22 Chm (T) 17/16

2016

CHEMISTRY

(Theory)

Full Marks : 70

Pass Marks : 21

Time : Three Hours and *Fifteen Minutes

(*15 minutes are given as extra time for reading questions)

All the Questions are compulsory.

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

*(Questions **1-10** are Very Short Answer (VSA) type of **1** mark each.)*

1. Write an equation for the relation between standard free energy change and standard cell potential. 1

2. Give the IUPAC name of the complex compound,

   $K_3[Co(CN)_5(NO)]$. 1

3. Define the term plasticizers. 1

4. Arrange the following in increasing order of acidic strength :

   phenol, benzyl alcohol, p – nitrophenol, o – nitrophenol. 1

5. Which type of linkage is responsible for secondary structure of protein ? 1

6. Bithionol is added to soap. Give reason. 1

7. Depict the galvanic cell in which the reaction

$$Zn(s) + 2Ag^{+}(aq) \rightarrow Zn^{2+}(aq) + 2Ag(s)$$

takes place. 1

8. Identify X from the following reactions:

$$Br_2 + X^{-} \xrightarrow{oxd^{n}} Br^{-} + X_2$$

and X_2 cannot oxidise other halide ions but it can oxidise $KClO_3$ as

$$X_2 + 2KClO_3 \xrightarrow[\text{little conc. } HNO_3]{\Delta} 2KXO_3 + Cl_2$$ 1

9. Predict the major product that would be formed by dehydrohalogenation of 2–Chloro–2–methyl butane with potassium hydroxide in prersence of ethanol. 1

10. Show how benzaldehyde can be converted into benzophenone ? 1

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

11. A plot of $log\,(x/m)$ versus $log\,p$ for the adsorption of a gas on a solid gives a straight line with slope equal to 1

(A) $log\ K$

(B) $-\ log\ K$

(C) n

(D) $1/n$

12. Which of the following pairs of ions are isoelectric and isostructural ? 1

(A) CO_3^{2-} , NO_3^-

(B) SO_3^{2-} , NO_3^-

(C) ClO_3^- , SO_3^{2-}

(D) ClO_3^- , CO_3^{2-}

13. Which of the following statements is not true about glucose ? 1

(A) It is an aldohexose.

(B) On heating with *HI* it forms *n*-hexane.

(C) It is present in furanose form.

(D) It does not give 2, 4 – DNP test.

14. Which of the following solutions will have the highest boiling points ? 1

(A) 1% *NaCl*

(B) 1% $BaCl_2$

(C) 1% glucose

(D) 1% sucrose

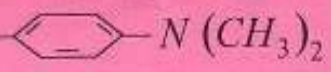
Question Nos. ***15-24*** *are Short Answer (SA-II) types of* ***2*** *marks each.*

15. What is a semiconductor ? Mention the type of semiconductor obtained when silicon is doped with arsenic. 1+1=2

16. State *(a)* Raoult's law for volatile solid

(b) Van't Hoff factor. 1+1=2

17. Write the IUPAC names of the following compounds :

(a) 

(b) *P*–Toluidine 1+1=2

18. What are analgesics ? Give *one* example. 1+1=2

19. The density of a face centered cubic element (atomic mass = 60·2 *amu*) is $6{\cdot}25 g\ cm^{-3}$. Calculate the edge of the unit cell. 2

20. Calculate the osmotic pressure of 5% solution of cane sugar (sucrose) at 1·5°*C*

$\left[R = 0{\cdot}082\ litre\ atm\ K^{-1} mol^{-1}\right]$ 2

21. State the following reactions giving an equation for each : 1+1=2

(i) Sandmeyer's reaction.

(ii) Coupling reaction.

22. Differentiate between DNA and RNA with respect to *(a)* Sugar and *(b)* base residue. 1+1=2

23. How is nylon–66 synthesized ? What type of polymer it is ? 1+1=2

24. Predict the number of unpaired electrons in the square planar $[Pt(CN)_4]^{2-}$ ion. 2

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

25. Write the principle of manufacture of sulphuric acid by contact process. 3

26. Calculate $\wedge_m^\infty$ for acetic acid,

given, $\wedge_m^\infty (HCl) = 426\Omega^{-1}Cm^2mol^{-1}$

$\wedge_m^\infty (NaCl) = 126\Omega^{-1}Cm^2mol^{-1}$

$\wedge_m^\infty (CH_3COONa) = 91\Omega^{-1}Cm^2mol^{-1}$ 3

27. Account for the following observations : 1×3=3

(i) A delta is formed at a point where the river enters the sea.

(ii) Powder substances are more effective as adsorbent than their crystalline forms.

(iii) Smoke from fire often has blue tinge.

28. *(i)* How is leaching carried out in case of low grade *Cu* Ore ?

(ii) How is cast iron different from pig iron ? 2+1=3

29. *(a)* Why neon is used in illuminating warning signal ?

(b) Give the product of the following reactions :

(i) $Xe(g) + F_2(g) \xrightarrow[873\,K,\ 7\,bar]{\text{Nickel tube}}$

(ii) $Xe + PtF_6 \xrightarrow{278K}$ 1+2=3

30. *(a)* Complete the following reactions :

(i) $CH_3Cl + KOH\ (aq) \xrightarrow{\text{heat}}$

(ii)  $+ CH_3Cl \xrightarrow{\text{anhy. } AlCl_3}$

(b) Provide the relevant mechanism of the reaction *(i)*. 2+1=3

31. A compound $A(C_4H_{10}O)$ is found to be soluble in concentrated sulphuric acid. *(A)* does not react with sodium metal or potassium permanganate. When *(A)* is heated with excess of *HI*, it gives a single alkyl halide. Deduce the structure of compoud *(A)* and explain all the reactions involved. 3

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

32. *(i)* Define Molecularity of a reaction.

(ii) Derive an integrated rate equation for rate constant for the first order reaction.

(iii) What are the units of rate constant for zero order reaction ?

1+3+1=5

33. *(a)* Describe the preparation of ehtanal from

(i) ethanol

(ii) ethanoylchloride

(iii) ethanoic acid

(b) Write *one* test each to differentiate

(i) acetaldehyde from acetone and

(ii) ethanal from methanal. 3+2=5

34. *(a)* Explain the following statements giving reasons :

(i) Transition metals are known to form many interstitial compounds.

(ii) Transition metals exhibit variable oxidation states.

(iii) The enthalpies of atomisation of transition metals are high.

(b) Why transition metals generally form coloured compounds ?

$1 \times 3+2=5$
