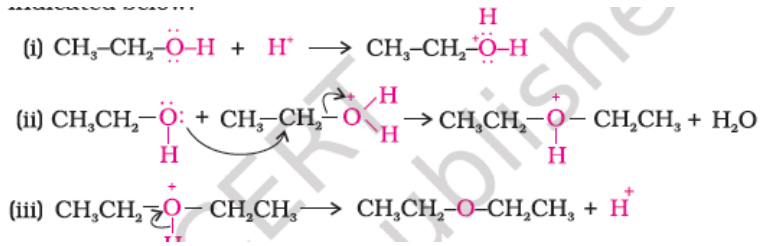
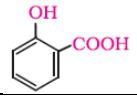
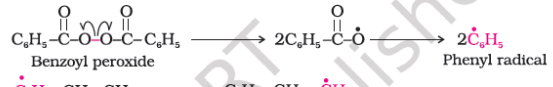
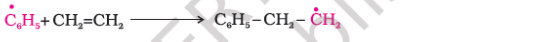
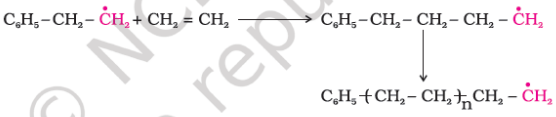
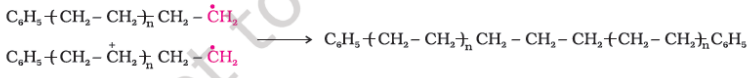
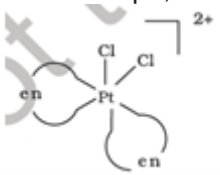
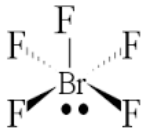
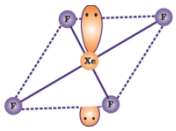
Chemistry Marking scheme
Delhi - 2016
Set – 56/1/1/D

Q.No	VALUE POINTS	MARKS
1	$CH_3CH_2CH(Cl)CH_3$; secondary halide/ 2^0 carbocation is more stable	½, ½
2	NH_3	1
3	Ferromagnetism	1
4	2,4,6-Tribromoaniline / 2,4,6-Tribromobenzenamine	1
5	Like Charged particles cause repulsion/ Brownian motion/ solvation	1
6	(i) Mercury cell (ii) Fuel cell (iii) Lead storage battery (iv) Dry cell	½ ½ ½ ½
7	A-Na_2CrO_4 B-$Na_2Cr_2O_7$ C-$K_2Cr_2O_7$ Use- strong oxidising agent / as a primary standard in volumetric analysis	½ ½ ½ ½
	OR	
7	$8MnO_4^- + 3S_2O_3^{2-} + H_2O \longrightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$ $Cr_2O_7^{2-} + 14\ H^+ + 3\ Sn^{2+} \rightarrow 2\ Cr^{3+} + 3\ Sn^{4+} + 7\ H_2O$	1 1
8	(i) $[Cr(H_2O)_5Cl]Cl_2.H_2O$ (ii) pentaaquachloridoChromium(III) chloride monohydrate (or chloride hydrate) (no deduction for not writing hydrate)	1 1
9.	(i) zero order , bimolecular/ unimolecular (ii) mol L^{-1} s^{-1}	½, ½ 1
10.		½ 1 ½
11.	(i) In chlorobenzene, each carbon atom is sp^2 hybridised / resonating structures / partial double bond character. (ii) Due to +R effect in chlorobenzene/ difference in hybridization i.e. sp^2 and sp^3 respectively/ -I and +R effect oppose each other while –I effect is the only contributing factor in cyclohexane. (iii) Due to formation of planar carbocation/ Carbon in carbocation formed is sp^2 hybridised.	1 1 1
12.	2 x10^{24} atoms weigh =300g	

	6.022×10^{23} atoms weigh = $(300 \times 6.022 \times 10^{23})/2 \times 10^{24}$ = 90.3 g	1
	$d = \frac{z \times M}{a^3 N_A}$ $= 4 \times 90.3/(250 \times 10^{-10})^3 \times N_0$ $= 38.4\ gcm^{-3}$ (or any other correct method)	½ + ½ 1
13	$\log k = \log A - E_a/2.303RT$ $E_a / 2.303\ RT = 1.0 \times 10^4\ K/T$ $E_a = 1.0 \times 10^4 \times 2.303 \times 8.314$ $= 191471.4\ J/mol$ $t_{1/2} = 0.693/k$ $k = 0.693/200\ min$ $= 0.0034 min^{-1}$	½ 1 ½ 1
14.	(i) **Adsorption** / **Absorption** **Surface phenomena** / **Bulk phenomena** **The accumulation of molecular species at the surface rather than in the bulk of a solid or liquid is termed adsorption.** / The substance is uniformly distributed throughout the bulk of the solid essentially a bulk phenomenon. **(any one difference)** (ii) $AlCl_3$, more positive charge/Hardy-Schulze rule (iii)Sulphur	1 ½ + ½ 1
15.	(i) Zone refining (ii) Leaching / Bayer's process (iii) Reducing agent / to form CO which acts as a reducing agent.	1 1 1
16.	(i) $E^0_{cell} = E^0_c - E^0_a$ $= (-0.44) - (-0.74)\ V$ $= 0.30V$ $E_{cell} = E^0_{cell} - \frac{0.059}{n} \log \frac{[Cr^{3+}]^2}{[Fe^{2+}]^3}$ $E_{cell} = E^0_{cell} - \frac{0.059}{6} \log \frac{[0.01]^2}{[0.1]^3}$ $= 0.30 - (-0.059/6)$ $= 0.3098V$	½ ½ 1 1
17.	(i) ability of oxygen to form multiple bond/ pπ-dπ bond. (ii) Partially filled d orbitals / due to comparable energies of ns and (n-1) d orbitals (iii) due to relative stabilities of the f^0, f^7 and f^{14} occupancies of the 5f orbitals/ Comparable energies of 7s,6d,5f orbitals.	1 1 1

18.	(i) CH_3OH , $(CH_3)_3C\text{-}I$ (ii) $CH_3CH_2CH_2OH$ (iii) 	1 1 1
19.	(i) $C_6H_5NH_2$, $C_6H_5N_2^+Cl^-$, C_6H_5I (ii) CH_3CN, $CH_3CH_2NH_2$, CH_3CH_2NC	½ + ½ + ½ ½ + ½ + ½
20.	a. Catalyst / initiator of free radical b. Hexamethylene diamine and adipic acid / structure / IUPAC name c. Buna-S<polystyrene<Terylene	1 ½, ½ 1
	OR	
20	*Chain initiation steps*   *Chain propagating step*  *Chain terminating step* For termination of the long chain, these free radicals can combine in different ways to form polythene. One mode of termination of chain is shown as under: 	1 1 1
21.	(i) β-D glucose and β-D-galactose / glucose and galactose (ii) water soluble ,excreted out of the body (iii)In nucleotide , phosphoric acid/phosphate group attached to the nucleoside / structures of both nucleotide and nucleoside / nucleotide= base +sugar + phosphate group, nucleoside= base +sugar.	½ , ½ 1 1
22.	d^2sp^3 , Paramagnetic, low spin 	1, ½ , ½ 1
23.	(i)Aware, concerned or any other correct two values. (ii) Side effects, unknown health problems (iii) Neurologically active drugs/ stress relievers Example- valium, equanil (or any other correct two example)	½ + ½ 1 1 ½ + ½
24	a) i. Endothermic compound / decomposition of ozone is exothermic in nature and ΔG is negative / decomposition of ozone is spontaneous. ii. Exists as $[PCl_4]^+[PCl_6]^-$ iii. Shows only -1 oxidation state / most electronegative element/ absence of d-orbitals	1 1 1

	b) i) ii)  	1,1
	OR	
24	(i) F_2 is the stronger oxidising agent than chlorine (a) low enthalpy of dissociation of F-F bond (b) less negative electron gain enthalpy of F (c) high hydration enthalpy of F^- ion ii) low temperature, high pressure and presence of catalyst iii) a) $H_3PO_4 < H_3PO_3 < H_3PO_2$ b) $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$	½ ×4=2 1 1 1
25.	A -$C_6H_5COCH_3$ B-$C_6H_5CH_2CH_3$ C-C_6H_5COOH D ,E -C_6H_5COONa , CHI_3	1 1 1 1+1
	OR	
25	a)HCHO + HCHO $\xrightarrow{\text{conc NaOH}}$ HCOONa +CH_3OH (or any other example) b)$CH_3CH=N-NHCONH_2$ c) Stronger -I effect of fluorine ,stronger acid less pk_a / strong electron withdrawing power of fluorine. d)$CH_3CH=CHCH_2CHO$ e)Silver mirror formed on adding ammonical silver nitrate to propanal and not with propanone (or any other correct test)	1 1 1 1 1
26.	a) $\Delta T_f = i \frac{K_f w_b \times 1000}{M_b \times w_a}$ $\Delta T_f = 3 \times (1.86 \times 1.9/95 \times 50) \times 1000$ $= 2.23K$ $T_f - \Delta T_{f'} = 273.15 - 2.23 / 273 - 2.23$ $T_{f'} = 270.92$ K or 270.77K b) i)2M glucose ; More Number of particles / less vapour pressure ii)Reverse Osmosis	1 1 1 ½ + ½ 1
	OR	
26	a)	

	$\Delta T_f = \frac{K_f w_b \times 1000}{M_b \times w_a}$	1
	$0.383 = (3.83 \times 2.56/M \times 100) \times 1000$	1
	$M=256$ $S \times x = 256$ $32 \times x = 256$	1
	$x=8$ b)	
	i)Shrinks	1
	ii)swells	1

Name	**Signature**	**Name**	**Signature**
Dr. (Mrs.) Sangeeta Bhatia		Sh. S.K. Munjal	
Dr. K.N. Uppadhya		Sh. D.A. Mishra	
Prof. R.D. Shukla		Sh. Rakesh Dhawan	
Dr. (Mrs.) Sunita Ramrakhiani		Ms. Nirmala Venkateswaran	
Sh. S. Vallabhan, Principal		Mrs. Deepika Arora	
Mr. K.M. Abdul Raheem		Ms. Minakshi Gupta	
Mrs. Sushma Sachdeva		Mrs. Preeti Kiran	
Ms. Seema Bhatnagar		Sh. Mukesh Kaushik	
Sh. Pawan Singh Meena		Mr. Roop Narayan	
Sh. Praveen Kumar Agrawal		Ms. Garima Bhutani	

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Delhi - 2016
Set – 56/1/2/D

Q.No	VALUE POINTS	MARKS
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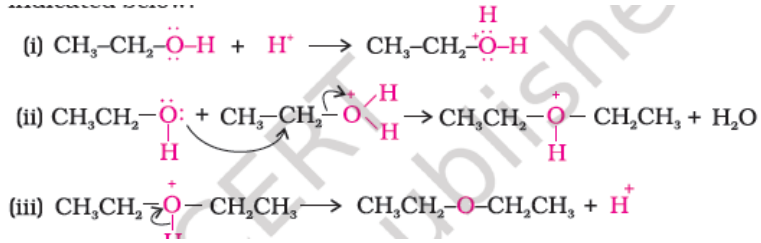
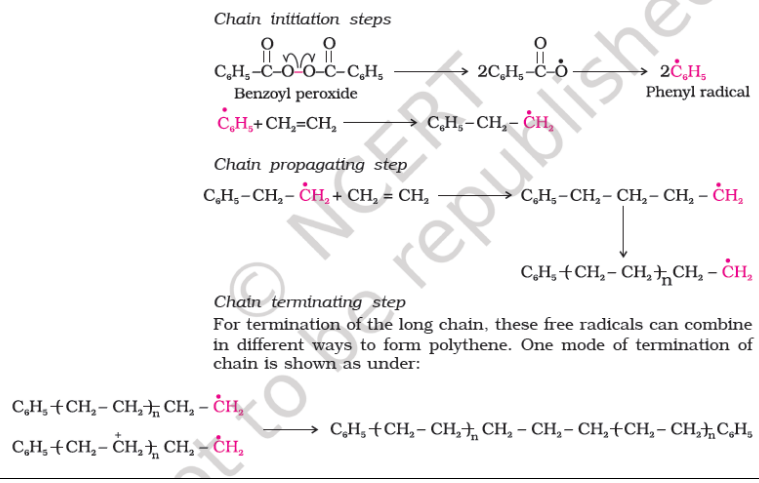
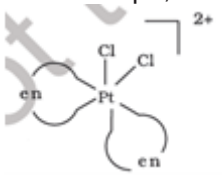
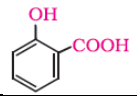
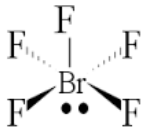
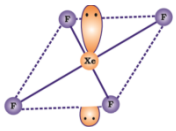
2	Like Charged particles cause repulsion/ Brownian motion/ solvation	1
3	$CH_3CH_2CH(Cl)CH_3$; secondary halide/ 2^0 carbocation is more stable	½, ½
4	NH_3	1
5	Ferromagnetism	1
6	(i) zero order , bimolecular/ unimolecular (ii) mol L^{-1} s^{-1}	½, ½ 1
7		½ 1 ½
8	(i) Mercury cell (ii) Fuel cell (iii) Lead storage battery (iv) Dry cell	½ ½ ½ ½
9	A-Na_2CrO_4 B-$Na_2Cr_2O_7$ C-$K_2Cr_2O_7$ Use- strong oxidising agent / as a primary standard in volumetric analysis	½ ½ ½ ½
	OR	
9	$8MnO_4^- + 3S_2O_3^{2-} + H_2O \longrightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$ $Cr_2O_7^{2-} + 14\ H^+ + 3\ Sn^{2+} \rightarrow 2\ Cr^{3+} + 3\ Sn^{4+} + 7\ H_2O$	1 1

10	(i) $[Cr(H_2O)_5Cl]Cl_2.H_2O$ (ii) pentaaquachloridoChromium(III) chloride monohydrate (or chloride hydrate) (no deduction for not writing hydrate)	1 1
11	**(i)** **Adsorption** | **Absorption** **Surface phenomena** | **Bulk phenomena** **The accumulation of molecular species at the surface rather than in the bulk of a solid or liquid is termed adsorption.** | The substance is uniformly distributed throughout the bulk of the solid essentially a bulk phenomenon. **(any one difference)**	1

	(ii) $AlCl_3$, more positive charge/Hardy-Schulze rule (iii)Sulphur	½ + ½ 1
12	(i) Zone refining (ii) Leaching / Bayer's process (iii) Reducing agent / to form CO which acts as a reducing agent.	1 1 1
13	(i) $E^0_{cell} = E^0_c - E^0_a$ $=(-0.44)-(-0.74)$ V $=0.30$V $E_{cell} = E^0_{cell} - \frac{0.059}{n} \log \frac{[Cr^{3+}]^2}{[Fe^{2+}]^3}$ $E_{cell} = E^0_{cell} - \frac{0.059}{6} \log \frac{[0.01]^2}{[0.1]^3}$ $= 0.30-(-0.059/6)$ $=0.3098$V	 ½ ½ 1 1
14	(i) In chlorobenzene, each carbon atom is sp^2 hybridised / resonating structures / partial double bond character. (ii) Due to +R effect in chlorobenzene/ difference in hybridization i.e. sp^2 and sp^3 respectively/ -I and +R effect oppose each other while –I effect is the only contributing factor in cyclohexane. (iii)Due to formation of planar carbocation/ Carbon in carbocation formed is sp^2 hybridised.	1 1 1
15	2×10^{24} atoms weigh $=300$g 6.022×10^{23} atoms weigh $= (300 \times 6.022 \times 10^{23})/2 \times 10^{24}$ $= 90.3$ g $d = \frac{z \times M}{a^3 N_A}$ $= 4 \times 90.3/(250 \times 10^{-10})^3 \times N_0$ $=38.4$ gcm^{-3} (or any other correct method)	1 ½ + ½ 1
16	$\log k = \log A - E_a/2.303RT$ $E_a / 2.303\ RT = 1.0 \times 10^4$ K/ T $E_a = 1.0 \times 10^4 \times 2.303 \times 8.314$ $=191471.4$ J/mol $t_{1/2} = 0.693/k$ $k = 0.693/200$ min $= 0.0034$min^{-1}	½ 1 ½ 1
17	a. Catalyst / initiator of free radical b. Hexamethylene diamine and adipic acid / structure / IUPAC name	1 ½, ½

	c. Buna-S<polystyrene<Terylene	1
	OR	
17		1 1 1
18	(i) β-D glucose and β-D-galactose / glucose and galactose (ii) water soluble ,excreted out of the body (iii)In nucleotide , phosphoric acid/phosphate group attached to the nucleoside / structures of both nucleotide and nucleoside / nucleotide= base +sugar + phosphate group, nucleoside= base +sugar.	½ , ½ 1 1
19	d^2sp^3 , Paramagnetic, low spin 	1, ½ , ½ 1
20	(i) ability of oxygen to form multiple bond/ pπ-dπ bond. (ii) Partially filled d orbitals / due to comparable energies of ns and (n-1) d orbitals (iii) due to relative stabilities of the f^0, f^7 and f^{14} occupancies of the 5f orbitals/ Comparable energies of 7s,6d,5f orbitals.	1 1 1
21	(i) CH_3OH , $(CH_3)_3C\text{-}I$ (ii) $CH_3CH_2CH_2OH$ (iii) 	1 1 1
22	(i) $C_6H_5NH_2$, $C_6H_5N_2^+Cl^-$, C_6H_5I (ii) CH_3CN, $CH_3CH_2NH_2$, CH_3CH_2NC	½ + ½ + ½ ½ + ½ + ½
23	(i)Aware, concerned or any other correct two values. (ii) Side effects, unknown health problems (iii) Neurologically active drugs/ stress relievers Example- valium, equanil (or any other correct two example)	½ + ½ 1 1 ½ + ½
24	a) $\Delta T_f = i \frac{K_f w_b \times 1000}{M_b \times w_a}$ $\Delta T_f = 3 \times (1.86 \times 1.9/95 \times 50) \times 1000$ $= 2.23K$ $T_f - \Delta T_f = 273.15 - 2.23 / 273 - 2.23$	1 1

	T_f = 270.92 K or 270.77K b) i)2M glucose ; More Number of particles / less vapour pressure ii)Reverse Osmosis	1 ½ + ½ 1
	OR	
24	a) $\Delta T_f = \frac{K_f w_b \times 1000}{M_b \times w_a}$ $0.383 = (3.83 \times 2.56/M \times 100) \times 1000$ M=256 S × x = 256 32× x= 256 x=8 b) i)Shrinks ii)swells	 1 1 1 1 1
25	a) i. Endothermic compound / decomposition of ozone is exothermic in nature and ΔG is negative / decomposition of ozone is spontaneous. ii. Exists as $[PCl_4]^+[PCl_6]^-$ iii. Shows only -1 oxidation state / most electronegative element/ absence of d-orbitals b) i) ii)  	1 1 1 1,1
	OR	
25	(i) F_2 is the stronger oxidising agent than chlorine (a) low enthalpy of dissociation of F-F bond (b) less negative electron gain enthalpy of F (c) high hydration enthalpy of F^- ion ii) low temperature, high pressure and presence of catalyst iii) a) $H_3PO_4 < H_3PO_3 < H_3PO_2$ b) $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$	½ ×4=2 1 1 1

26	A -$C_6H_5COCH_3$ B-$C_6H_5\,CH_2\,CH_3$ C-C_6H_5COOH D ,E -C_6H_5COONa , CHI_3	1 1 1 1+1
	OR	
26	a)HCHO + HCHO $\xrightarrow{\text{conc. NaOH}}$ HCOONa +CH_3OH (or any other example) b)$CH_3CH{=}N\text{-}NHCONH_2$ c) Stronger -I effect of fluorine ,stronger acid less pk_a / strong electron withdrawing power of fluorine. d)$CH_3CH{=}CHCH_2\,CHO$ e)Silver mirror formed on adding ammonical silver nitrate to propanal and not with propanone (or any other correct test)	1 1 1 1 1

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6	(i) $[Cr(H_2O)_5Cl]Cl_2.H_2O$ (ii) pentaaquachloridoChromium(III) chloride monohydrate (or chloride hydrate) (no deduction for not writing hydrate)	1 1
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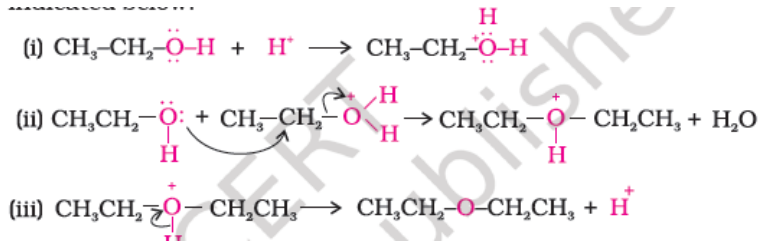
8	$8MnO_4^- + 3S_2O_3^{2-} + H_2O \longrightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$ $Cr_2O_7^{2-} + 14\ H^+ + 3\ Sn^{2+} \rightarrow 2\ Cr^{3+} + 3\ Sn^{4+} + 7\ H_2O$	1 1

9	 (i) $CH_3–CH_2–\ddot{O}–H + H^+ \longrightarrow CH_3–CH_2–\overset{+}{\ddot{O}}(H)–H$ (ii) $CH_3CH_2–\ddot{O}(H)–H + CH_3–CH_2–\overset{+}{O}(H)_2 \rightarrow CH_3CH_2–\overset{+}{O}(H)–CH_2CH_3 + H_2O$ (iii) $CH_3CH_2–\overset{+}{O}(H)–CH_2CH_3 \longrightarrow CH_3CH_2–O–CH_2CH_3 + H^+$	½ 1 ½
10	(i) zero order , bimolecular/ unimolecular (ii) mol L^{-1} s^{-1}	½, ½ 1
11	$\log k = \log A - E_a/2.303RT$ $E_a / 2.303\ RT = 1.0 \times 10^4\ K/T$ $E_a = 1.0 \times 10^4 \times 2.303 \times 8.314$ $= 191471.4$ J/mol $t_{1/2} = 0.693/k$ $k = 0.693/200$ min $= 0.0034 min^{-1}$	½ 1 ½ 1

12	(i) **Adsorption** / **Surface phenomena**: **The accumulation of molecular species at the surface rather than in the bulk of a solid or liquid is termed adsorption.** **Absorption** / **Bulk phenomena**: The substance is uniformly distributed throughout the bulk of the solid essentially a bulk phenomenon. **(any one difference)** (ii) $AlCl_3$, more positive charge/Hardy-Schulze rule (iii)Sulphur	1 ½ + ½ 1
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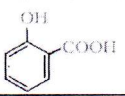
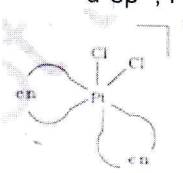
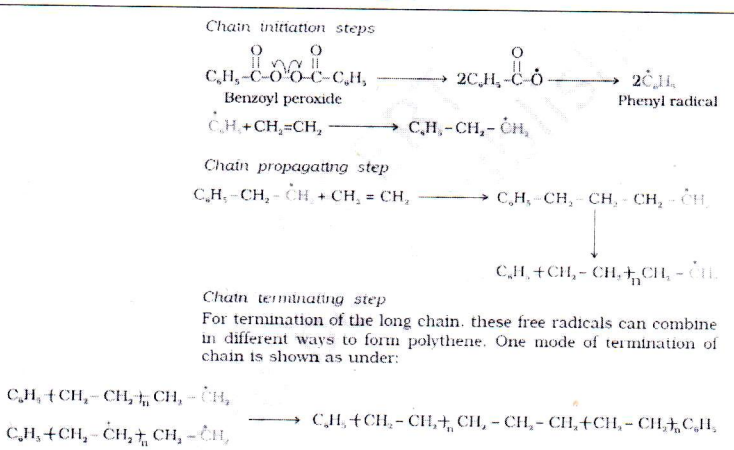
15	(i) ability of oxygen to form multiple bond/ pπ-dπ bond. (ii) Partially filled d orbitals / due to comparable energies of ns and (n-1) d orbitals (iii) due to relative stabilities of the f^0, f^7 and f^{14} occupancies of the 5f orbitals/ Comparable energies of 7s,6d,5f orbitals.	1 1 1
16	(i) CH_3OH , $(CH_3)_3C\text{-}I$ (ii) $CH_3CH_2CH_2OH$ (iii) 	1 1 1
17	(i) Zone refining (ii) Leaching / Bayer's process (iii) Reducing agent / to form CO which acts as a reducing agent.	1 1 1
18	(i) $E^0_{cell} = E^0_c - E^0_a$ =(-0.44)-(-0.74) V =0.30V	½

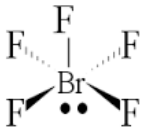
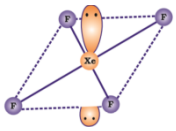
	$E_{cell} = E^0_{cell} - \frac{0.059}{n} \log \frac{[Cr^{3+}]^2}{[Fe^{3+}]^3}$ $E_{cell} = E^0_{cell} - \frac{0.059}{6} \log \frac{[0.01]^2}{[0.1]^3}$ $= 0.30-(-0.059/6)$ $=0.3098V$	½ 1 1
19	(i) β-D glucose and β-D-galactose / glucose and galactose (ii) water soluble ,excreted out of the body (iii)In nucleotide , phosphoric acid/phosphate group attached to the nucleoside / structures of both nucleotide and nucleoside / nucleotide= base +sugar + phosphate group, nucleoside= base +sugar.	½ , ½ 1 1
20	d^2sp^3 , Paramagnetic, low spin 	1, ½ , ½ 1
21	(i) $C_6H_5NH_2$, $C_6H_5N_2^+Cl^-$, C_6H_5I (ii) CH_3CN, $CH_3CH_2NH_2$, CH_3CH_2NC	½ + ½ + ½ ½ + ½ + ½
22	a. Catalyst / initiator of free radical b. Hexamethylene diamine and adipic acid / structure / IUPAC name c. Buna-S<polystyrene<Terylene	1 ½, ½ 1
	OR	
22	 *Chain initiation steps* Benzoyl peroxide → Phenyl radical *Chain propagating step* *Chain terminating step* For termination of the long chain. these free radicals can combine in different ways to form polythene. One mode of termination of chain is shown as under:	1 1 1

23	(i)Aware, concerned or any other correct two values. (ii) Side effects, unknown health problems (iii) Neurologically active drugs/ stress relievers Example- valium, equanil (or any other correct two example)	½ + ½ 1 1 ½ + ½
24	A -$C_6H_5COCH_3$ B-$C_6H_5CH_2CH_3$ C-C_6H_5COOH	1 1 1

	D ,E -C_6H_5COONa , CHI_3	1+1
	OR	
24	a)HCHO + HCHO $\xrightarrow{\text{conc NaOH}}$ HCOONa +CH_3OH (or any other example) b)$CH_3CH=N-NHCONH_2$ c) Stronger -I effect of fluorine ,stronger acid less pk_a / strong electron withdrawing power of fluorine. d)$CH_3CH=CHCH_2CHO$ e)Silver mirror formed on adding ammonical silver nitrate to propanal and not with propanone (or any other correct test)	1 1 1 1 1

25	a) $\Delta T_f = i \frac{K_f w_b \times 1000}{M_b \times w_a}$ $\Delta T_f = 3 \times (1.86 \times 1.9/95 \times 50) \times 1000$ $= 2.23K$ $T_f - \Delta T_{f'} = 273.15 - 2.23 / 273 - 2.23$ $T_{f'} = 270.92$ K or 270.77K b) i)2M glucose ; More Number of particles / less vapour pressure ii)Reverse Osmosis	1 1 1 ½ + ½ 1
	OR	
	a) $\Delta T_f = \frac{K_f w_b \times 1000}{M_b \times w_a}$ $0.383 = (3.83 \times 2.56/M \times 100) \times 1000$ $M=256$ $S \times x = 256$ $32 \times x = 256$ $x=8$ b) i)Shrinks ii)swells	 1 1 1 1 1

26	a) i. Endothermic compound / decomposition of ozone is exothermic in nature and ΔG is negative / decomposition of ozone is spontaneous.	1

	ii. Exists as $[PCl_4]^+[PCl_6]^-$ iii. Shows only -1 oxidation state / most electronegative element/ absence of d-orbitals b) i) ii)  	1 1 1,1
	OR	
26	(i) F_2 is the stronger oxidising agent than chlorine (a) low enthalpy of dissociation of F-F bond (b) less negative electron gain enthalpy of F (c) high hydration enthalpy of F^- ion ii) low temperature, high pressure and presence of catalyst iii) a) $H_3PO_4 < H_3PO_3 < H_3PO_2$ b) $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$	½ ×4=2 1 1 1