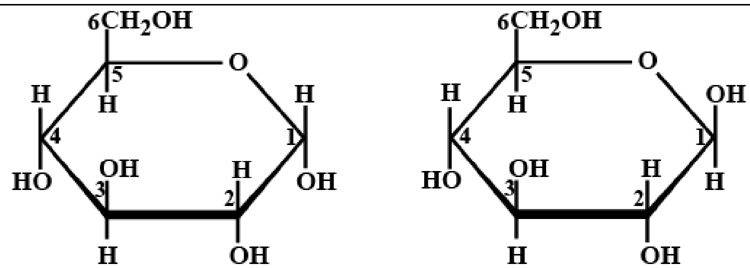
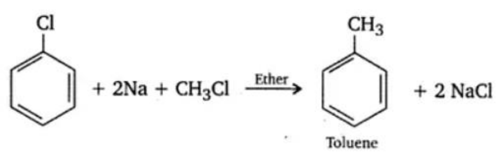
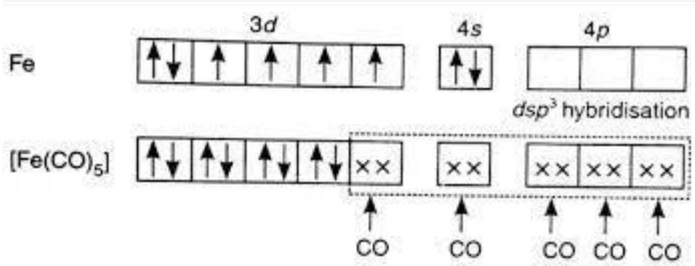
COMMON PRE-BOARD EXAMINATION 2022-23

Subject: CHEMISTRY (043) Answer Key

Class: XII | Time: 3 Hours
Date: | Max. Marks: 70

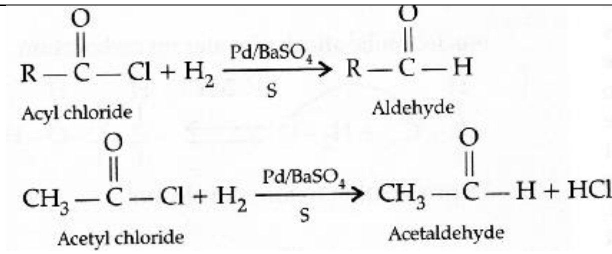
SECTION A

1.	a. 2-methylbutan-2-ol	1
2.	a. Racemisation	1
3.	b. They are chemically reactive	1
4.	b. 2 and 1 ½	1
5.	b. 3F	1
6.	b. k= $\frac{2.303}{t} log \frac{Pi}{2Pi-Pt}$	1
7.	d. dimethylamine	1
8.	d. hexadentate lingad	1
9.	a. o-nitrophenol	1
10.	b. C_6H_5 - CH_2NC	1
11.	c. Cannizzaro reaction	1
12.	d. i) – C, (ii) – A, (iii) – D, (iv) – B.	1
13.	b. $[Pt(NH_3)_6]^{4+}$: octahedral :: $[Zn(NH_3)_4]^{2+}$: tetrahedral	1
14.	a. Acetic acid	1
15.	a. Both A and R are true and R is the correct explanation of A	1
16.	b. Both A and R are true and R is not the correct explanation of A	1
17.	c. A is true but R is false.	1
18.	a. Both A and R are true and R is the correct explanation of A	1
19.	**(i)** $k = \frac{2.303}{t}\log\frac{[A]_0}{[A]}$ $= \frac{2.303}{300}\log\frac{1.6\times10^{-2}}{0.8\times10^{-2}}$ $= \frac{2.303}{300}\log 2 = 2.31\times10^{-3}s^{-1}$ At 600 s, $k = \frac{2.303}{t}\log\frac{[A]_0}{[A]}$ $= \frac{2.303}{600}\log\frac{1.6\times10^{-2}}{0.4\times10^{-2}}$ $= 2.31\times10^{-3}s^{-1}$ k is constant when using first order equation therefore it follows first order kinetics. OR In equal time interval, half of the reactant gets converted into product and the rate of reaction is independent of concentration of reactant, so it is a first order reaction.	2

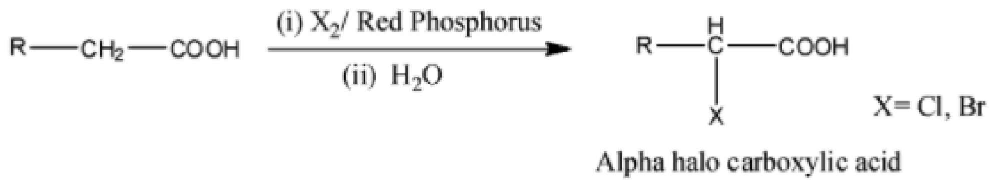
20.	 a. α-D-(+)-Glucopyranose β-D-(+)-Glucopyranose (any one of the structure 1 mark) b. The known vitamins include the fat-soluble vitamins: **A, D, E, and K**, and the water-soluble vitamins: C and the B vitamins: thiamin (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), biotin (B7), folate/folic acid (B9), and cobalamin (B12). (any one example each ½ + ½) OR a. Amino acids have amino (−NH2) group, basic in nature and accepts a proton and COOH group loses a proton forming a dipolar ion, called the Zwitter ion. In this form, amino acids behave both as acids and bases so they are amphoteric in nature. (1) b. Vitamin C is cannot be stored in our body because it is a water-soluble vitamin and gets excreted from the body with sweat or urine.(1)	2
21.	Chloroethane is **unable to form hydrogen bonds with water**. Hence, it is insoluble in water.(1) In the preparation of alkyl chloride from alcohols. Thionyl chloride is preferred **because alkyl halide is prepared using thionyl chloride** the by-products that we get are. These are both gases and they escape out leaving behind the desired product which is an alkyl chloride. OR  (1) In Finkelstein reaction $CH_3-Cl+NaI \xrightarrow{Acetone} CH_3I+NaCl_{(ppt)}$ (1)	2
22.	 Hybridisation: dsp3 Magnetic character:Diamagnetic Spin of the complex: Low spin complex or inner orbital complex	2
23.	Cu2+(aq)→2e−→Cu (s) Quantity of electricity passed = I×t =0.75×25×60 =1125 C 1125 C of electricity produces copper = 0.369 g 2×96500C of electricity produce copper = $\frac{0.369}{1125}$×2×96500=63.3u Atomic mass of Cu = 63.3 u .	2
24.	(i) Pseudo first-order reaction	2

The reactions that have higher order true rate law but are found to behave as first order are called psuedo first order reactions.
(ii) Half-life period of reaction (t 1/2).
The half life period of a reaction is the time needed for the reactant concentration to fall to one half of its initial value.

25. (Marks: 2)

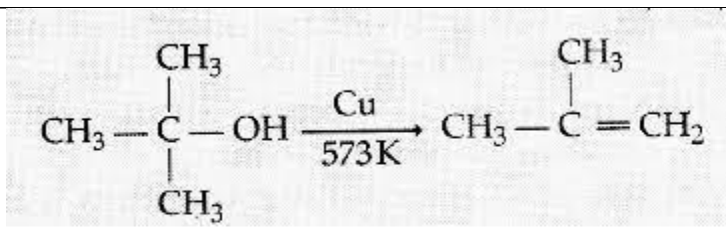


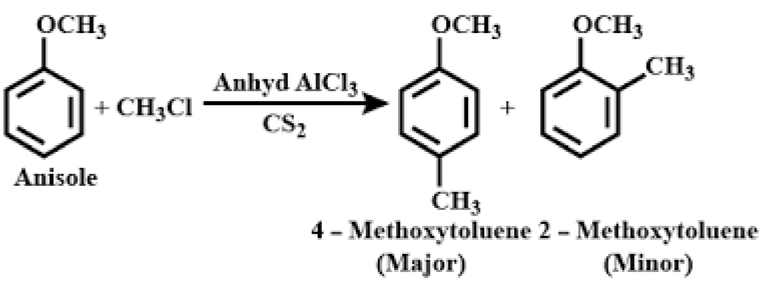
(1m)

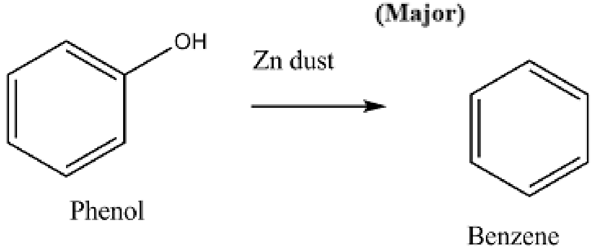


(1)

26. (Marks: 3)



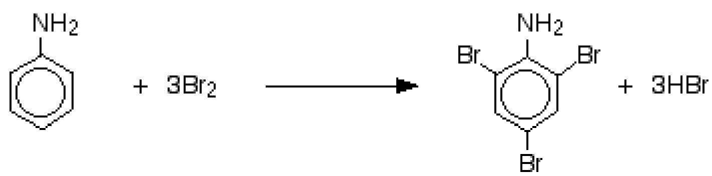
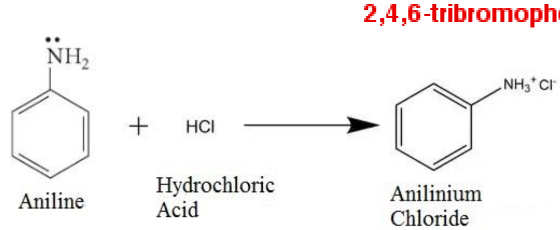
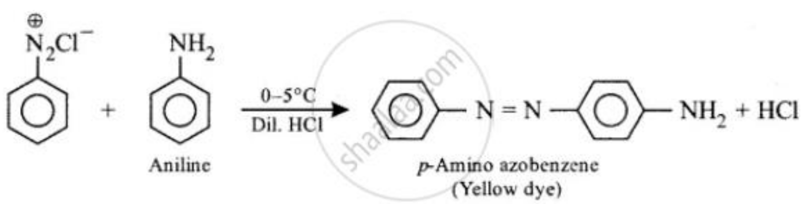
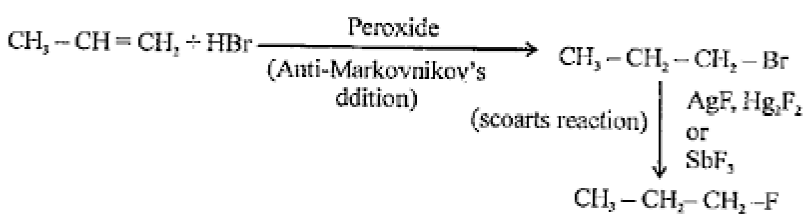
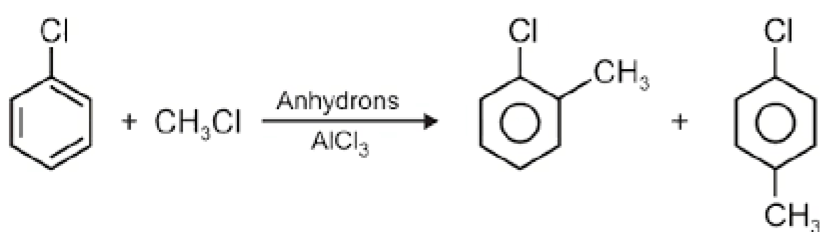


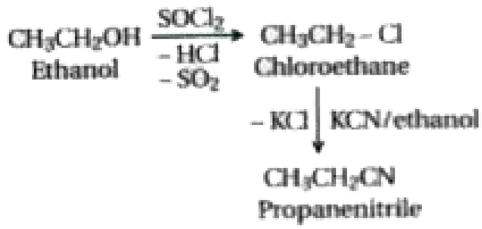
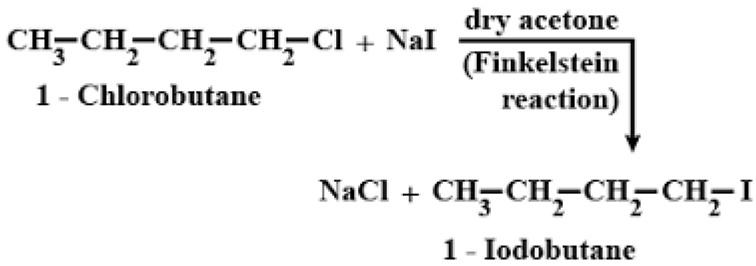


27. (Marks: 3)

S.No.	Weak field coordination entity	Strong field coordination entity
(i)	They are formed when the crystal field stabilisation energy (Δ_o) in octahedral complexes is less than the energy required for an electron pairing in a single orbital (P).	They are formed when the crystal field stabilisation energy (Δ_o) is greater than the P.
(ii)	They are also called high spin complexes.	They are called low spin complexes.
(iii)	They are mostly paramagnetic in nature.	They are mostly diamagnetic or less paramagnetic than weak field.
(iv)	Never formed by CN^- ligands.	Formed by CN^- like ligands.

(any one difference 1mark)

	The formula of the given compound Tris(ethane-1,2-diamine) chromium(III) chloride is [Cr(en)3]Cl3. (1m) Hexaaquachromium(III)chloride (1m)	
28.	wB = 250 g, wA = 60 g, M_A = 180g mol-1 $K_f = 1.86\ K\ kg\ mol^{-1}$ $\Delta T_f = K_f\ m$ $= K_f \times \frac{w_A \times 1000}{M_A \times w_B}$ $= 1.86 \times \frac{60 \times 1000}{180 \times 250}$ $= \frac{1.86 \times 600}{18 \times 25} = \frac{1116}{450} = 2.48\ K$ $\Delta T_f = T_{solvent} - T_{solution}$ $T_{solution} = T_{solvent} - \Delta T_f = 273.15 - 2.48 = 270.67\ K$	3
29.	 2,4,6-tribromophenylamine  	3
30.	 	3

	 OR  1-Bromopentane is most reactive twoards SN2 reactin because it is 1∘ alkylhalide. 4-bromo-4-methylpent-2-ene	
31.	i. Glucose ii. Glycogen iii. (a) Cellulose (b) Glycosidic linkage OR iii. (a) β-D-Galactose and β-D-Glucose (b) Starch	4
32.	i. Liquid that have similar structures and polarizes form ideal solutions. ii. Benzene + Toluene iii. $\Delta H_{mix} \neq 0$, $\Delta V_{mix} \neq 0$ OR iii (a) The solution will show a negative deviation from Raoult's law. (b) Solution will show positive deviation.	4
33.	At anode: Mg → Mg2+ + 2e At cathode: 2Ag+ + 2e → 2Ag Mg + 2 Ag+ → Mg2+ + 2Ag n = 2 $E^0_{Cell} = E^0_{Cathode} - E^0_{Anode}$ $E^0_{Cell} = E^0_{Ag+/Ag} - E^0_{Mg2+/Mg} = 0.080V - (-2.37V) = 3.17\ V$ Nernst equation for cell reaction. $E_{cell} = E^0_{Cell} - \frac{0.059}{n} log \frac{[Mg^{2+}]}{[Ag^+]^2}$ $E_{cell} = 3.17 - \frac{0.059}{2} log \frac{[10^{-2}]}{[10^{-4}]^2}$ = 3.17 – 0.0295 log 10^6 = 3.17 – 0.177 V = 2.993 Substituting n = 2, F = 96500 C mol^{-1},E_{cell} = 2.993 V in the expression, $\Delta G = -nFE_{cell}$ we get ΔG = -2x96500 C mol^{-1} x 2.993 V ΔG = - 577649 J mol^{-1} = - 577.649 kJ mol^{-1} **OR** (i) Advantages of fuel cell: (any two ½ mark each) (a) It is a pollution free device since no harmful products are formed.	5

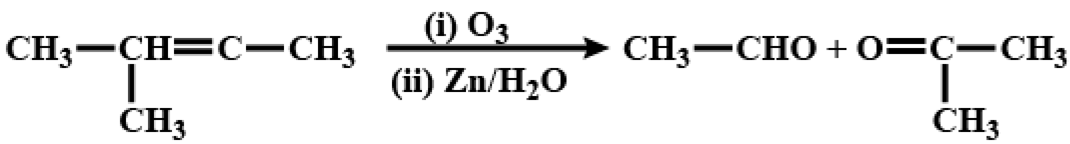
(b) Its efficiency is about 75% which is considerably higher than conventional cells.
(c) It is a continuous source of energy if the supply of gases is maintained

(ii)Lead storage battery is an example for secondary cells. It is rechargeable and can be used again and again. It is recharged by passing current through it from an external source. (1m)
Reaction at anode: Pb(s) + SO42- (aq) → PbSO4 (s) + 2e (½ m)
Reaction at cathode: PbO2 (s) + SO42- + 4H+ + 2e → PbSO4(s) + 2H2O (l) (½ m)
The overall reaction is
Pb(s) + PbO2(s) + $2H_2SO_4$ → $2PbSO_4$(s) + $2H_2O$ (1m)

(iii)$\Lambda_m^o\ (CH_3COOH) = \Lambda^0$m ($CH_3COONa$) + Λ^0m (HCl) - Λ^0m (NaCl)
= 91 + 426 – 126 = 391 $Scm^2\ mol^{-1}$ (1m)

34. **Hence compound A is $CH_3-CH=C(CH_3)-CH_3$** 5

(i)



2-Methylbut-2-ene (A) **Acetaldehyde (Ethanal) (B)** **(Acetone) (C)**

(ii) $CH_3CHO + 3NaOI \longrightarrow Cl_3CHO + 3NaOH$

(B) Sodium hypoiodite **Tri-iode acetaldehyde**

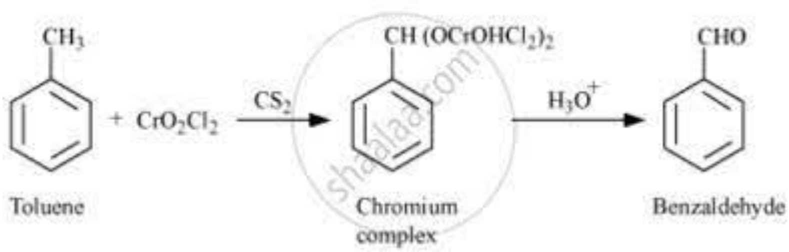
$CH_3CHO + 3\ I\ 2 + NaOH \xrightarrow{\text{Hydrolysis}} CHI_3 + 3HI + HCOONa$

Iodoform (3)

(b) b. (i) Tollen's reagent test: Add ammoniacal solution of silver nitrate (Tollen's Reagent) in both the solutions. Butanal gives silver mirror whereas Butan-2-one does not. (1)
(ii) Add neutral FeCl3 in both the solutions, phenol forms violet colour but benzoic acid does not. (1)

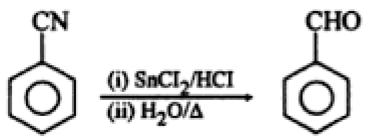
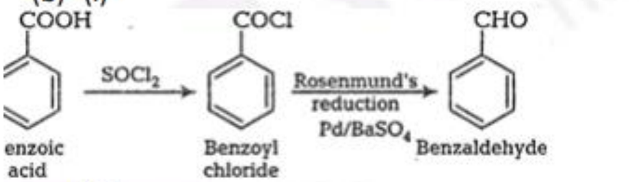
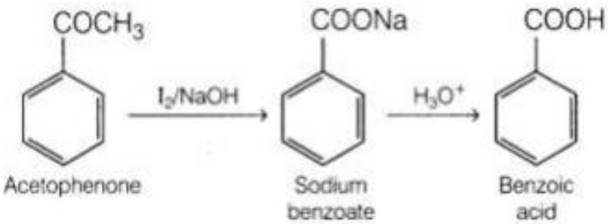
OR

Etard reaction



(1)

Stephen reaction

	 (1) (b) (i)  (ii)  (c) $CH_3COOH \xrightarrow{Cl_2/P} \underset{\mid \atop Cl}{CH_2}COOH \xrightarrow{KOH(Aq)} \underset{\mid \atop OH}{CH_2}COOH$ (or any other correct method) (3)	
35.	A) (i) Cr, the highest melting point of Cr is attributed to the involvement of greater number of electrons(5)from 3d in addition to 4s electrons in interatomic metallic bonding. (ii)Mn, because the change from Mn^{3+} (d^4) to Mn $^{2+}$ (d^5) results in the half filled configuration which has extra stability. (iii)Zn, in Zn ($3d^{10}4s^2$) all the electrons present in d-orbitals are paired and hence metallic bonds present in it are weak. That is why , it is soft. B) Sodium chromate is acidified with sulphuric acid to give a solution from which orange sodium dichromate, $Na_2Cr_2O_7.2H_2O$ can be crystallised. $2Na_2CrO_4 + 2H^+ \rightarrow Na_2Cr_2O_7 + 2Na+ + H_2O$ Sodium dichromateis more soluble than potassium dichromate. The letter is therefore, prepared by treating the solution of sodium dichromate with potassium chloride. $Na_2Cr_2O_7 + 2KCI \rightarrow K_2Cr_2O_7 + 2NaCI$	5

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