MALAPPURAM DISTRICT HIGHER SECONDARY CHEMISTRY TEACHERS ASSOCIATION

FIRST YEAR MODEL EXAMINATION 2022

Time 2 hrs   **Cool Off Time : 15 minutes**   **(Maximum score 60)**

There is a cool off time of 15 minutes in addition to the writing time

Read questions carefully before answering.

Calculations, figures and graphs should be shown in the answer sheet itself.

Answer any 8 questions from 1 to 11. Each carries 2 scores.   **[8 X 2 = 16]**

1. Define 1amu.   (2)

2. (a) What is photoelectric effect?   (1)
(b) Write any two observations of photoelectric effect.   (1)

3. Account for the following:
(a) Electron gain enthalpy of noble gases is positive.   (1)
(b) Chlorine has the highest electron gain enthalpy.   (1)

4. Write any two limitations of octet rule.   (2)

5. Define entropy and give its unit.   (2)

6. For the equilibrium, 2 NOCl (g) $\rightarrow$ 2 NO(g) + Cl$_2$(g), the value of equilibrium constant Kp is 1.8 x 10^{-2} at 500 K. Calculate Kc for this reaction at the same temperature.   (2)

7. H$_2$O$_2$ is stored in wax-lined glass or plastic vessels in dark. Give reason.   (2)

8. What are zeolites? Give any two uses of zeolites.   (2)

9. Differentiate homolytic cleavage from heterolytic cleavage of covalent bonds.   (2)

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10. Draw the Newman Projections of the eclipsed and staggered conformations of ethane molecule.

                                                                                        (2)

11.What is mean by acid rain? What are the major compounds responsible for acid rain? (2)

12. The combination of elements to form compounds is governed by the laws of chemical combination.
(a) Hydrogen combines with oxygen to form compounds, namely water and hydrogen peroxide. State and illustrate the related law of chemical combination.   (2)

(b) What is mean by limiting reagent in a chemical reaction?   (1)

13. (a) Write the sub shell-wise electronic configurations of the following elements:
i) Cu (Z = 29),
ii) Cr (Z = 24)
 give reason for the extra stability of these atoms.   (2)

(b) Canal rays were discovered by discharge tube experiments conducted in a modified cathode ray tube. Give any two characteristics of canal rays.   (1)

14. Give reasons for the following :
(a) 'O' has lower ionisation enthalpy than N and F.
(b) Cl has higher negative electron gain enthalpy than F.   (3)

15. (a) The dipole moment of BeF_2 is zero, while that of H_2O is 1.85 D. Account for this on basis of their molecular structure.   (2)

(b) A molecule of the type AB_4E has 4 bond pairs of electrons and 1 lone pair of electron. Predict the most stable structure of this compound.   (1)

16. (a) State Dalton's law of partial pressures.   (1)
    (b) Calculate the total pressure exerted by a mixture of 8 g of O_2, and 4g of H_2 enclosed in a vessel of 1 dm^3 at 270^{0}C. R = 0.083 bar dm^3 K^{-1} mol$^{-l.}$

                                                                                        (2)

17.
(a) Classify the following into intensive and extensive properties.
i) Internal energy ii) Density iii) Heat capacity iv) Temperature. (1)

(b) Calculate the standard free energy (ΔG^0) for the conversion of oxygen to ozone
$3/2\ O_2(g) \rightarrow O_3(g)$ at 298K, if the equilibrium constant for the conversion is 2.47×10^{-29}.
(Given R = 8.314 $JK^{-1}mol^{-1}$). (2)

18. Explain the hydrolysis of different types of salts with the help of examples and comment
on the pH of the resulting solutions in each case. (3)

19. Briefly explain the different types of hydrides. (3)

20. Borax is an important compound of Boron.

(a) The solution of borax is alkaline. Give reason. (1)
(b) Give any two uses of borax. (1)
(c) Diamond has covalent bonding. Yet it has high melting point. Give a reason. (1)

21. A group of organic compounds, each containing a characteristic functional group forms
a homologous series.
(a) Give an example for a homologous series. (1)
(b) Give the IUPAC name of the following compound: CH_3-CH_2-CO-CH_2-CH_2-$COOH$. (1)
(c) Write the metamers corresponding to the molecular formula $C_4H_{10}O$. (1)

22. Explain the Markovnikov's rule for the addition reaction using a suitable example. (3)

23. What is mean by 'smog'? Which are the different types of smog? Explain. (3)

Answer any 5 questions from 24-31. Each carries 4 scores each. (5x4=20)

24. Explain quantum numbers. Give the importance of quantum numbers in Pauli's (4)
Exclusion Principle.

25. The stability and magnetic properties of a molecule can be explained using the
molecular orbital theory proposed by F. Hund and R.S. Mulliken.

(a) Define bond order according to the M.O theory. (1)
(b) Draw the energy level diagram for the formation of O_2 molecule. (2)
(c) Calculate the bond order and predict the magnetic character of O_2 molecule. (1)

26.
(a) What is the thermodynamic scale of temperature. (1)
(b) Viscosity of liquids decreases as the temperature increases. Why? (1)
(c)Gases deviate from ideal behaviour due to the faulty assumptions of Kinetic theory of gases. State those faulty assumptions. (2)
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27. Equilibrium constant helps in predicting the direction in which a given reaction will proceed at any stage.
(a) In which one of the following conditions a chemical reaction Proceeds in the forward direction?
i) $Q_c < K_c$ ii) $Q_c > K_c$ iii) $Q_c = 1/K_c$ IV) $Q_c = -K_c$ (1)
(b) Write whether the following statement is true or false:
"High value of equilibrium constant suggests high concentration of the reactants in the equilibrium mixture". (1)
(c) State the Le-Chatlier's principle. Applying this principle, explain the effect of pressure in the following
equilibrium. (2)
$CO(g) + 3 H_2(g) \rightarrow CH_4(g) + H_2O(g)$
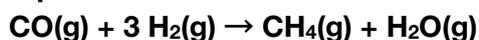
28. (a) Redox reactions are classified into four types. Describe any three of them with suitable examples. (3)

(b) The oxidation number of sulphur in SO_4^{2-} is .... (1)

29. Name the commercial process used to prepare sodium carbonate and write the chemical equations of the steps involved in it. (4)

30.Organic compounds have to be purified before analysis.
a) Which type of liquids can be purified using distillation under reduced pressure? Suggest an example. (1)
b) Name the two main types of chromatographic techniques based on the principle of differential adsorption. (1)
c) In the Lassaigne's test for halogens, they are precipitated as .... (1)
d) In what form is nitrogen estimated in the Dumas method? (1)

31.
a) Name the following reactions: (2)

i) C_6H_{14} $\xrightarrow{\text{Anhydrous AlCl}_3/\text{HCl}}$ $CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_2 - CH_2 - CH_3$
     n-hexane   2-Methyl pentane

ii) C_6H_{14} $\xrightarrow[10-20 \text{ atm}]{V_2O_5/773K}$ Benzene
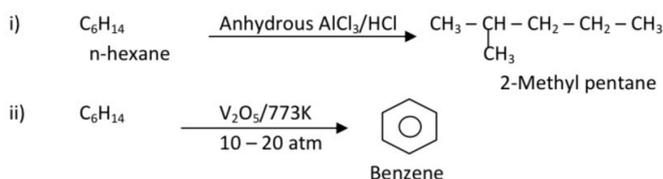
b) Naphthalene is an aromatic compound. Explain its aromaticity using Huckel's rule. (2)