following pair of elements would have a more negative electron gain enthalpy? O or F. Explain.

b) Which is more electronegative? F or Cl. Explain.

Q19. a) What is meant by term Bond order?

b) Which out of  $NH_3$  and  $NF_3$  has higher dipole moment and why?

Q20. a) Which type of intermolecular forces exist among the following molecules:

✓  $H_2O$  Molecules

✓ He atoms

b) What will the minimum pressure required to compress  $500 \text{ dm}^3$  of air at 1 bar to  $200 \text{ dm}^3$  at 30 degree celsius.

*7/3  
28/3*

Q21. a) Define limiting reagent.

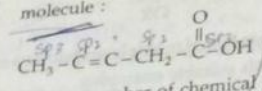
b) Calculate the volume of Hydrogen liberated at STP when  $500 \text{ cm}^3$  of 0.25 M  $H_2SO_4$  reacts with excess of Zn. *calc.*

Q22. a) Iron pieces are attracted towards magnet. Why?

*diamagnetic*

b) Arrange elements in increasing order of metallic character. B, Al, Mg, K. Give reasons.

c) Indicate hybridization of each carbon in the molecule :



Q23. We use a large number of chemical compounds in our everyday life. Quite often, we are familiar with their common names and not with their chemical names. A basic knowledge of their chemical names helps us to understand why some materials lose their use after a long time or how some materials help us in the use to which they are being put. After reading the above paragraph, answer the following questions:

a) What values are expressed in the above paragraph?

b) Why baking soda loses its use after a long time?

c) What is lime water chemically?

Q24. a) Commercially available conc. HCl contains 38% HCl by mass.

1. What is the molarity of this solution if its density is  $1.12 \text{ g/cm}^3$

2. What volume of conc. HCl is required to make 1L of 0.1 M HCl?

*22  
2/55/2*



- b) Define
1. Molecular mass
  2. Avogadro Law

OR

- Q24. a) State law of multiple proportions and explain with suitable examples.
- b) Calculate the mass of  $\text{Na}_2\text{CO}_3$  which will have same number of molecules as contained in 12.3 g of  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ .
- c) What is mass percent of solute in the solution obtained by dissolving 5g of Solute in 50g of water?

- Q25. a) What happened to Bohr's model of atom in the light of uncertainty principle?

b) Define atomic orbital.

c) When electromagnetic radiation of wavelength 300 nm falls on surface of Sodium, electrons are emitted with kinetic energy of  $1.68 \times 10^6 \text{ J Mol}^{-1}$ . What is the minimum energy needed to remove an electron from Sodium? What is the maximum wavelength that will cause photoelectron to be emitted?

OR

Handwritten calculations:  
$$\frac{1100}{100} \times 100 = 1100$$
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- Q25. a) Calculate the de Broglie wavelength of an electron that has been accelerated from rest through a potential difference of 1 Kv.
- b) What is Hund's rule of maximum multiplicity?
- c) What is the difference between  $d_{xy}$  and  $d_{x^2-y^2}$  orbitals.

- Q26. a) Predict the position of the element in the periodic table with configuration  $(n-1)d^1ns^2$  for  $n=4$ .

- b) Consider the following species  $\text{N}^3$ ,  $\text{O}^{2-}$ ,  $\text{F}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Al}^{3+}$  and explain what is common in them and arrange them in increasing order of ionic radii.

- c) Using VSEPR theory explain the shapes of following molecules:

1.  $\text{ClF}_3$
2.  $\text{NH}_3$

OR

- Q26. a) Using the concept of hybridization draw and explain the shape of  $\text{C}_2\text{H}_2$  molecule.

- b) Explain why anions are larger and cations are smaller than parent atoms.

- c) Write names and symbols for elements of group 14.

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