Name: Aman
Class: XII – C
Subject: Chemistry
Date: 9/9/24
Session: 2024-25

MAXFORT
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Senior Secondary School

Set A

Time Allowed: 3 Hours **Subject Code- 043**
Maximum Marks: 70

General Instructions:

(1) All questions are compulsory. There are 33 questions in all in the question paper.
*(2) This question paper has five sections: **Section A, Section B, Section C, Section D, Section E.***
*(3) **Section A** contains **16** multiple choice questions carrying one marks each.*
*(4) **Section B** contains **5** short answer questions carrying two marks each.*
*(5) **Section C** contains **7** short answer questions carrying three marks each.*
*(6) **Section D** contains **2** case-based questions carrying four marks each.*
*(7) **Section E** contains **3** long answer questions carrying five marks each.*

Section-A

Q1. Which of the following statements is false? 1
(a) Units of atmospheric pressure and osmotic pressure are the same.
(b) In reverse osmosis, solvent molecules move through a semipermeable membrane from a region of lower concentration of solute to a region of higher concentration.
(c) The value of molal depression constant depends on nature of solvent.
(d) Relative lowering of vapour pressure, is a dimensionless quantity.

Q2. A first order reaction is 50% completed in 1.26×10^{14} s. How much time would it take for 100% completion? 1
(a) 1.26×10^{15} s (b) 2.52×10^{14} s (c) 2.52×10^{28} s (d) infinite

Q3. The cell constant of a conductivity cell_____. 1
(a) changes with change of electrolyte.
(b) changes with change of concentration of electrolyte.
(c) changes with temperature of electrolyte.
(d) remains constant for a cell.

Q4. Which of the following compounds are gem-dihalides? 1
(a) Ethylidene chloride (b) Ethylene dichloride
(c)Methyl chloride (d) Benzyl chloride

Q5. Which one of the following compounds is obtained by dehydrogenation of secondary alcohols? 1
(a) Ketone (b) Aldehyde (c) Carboxylic acid (d) Amine

Q6. The correct order of increasing acidic strength is 1
(a) Phenol < Ethanol < Chloroacetic acid < Acetic acid
(b) Ethanol < Phenol < Chloroacetic acid < Acetic acid
(c) Ethanol < Phenol < Acetic acid < Chloroacetic acid
(d) Chloroacetic acid < Acetic acid < Phenol < Ethanol

Q7. The correct IUPAC name for $CH_2=CHCH_2NHCH_3$ is 1
(a) Allyl methylamine (b) 2-amino-4-pentene
(c) 4-aminopent-1-ene (d)N-methylprop-2-en-1-amine

Q8. Hoffmann Bromamide Degradation reaction is shown by 1
(a) $ArNH_2$ (b) $ArCONH_2$
(c) $ArNO_2$ (d) $ArCH_2NH_2$

Q9. Vitamin B1 is – 1

(a) Riboflavin (b) Cobalamin

(c) Thiamine (d) Pyridoxine

Q10. Which of the following vitamins is water soluble? 1

(a) Vitamin E (b) Vitamin K

(c) Vitamin A (c) Vitamin B

Q11. Reaction of phenylacetylene with dil. H_2SO_4 and HgSO4 gives 1

(a) Acetophenone (b) 2-phenylethanol

(c) phenylacetaldehyde (d) phenylacetic acid

A statement of assertion is followed by a statement of reason. Mark the correct choice from the options given below:

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

Q12. Assertion: In an ideal solution, Δmix H is zero. 1

Reason: In an ideal solution, A - B interactions are lower than A-A and B-B interactions.

Q13. Assertion: Nucleophilic substitution reaction in an optically active alkyl halide gives a mixture of enantiomers.

Reason: Reaction occurs by SN1 mechanism. 1

Q14. Assertion: When a copper wire is dipped in silver nitrate solution, there is no change in the colour of the solution. 1

Reason: Copper cannot displace silver from its salt solution.

Q15. Assertion: The rate of a reaction sometimes does not depend on concentration. 1

Reason: Lower the activation energy faster is the reaction.

Q16. Assertion: Carbonyl compounds take part in nucleophilic addition reactions. 1

Reason: These reactions are initiated by nucleophilic attack at the electron deficient carbon atom.

Section-B

Q17.The vapour pressure of pure liquids A and B at 400 K are 450 and 700 mmHg respectively. Find out the composition of liquid mixture if total vapour pressure at this temperature is 600 mmHg 2

Q18. (a) The cell in which the following reaction occurs: 2

$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I2(s)$

has Eo Cell = 0.236 V at 298 K. Calculate the standard Gibbs energy of the cell reaction. (Given: 1F = 96,500 C mol^{-1})

(b) How many electrons flow through a metallic wire if a current of 0.5 A is passed for 2 hours? (Given: 1F = 96,500 C mol^{-1})

Q19. Explain why: 2

(a) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

(b) Alkyl halides, though polar, are immiscible with water.

Q20. How would you obtain the following: 2

(a) 2-methylpentan-2-ol from 2-methyl-1-pentene

(b) Acetophenone from phenol

Q21. Explain the following: 2

(a) Primary amines ($R\text{-}NH_2$) have higher boiling point than tertiary amines (R_3N).

(b) Aniline does not undergo Friedel – Crafts reaction.

Section – C

Q22. Answer the following questions: 3

(a) What is van't Hoff factor? What types of values can it have if in forming the solution, the solute molecules undergo (i) Dissociation? (ii) Association?

(b) A solution of glucose (molar mass = 180 g mol^{-1}) in water is labelled as 10% (by mass). What would be the molality and molarity of the solution? (Density of solution = 1.2 g mL^{-1})

Q23. Answer the following questions: 3

(a) Write the anode and cathode reactions and the overall reaction occuring in a lead storage battery.

(b) A copper-silver cell is set up. The copper ion concentration in it is 0.10 M. The concentration of silver ion is not known. The cell potential is measured 0,422 V. Determine the concentration of silver ion in the cell. Given : $E°Ag^{+}/Ag = +0.80$ V, $E° Cu^{2+}/Cu = +0.34$ V.

Q24. A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed. 3

(Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

Q25. The following compounds are given to you: 3

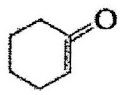
2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane

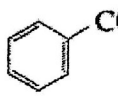
(a) Write the compound which is most reactive towards SN_2 reaction.

(b) Write the compound which is optically active.

(c) Write the compound which is most reactive towards β-elimination reaction.

Q26. Write the product(s) in the following reactions: 3

(i)  + HCN ⟶ ?

(ii)  + NaOH $\xrightarrow[\Delta]{CaO}$?

(iii) $CH_3—CH = CH—CN \xrightarrow[(b)H_2O]{(a)\text{DIBAL-H}}$

Q27. How will you convert the following: 3

(a) Nitrobenzene into aniline

(b) Ethanoic acid into methanamine

(c) Aniline into N-phenylethanamide

Q28. Answer the following questions: 3

(a) Deficiency of which vitamin causes rickets?

(b) Give an example for each of fibrous protein and globular protein.

(c) Write the product formed on reaction of D-glucose with Br_2 water.

Section – D

Q29. Read the following passage and answer the following questions: 4

Scuba divers when come towards the surface, the pressure gradually decreases resulting in the release of dissolved gases leading to formation of bubbles of nitrogen gas in the blood which blocks the capillaries and thus, harmful effects are created. To avoid bends and toxic effect of high concentration of nitrogen gas, the air is diluted with helium. After reading the above passage, answer the following questions:

(a) Which law is associated with this?

(b) Why is the condition of bends overcome by the use of Helium?

(c) Give one application of above-mentioned law.

(d) Hydrogen is more soluble than helium in water at a particular temperature. Why?

Q30. Read the following passage and answer the following questions: 4

Miss Kalpana was asked to synthesise alcohol by acidic hydration of 1-buctane. She was unware of the fact that the vessel she used has some coating of metal and in addition to alcohol (b.p. 373 K) compound Z (b.p. 353 K) was also isolated. Z forms bisulphite compound as well as 2, 4-dinitrophenyl hydrazone. Separation of alcohol could be made by physical as well as chemical method.

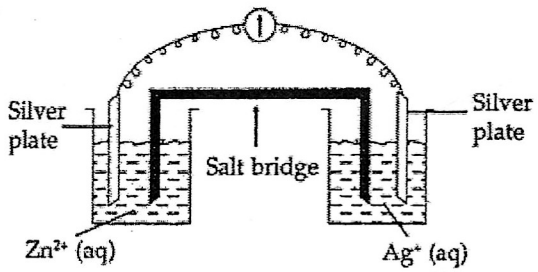
(a) How is alcohol acid 'Z' formed?
(b) Can alcohol acid Z give iodoform test?
(c) Give any method of separation.
(d) Draw the functional isomer of C_2H_5OH.

Section- E

Q31. Answer the following questions: 2+3=5

(a) When a bright silver object is placed in the solution of gold chloride, it acquires a golden tinge but nothing happens when it is placed in a solution of copper chloride. Explain this behaviour of silver.
[Given: E_0Cu^{2+}/Cu =+0.34V, E_0Ag^{+}/Ag =+0.80V, E_0Au^{3+}/Au = +1.40V]

(b) Consider the figure given and answer the following questions:
(i) What is the direction of flow of electrons?
(ii) Which is anode and which is cathode?
(iii) What will happen if the salt bridge is removed?



(iv) How will concentration of Zn^{2+} and Ag^{+} ions be affected when the cell functions?
(v) How will concentration of these ions be affected when the cell becomes dead?

Q32 Answer the following questions: 2+3=5

.(a) Explain the following terms:
(i) Rate of a reaction
(ii) Activation energy of a reaction

(b) The decomposition of phosphine, PH_3, proceeds according to the following equation:

$$4\,PH_3\,(g) \rightarrow P_4\,(g) + 6H_2\,(g)$$

It is found that the reaction follows the following rate equation:

$$\text{Rate} = K\,[PH_3].$$

The half-life of PH_3 is 37.9 s at 120° C.

(i) How much time is required for 3/4th of PH_3 to decompose?
(ii) What fraction of the original sample of PH_3 remains behind after 1 minute?

Q33. Answer the following questions: 5

(a) Write the chemical equation for the reaction involved in Cannizzaro reaction Draw the structure of the semicarbazone of ethanal.
(b) Why pKa of F—CH_2—COOH is lower than that of Cl—CH_2—COOH?
(c) Write the product in the following reaction:

$$CH_3—CH = CH—CH_2CN \xrightarrow[(ii)\,H_2O]{(i)\,DIBAL\text{-}H}$$

(d) How can you distinguish between propanal and propanone?