CLASS-XI
SUB: CHEMISTRY

TIME ALLOWED: 3 HOURS **MM: 70**

General Instructions:

(i) All Questions are Compulsory.
(ii) Question numbers 1 to 5 are very short- answer questions and carry 1 mark each.
(iii) Question numbers 6 to 10 are short- answer questions and carry 2 marks each.
(iv) Question numbers 11 to 22 are short- answer questions and carry 3 marks each.
(v) Question number 23 is a value based question and carries 4 marks.
(vi) Question numbers 24 to 26 are long- answer questions and carry 5 marks each.
(vii) Use log table if necessary. Use of calculator is not allowed.

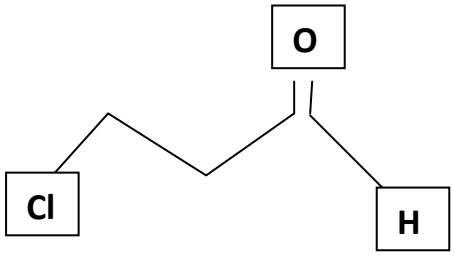
1. Write the electronic configuration of Cr (atomic number-24) 1

2. Write the general electronic configuration of d- block elements. 1

3. What is the oxidation number of Mn in MnO_4^- ion? 1

4. Explain why K_2CO_3 cannot be prepared by Solvay process? 1

5. Write the IUPAC name of



1

6. (a) How many significant figures are present in the following?

(i) 0.0025 (ii) 6.02×10^{23}

(b) Calculate the number of the atoms present in 52 g of $_2^4He$. (1+1)

7. Write two limitations of Bohr's theory. 2

8. (a) Write Vanderwaals equation for n moles of a gas.

(b) Critical temperature for CO_2 and CH_4 are 31.1^oC and -81.9^oC respectively. Which has stronger intermolecular forces? (1+1)

9. Derive the relation $\Delta G = -T\Delta S_{total}$ 2

OR

Define entropy. What will be the sign of ΔS for $H_2(g) \rightarrow 2H(g)$. 2

10. Write chemical reactions to illustrate the following:-

(i) Wurtz reaction (ii) Friedel Craft reaction. 2

11. What is the concentration of sugar ($C_{12}H_{22}O_{11}$) in mol L^{-1} if 20 g of it are dissolved in enough water to make final volume upto 2 L ? (Atomic mass of C=12 u, H=1 u, O = 16 u).

3

12. (a) How many electrons in an atom may have the following quantum numbers?

n=4, m_s=-1/2

(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 the orbit. (1+2)

OR

12. What is the energy in Joules required to shift the electron of the hydrogen atom from the first Bohr orbit to the fifth Bohr orbit and what is the wavelength of light emitted when electron returns to the ground state? The ground state electronic energy is -2.18×10^{-18} J.

3

13. (a) Arrange the following species in order of increasing radii : O^{2-}, N^{3-}, Mg^{2+}, Al^{3+}.

(b) Explain why: - (i) Be has higher $\Delta_i H_1$ than B.

(ii) The electron gain enthalpy of F is less negative than that of Cl.

1+2

14. At 0^oC the density of a gaseous oxide at 2 bar is the same as that of nitrogen (N_2) at 5 bar. What is the molecular mass of the oxide? (Atomic mass of N = 14u)

3

15. (a) State Hess's Law of constant heat summation.

(b) Calculate the enthalpy of the reaction:

$N_2O_4(g) + 3\,CO(g) \rightarrow N_2O(g) + 3\,CO_2(g)$

Given that $\Delta_f H$ CO (g) = -110 KJ mol^{-1}; $\Delta_f H$ CO_2 (g) = -393 KJ mol^{-1}

$\Delta_f H$ N_2O (g) = 81 KJ mol^{-1} ; $\Delta_f H$ N_2O_4 (g) = 9.7 KJ mol^{-1}. 1+2

16. Derive the relation between Kp and Kc for a reaction in the gaseous phase in a state of equilibrium. 3

17. (a) Write the conjugate acid and base of HCO_3^-.

(b) What is the effect of increase in temperature on the equilibrium state of the reaction:-

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + \text{heat}$$

(c) Explain the term common ion effect with the help of an example. 1+1+1

18. Balance the following equation by ion- electron method.

$Cr_2O_7^{2-}(aq) + SO_2(g) \rightarrow Cr^{3+}(aq) + SO_4^{2-}(aq)$ (in acidic medium) 3

19. (a) Arrange LiH, NaH and CsH in order of increasing ionic character.

(b) What causes temporary and permanent hardness of water?

(c) What do you mean by '10 volume H_2O_2 solution'? 1+1+1

20. (i) Explain why :- (a) a solution of Na_2CO_3 is alkaline.

(b) BeO is insoluble in water while $BeSO_4$ is soluble.

(ii) Write two uses of caustic soda. 2+1

21. Describe the chemistry of Lassaigne's test to detect nitrogen in an organic compound. Write the chemical equations for the reactions involved. 3

22. (a) Define nucleophile with suitable example.

(b) In an estimation of sulphur by Carius method, 0.640 g of an organic compound gave 0.699 g of barium sulphate. Find the percentage of sulphur in the compound. (Atomic masses of Ba = 137 u, S=32u) 1+2

23. In slum areas, in winter season, people often burn coke angithis to heat up their rooms and then sleep there the whole night. Sometimes, cases of unconsciousness or death are reported from these houses, not because their houses catch fire but because of the poisonous gases accumulated in their rooms.

(a) How is poisoning caused by burning of coke angithi inside a closed room?

(b) Name two green house gases.

(c) Write any one harmful effect of photochemical smog.

(d) What value is learnt from the incident reported in the above paragraph? 4

24. (a) Write 2 points of differences between a sigma bond and a pi bond.

(b) Explain why BeH_2 molecule has zero dipole moment although the Be-H bonds are polar.

(c) Explain sp^2 hybridization with a suitable diagram. 2+1+2

OR

(a) Write the M.O. electronic configuration of O_2 and N_2. Determine their bond order.

(b) Draw the shapes of SF_6 and NH_3 according to VSEPR theory. 3+2

25. (a) What happens when?

(i) Borax is heated strongly.

(ii) Boric acid is added to water.

(iii) BF_3 is reacted with ammonia.

(b) Draw the structure of Diborane and explain the special features of it. 3+2

OR

(a) Complete the following:

(i) $BF_3 + LiH \rightarrow$

(ii) $B_2H_6 + H_2O \rightarrow$

(b) Give reason:-

(i) TlCl is more stable than $TlCl_3$.

(ii) CO_2 is gas but SiO_2 is solid at room temperature.

(iii) Carbon has maximum covalency four but silicon can exhibit higher covalency of six.

2+3

26. (a) An alkene 'A' upon ozonolysis gives a mixture of ethanal and pentan-3-one. Write the structure and IUPAC name of A.

(b) How will you distinguish between ethane and ethene by a suitable chemical test?

(c) How will you convert benzene into

(i) p-chloronitrobenzene and (ii) p-nitrotoluene? 2+1+2

OR

(a) How will you distinguish between ethene and ethyne by a suitable chemical test?

(b)Write the mechanism for the reaction:

$$CH_3 - CH = CH_2 + HBr \rightarrow CH_3 - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3$$

(c) Arrange benzene, n-hexane and ethyne in decreasing order of acidic strength.

1+3+1