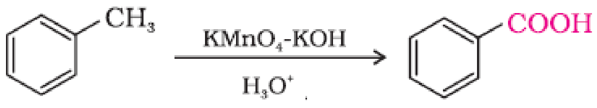
# Marking Scheme – 2017-18

# CHEMISTRY (043)/ CLASS XII

# 56/1

| Q.No | Value Points | Marks |
|---|---|---|
| 1 | Shows metal deficiency defect / It is a mixture of $Fe^{2+}$ and $Fe^{3+}$/Some $Fe^{2+}$ ions are replaced by $Fe^{3+}$ / Some of the ferrous ions get oxidised to ferric ions. | 1 |
| 2 | Selectivity of a catalyst | 1 |
| 3 | Coordination Number = 6 , Oxidation State = +2 | ½, ½ |
| 4 | Benzyl chloride ;<br>Due to resonance, stable benzyl carbocation is formed. | ½<br>½ |
| 5 | 3,3 - Dimethylpentan-2-ol | 1 |
| 6 | $\Delta T_f = K_f\, m$<br>$= K_f \frac{w_2 \times 1000}{M_2 \times w_1}$<br>$= \frac{1.86 \times 60 \times 1000}{180 \times 250}$<br>$= 2.48\ K$<br>$\Delta T_f = T_f^{o} - T_f$<br>$2.48 = 273.15 - T_f$<br>$T_f =$ 270.67 K / 270.52 K / - 2.48 °C | ½<br><br>½<br>½<br><br><br>½ |
| 7 | $\boldsymbol{Rate} = \frac{1}{4}\frac{\Delta(NO2)}{\Delta(t)} = -\frac{1}{2}\frac{\Delta(N_2O_5)}{\Delta(t)}$<br>$\frac{1}{4}(2.8 \times 10^{-3}) = -\frac{1}{2}\frac{\Delta(N_2O_5)}{\Delta(t)}$<br>Rate of disappearance of $N_2O_5$ $\left(-\frac{\Delta(N_2O_5)}{\Delta(t)}\right) = 1.4 \times 10^{-3}$ M/s<br>(Deduct half mark if unit is wrong or not written) | ½<br>½<br>1 |
| 8 | (a)$PH_3$<br>(b)$NH_3$<br>(c)$NH_3$<br>(d)$BiH_3$ | ½<br>½<br>½<br>½ |
| 9 | (a)$CH_3CHO$ $\xrightarrow{(i)CH_3MgBr,\ Dry\ ether\ (ii)H_2O/H^+}$ $CH_3CH(OH)CH_3$ $\xrightarrow{CrO_3}$ $CH_3COCH_3$<br>(b)<br><br>(or any other correct method) | 1<br><br>1 |
| | OR | |
| 9 | (a) because the carboxyl group is deactivating and the catalyst aluminium chloride (Lewis acid) gets bonded to the carboxyl group<br>(b) Nitro group is an electron withdrawing group (-I effect) so it stabilises the carboxylate anion and strengthens the acid / Due to the presence of an electron withdrawing Nitro group (-I effect). | 1<br>1 |
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| 10. | (a) $5Fe^{2+} + MnO_4^- + 8H^+ \longrightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$<br>(b) $2MnO_4^- + H_2O + I^- \longrightarrow 2MnO_2 + 2OH^- + IO_3^-$<br>(Half mark to be deducted in each equation for not balancing) | 1<br>1 |
| 11 | (a) As compared to other colligative properties, its magnitude is large even for very dilute solutions / macromolecules are generally not stable at higher temperatures and polymers have poor solubility / pressure measurement is around the room temperature and the molarity of the solution is used instead of molality.<br>(b) Because oxygen is more soluble in cold water or at low temperature.<br>(c) Due to dissociation of KCl / KCl (aq) → $K^+$ + $Cl^-$ , i is nearly equal to 2 | 1<br>1<br>1 |
| 12 | $d = \frac{zM}{a^3 N_A}$<br>$= \frac{4 \times 40}{(4\times10^{-8})^3 \times 6.022\times10^{23}}$<br>= 4.15 g/cm$^3$<br>No of unit cells = total no of atoms /4<br>$=[\frac{4}{40} \times 6.022\times10^{23}] / 4$<br>$=1.5 \times 10^{22}$<br>(Or any other correct method) | ½<br>½<br>½<br>½<br>½<br>½ |
| 13 | $k_2 = 0.693 / 20$,<br>$k_1 = 0.693/40$<br>$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}[\frac{1}{T_1} - \frac{1}{T_2}]$<br>$k_2/k_1 = 2$<br>$\log 2 = \frac{E_a}{2.303 \times 8.314}[\frac{320-300}{320 \times 300}]$<br>Ea = 27663.8 J/mol or 27.66 kJ/ mol | ½<br>½<br>½<br>½<br>1 |
| 14 | (a)Peptisation occurs / Colloidal solution of $Fe(OH)_3$ is formed<br>(b)Coagulation occurs<br>(c)Demulsification or breaks into constituent liquids | 1<br>1<br>1 |
| 15 | $4Au(s) + 8CN^-(aq) + 2H_2O(aq) + O_2(g) \rightarrow 4[Au(CN)_2]^-(aq) + 4OH^-(aq)$<br>$2[Au(CN)_2]^-(aq) + Zn(s) \rightarrow 2Au(s) + [Zn(CN)_4]^{2-}(aq)$<br>(No marks will be deducted for not balancing)<br>NaCN leaches gold/NaCN acts as a leacing agent / complexing agent<br>Zn acts as reducing agent / Zn displaces gold. | 1<br>1<br>½<br>½ |
| 16 | (a) The comparatively high value for Mn shows that $Mn^{2+}(d^5)$ is particularly stable / Much larger third ionisation energy of Mn (where the required change is from | 1 |

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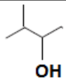
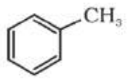
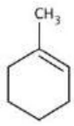
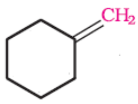
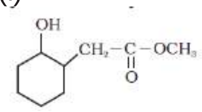
| | $d^5$ to $d^4$)<br>(b)Due to higher number of unpaired electrons.<br>(c)Absence of unpaired d- electron in $Sc^{3+}$ whereas in $Ti^{3+}$ there is one unpaired electron or $Ti^{3+}$shows d-d transition. | <br>1<br>1 |
| 17 | (a) (i) / <br>(b)<br><br>(c)<br> or  | 1<br>1<br>1 |
| 18 | (a)<br>A= $CH_3CH_2CH_2CHO$<br>B = $CH_3COCH_2CH_3$<br>C= $(CH_3)_2CHCHO$<br>D= $CH_3CH_2CH_2CH_3$<br>(b) B | <br>½<br>½<br>½<br>½<br>1 |
| 19. | (i)<br><br>(ii) $C_6H_5CH(OH)CH_3$<br>(iii) $C_2H_5I$ + $C_6H_5OH$ (No splitting of marks) | 1<br>1<br>1 |
| 20. | a) To impart antiseptic properties<br>b) 2-3% solution of iodine in alcohol – water mixture / iodine dissolved in alcohol , used as an antiseptic/ applied on wounds.<br>c) Sodium benzoate / Aspartame | 1<br>½ , ½<br>1 |
| 21 | (a)Carbohydrates that give large number of monosaccharide units on hydrolysis / large number of monosaccharides units joined together by glycosidic linkage<br>Starch/ glycogen/ cellulose (or any other)<br>(b)Proteins that lose their biological activity / proteins in which secondary and tertiary structures are destroyed<br>Curdling of milk (or any other)<br>( c)Amino acids which cannot be synthesised in the body.<br>Valine / Leucine (or any other) | ½<br>½<br>½<br>½<br>½<br>½ |
| | OR | |
| 21 | (a)Saccharic acid / COOH-$(CHOH)_4$-COOH<br>(b)Due to the presence of carboxyl and amino group in the same molecule / due to formation of zwitter ion or dipolar ion.<br>( c)α- helix has intramolecular hydrogen bonding while β pleated has intermolecular hydrogen bonding / α- helix results due to regular coiling of polypeptide chains while in β pleated all polypeptide chains are stretched and arranged side by side. | 1<br>1<br>1 |
| 22 | (a) $Fe_4[Fe(CN)_6]_3$<br>(b) Ionisation isomerism<br>(c) $sp^3d^2$, 4 | 1<br>1<br>½, ½ |
| 23 | (a) Concerned about environment, caring, socially alert, law abiding citizen ( or any other 2 values) | ½ , ½ |

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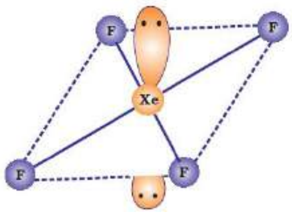
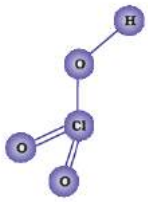
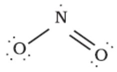
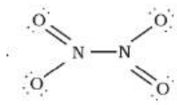
| | (b) Low density polythene is highly branched while high density polythene is linear.<br>(c) As it is non-biodegradable .<br>(d) Which can be degraded by microorganisms, eg *PHBV(or any other correct example)* | 1<br>1<br>½ , ½ |
| 24 | a) (i) In +3 oxidation state of phosphorus tends to disproportionate to higher and lower oxidation states / Oxidation state of P in $H_3PO_3$ is +3 so it undergoes disproportionation but in $H_3PO_4$ it is +5 which is the highest oxidation state, so it cannot.<br>(ii) F cannot show positive oxidation state as it has highest electronegativity/ Because Fluorine cannot expand its covalency / As Fluorine is a small sized atom, it cannot pack three large sized Cl atoms around it.<br>(iii) Oxygen has multiple bonding whereas sulphur shows catenation / Due to pπ-pπ bonding in oxygen whereas sulphur does not / Oxygen is diatomic therefore held by weak intermolecular force while sulphur is polyatomic held by strong intermolecular forces.<br>b) (i)   (ii)   | 1<br><br>1<br><br>1<br><br>1, 1 |
| | OR | |
| 24 | a) (i) A = $NO_2$ , B = $N_2O_4$<br>(ii)<br>  ,  <br>(iii) Because $NO_2$ dimerises to $N_2O_4$ / $NO_2$ is an odd electron species.<br>b) HI > HBr > HCl > HF<br>c) $XeF_4 + SbF_5 \rightarrow [XeF_3]^+ [SbF_6]^-$ | ½, ½<br>½ , ½<br><br>1<br>1<br>1 |
| 25 | (a) $Sn + 2H^+ \rightarrow Sn^{2+} + H_2$ (Equation must be balanced)<br>$E = E^o - \frac{0.059}{2} \log \frac{[Sn^{2+}]}{[H^+]^2}$<br>$= [0 - (-0.14)] - 0.0295 \log \frac{(0.004)}{(0.02)^2}$<br>$= 0.14 - 0.0295 \log 10 = 0.11 V$ / 0.1105 V<br>(b) (i) Due to overpotential/ Overvoltage of $O_2$<br>(ii) The number of ions per unit volume decreases. | 1<br>½<br>½<br>1<br>1<br>1 |
| | OR | |
| 25 | a) $\Delta G^o = - nFE^o$<br>$-43600 = - 2 \times 96500 \times E^o$<br>$E^o = 0.226 V$<br>$E = E^o - 0.059/2 \log ( [H^+]^2 [Cl^-]^2 / [H_2] )$<br>$= 0.226 - 0.059/2 \log[ (0.1)^2 \times (0.1)^2 ] / 1$<br>$= 0.226 - 0.059 /2 \log 10^{-4}$ | ½<br><br>½<br>½<br>½<br>1 |

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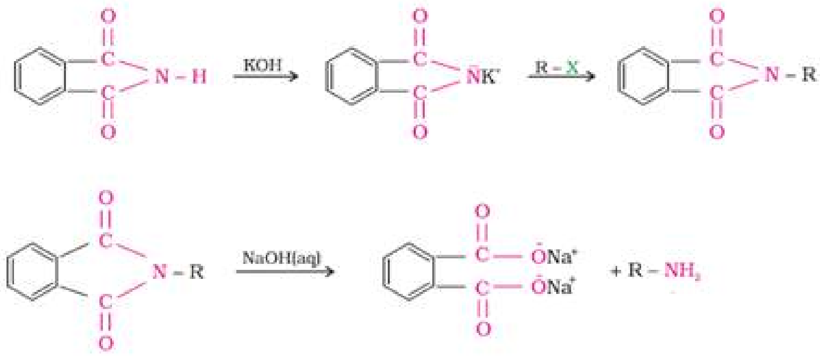
| | = 0.226 + 0.118 = 0.344 V (Deduct half mark if unit is wrong or not written)<br><br>b) Cells that convert the energy of combustion of fuels (like hydrogen, methane, methanol, etc.) directly into electrical energy are called fuel cells.<br>Advantages : High efficiency, non polluting (or any other suitable advantage) | 1<br><br>½ ,½ |
| 26 | (a)(i) Ar/ R-$CONH_2$ + $Br_2$ + 4 NaOH → Ar/ R-$NH_2$ + 2NaBr + $Na_2CO_3$ + 2 $H_2O$<br>(ii)<br>$C_6H_5NH_2 + NaNO_2 + 2HCl \xrightarrow{273-278K} C_6H_5\overset{+}{N_2}\overset{-}{Cl} + NaCl + 2H_2O$<br>(or any other correct equation)<br>(iii)<br><br>(b)(i)Because of the combined factors of inductive effect and solvation or hydration effect<br><br>(ii)Due to resonance stabilisation or structural representation / resonating structures. | 1<br><br>1<br><br>1<br><br>1<br><br>1 |
| | OR | |
| 26 | (a) (i) $C_6H_5NHCOCH_3$<br>(ii) $C_6H_5SO_2N(CH_3)_2$<br>(iii) $C_6H_6$<br>(b) Add chloroform in the presence of KOH and heat , Aniline gives a offensive smell while N,N dimethylaniline does not. (or any other correct test)<br>(c)$C_2H_5NH_2$< $C_6H_5NHCH_3$< $C_6H_5NH_2$ | 1<br>1<br>1<br>1<br><br>1 |