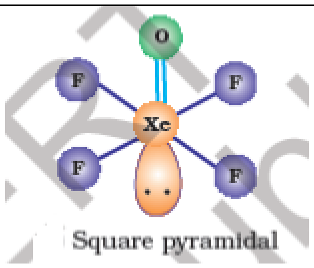
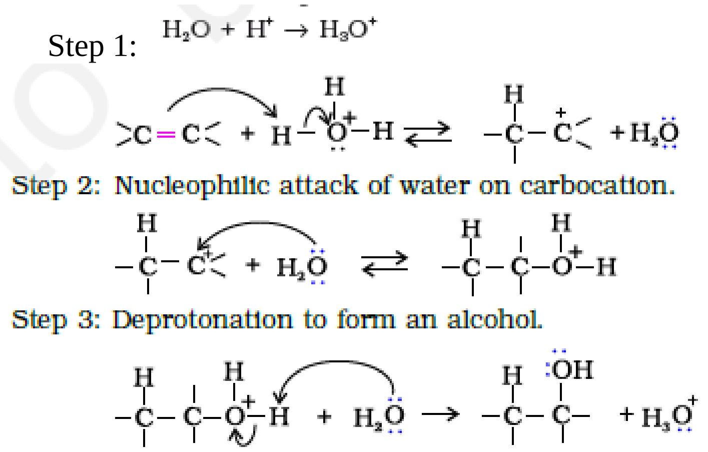
CHEMISTRY MARKING SCHEME 2015
BLIND
SET -56/B

<table>
<tr><th>Ques.</th><th>Value points</th><th>Marks</th></tr>
<tr><td>1</td><td>With increase in temperature extent of adsorption decreases.</td><td>1</td></tr>
<tr><td>2</td><td>

(Either name or structure)</td><td>1</td></tr>
<tr><td>3</td><td>Phosphorus is already in its highest oxidation state (+5) in H_3PO_4 whereas in H_3PO_3 , phosphorus is in its intermediate oxidation state, can be oxidized as well as reduced.</td><td>1</td></tr>
<tr><td>4</td><td>Because of non- involvement of d electrons / Due to small splitting energy gap, electrons are not forced to pairup.</td><td>1</td></tr>
<tr><td>5</td><td>Diazotization</td><td>1</td></tr>
<tr><td>6</td><td>Cationic vacancies are formed/ non-stoichiometric defect/ Impurity defect.</td><td>2</td></tr>
<tr><td>7</td><td>Density = $\frac{MZ}{a^3 N_A}$
$a^3 = \frac{MZ}{\rho N_A}$
$= \frac{99\ g\ mol^{-1} \times 4}{3.4\ g\ cm^{3} \times 6.023 \times 10^{23} mol^{-1}}$
$= 1213.4 \times 10^{-23}\ cm^3$
$a = 5.78 \times 10^{-8}$ cm
OR</td><td>½
½
1</td></tr>
<tr><td>7</td><td><table>
<tr><th>Insulators</th><th>Semiconductors</th></tr>
<tr><td>1. Large energy gap occurs between valence band and conduction band</td><td>Small energy gap occurs between valence band and conduction band</td></tr>
<tr><td>2.Temperature has no effect.</td><td>Conduction increases with temperature.</td></tr>
</table></td><td>1,1</td></tr>
<tr><td>8</td><td>$K_4[Fe(CN)_6] \longrightarrow 4 K^+ + [Fe(CN)_6]^{4-}$
Initial Conc. 1 0 0
Conc. After dissociation $1 - \alpha$ 4α α
Total no.of moles after dissociation = $1- \alpha + 4 \alpha + \alpha = 1 + 4 \alpha$
Van't Hoff's factor = $\frac{\text{No. of moles after dissociation}}{\text{No. of moles before dissociation}}$
$i = (1 + 4 \alpha) / 1 = 1 + 4 \alpha$
$\alpha = 50 / 100 = 0.5$
$i = 1 + 4 \times 0.5 = 3.0$</td><td>½
½
½
½</td></tr>
<tr><td>9</td><td>(a)Saline water contains many electrolytes which favour formation of more no. of electrochemical cells.
(b) Mg acts as sacrificial anode / Mg is more reactive than iron/ cathodic protection/ Mg prevents</td><td>1
1</td></tr>
</table>

	the oxidation of steel..	
10	Sulphur; Due to small size and greater inter electronic repulsions in oxygen.	**1,1**
11	Molality of the solution ,m = Moles of solute / Mass of solvent in Kg $= \frac{5/342}{95/1000}$ $\Delta T_f = K_f\, m$; $K_f = \Delta T_f / m$ $K_f = \frac{(273.15 - 271)K \times 95 \times 342}{5 \times 1000}$ $K_f = 13.97\ K\ kg\ mol^{-1}$ Molality of the glucose = (5/180) / (95 / 1000) $\Delta T_f = K_f\, m$ = (13.97 x 5000) / (95 x 180) = 4.08 K f.p of glucose = 273.15 – 4.08 = 269. 07 K (or by any other method)	½ ½ ½ ½ ½ ½
12	$E_{cell} = E^o_{cell} - \frac{0.0591}{n} V \log\frac{[Mg^{2+}]}{[Cu^{2+}]}$ = 2.71 – (0.0591/2) V log(0.1/ 0.01) = 2.71 – 0.02955 V log (10) = 2.71 – 0.0295 = 2.684 V If the conc. of Mg^{2+} ions increases, E_{cell} deceases If the conc. of Cu^{2+} ions increases, E_{cell} increases	**1** **1** ½ ½
13	(a)Depending upon size of the particles. (b)It causes coagulation of the colloidal particles of cloud. © The colloidal particles of clay get coagulated by the ions of the electrolytes.	**1** **1** **1**
14	(a)The impurities are more soluble in the melt than in solid state of the metal, eg., Germanium/Silicon. (b)Low melting metals with high melting impurities are heated, and made to flow on sloping surface. eg-Tin, lead OR	**1, ½** **1, ½**
14	Calcination: Heating of concentrated ore in limited supply or absence of air or oxygen Eg., $ZnCO_3(s) \xrightarrow{Heat} ZnO(s) + CO_2(g)$ Roasting : Heating of concentrated ore in presence of air or oxygen Eg., $2ZnS(s) + 3O_2(g) \xrightarrow{heat} 2ZnO(s) + 2SO_2(g)$ (or any other correct example)	**1** ½ **1** ½
15	(a)Because O-H bond is stronger than S-H bond / Due to strong H-bonding in water. (b)Bi^{+3} more stable due to inert pair effect, so Bi^{+5} gets reduced to +3 state. © Due to its affinity for water .	**1** **1** **1**
16	(a) 5 (b) $[Co(NH_3)_6]_2(SO_4)_3$, octahedral. (c) It forms a Copper complex, not having free Cu^{+2} ions	**1** ½ , ½ **1**
17	(a) Due to resonance the C-Cl bond develops double bond character / The C in Chlorobenzene is in sp^2 hybridised state but it is in sp^3 state in chloromethane (b) $(CH_3)_2CHCl < CH_3CH_2Cl < CH_3Cl < CH_3Br$ (c) 1-Chloro-6-methylcyclohexene	**1** **1** **1**

18	$(CH_3CO)_2O \xrightarrow{C_2H_5OH} CH_3COOH + CH_3COOC_2H_5$ A B C $CH_3COOC_2H_5 \xrightarrow{H2O / H+} CH_3COOH + C_2H_5OH$ D $CH_3COOH \xrightarrow{Ca(OH)2 / Heat} CH_3COCH_3$ E (Note: award full marks if the identification of the compounds is correct)	**1** **1** **1**
19	(a) (i) $2CH_3CHO \xrightarrow{dil\ NaOH} CH_3CH(OH)CH_2CHO$ (ii) $R_2C{=}O + 4(H) \xrightarrow{Zn\text{-}Hg/\ Conc.HCl} R_2CH_2 + H_2$ (b) $CH_3CH_2CH_3 < CH_3CHO < CH_3CH_2OH$	**1** **1** **1**
20	(a) (i) Due to resonance in the benzene ring the lone pair of nitrogen gets delocalized in aniline (ii) Methylamine forms water soluble complex with Ag^+ ions (b) $NH_3 < R_3N < RNH_2 < R_2NH$	**1** **1** **1**
21	(a) $H_3N^+\text{-}CH_2\text{-}COO^-$ (b) $COOH\text{-}(CHOH)_4\text{-}COOH$ (c) Denaturation of albumin occurs , water soluble globular protein gets converted to water insoluble fibrous protein which absorbs the water.	**1** **1** **1**
22	(a) Buna-S < Polythene < Nylon-66 (b) $CH_2{=}CH\text{-}CH{=}CH_2$ and $C_6H_5CH{=}CH_2$ (either name or structure) (c) Thermoplastic polymer	**1** **½ , ½** **1**
23	(a) Synthetic detergents work even in hard water (b) $2C_{17}H_{35}COONa + Ca^{2+}(aq) \longrightarrow (C_{17}H_{35}COO)_2Ca\ (s) + 2\ Na^+(aq)$ (or any other correct reaction of soap) (c) General awareness, use of knowledge of chemistry, helping,caring, social concern.	**1** **1** **2**
24	(a)(i) First order (ii) Due to low atmospheric pressure, water boils at low temperature. (iii) $k = Ae^{-Ea/RT}$, if $E_a = 0$ then $k = A$, so the rate constant does not depend on temperature. (b)Rate(R) = $k[A][B]^2$ (i)Rate(R_1) = $k[A][B]^2$ (R_1) = 9R, so the rate increases 9 times. (ii) $R_2 = k[A][B]^2$ R_2 = 8R , rate increases 8 times	**1** **1** **1** **½** **½** **1**
	OR	
24	(a) (i)Rate = $k(x)^n$; 3Rate = $k(27x)^n$ Solving the two n = 1/3 , so order of reaction = 1/3 (ii)Rate = $k[A]^0[B]^0 = k$ (iii)The activation energy for combustion of fuels is generally very high, and not achieved at room temperature. (b) $t = \frac{2.303}{k} \log \frac{[R_0]}{[R]}$ $t_{3/4} = \frac{2.303.}{2.54 \times 10^{-3}} \log \frac{[R_0]}{¼[R_0]}$ $= \frac{2.303}{2.54 \times 10^{-3}} \log 4$ $= 5.46 \times 10^2$ s	**1** **1** **1** **½** **½** **1**

25	a) $2MnO_2 + 4KOH + O_2 \xrightarrow{\text{Fusion}} 2K_2MnO_4 + 2H_2O$ (A) (B) $2K_2MnO_4 + H_2O + (O) \longrightarrow 2KMnO_4 + 2\ KOH$ (C) $3MnO_4^{2-} + 4H^+ \longrightarrow 2\ MnO_4^- + MnO_2 + 2H_2O$ (award full marks for identification only) (b)(i)Electronic configuration of M = (Ar) $3d^7 4s^2$ Magnetic moment of $M^{2+} = \sqrt{n(n+2)} = \sqrt{3(3+2)} = 3.87$ BM (ii) Metal-metal interactions are strong in Cr due to large no of unpaired d-orbital electrons, but in Hg no unpaired d-orbital electrons hence metal-metal interactions are weak. OR	1 1 1 1 1
25	(a) Cr^{2+} changes to Cr^{3+} with stable t_{2g}^3 configuration, but Mn^{3+} changes to Mn^{2+} with stable Half filled d^5 configuration. (b) Mn^{2+} with d^5 stable configuration has high third I.E , whereas Fe^{2+} with d^6 configuration loses electron easily / Mn^{2+} is more stable than Mn^{3+} whereas Fe^{3+} is more stable than Fe^{2+}. (c) Dichromate ion and chromate ion are interconvertible with change in pH / $Cr_2O_7^{2-} + H_2O \longleftrightarrow 2\ CrO_4^{2-} + 2H^+$ Orange Yellow pH< 7 pH > 7 (d) This is due to relatively poor shielding effect of 5f electrons as compared to 4f. (e) Ti (III) is less stable than Ti (IV) is more stable .	1 1 1 1 1
26	a) Step 1:  b) i) $C_6H_5OH \xrightarrow{\text{Zn dust / Heat}} C_6H_6 \xrightarrow{CH_3Cl\ /\ \text{Anhy}\ AlCl_3} C_6H_5CH_3$ ii) $C_6H_5NH_2 \xrightarrow[0\text{-}5\ ^0C]{NaNO_2+HCl} C_6H_5N_2Cl \xrightarrow{H_2O\ /\ H^+} C_6H_5OH$ (or by any other correct method) c) 2-bromo-3-methylbut-2-en-1-ol	1 ½ ½ 1 1 1

26.	**OR**	
	a) (i) Due to electron withdrawing effect of $-NO_2$ group	1
	(ii) Due to resonance, C-O bond in phenol acquires a partial double bond character. In ethanol, resonance is not possible / carbon in phenol is sp^2 hybridised whereas in ethanol it is sp^3 hybridised.	1
	b) i) Add neutral $FeCl_3$ to both the compounds. Phenol gives violet complex whereas ethanol does not.	1
	ii) Heat both the compounds with I_2 and NaOH . Propan-2-ol gives yellow ppt of iodoform whereas methanol does not. (or any other correct distinguishing test)	1
	c) 3-Phenoxyheptane	1

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