

AIRPORT SENIOR SECONDARY SCHOOL

TERMINAL EXAMINATION - 1(2023-24)

CLASS XII

CHEMISTRY

MARKS: 70

TIME: 3 hours

General Instructions:

- This question paper contains 35 questions. All questions are compulsory.
- This question paper is divided into five sections - A, B, C, D and E.
- In **Section A** – Questions no. 1 to 18 are multiple choice (MCQ) type questions, carrying 1 mark each.
- In **Section B** – Questions no. 19 to 25 are very short answer (VSA) type questions, carrying 2 marks each.
- In **Section C** – Questions no. 26 to 30 are short answer (SA) type questions, carrying 3 marks each.
- In **Section D** – Questions no. 31 and 32 to 25 are case-based questions, carrying 4 marks each.
- In **Section E** – Questions no. 33 to 35 are long answer (VSA) type questions, carrying 5 marks each.
- Use of calculators and logarithmic tables are not allowed.

SECTION A

Questions no. 1 to 18 are multiple choice (MCQ) type questions, carrying 1 mark each.

1. Alcoholic solution of KOH is a specific reagent for
a) dehydration b) dehalogenation c) dehydrohalogenation d) dehydrogenation
2. An unripe mango placed in a concentrated salt solution to prepare pickle, shrinks because
a) It gains water due to osmosis
b) It loses water due to reverse osmosis
c) It gains water due to reverse osmosis
d) It loses water due to osmosis
3. The value of Henry's constant K_H is _____
a) Greater for gases with higher solubility
b) Greater for gases with lower solubility
c) Constant for all gases
d) Not related to the solubility of gases
4. Maximum amount of solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon _____
a) Temperature b) Nature of solute c) Pressure d) Nature of solvent
5. Salicylic acid on heating with acetic anhydride in basic medium gives
a) Aspirin b) Methyl salicylate c) Phenyl salicylate d) Acetyl salicylate
6. Relative lowering of vapour pressure is a colligative property because
a) It depends on the concentration of a solvent in solution and does not depend on the nature of the solute molecules
b) It depends on the relative number of solute particles in solution and does not depend on the nature of the solute molecules
c) It depends on the concentration of a non-electrolyte solute in solution as well as on the nature of the solute molecules

- d) It depends on the concentration of a solvent in solution and also depend on the nature of the solute molecules
7. An S_N1 reaction of an optically active alkyl halide gives a product _____
 a) With retention in configuration c) With racemisation
 b) With inversion in configuration d) None of these
8. The synthesis of alkyl fluoride is best accomplished by
 a) Finkelstein reaction c) Swartz reaction
 b) Sandmeyer's reaction d) Kolbe's reaction
9. The half life of a zero order reaction equals
 a) $2k/R$ b) $k/2R^2$ c) $R^2/2k$ d) $R/2k$
 Where R is the initial concentration.
10. How many Faradays are required to obtain one mole of aluminium from Al_2O_3 is _____
 a) 0 b) 1 c) 2 d) 3
11. In a Leclanche dry cell, the cathode is
 a) Zn container b) MnO_2 c) Graphite rod d) NH_4Cl
12. The role of a catalyst is to change _____
 a) Gibbs energy of reaction c) enthalpy of reaction
 b) Activation energy of reaction d) equilibrium constant
13. Low concentration of oxygen in the blood and tissues of people living at high altitude is due to _____
 a) low temperature c) low atmospheric pressure
 b) high atmospheric pressure d) both low temperature and high atmospheric pressure
14. Racemisation occurs in
 a) S_N1 reaction c) S_N2 reaction
 b) Neither S_N1 nor S_N2 reaction d) S_N1 reaction as well as S_N2 reaction

For Questions number 15 to 18, two statements are given-one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

These consist of two statements - Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true and R is the correct explanation of A
 (b) Both A and R are true and R is not the correct explanation of A
 (c) A is true but R is false
 (d) A is False but R is true
15. Assertion: Conductivity decreases for weak electrolyte and increases for strong electrolyte with decrease in concentration.
 Reason: On dilution, the number of ions per unit volume that carry the current decreases.
16. Assertion: E_{cell} should have a positive value for the cell to function.
 Reason: $E_{cathode} < E_{anode}$
17. Assertion: Hydrolysis of ester follows first order kinetics.
 Reason: Concentration of water remains nearly constant during the course of the reaction.
18. Assertion : When NaCl is added to water, a depression in freezing point is observed.
 Reason : The lowering of vapour pressure of a solution causes depression in the freezing point.

SECTION B

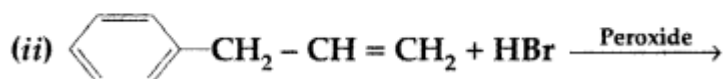
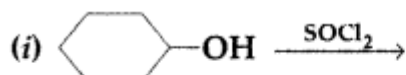
Questions no.19 to 25 are very short answer (VSA) type questions, carrying 2 marks each.

19. Name the cell which :
 (a) was used in Apollo Space programme
 (b) is used in automobiles and inverters

- (c) is suitable for hearing aids and watches
 (d) does not give a steady potential and is used in transistors.
20. Briefly describe the following.
 (a) Plane polarised light b) Optical activity
21. A) What type of deviation from Raoult's law is shown by a mixture of ethanol and acetone?
 Give reason.

OR

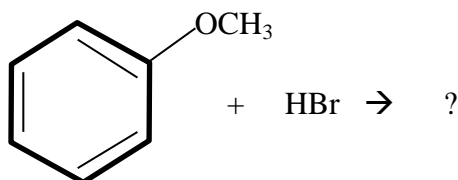
- B) State Henry's law. Write its one application. What is the effect of temperature on solubility of gases in a liquid?
22. A first order reaction is 50 % complete in 25 min. Calculate the time for 80 % completion of the reaction.
23. What is activation energy? How is the rate constant related to its activation energy?
24. Differentiate between order and molecularity of a reaction.
25. Draw the structure of major monohalo product in each of the following reactions :



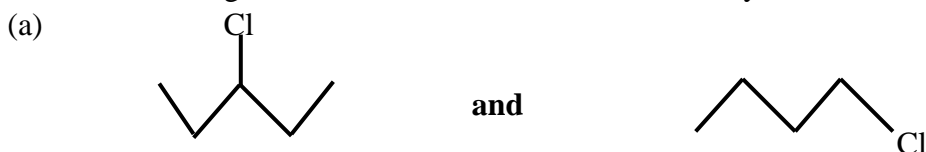
SECTION C

Questions no. 26 to 30 are short answer (SA) type questions, carrying 3 marks each.

26. (i) Write hydroboration-oxidation reaction with example.
 (ii) Write the products of the following reaction:



- (iii) Why is p-nitrophenol more acidic than phenol?
27. (i) What happens when phenol reacts with
 (a) Con. HNO₃
 (b) NaOH
 (ii) $(\text{CH}_3)_3\text{C-ONa} + \text{CH}_3\text{Br} \rightarrow ?$
28. Account for the following.
 a) Alkyl halides though polar are immiscible with water.
 b) Grignard reagents should be prepared under anhydrous conditions.
 c) Although chlorine is an electron withdrawing group, yet it is ortho-, para- directing in electrophilic substitution reaction.
29. I) Which of the following reacts faster in an S_N1 reaction and why?

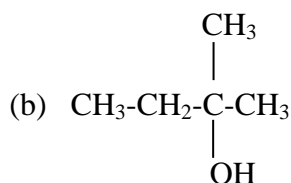
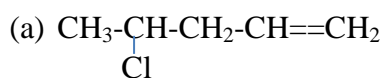


- (b) Of the two bromoderivatives, C₆H₅CH(CH₃)Br and C₆H₅CH(C₆H₅)Br, which is more reactive in S_N1 substitution reaction and why?

II) Which one undergoes S_N2 reaction faster and why?



30. I) Write the IUPAC names of the following compounds.



II) Write the structures of the compounds whose IUPAC names are as follows.

(a) 2-Methylphenol

SECTION D

Questions no. 31 and 32 to 25 are case-based questions, carrying 4 marks each.

Read the following passage and answer the questions that follow.

31. Boiling point or freezing point of liquid solution would be affected by the dissolved solids in the liquid phase. A soluble solid in solution has the effect of raising its boiling point and depressing its freezing point. The addition of non-volatile substances to a solvent decreases the vapour pressure and the added solute particles affect the formation of pure solvent crystals. According to many researches the decrease in freezing point is directly correlated to the concentration of the solute dissolved in the solvent. This phenomenon is expressed as freezing point depression and it is useful for several applications such as freeze concentration of liquid food and to find the molar mass of an unknown solute in the solution. Freeze concentration is a high quality liquid food concentration method where water is removed by forming ice crystals. The freezing point depression is referred to as a colligative property and it is proportional to the molar concentration of the solution along with vapour pressure lowering, boiling point elevation and osmotic pressure. These are physical characteristics of solutions that depend only on the identity of the solvent and the concentration of the solute. The characters are not depending on the solute's identity.

1) When a non-volatile solid is added to pure water it will

- (a) Boil above 100⁰C and freeze above 0⁰C
- (b) Boil below 100⁰C and freeze above 0⁰C
- (c) Boil above 100⁰C and freeze below 0⁰C
- (d) Boil below 100⁰C and freeze below 0⁰C

2) Colligative properties are:

- (a) Dependent only on the concentration of the solute and independent of the solvent's and solute's identity.
- (b) Dependent only on the identity of the solute and the concentration of the solute and independent of the solvent's identity.
- (c) Dependent on the identity of the solvent and solute and thus on the concentration of the solute.
- (d) Dependent only on the identity of the solvent and the concentration of the solute and independent of the solute's identity.

- 3) Identify which of the following is a colligative property.
 - (a) Freezing point
 - (b) Boiling point
 - (c) Osmotic pressure
 - (d) All of the above.
- 4) For determination of molar mass of polymers and proteins, which colligative property is used?
 - (a) Relative lowering in vapour pressure
 - (b) Elevation in boiling point
 - (c) Osmotic pressure
 - (d) Depression in freezing point

32. The rate of a reaction which may also be called its velocity or speed, can be defined with relation to the concentration of any of the reacting substances, or to that of any product of the reaction. If the species chosen is a reactant which has a concentration c at time t , the rate is $-dc/dt$, while the rate with reference to a product having a concentration x at time t , is $-dx/dt$. Any concentration units may be used for expressing the rate; thus, if moles per liter are employed for concentration and seconds for the time, the units for the rate are $\text{moles liter}^{-1}\text{sec}^{-1}$. For gas reactions, pressure units are sometimes used in place of concentrations, so that legitimate units for the rate would be $(\text{mmHg}) \text{sec}^{-1}$ and atm sec^{-1} . The order of a reaction concerns the dependence of the rate upon the concentration of reacting substances; thus, if the rate is found experimentally to be proportional to the α^{th} power of the concentration of one of the reactants A , to the β^{th} power of the concentration of a second reactant B , and so forth, via,

$$\text{Rate} = kC_A^\alpha C_B^\beta$$

The overall order of the reaction is simply

$$n = \alpha + \beta + \dots$$

Such a reaction is found to be of the α^{th} order with respect to the substance A , β^{th} order with respect to B and so on...

1. Rate of reaction is a measure of
 - (a) Change in concentration of reactant with respect to time.
 - (b) Change in concentration of product with respect to time.
 - (c) Change in concentration of both reactants and products with respect to time.
 - (d) Change in concentration of catalyst used in a reaction.
2. For a reaction:

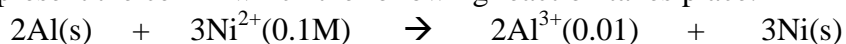
$$P + 2Q \rightarrow \text{Products,}$$

$$\text{Rate} = k[P]^{1/2}[Q]^1, \text{ so the order of reaction is}$$
 - (a) 1.5
 - (b) 2
 - (c) 1
 - (d) 0
3. Which of the following statements is incorrect?
 - (a) The time of k is independent of order of reaction.
 - (b) The unit of k depends on order of reaction.
 - (c) The unit of k is $\text{moles L}^{-1}\text{s}^{-1}$
 - (d) The unit of $k = \text{Rate} / [\text{Reactant}]^n$
4. Which among the following cannot be used to express the rate of the reaction?
 - (a) mmHgsec^{-1}
 - (b) atm sec^{-1}
 - (c) $\text{moles l}^{-1}\text{sec}^{-1}$
 - (d) All of these can be used

SECTION E

Questions no. 33 to 35 are long answer (VSA) type questions, carrying 5 marks each.

33. (i) Represent the cell in which the following reaction takes place:



Calculate the emf if $E_{\text{cell}}^0 = 1.41 \text{ V}$

- (ii) How does molar conductivity vary with increase in concentration for strong electrolyte and weak electrolyte? How can you obtain limiting molar conductivity (Λ^0) for weak electrolyte?
34. Write short notes on the following.
- Wurtz reaction
 - Finkelstein reaction
 - Friedel Crafts alkylation reaction
 - Reimer -Tiemann reaction
 - Kolbe's reaction
35. I) Define the following terms.
- Azeotrope
 - Osmotic pressure
 - Colligative property
- II) Calculate the freezing point of a solution containing 60 g of glucose. (Molar mass = 180 gmol^{-1}) in 250 g of water. (K_f of water = 1.86 KKgmol^{-1})
