2019

CHEMISTRY

(Theory)

Full Marks : 70

Pass Marks : 21

Time : Three hours

All the Questions are compulsory.

The figures in the right margin indicate full marks for the questions.

(Question 1-10 are Very short Answer (VSA) type of 1 mark each.)

1. Define fuel cell. 1

2. Two metals A and B have reduction potential values of –0·25V and +0·80V respectively. Predict the metal which will liberate hydrogen gas from dilute sulphuric acid. 1

3. Identify the compound A from the following reaction. 1

$$H_3\overset{+3}{P}O_3 \xrightarrow{573K} A + \overset{-3}{P}H_3$$

4. Give the IUPAC name of the following : 1

$[CoCl(en)_2(ONO)]^+$

5. Chlorobenzene when heated with chloromethane in presence of anhydrous $AlCl_3$ gives two isomeric products. Give the IUPAC name of the major product. 1

6. How is tert–Butylethylether prepared by Williamson's synthesis ? 1

7. Convert ethylbenzene to benzoic acid. 1

8. Why is methylamine soluble in water? 1

9. What are biodegradable polymers? 1

10. Pickles have a long shelf life and do not get spoiled for months. Why? 1

Questions ***11-14*** *are Objective type carrying* ***1*** *mark each. Choose and rewrite the best answer out of the given alternatives.*

11. Which of the following aqueous solutions would have the highest boiling point? 1

A. 1·0 M NaOH

B. 1·0 M Na_2SO_4

C. 1·0 M NH_4NO_3

D. 1·0 M KNO_3.

12. Hardy-Schulze Law helps in comparing 1

A. protecting powers of different protecting colloids.

B. Emulsifying powers of different emulsifiers.

C. Coagulating powers of different active ions.

D. Catalytic capacity of different catalysis.

13. On heating with concentrated NaOH solution in an inert atmosphere of CO_2, white phosphorus gives a gas. Which of the following statement is NOT about the gas ? 1

A. It is highly poisonous and has smell like rotten egg.

B. Its solution in water decomposes in the presence of light.

C. It is more basic than NH_3.

D. It is less basic than NH_3.

14. IUPAC name for $CH_2=CHCH_2NHCH_3$, is 1

A. N – Methylprop–2–en–1–amine

B. 2– Amino – 4– pentene

C. 4 – Aminopent – 1 – ene

D. Allyl methylamine.

Question Nos. ***15-24*** *are Short Answer (SA-II) types of* ***2*** *marks each.*

15. What are dislocations in crystals? Name the non-stoichiometric point defect responsible for the colour of alkali metals. 2

16. Density of Li is $0 \cdot 53\ gcm^{-3}$. The edge length of Li unit cell is 3.5 Å. Find the number of atom in a unit cell. $\left(N_A = 6 \cdot 023 \times 10^{23}, M = 6 \cdot 94\right)$ 2

17. State Raoult's law for non-volatile solute. How does it depend on the temperature? 2

18. 500 ml of an aqueous solution of sugar contains $1 \cdot 71$ g of sugar dissolved in it. Calculate the osmotic pressure of the solution at 300 K.

    (Mol mass of suagar = 342 and

    $R = 0 \cdot 0821\ L\ atm.\ K^{-1}\ mol^{-1}$) 2

19. Using valence bond approach, predict the shape and magnetic behaviour of $\left[MnCl_4\right]^{2-}$. 2

20. Describe Hofmann bromamide reaction with a suitable example. 2

21. Name the vitamin which is needed for beautiful glowing skin and write two sources of it. 2

22. Structure of glycine and alanine are given below. Show the peptide linkages in glycylalanine and alanylglycine. 2

H_2N-CH_2-COOH ; $H_2N-\underset{\displaystyle CH_3}{\underset{|}{CH}}-COOH$

(glycine) (alanine)

23. How is natural rubber structurally different from neoprene rubber ? 2

24. Define the following terms :

(a) Antioxidant

(b) Tranquilizer. 2

*Question Nos. **25 – 31** are Short Answer (SA-I) types of 3 marks each.*

25. A cell with $^{N}/_{50}$ KCl solution showed a resistance of 550 ohms at 25°C. The specific conductivity of $^{N}/_{50}$ KCl at 25°C is $0 \cdot 00278$ $ohm^{-1}cm^{-1}$. The cell filled with $^{N}/_{10}$ $ZnSO_4$ solution at 25°C shows a resistance of $72 \cdot 18$ ohms. Find the cell constant and specific conductivity of $ZnSO_4$ solution. 3

26. Explain the following terms with suitable examples : 3

(a) Gel

(b) Aerosol

(c) Emulsion.

27. How is Copper matte converted into metallic Copper in the silicalined Bessemer Converter ? 3

28. Describe the preparation of Nitric acid by Ostwald's process. 3

29. Sulphurdioxide and chlorine act as bleaching agents in presence of moisture. Discuss their bleaching actions and natures of bleaching. 3

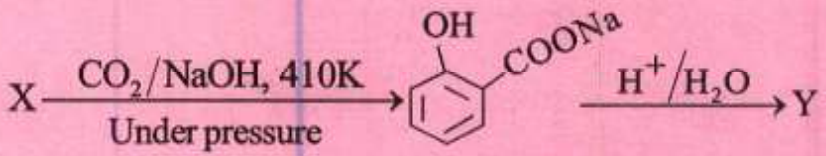
30. (a) Which of the following two compounds would react faster by SN^2 pathway and why?

1–Bromobutane or 2–Bromobutane

(b) Rearrange the following in order of increasing ease of dehydrohalogenation;

$CH_3CH_2CH_2Cl, CH_3CHClCH_3, CH_3CCl(CH_3)_2$ 2+1 = 3

31. Identify the organic compounds X, Y and Z in the following chemical reactions. 3



$$Y \xrightarrow[CH_3COONa]{(CH_3CO)_2O} Z + CH_3COOH$$

Question from ***32-34*** *are Essay (E) type of* ***5*** *marks each.*

32. (a) Define order of a reaction.

(b) Derive an expression for the rate constant of a first order reaction.

(c) Name the photosensitizer in photosynthesis of plants. 1+3+1=5

33. (a) Give the valence shell electronic configuration of transition metals.

(b) Transition metals are known to form many interstitial compounds, why?

(c) Describe chromyl chloride test for the detection of chloride ion with necessary reactions. 1+1+3=5

34. (a) Write the chemical equations for the preparation of propanone from the following compounds :

(i) Ethanoylchloride

(ii) Ehanoic acid

(iii) Propyne.

(b) Describe neutral $FeCl_3$ test to distinguish between carboxylic acid and phenol. 3+2=5