Q. No		Value points	Mark
		SECTION A	
1	(C)		1
2	(B)		1
3	(A)		1
4	(C)		1
5	(A)		1
6	(B)		1
7	(B)		1
8	(C)		1
9	(D)		1
10	(C)		1
11	(C)		1
12	(D)		1
13	(A)		1
14	(D)		1
15	(D)		1
16	(A)		1
		SECTION B	
17		(a) Tetraammineaquachloridocobalt(III) chloride	1
		(b) Dichloridobis(ethane-1,2-diamine)chromium(III) chloride	1
18		Rate law is the expression in which reaction rate is given in terms of molar concentration of reactants raised to the power which is experimentally determined.	½
		Rate constant is the rate of reaction when molar concentration of reactants is unity.	½
		a) First order	½
		b) Second order	½
19	(a)	$8MnO_4^- + 3S_2O_3^{2-} + H_2O \longrightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$	1
	(b)	$Cr_2O_7^{2-} + 3\ Sn^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 3Sn^{4+} + 7H_2O$	1
20		$k = \dfrac{[R]_0 - [R]}{t}$	½
		$t = \dfrac{0.10 - 0.075}{0.0030}$	
		$t = \dfrac{0.025}{0.0030}$	1
		$t = .\ 8.33\ s$	½
		OR	
20		Rate $= \dfrac{-1}{2}\dfrac{\Delta[NH3]}{\Delta t} = \dfrac{\Delta[N2]}{\Delta t} = \dfrac{+1}{3}\dfrac{\Delta[H2]}{\Delta t}$	½
		$\dfrac{-1}{2}\dfrac{\Delta[NH3]}{\Delta t} = \dfrac{\Delta[N2]}{\Delta t} = \dfrac{+1}{3}\dfrac{\Delta[H2]}{\Delta t} = k$	½
		$\dfrac{\Delta[N2]}{\Delta t} = 2.5 \times 10^{-4}$ mol L^{-1} s^{-1}	½
		$\dfrac{\Delta[H2]}{\Delta t} = 3 \times 2.5 \times 10^{-4}$	
		$= 7.5 \times 10^{-4}$ mol L^{-1} s^{-1}	½
21		(a) Due to electron withdrawing nature of -NO$_2$ group.	1

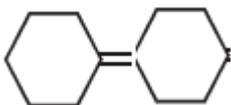|	(b) KCN is predominantly ionic and both carbon and nitrogen atoms can donate electron pairs, the attack takes place mainly through carbon atom as C—C bond is more stable than C—N bond. However, AgCN is mainly covalent in nature and nitrogen is free to donate electron pair forming isocyanide as the main product.	1
	SECTION C	
22	$$x_{CO_2} = \frac{p_{CO_2}}{K_H}$$ $$= \frac{3.34 \times 10^5}{1.67 \times 10^8}$$ $$= 2 \times 10^{-3}$$ $$2 \times 10^{-3} = \frac{n_{CO_2}}{n_{CO_2} + n_{H_2O}}$$ For a dilute solution , $$2 \times 10^{-3} = \frac{n_{CO_2}}{n_{H_2O}}$$ $$n_{CO_2} = \frac{540}{18} \times 2 \times 10^{-3}$$ $$= \mathbf{6 \times 10^{-2}} \text{ mol.}$$	½ ½ ½ ½ ½ ½
23	(a) Fuel cells are pollution free than thermal plants / Fuel cells have higher efficiency than thermal plants.	1
	(b) Zinc is easily oxidized as compare to iron / E° value of Zn is more -ve than iron	1
	(c) Direct current changes the composition of the solution.	1
24	(a) Mn^{2+} results in the half-filled (d^5) configuration which has extra stability.	1
	(b) The steady decrease in atomic and ionic radii in lanthanoid series.	1
	(c) Due to weak interatomic interactions / weak metallic bonds.	1
25	(a)(i) Hybridization: d^2sp^3 **Magnetic character: Diamagnetic.** (ii) Hybridization: sp^3 **Magnetic character: Paramagnetic.** **(b) $t_{2g}^5 e_g^0$**	½ ½ ½ ½ 1
26.	(a) (i) The stereoisomers related to each other as non-superimposable mirror images.	1
	(ii) A mixture containing dextro and laevo enantiomers in equal proportions.	1
	(b) C—Cl bond acquires a partial double bond character due to resonance / the carbon atom of benzene attached to halogen is sp^2-hybridised / Explanation through resonating structures.	1
27	(A) (a) The carbonyl group of aldehydes and ketones is reduced to CH_2 group on treatment with hydrazine followed by heating with sodium or potassium hydroxide in high boiling solvent such as ethylene glycol	½
		½
	(b) Chromyl chloride oxidises methyl group of toluene to a chromium complex, which on hydrolysis gives corresponding benzaldehyde.	½

		½
	(c) Aldehydes which do not have α-hydrogen atom, undergo self-oxidation and reduction reaction on heating with concentrated alkali gives salt of carboxylic acid and alcohol	½
		½
	(Or any other example)	
	OR	
27	(B) (a) A = CH_3COCl (b) CH_3CHO (c) $CH_3CH=NNH_2$ (b) A = CH_3CHO (b) $CH_3CH(OH)CH_2CHO$ (c) $CH_3CH=CHCHO$	½ x 3 ½ x 3
28	(a) Protein found in a biological system with a unique three-dimensional structure and biological activity.	1
	(b) Nitrogenous base + Pentose Sugar + Phosphate / a unit formed when a nucleoside is linked with phosphate.	1
	(c) Those acids which cannot be synthesized in the body and must be obtained through diet.	1
	SECTION D	
29	(a) • When external pressure is larger than the osmotic pressure, then the movement of solvent is from solution to solvent side through semi permeable membrane. / The direction of osmosis can be reversed if a pressure larger than the osmotic pressure is applied to the solution side.	1
	• Cellulose acetate / Or any other suitable example.	1
	(b) (i) RBC swells up / Cells swell and may even burst due to endo-osmosis.	1
	OR	
	(ii) 1 M KCl,	½
	i = 2 / KCl dissociates into ions, whereas urea does not dissociate.	½
	(c) It depends upon the number of solute particles in the solution.	1
30	(a) / Award full marks if attempted because of printing error.	2
	(b) Due to resonance in aniline the lone pair of electrons are less available while they are easily available in methyl amine.	1
	(c) (i) $NH_3 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$ OR	1
	(ii) A mixture of primary, secondary and tertiary amines and also a quaternary ammonium salt is formed.	
	SECTION E	

31	(A)
	 (a) $E°_{cell} = E°_{cathode} - E°_{anode}$
	  = - 2.87 – 1.5 V
	  = **- 4.37 V**
	$\triangle G^0 = - nF E°_{Cell}$
		½
		½

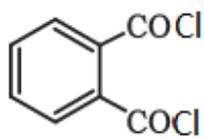|		
	= -6 x 96500 X (-4.37) = 2530.230 kJ/mol Reaction is non-spontaneous.	1 1

	(b) Yes, the tarnish can be removed.
	Aluminium has more negative standard electrode potential than silver so will reduce silver sulphide to silver, tarnish will be removed. /
	
	$3\ Ag^+ + Al \longrightarrow 3\ Ag + Al^{3+}$
	$E^o_{Cell} = E^o_{cathode} - E^o_{anode}$
	    = - 0.71 −(-1.66) V
	    = 0.95 V
	This indicates that the reaction is feasible and tarnish can be removed.
		1
		1

	OR	

31	(B)
	(a) (i) Potential difference between two electrodes of a galvanic cell.
	    (ii) The galvanic cell in which combustion energy of fuels is directly converted into electrical energy.
	
	b)
	 n =2
	$E^o_{cell} = E^o_{cathode} - E^o_{anode}$
	    = - 0.40 −(-0.76) V
	    = **0.36 V**
	$E_{Cell} = E^o_{celi} - \frac{0.059}{2} log \left[\frac{Zn^{2+}}{Cd^{2+}}\right]$
	    $= [0.36] - \frac{0.059}{2} log \frac{0.1}{0.01}$
	
	    $= (0.36 - 0.0295)$
	    = 0.3305 V (Deduct ½ mark for no or incorrect unit)
		1
		1
		
		1
		1
		
		1

32	(A) A = CH_3CH_2OH / Ethanol / Ethyl alcohol, B = CH_3CHO / Ethanal / Acetaldehyde, C = CHI_3 / Iodoform / Triiodomethane, D = $CH_3CH_2O\ CH_2\ CH_3$ / Ethoxyethane / Diethyl ether, E = CH_3CH_2I / Ethyl iodide / Iodoethane. 	½ x 5 ½ x 5
	OR	

32	(B) (a)	
	(i)	
		1
	(ii)	
	$3\ CH_3-CH=CH_2\ +\ (H-BH_2)_2 \longrightarrow (CH_3-CH_2-CH_2)_3B$ $\qquad\qquad\qquad\qquad\qquad\qquad H_2O\downarrow 3H_2O_2,\ \bar{O}H$ $\qquad\qquad\qquad\qquad\qquad\qquad 3CH_3-CH_2-CH_2-OH$	1
	(iii)	
		1
	(b) On heating with NaOH + I_2, Butan-2-ol gives yellow ppt. Of iodoform (CHI_3) whereas Butan-1-ol does not. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (Or any other suitable chemical test)	1
	(c) Ethanol < Water < Phenol.	1
33	(a) But-2-enal	1
	(b) On heating with NaOH + I_2, propanone gives yellow ppt. Of iodoform (CHI_3) whereas propanal does not. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (Or any other suitable chemical test)	1
	(c) (i)	
		1
	(ii) $CH_3CH_2OH \xrightarrow{\quad PCC \quad} CH_3CHO \xrightarrow[\quad 2.\ H_3O^+ \quad]{1.\ CH_3MgBr} CH_3CH(OH)CH_3$	1
	(iii)	
	$\qquad\qquad\qquad\qquad$ (Or any other correct method)	1
	OR	
33	(B) (a)	1 × 5= 5
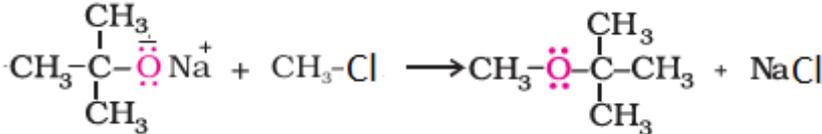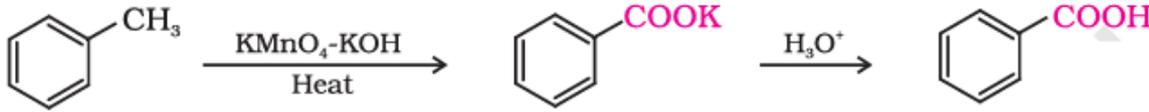
(b)

(c)

(d)

(e) CH_3COCl / Anhy. $AlCl_3$ or $(CH_3CO)_2O$/ Anhy. $AlCl_3$