INDIAN SCHOOL SOHAR
TERM II EXAMINATION (2018 – 19)
CHEMISTRY

CLASS : XI **MAX. MARKS :** 70

DATE : 28.11.2018 **DURATION :** 3.00 HRS

General Instructions:

(b) All questions are compulsory.

(c) Section A: Question numbers 1 to 5 very short answer questions carrying 1 mark each.

(d) Section B: Question numbers 6 to 12 are short answer questions carrying 2 marks each.

(e) Section C: Question numbers 13 to 24 are also short answer questions carrying 3 marks each.

(f) Section D: Question numbers 25 and 27 are long answer questions carrying 5 marks each.

(g) There is no overall choice. However an internal choice has been provided in two questions of one mark, two questions of two marks, four questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

(h) Use log tables, if necessary, Use of calculator is not allowed.

Section - A

1. Calculate the percentage of nitrogen in NH_3. (Atomic mass of N = 14, H = 1)

   OR

   Calculate the molecular mass of glucose ($C_6H_{12}O_6$). (Atomic mass of C = 12, H = 1, O = 16)
2. State Aufbau principle.
3. What are s-block elements?

   OR

   What is meant by Lanthanoids and actinoids?
4. CO_2 and SO_2 both are triatomic molecules but there is a big difference in their dipole moment, why?
5. Write the structural formula of 3,4,4,5-tetramethylhepatane.

Section - B

6. What is the SI unit of mass? How is it defined?

   OR

   Pressure is determined as force per unit area of the surface. The SI unit of pressure, pascal is as shown: 1 Pa = $1Nm^{-2}$. If the mass of air at sea level is 1034 gcm^{-3}, calculate the pressure in pascal.
7. What is the total number of orbitals associated with the principal quantum number, n=3?

   OR

   How many 4d electrons can have spin quantum number -1/2? Explain.
8. Give correct reason for the following:

   (a) BF_3 has a zero dipole moment although the B-F bonds are polar.

   (b) All carbon to oxygen bonds in CO_3^{2-} are equivalent.
9. A sample of a gas contains 15 molecules with a speed of $3ms^{-1}$, 25 molecules with a speed of 5 ms^{-1} and 30 molecules with a speed of 8 ms^{-1}. Calculate root mean square speed of these molecules.

10. Name the energy which arises due to motion of atoms or molecules in a body. How is this energy affected when the temperature is increased?
11. Which of the following represents the correct IUPAC name for the compounds concerned?
    (a) 2,2-Dimethylpentane or 2-Dimethylpentane
    (b) 2,4,7-Trimethyloctane or 2,5,7-Trimethyloctane
    (c) 2,3,5-Trimethyl-4-propylheptane or 4-sec-butyl-2,3-dimethylheptane
    (d) 5-(2-Ethylbutyl)-3,3-dimethyldecane or 5-(2,2-dimethylbutyl)-3-ethyldecane
12. Write bond line formulae for: Isopropyl alcohol, 2,3-Dimethylbutanal, Heptan-4-one

Section -C

13. A Welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38g of carbon dioxide, 0.690 g of water and no other products. A volume of 10 L (measured at STP) of this welding gas is found to weigh 11.6 g. Calculate (a) empirical formula, (ii) molar mass of the gas and (iii) molecular formula. (Atomic weight of C = 12, H = 1, O = 16 u).
14. How many grams of $KClO_3$ must be decomposed to prepare 3.36 L of oxygen at STP? (Atomic mass of K = 39, Cl = 35.5, O = 16u)
15. If 4 g of NaOH dissolves in 36 g of H_2O, Calculate the mole fraction of each component I the solution. Also, determine the molarity of solution. (specific gravity of solution is 1 gmL^{-1})
16. List two main differences between orbit and orbital.
    If an electron is moving with a velocity 600 m/s which is accurate upto 0.005%, then calculate the uncertainty in its position. (h=6.626 x 10^{-34} Js and mass of electron = 9.11 x 10^{-31} kg)
17. The electron energy in hydrogen atom is given by $E_n = (-2.18 \times 10^{-18})/n^2$ joules. Calculate the energy required to remove an electron completely from the n=2 orbit. What is the longest wavelength (in A^0) of light that can be used to cause this transition?

    OR

    (i) What is the lowest value of n that allows g-orbital to exist?
    (ii) An electron is in one of the 3d orbitals. Give the possible values of n, l and m for this electron.
    (iii) An atom of an element contains 29 electrons and 35 neutrons. Deduce (a) the number of protons and (b) the electronic configuration of the element.
18. Give reason for the following:
    (i) Halogens act as good oxidising agent.
    (ii) Electron gain enthalpy of noble gas is almost zero.
    (iii) Na and Mg^+ have same number of electrons but removal of electron from Mg^+ requires more energy.
19. Predict the formulae of the stable binary compounds that would be formed by the combination of the following pairs of elements.
    (a) Lithium and oxygen
    (b) Magnesium and nitrogen
    (c) Aluminium and iodine
    (d) Silicon and oxygen
    (e) Phosphorus and fluorine
    (f) Element with atomic number 71 and fluorine

20. Nitrogen has positive electron gain enthalpy whereas oxygen has negative. However, oxygen has lower ionisation enthalpy than nitrogen. Explain

OR

First member of each representative elements (i.e., s and p block elements) show anomalous behaviour. Illustrate with two examples.

21. (i) Deduce the structures of (a) BrF_5 and (b) PF_5 on the basis of VSEPR theory.
(ii) Which out of NH_3 and NF_3 has higher dipole moment and why?

22. Consider the following structure:
CH_3-CH_2- CO-CH_2-C≡CH
(a) How many σ and π bonds are present in this compound?
(b) Arrange carbon no. 2,3,5 in decreasing order of s-character.
(c) Which atoms have same hybrid state?

OR

Explain the important aspects of resonance with reference to the CO_3^{2-} ion.

23. Define Boyle's law.
What will be the minimum pressure required to compress 500 dm^3 of air at 1 bar to 200 dm^3 at 30^0C.

24. Density of a gas is found to be 5.46 g/dm^3 at 27^0 C at 2 bar pressure. What will be its density at STP?

Section -D

25. What is (i) emission spectrum and (ii) Zeeman effect?
The velocity associated with a proton moving in a potential difference of 1000 V is 4.37 x 10^5 ms^{-1}. If the hockey ball of mass 0.1 kg is moving with this velocity, calculate the wavelength associated with this velocity.

OR

(a) Two particles A and B are in motion. The momentum of particle 'B' is half of 'A'. If the wavelength associated with the particle 'A' is 5 x 10^{-8}m, calculate the wavelength associated with the particle 'B'.
(b) Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Broglie wavelength associated with the electron revolving around orbit.

26. Answer the following:
(i) What is the total number of electrons in NO_3^- and $NH_4^{+?}$
(ii) Why is melting point of MgO (2800^0C) higher than that of BaO (1920^0C)?
(iii) Why is solubility of $MgCl_2$ greater than that of MgF_2?
(iv) Why are carbon-oxygen bond lengths in Na_2CO_3 equal?
(v) Why is AlF_3 high melting solid whereas SiF_4 is a gas?

OR

(a) How is molecular orbital different from atomic orbital?
(b) Give electronic configuration of (i) H_2^+, (ii) Li_2, (iii) B_2, (iv) C_2. Calculate their bond orders and predict their paramagnetic behaviour.

27. (a) Silver crystallises in face-centred cubic unit cell. Each side of this unit cell has a length of 400 pm. Calculate the radius of the silver atom. (Assume the atoms just touch each other on the diagonal across the face of the unit cell. That is, each face atom is touching the four corner atoms).
(b) Account for the following:

1) Schottky defects lower the density of related solids.

2) Conductivity of silicon increases on doping it with phosphorus.

OR

(a) The density of lead is 11.35 gcm^{-3} and the metal crystallises with fcc unit cell. Estimate the radius of lead atom. (Atomic mass of lead = 207 $gmol^{-1}$ and $N_A = 6.02 \times 10^{23} mol^{-1}$)

(b) Calculate the packing efficiency of metal crystal for a simple cubic lattice.