



INDIAN SCHOOL MUSCAT
ANNUAL EXAMINATION
CHEMISTRY

CLASS: XI

Sub. Code: 043

Time Allotted: 3 Hrs.

09.02.2020

Max. Marks: 70

- **General Instructions:** All questions are compulsory.
- Marks for each question are indicated against it.
- Section A: Question numbers 1 to 20 are very short answer questions and carry 1 mark each.
- Section B: Question numbers 21 to 27 are short answer questions and carry 2 marks each.
- Section C: Question numbers 28 to 34 are also short answer questions and carry 3 marks each.
- Section D: Question numbers 35 to 37 are long answer questions and carry 5 marks each.
- There is no overall choice. But internal choice has been provided. You have to attempt only one choice in such questions.
- Use log tables if necessary, use of calculators is not allowed.

SECTION A

Read the given passage and answer the questions 1 to 3 that follow:

Nomenclature of organic compounds with polyfunctional group is done on the basis of principal functional group and the remaining groups are named as substituents with appropriate prefixes. Suitable numbering separated by commas and hyphens, gives a uniform identity to compounds. In this systematic nomenclature, names are correlated to structure such that its structure can be deduced from its name.

- 1 Write the IUPAC name of $\text{CH}_3\text{CH}(\text{C}_2\text{H}_5)\text{CH}_2\text{CH}(\text{Cl})\text{CH}_3$. 1
- 2 Draw the structure 3,4-dimethylhept-3-ene. 1
- 3 Define the type of isomerism exhibited by $\text{C}_3\text{H}_6\text{O}$ 1

Questions 4-6 are fill in the blanks:

- 4 _____ smog is oxidising in nature. 1
- 5 Aniline is purified by the method of _____. 1
- 6 The general outer configuration of f-block elements is _____. 1

Questions 7-9 are one word answers:

- 7 What is the shape of BF_3 molecule? 1
- 8 What is the oxidation state of manganese in K_2MnO_4 ? 1

- 9 What is the term given to the reduction in concentration of dissolved oxygen in water due to phosphate pollution in water? 1
- Questions 10-18 are Multiple choice questions:
- 10 Which of the following is not a greenhouse gas? 1
a) CO b) O₃ c) CH₄ d) H₂O vapor
- 11 The structure of diborane contains ____ two center-two electron bonds and ____ three center-two electron bonds 1
a) 2,4 b) 4,2 c) 2, 2 d) 4, 4
- 12 The reducing power of a metal depends on various factors. Suggest the factor which makes Li, the strongest reducing agent in aqueous solution. 1
a) Sublimation enthalpy
b) Ionisation enthalpy
c) Hydration enthalpy
d) Electron-gain enthalpy
- 13 When sodium is dissolved in liquid ammonia, a solution with deep blue colour is obtained. The colour of the solution is due to 1
a) ammoniated electron
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- 14 When a sample of hard water is passed through a layer of sodium zeolite, the ions that will not be present in the resulting sample of water will be 1
a) Ca²⁺ b) Mg²⁺ c) Ca²⁺ and Mg²⁺ d) all ions will be removed
- 15 Sodium polymetaphosphate is commercially termed as 1
a) Zeolite b) Permutit c) Calgon d) lime
- 16 Filling of atomic orbital in increasing order of energy is governed by 1
a) Hund's rule b) Pauli's exclusion principle c) Heisenberg uncertainty principle d) (n+l) rule
- 17 Identify the pair of degenerate orbitals from the following? 1
a) 2s, 2p b) 1s, 2s c) 2p_x, 2p_y d) 4s, 3d
- 18 How many electrons will be present in sub-shells having $s = +\frac{1}{2}$ for $n=3$? 1
a) 9 b) 8 c) 18 d) 1

Questions 19-20 are assertion & reasoning questions:

- (A) Both assertion and reason are correct statements, and the reason is the correct explanation of the assertion
(B) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion
(C) Assertion is correct, but reason is wrong statement
(D) Assertion is wrong, but reason is correct statement

- 19 [A]: O²⁻ is isoelectronic with Ar. 1
[R]: Isoelectronic species have different atomic number and same number of electrons.
- 20 [A]: Boron forms [BF₄]⁻. 1
[R]: Boron is restricted to a maximum covalence of four.

SECTION B

- 21 Account the following 2
- First ionisation enthalpy of nitrogen is higher than oxygen
 - Electron gain enthalpy of oxygen is less negative than sulphur
- OR**
- What is the atomic number of an element whose symbol is Unb? What is its IUPAC name? To which period of the periodic table, does it belong to?
- 22 a) State the law of multiple proportions. 2
- b) Define the term molality.
- 23 a) What do you understand by the term absolute zero of temperature? 2
- b) Critical temperature of ammonia and carbon dioxide are 405.5 K and 304.10 K respectively. Which of these gases will liquefy easily? Why?
- 24 a) Predict the sign of i) entropy for atomization of hydrogen gas ii) Gibbs energy for spontaneous process. 2
- b) State the third law of thermodynamics.
- 25 Differentiate between saline hydrides and metallic hydrides with an example each. 2
- OR**
- Give reason: a) Dihydrogen is inert at room temperature.
- b) Hydrogen peroxide is stored in wax lined dark colored bottles
- 26 Why does lithium resemble magnesium in its properties? Give any two similarities between Li-Mg. 2
- 27 a) Name a zeolite that converts alcohol to gasoline. 2
- b) What happens when orthoboric acid is heated above 370K?

SECTION C

- 28 a) Draw resonating structures of nitrobenzene. 3
- b) Why is sodium fusion extract boiled with nitric acid before testing for halogens?
- 29 A mixture of 4g of O₂ and 2g of H₂ is confined in a bulb of 1L at 0°C. Calculate the pressure exerted by this mixture. [Given O=16, H=1, R=0.0821 L atm/K/mol]. 3
- OR**
- Two moles of an ideal gas at 546K exerts a pressure of 2atm. Calculate the volume occupied by the gas. [Given R= 0.0821 L atm/K/mol]
- 30 Balance the following in basic medium 3
- $$\text{MnO}_4^- + \text{S}_2\text{O}_3^{2-} \rightarrow \text{MnO}_2 + \text{SO}_4^{2-}$$
- 31 a) Define threshold frequency. 3
- b) Electronic configuration in Copper is [Ar] 4s¹, 3d¹⁰ and not [Ar] 4s², 3d⁹. Why?
- c) How is an orbit different from an orbital? [one point]
- 32 a) Draw the sawhorse projection of eclipsed and staggered conformers of ethane. 3
- b) Give the mechanism of addition of HBr to propene.
- 33 Calculate the enthalpy of formation of benzene (C₆H₆) from the following data 3
- $$\text{C}_6\text{H}_6 + 15/2 \text{O}_2 \rightarrow 6\text{CO}_2 + 3\text{H}_2\text{O} \quad \Delta H = -3267 \text{ KJ/mol}$$
- $$\text{C} + \text{O}_2 \rightarrow \text{CO}_2 \quad \Delta H = -393.5 \text{ KJ/mol}$$
- $$\text{H}_2 + 1/2 \text{O}_2 \rightarrow \text{H}_2\text{O} \quad \Delta H = -286 \text{ KJ/mol}$$

OR

Calculate the enthalpy change for the hydrogenation of ethene to ethane. Given bond enthalpies of C-C, C=C, H-H and C-H bonds are 350, 600, 400 and 410 kJ/mol respectively.

- 34 A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96 g. What are its empirical and molecular formulas? [C=12, H=1, Cl=35.5] 3

OR

- a) Commercially available concentrated HCl contains 38% HCl by mass. What is its molarity, if its density is 1.19 g/cm³? [H=1, Cl=35.5]
b) 3g of hydrogen reacts with 35.5g of chlorine to form hydrogen chloride. Find the mass of HCl formed?

SECTION D

- 35 a) Discuss the geometry of the following molecules using VSEPR theory i) PCl₅ ii) SF₄ 5
b) BeH₂ has a zero dipole moment though Be—H bonds are polar. Why?
c) Explain hybridisation in C₂H₄.

OR

- a) Calculate the bond order and predict the magnetic property of N₂ using molecular orbital theory.
b) Differentiate between sigma and pi bond. [any 2 points].
c) Draw the Lewis dot structure for carbonate ion.

- 36 a) Convert chloropropane to the following: (in not more than two steps) 5
i) Benzene ii) propane
b) Give a chemical test to distinguish between ethene and ethyne.
c) Illustrate i) Friedel craft alkylation of benzene ii) Kolbe's electrolysis.

OR

- a) An alkene A on ozonolysis gave two moles of ethanal. Write the structure and IUPAC name of alkene A.
b) Predict the major product in the following reactions
(i) $\text{C}_6\text{H}_6 + \text{CH}_3\text{COCl} \xrightarrow{\text{anhy AlCl}_3}$
(ii) $\text{C}_6\text{H}_5\text{OH} \xrightarrow{\text{Zn dust, } \Delta}$
c) Explain aromaticity of benzene using Huckle's rule.

- 37 a) What do you understand by dynamic equilibrium? 5
b) Describe the addition of CH₃OH on the equilibrium of the reaction
 $2\text{H}_2(\text{g}) + \text{CO}(\text{g}) \rightleftharpoons \text{CH}_3\text{OH}(\text{g})$
c) Calculate K_c for the reaction
 $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$. [Given K_p=167 at 1073K, R=8.314J/K/mol.]
d) Calculate the solubility of lead chloride, PbCl₂, if its solubility product is 1.7×10⁻⁵ at 298K.

OR

- a) Write the conjugate acid and conjugate base of HSO₄⁻
b) Derive the relation between K_p and K_c.
c) The pH of sample of vinegar is 3.76. Calculate the concentration of hydrogen ion in it.
d) Calculate the pH of a buffer solution containing 0.2 mol of NH₄Cl and 0.1 mol of NH₄OH per litre. (K_b of NH₄OH = 1.85 × 10⁻⁵)

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c) Explain aromaticity of benzene using Huckle's rule.

- 36 a) What do you understand by dynamic equilibrium? 5
b) Describe the addition of CH_3OH on the equilibrium of the reaction

$$2\text{H}_2(\text{g}) + \text{CO}(\text{g}) \rightleftharpoons \text{CH}_3\text{OH}(\text{g})$$

c) Calculate K_c for the reaction

$$\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g}). \text{ [Given } K_p=167 \text{ at } 1073\text{K, } R=8.314\text{J/K/mol.}]$$

d) Calculate the solubility of lead chloride, PbCl_2 , if its solubility product is 1.7×10^{-5} at 298K.

OR

- a) Write the conjugate acid and conjugate base of HSO_4^-
b) Derive the relation between K_p and K_c .
c) The pH of sample of vinegar is 3.76. Calculate the concentration of hydrogen ion in it.
d) Calculate the pH of a buffer solution containing 0.2 mol of NH_4Cl and 0.1 mol of NH_4OH per litre. (K_b of $\text{NH}_4\text{OH} = 1.85 \times 10^{-5}$)

- 37 a) Discuss the geometry of the following molecules using VSEPR theory i) PCl_5 ii) SF_4 5
b) BeH_2 has a zero dipole moment though Be—H bonds are polar. Why?
c) Explain hybridisation in C_2H_4 .

OR

- a) Calculate the bond order and predict the magnetic property of N_2 using molecular orbital theory.
b) Differentiate between sigma and pi bond. [any 2 points].
c) Draw the Lewis dot structure for carbonate ion.

End of the Question Paper