SAMPLE PAPER (2022-23)
CHEMISTRY THEORY (043)
MARKING SCHEME
SECTION A

Q1 to 18 each correct answer 1 Mark

1. c.

When phenol is treated with bromine water, a white precipitate is formed, which is 2, 4, 6-tribromophenol.

2. d.

Because carbocation will be readily formed.

3. d.

Due to lanthanide contraction.

4. b.

For the half-life of a first-order reaction, the rate constant is inversely proportional to half-life; thus, on increasing temperature, half-life decreases.

5. a.

A secondary cell.

5.* b.

Because cell potential is independent of the amount of material present, it is an intense attribute.

6. c.

t1/2 = 30 minutes.

In two half-lives, t = 2 ×30 = 60 minutes.

In three half-lives, 87.5 percent of the reaction is finished. t = 3 × 30 = 90 minutes.

7. c.

Hoffmann bromamide degradation reaction is a reaction that involves the degradation of an amide.

8. b.

VSEPR Theory uses electron pairs in atoms to explain the structure of particular molecules.

9. b.

10. c.

Secondary and tertiary amines do not react with $CHCl_3$ and alc. KOH generates isocyanide, whereas primary amine does.

11. b.

Because formaldehyde has only one carbon atom.

12. a.

Rate constant does not depend upon concentration of reactants.

12.* c.
The order of a reaction is not always equal to the sum of the stoichiometric coefficients of reactants in the balanced chemical equation for a reaction.
13. c.

Chlorophyll is a coordination molecule of magnesium that is found in plants and is important for photosynthesis.

14. b.

When benzyl alcohol is oxidised with $KMnO_4$, benzoic acid is formed.

15. b.
16. a.
17. a.
18. a.

SECTION B

19. (i) Rate = k $[H_2O_2]$ $[I^-]$
(ii) order = 2
(iii) Step 1

20. (i) Amylose is water soluble component while amylopectin is water insoluble
(ii) In fibrous protein, the polypeptide chains run parallel while in globular, the chains of polypeptides coil around to give a spherical shape

OR

(i) n-hexane
(ii) Gluconic acid

21. (a) Benzyl chloride; Due to resonance, stable benzyl carbocation is formed.
(b) Pent-2-ene / $CH_3CH{=}CHCH_2CH_3$

22. (a) $K_2[Zn(OH)_4]$
(b) $[Pt(NH_3)_6]Cl_4$

23. Ecell = E^o cell – [0.059/n] log Kc
Ecell = 2.7395 V
24. Rate of disappearance of N_2O_5 = 1.4×10^{-3} M/s
25. (a) (i)CH_3MgBr, Dry ether (ii)H_2O/H^+
(b) $KMnO_4$, KOH and H_2O

OR

(a) because the carboxyl group is deactivating and the catalyst aluminium chloride (Lewis acid) gets bonded to the carboxyl group

(b) Nitro group is an electron withdrawing group (-I effect) so it stabilises the carboxylate anion and strengthens the acid / Due to the presence of an electron withdrawing Nitro group (-I effect).

SECTION C

26. (a) A= $CH_3CH_2CH_2CHO$
B = $CH_3COCH_2CH_3$
C= $(CH_3)_2CHCHO$
D= $CH_3CH_2CH_2CH_3$
(b) B

27. (a) $Fe_4[Fe(CN)_6]_3$
(b) Ionisation isomerism
(c) $sp^3 d^2$, 4

28. (a) As compared to other colligative properties, its magnitude is large even for very dilute solutions / macromolecules are generally not stable at higher temperatures and polymers have poor solubility / pressure measurement is around the room temperature and the molarity of the solution is used instead of molality.
(b) Because oxygen is more soluble in cold water or at low temperature.
(c) Due to dissociation of KCl
$KCl(aq) \longrightarrow K^+ + Cl^-$, i is nearly equal to 2

29. (a) (i)Because of the combined factors of inductive effect and solvation or hydration effect
(ii)Due to resonance stabilisation or structural representation / resonating structures.
(b) Add chloroform in the presence of KOH and heat, Aniline gives an offensive smell while N, N dimethyl aniline does not.

30. (i) $(CH_3)_3C$-I, Due to large size of iodine / better leaving group / Due to lower electronegativity.
(ii) p-nitro hydroxybenzene (a) NaOH, 443 K (b) H^+
(iii) Because enantiomers have same boiling points / same physical properties.
OR
(a) (i) 3-methyl butan-2-ol
(b) Toluene
(c) 1-methyl cyclohex-1-ene

SECTION D

31. (i) Glycosidic linkage.
(ii) Amylopectin

(iii) Glucose has cyclic structure in which -CHO group is not free because it forms hemiacetal linkage with -OH group at C-5.

OR

True, Glucose forms two isomeric methyl glycosides; methyl α-D glucoside and methyl β-D glucoside.

32.(i) Two solutions having the same osmotic pressure are called isotonic solutions.
(ii) 0.9/100 ml solution of sodium chloride in water is suitable for transfusion into blood.
(iii)The concentration of this solution is 0.6 g per 100 ml or 0.6%. Hence, water will flow into the cells and they would burst.

OR

Hypertonic solution	Hypotonic solution
If the osmotic pressure of a solution is higher that of another solution, the former solution is hypertonic solution.	If the osmotic pressure of a solution is lower that of another solution, the former solution is hypotonic solution.

SECTION E

33. (a) E^0cell = 1.10V

$\Delta G^o = -n F E^o = -2 \times 1.10 \times 96500 = -212300$ J/mol or -212.3 kJ/mol

(b) (i) Pollution free

(ii) High efficiency.

OR

(a) (i) Silver wire at 30°C because as temperature decreases, resistance decreases so conduction increases.

(ii) 0.1 M CH_3COOH, because on dilution degree of ionization increases hence conduction increases.

(iii)KCl solution at 50°C, because at high temperature mobility of ions increases and hence conductance increases

(b)

Electrochemical	Electrolytic
(1) Anode -ve, Cathode +ve	(1) Anode +ve Cathode -ve
(2) Convert chemical Energy to electrical energy	(2) Convert electrical Energy to chemical energy

34. (a) (i) C_6H_5-CH(OH)-CN

(ii) 2 $CH_3COCH_2C_6H_5 + CdCl_2$

(iii) $(CH_3)_2$-C(Br)COOH

(b)

(i) $(CH_3)_3C$-OH / tertiary butyl alcohol is formed.

(ii) $C_6H_5COCH_3$ / acetophenone is formed

OR

(a) (i) $(CH_3)_2C(OH)CH_2COCH_3$

(ii) $C_6H_5CH_2CH_3$

(iii) C_6H_5CHO

(b) (i) because the carboxyl group is deactivating and the catalyst aluminium chloride (Lewis acid) gets bonded to the carboxyl group

(ii) Nitro group is an electron withdrawing group (-I effect) so it stabilises the carboxylate anion and strengthens the acid / Due to the presence of an electron withdrawing Nitro group (-I effect).

35. (a) (i) $Cu^{+1}(3d^{10})$ compounds are white because of absence of unpaired electrons while Cu^{+2} $(3d^9)$ compounds are coloured due to unpaired electrons and shows d-d transition.

(ii) chromate (CrO_4^{2-}) changes to dichromate ($Cr_2O_7^{2-}$) ion in acidic medium.

(iii) due to completely filled d-orbitals in their ground state as well as in oxidized state.

(b) Co = $[Ar]4s^2\ 3d^7$, Co^{+2} =$[Ar]\ 3d^7$

$\mu = \sqrt{n(n+2)}$, n = 3,

μ = 3.92 BM.

OR

(a)

Lanthanoids	Actinoids
(1) most of them are not radioactive	(1) All are radioactive
(2) don't show a wide range of oxidation state	(2) Show a wide range of oxidation states
(3) Most of their ions are colourless	(3) Most of their ions are coloured

(b) (i) Sc^{+3}, because of absence of unpaired electron.

(ii) Cr, because of presence of strong intermetallic bonding than Cu.