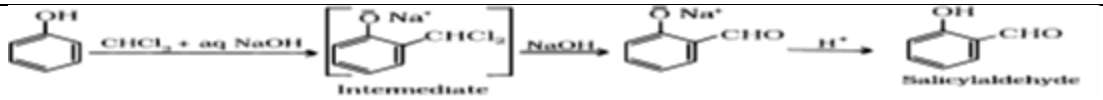
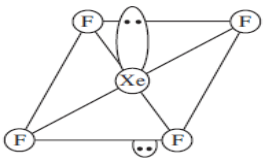
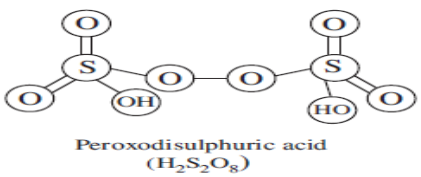
COMMON PRE-BOARD EXAMINATION 2017-2018

CHEMISTRY- CLASS XII
ANSWER KEY - SET – 3-VALUE POINTS

1	2-Bromobutane	1
2	The unequal bombardment of colloidal particles by the molecules of dispersion medium	1
3	The energy gap between valance band and conduction is known as forbidden zone.	1
4		1
5	NO_2 contains odd number of electrons, on dimerization it is converted into stable N_2O_4 molecules with even no. of electrons.	
6	i)The solutions which obey Raoult's law over the entire range of concentration are known as *ideal solutions*. ii) **Azeotropes** which are binary mixtures having the same composition in liquid and vapour phase and boil at a constant temperature	1 1
7	a) The reaction that takes place in a single step. b) Second order OR $\text{Rate} = k[R]^2$ (*i*) If [*R*] is doubled, $\text{Rate} = k[2R]^2 = 4k[R]^2 = 4$ times (*ii*) If [*R*] is reduced to $\frac{[R]}{2}$, $\text{Rate} = k\left[\frac{R}{2}\right]^2 = \frac{1}{4}k[R]^2 = \frac{1}{4}$th	1 1 ½ ½ 1
8	a) The ligand that can ligate through either of its donor atom (CN^-) b)$[Pt(NH_3)BrCl(NO_2)]^-$	1 1
9	a)  b) 	1 1

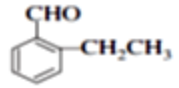
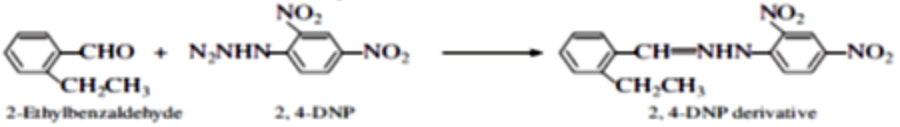
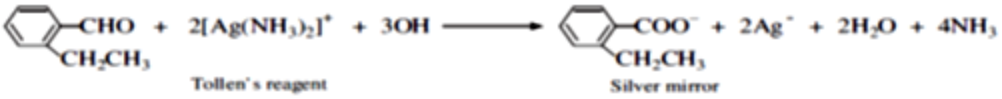
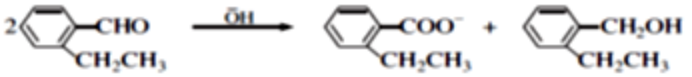
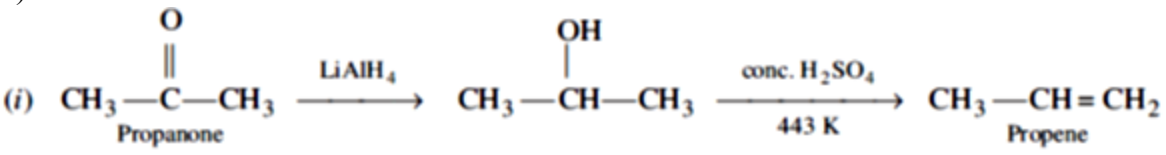
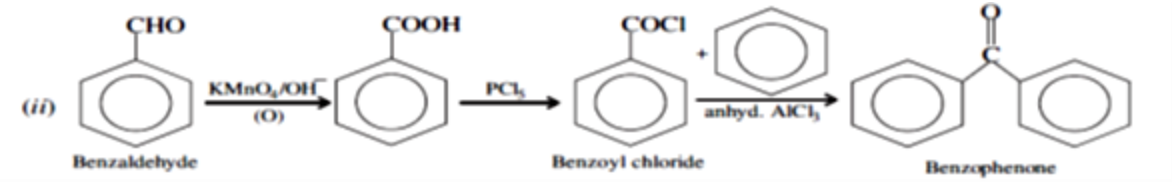
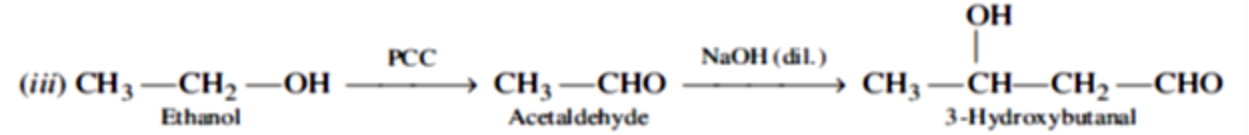
10	a) Heat with chloroform and KOH- methylamine gives foul smell With Hinseberg's reagent methylamine gives ppt soluble in alkali. b) **Intermolecular association is more in primary and secondary amines as there are hydrogen atoms available for hydrogen bond formation.** Tertiary amines do not have intermolecular association due to the absence of hydrogen atom available for hydrogen bond formation	1 1
11	For *fcc*, $a = 2\sqrt{2}r$ $\therefore \quad a = 2\sqrt{2} \times 127.8 \text{ pm} = 361.4 \text{ pm} = 361.4 \times 10^{-10} \text{ cm}$ Here, $z = 4$; $M = 63.55 \text{ g mol}^{-1}$; $a = 3.614 \times 10^{-8} \text{ cm}$; $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ Substituting the values in the expression, $d = \frac{z \times M}{a^3 \times N_A}$, we get $d = \frac{4 \times 63.55 \text{ g mol}^{-1}}{(3.614 \times 10^{-8} \text{ cm})^3 \times 6.02 \times 10^{23} \text{ mol}^{-1}} = 8.95 \text{ g cm}^{-3}$	½ ½ ½ ½ 1
12	$i = 2$, Substituting these values in the expression, $W_B = \frac{\Delta T_f \times M_B \times W_A}{i \times K_f \times 1000}$ $W_B = \frac{2 \text{ K} \times 74.5 \text{ g mol}^{-1} \times 1000 \text{ g}}{2 \times 1.86 \text{ K kg mol}^{-1} \times 1000 \text{ g kg}^{-1}} = 40.05 \text{ g}$	½ ½ 2
13	*i*) Scattering of light by the colloidal particles takes place and the path of light becomes visible (Tyndall effect). (*ii*) The positively charged colloidal particles of $Fe(OH)_3$ get coagulated by the oppositely charged Cl^- ions provided by NaCl. (*iii*) On passing direct current, colloidal particles move towards the oppositely charged electrode (Electrophoresis)	1 1 1

14	$t_{1/2} = 5730$ years $\therefore \quad K = \frac{0.693}{t_{1/2}} = \frac{0.693}{5730} = 1.209 \times 10^{-4}$ year^{-1} $t = \frac{2.303}{K} \log \frac{[R]_0}{[R]} = \frac{2.303}{1.2 \times 10^{-4}} \log \frac{100}{80}$ $t = \frac{2.303 \times 10^4}{1.209} (\log 10 - \log 8) = \frac{2.303 \times 10^4}{1.209} (1 - 3 \log 2)$ $t = \frac{2.303}{1.209} \times 10^4 \, (1 - 3 \times 0.3010) = \frac{2.303 \times 0.097 \times 10^4}{1.209}$ $t = 1847.7$ years (Accept 1845 years)	*1* *½* *½* *1*
15	a) The ore is leached with a dilute solution of NaCN or KCN in the presence of air, where the metal dissolves by forming a complex. $4Au + 8CN^- + 2H_2O + O_2 \rightarrow 4[Au(CN)_2]^- + 4OH^-$ From the solution the metal is recovered by displacement $2[Au(CN)_2]^- + Zn \rightarrow [Zn(CN)_4]^{2-} + 2Au$ b) Copper is extracted by hydrometallurgy from low grade ores. It is leached out using acid or bacteria. The solution containing Cu^{2+} is treated with scrap iron or H_2. $Cu^{2+} + H_2 \rightarrow Cu + 2H^+$ (*ii*) SiO_2 is added to copper matte to remove FeO (into slag) $FeO + SiO_2 \rightarrow FeSiO_3$ (Slag) (*iii*) Iodine is heated with impure Zr to form volatile compound which on further heating decomposes to give pure zirconium. Zr (Impure) $+ 2I_2 \rightarrow ZrI_4 \rightarrow$ Zr (pure) $+ 2I_2$	*½* *1* *½* *½* *½* *½* *½* *½* *½*
16	a) i) CH_3Cl, CH_3Br, CH_2Br_2, $CHBr_3$ ii) $(C_6H_5)_2C(CH_3)Br$, $(C_6H_5)_2CHBr$, $C_6H_5CH(CH_3)Br$, $C_6H_5CH_2Br$ **b)** Oxidation of $CHCl_3$ in the presence of light gives poisonous gas phosgene (carbonyl chloride). $2CHCl_3 + O_2 \xrightarrow{\text{Light}} \underset{\text{phosgene}}{2COCl_2} + 2HCl$	*1* *1* *½* *½*

17	a) (i) $CH_3–CH_2–\ddot{O}–H + H^+ \longrightarrow CH_3–CH_2–\overset{H}{\overset{|}{\overset{+}{O}}}–H$ (ii) $CH_3CH_2–\ddot{O}: + CH_3–CH_2–\overset{+}{O}\begin{matrix}H\\H\end{matrix} \longrightarrow CH_3CH_2–\overset{+}{\underset{H}{O}}–CH_2CH_3 + H_2O$ (iii) $CH_3CH_2–\overset{+}{\underset{H}{O}}–CH_2CH_3 \longrightarrow CH_3CH_2–O–CH_2CH_3 + H^+$ b) $CH_3CH_2Br + CH_3CH_2ONa \longrightarrow CH_3CH_2OCH_2CH_3 + NaBr$ (or any other example	½ 1 ½ 1
18	a) (i) $6NaOH + 3Cl_2 \longrightarrow 5NaCl + NaClO_3 + 3H_2O$ (hot and conc) (ii) $XeF_4 + O_2F_2 \longrightarrow XeF_6 + O_2$ b) In vapour phase sulphur partly exists as S_2 molecules and has 2 unpaired electrons in antibonding π^*orbitals.	1 1 1
19	A= $[Ni(NH_3)_6]^{2+}$ B= $[Ni(NH_3)_4(en)]^{2+}$ C= $[Ni(NH_3)_2(en)_2]^{2+}$ D = $[Ni(en)_3]^{2+}$ Each ½ mark C= Diamminebis(ethane-1,2-diamine)Nickel(II)---1	
20	(i) $R–\overset{O}{\overset{\|}{C}}–NH_2 \xrightarrow[H_2O]{LiAlH_4} R–CH_2–NH_2$ (1° amine) (ii) Benzene diazonium chloride + $H_3PO_2 + H_2O \longrightarrow$ Benzene + $N_2 + H_3PO_3 + HCl$ Aniline + $3Br_2(aq) \longrightarrow$ 2, 4, 6 – Tribromo aniline + 3HBr	1 1 1
21	(i)Structural differences 1. In DNA molecules, the sugar moiety is β-D-2-deoxyribose whereas in RNA molecule, it is β-D-ribose. 2. DNA contains four bases viz. adenine (A), guanine (G), cytosine (C) and thymine (T). RNA also contains four bases, the first three bases are same as in DNA but the fourth one is uracil (U).	1

	3. DNA has double strand helix structure but in secondary structure of RNA, only single stranded. **Functional differences** DNA is exclusively responsible for maintaining the identity of different species of organisms over millionsof years. The proteins are synthesised by various RNA molecules **Any two each ½ mark=1** ii) Xerophalmia , souces; fish liver oil, carrots, butter and milk(any one) ---1/2+1/2=1 iii) α-D-Glucose and β-D- fructose--1	
22	**i)** $CH_2=CHCl$ **ii)** $n\ H_2N(CH_2)_6NH_2 + n\ HOOC(CH_2)_4COOH$ **iii)** $n\ CH_2=CH-CH=CH_2 + n\ CH_2=\underset{\displaystyle CN}{\underset{\vert}{C}}H$ 1,3-Butadiene Acrylonitrile	*1* *1* *1*
23	**i)** Caring/ helping the people ii) Tranquilizers example: valium / barbiturates/ **chlorodiazepoxide** or any other example---1/2 + ½ iii) **Dettol** is a mixture of **Chloroxylenol** and **Terpinol-----1** **iv)** Antibiotics which kill or inhibit the growth of Gram-positive or Gram-negative bacteria are cal **narrow spectrum antibiotics----------1**	*1*
24	**a)** The lead storage battery is a secondary cell The cell reactions when the battery is in use are given below At anode : $Pb(s) + SO_4^{2-}(aq) \longrightarrow PbSO_4(s) + 2e^-$ At cathode : $PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \longrightarrow PbSO_4(s) + 2H_2O(l)$ Overall cell reaction : $Pb(s) + PbO_2(s) + 2H_2SO_4(aq) \longrightarrow 2PbSO_4(s) + 2H_2O(l)$ **b) Zn(s)/ Zn^{2+}(aq) //Ag^+(aq) /Ag(s)** **i) Zn is negatively charged** ii) Cathode : $2Ag^+(aq) + 2e^- \longrightarrow 2Ag(s)$ Anode: $Zn(s) \longrightarrow Zn^{2+} + 2e^-$	½ ½ ½ ½ *1* ½ ½

	OR **a) Conductivity:** It is the conductance of one unit volume of solution kept between two platinum electrodes with unit area of cross section and at a distance of unit length. Molar conductivity: It can be defined as the conductance of the electrolytic solution kept between the electrodes of a conductivity cell at unit distance but having area of cross section large enough to accommodate sufficient volume of solution that contains one mole of the electrolyte. Conductivity decreases with decrease in concentration both, for weak and strong electrolytes but molar conductivity increases with decrease in concentration. b) Galvanic cells that are designed to convert the energy of combustion of fuels like hydrogen, methane, methanol, etc. directly into electrical energy are called **fuel cells.** Cathode: $O_2(g) + 2H_2O(l) + 4e^- \longrightarrow 4OH^-(aq)$ Anode: $2H_2(g) + 4OH^-(aq) \longrightarrow 4H_2O(l) + 4e^-$	*1* *1* *1* *½+1/2* 1 *½* *1/2*
25	**a)** **i)** This is due to comparable energy between 5*f*, 6*d* and 7s orbitals in the actinoid series. ii) Cr^{2+} is reducing as its configuration changes from d^4 to d^3, a more stable half-filled t_2g3 configuration while Mn3+ is oxidising as Mn^{3+} to Mn^{2+}results a more stable half-filled d^5 configuration. iii) Because of their ability to form variable oxidation states and to form complexes. b) i) $2MnO_4^- + 5NO_2^- + 6H^+ \longrightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$ ii) $Cr_2O_7^{2-} + 2OH^- \longrightarrow 2CrO_4^{2-} + H_2O$ [corrected balanced equation I mark each. Unbalanced but correct products ½ mark each] OR a) i) The decrease in metallic radius coupled with increase **b)** A— MnO_2 /Manganese dioxide B--- K_2MnO_4/ potassium manganate C--- $KMnO_4$ / potassium permanganate---each ½ mark $2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$---- 1/2 Potassium manganate. $3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^- + MnO_2 + 2H_2O$ ---- 1/2	*1* *1* *1* *1* *1* *1* *1*

	Disproportionation----- 1/2	
26	**a)** **i)** carboxyl group is deactivating and the catalyst aluminium chloride (Lewis acid) gets bonded to the carboxyl group.	*1*
	ii) Due to presence of three methyl groups, the nucleophilic attack does not occur due to steric hindrance in 2, 4, 6-trimethyl cylcohexanone.	*1*
	(*b*) The compound is  2-ethyl benzaldehyde	*1*
	The reactions involved in the question are:  2-Ethylbenzaldehyde 2, 4-DNP 2, 4-DNP derivative  Tollen's reagent Silver mirror 	
	$C_9H_{10}O + (O) \longrightarrow C_6H_5COOH$ 4 reactions each ½ mark(Only main product enough)	
	OR	
	a) i) Add NaOH and iodine ethanol gives yellow ppt	*1*
	ii) Add Sodium bicarbonate/ sodium carbonate benzoic acid give effervescence.	*1*
	b)  Propanone Propene	*1*
	 Benzaldehyde Benzoyl chloride Benzophenone	*1*
	 Ethanol Acetaldehyde 3-Hydroxybutanal	*1*