

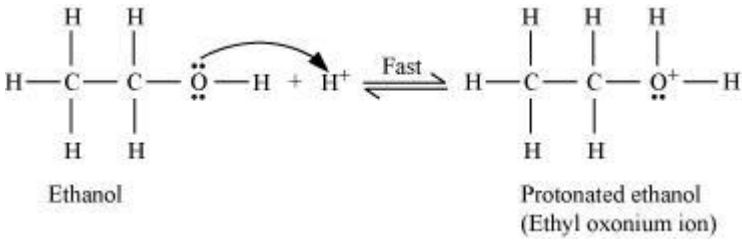
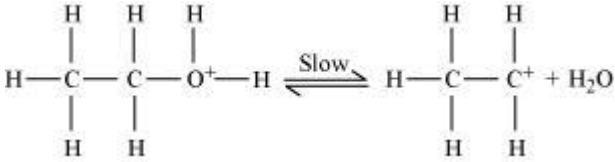
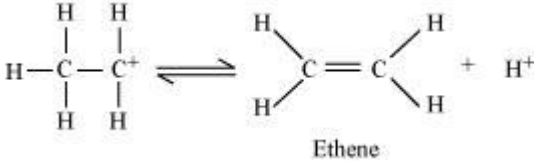
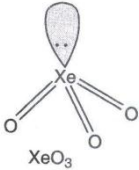
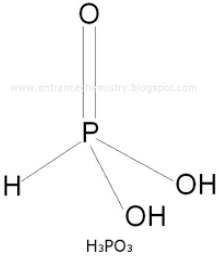
**Class: XII**  
**Chemistry**  
**Marking Scheme 2018-19**

**Time allowed: 3 Hours**

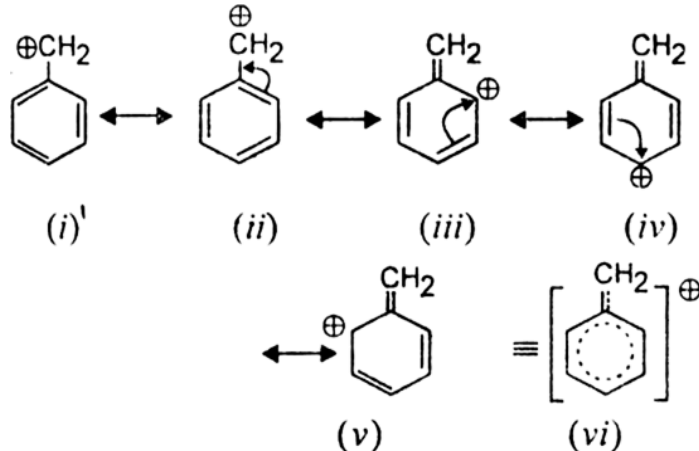
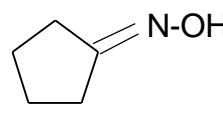
**Maximum Marks: 70**

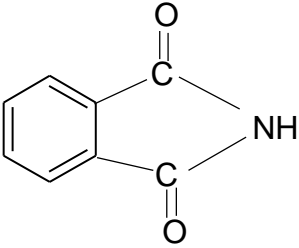
Q No	SECTION A	Marks
1.	On heating ZnO , it loses oxygen and there is excess of $Zn^{2+}$ ions in the crystal.	1
	<b>OR</b>	
	When silicon is doped with phosphorous (group 15 element), the increase in conductivity is due to the delocalised negatively charged electrons.	1
2.	Associated colloids	1
3.	$t_{2g}^3 e_g^3$	1
	<b>OR</b>	
	The orbital splitting energies, $\Delta_t$ are not sufficiently large for forcing pairing of electrons in the tetrahedral coordination entity formation.	1
4.	B	1
5.	<i>Poly <math>\beta</math> – hydroxybutyrate – co – <math>\beta</math> – hydroxy valerate</i>	1
<b>SECTION B</b>		
6.	$HBr \rightarrow H^+ + Br^-$ $i = 1 - \alpha + n\alpha$ $n = 2$ $i = 1 + \alpha$ $\Delta T_f = iK_f m$ $\Delta T_f = (1 + \alpha) 1.86 \times \frac{8.1}{81} \times \frac{1000}{100}$ $\Delta T_f = 3.53$ $T_f^0 = 0^0 C$ $\Delta T_f = T_f^0 - T_f'$ $T_f' = -3.534^0 C$	           1/2 1/2  1/2  1/2 1/2 1/2
	<b>OR</b>	
	<i>Mole fraction of water, <math>\chi_{H_2O} = 0.88</math></i> <i>Mole fraction of ethanol, <math>\chi_{C_2H_5OH} = 1 - 0.88</math></i> $= 0.12$ $\chi_{C_2H_5OH} = \frac{n_2}{n_1 + n_2} \dots\dots\dots(1)$	1/2

	<p><math>n_2</math> = number of moles of ethanol.  <math>n_1</math> = number of moles of water. Molality of ethanol means the number of moles of ethanol present in 1000 g of water.</p> $n_1 = \frac{1000}{18} = 55.5 \text{ moles}$ <p>Substituting the value of <math>n_1</math> in equation (1)</p> $\frac{n_2}{55.5 + n_2} = 0.12$ <p><math>n_2 = 7.57 \text{ moles}</math>  Molality of ethanol (C<sub>2</sub>H<sub>5</sub>OH) = 7.57 m</p> <p><b>Alternatively,</b></p> <p>Mole fraction of water = 0.88  Mole fraction of ethanol = 1 - 0.88 = 0.12  Therefore 0.12 moles of ethanol are present in 0.88 moles of water.  Mass of water = 0.88 x 18 = 15.84 g of water.  Molality = number of moles of solute (ethanol) present in 1000 g of solvent (water)</p> $= 12 \times 1000 / 15.84$ $= 7.57 \text{ m}$ Molality of ethanol (C <sub>2</sub> H <sub>5</sub> OH) = 7.57 m	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>
7.(a)	Reaction : Hell-Volhard-Zelinsky reaction. IUPAC : 2-Bromopropanoic acid.	1/2
(b)	Reaction : Rosenmund reduction reaction. IUPAC : Benzaldehyde.	1/2
	<b>OR</b>	
	i) 2-Methylbut-2-enal	1/2
	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3\text{-CH=CH-CHO} \end{array}$	1/2
	ii) Pent-2-enal	1/2
	$\text{CH}_3\text{-CH}_2\text{-CH=CH-CHO}$	1/2
8.(a)	Tert-butyl peroxide acts as a free radical generating initiator(catalyst)	<b>1</b>
(b)	CH <sub>2</sub> = CH- CH = CH <sub>2</sub>	1/2
	C <sub>6</sub> H <sub>5</sub> - CH= CH <sub>2</sub>	1/2

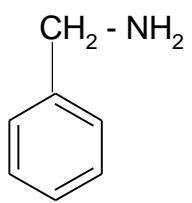
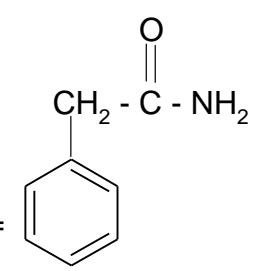
9.	<p>Step 1 : Formation of protonated alcohol.</p>  <p>Ethanol</p> <p>Protonated ethanol (Ethyl oxonium ion)</p> <p>Step 2 : Formation of carbocation.</p>  <p>Step 3: Formation of ethane by elimination of a proton.</p>  <p>Ethene</p>	<p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p>
10.	<p>(i) Zero order reaction  (ii) Slope represents <math>-k</math> ; Intercept represents <math>[R]_0</math>  (iii) <math>\text{mol L}^{-1} \text{s}^{-1}</math></p>	<p><math>\frac{1}{2}</math>  <math>\frac{1}{2} + \frac{1}{2}</math>  <math>\frac{1}{2}</math></p>
11.(a)	 <p>XeO<sub>3</sub></p> <p>(b)</p>  <p>H<sub>3</sub>PO<sub>3</sub></p>	<p>1</p> <p>1</p>
12.(i)	<p>Since <math>\text{Ti}^{4+}/\text{Ti}^{3+}</math> has lower reduction potential than <math>\text{Fe}^{3+}/\text{Fe}^{2+}</math>, it cannot be reduced in comparison with <math>\text{Fe}^{3+}/\text{Fe}^{2+}</math> ions.  Hence <math>\text{Ti}^{4+}</math> cannot oxidise <math>\text{Fe}^{2+}</math> to <math>\text{Fe}^{3+}</math>.</p>	<p>1</p> <p><math>\frac{1}{2}</math></p>
(ii)	<p>As the value of reduction potential increases the stability of +2 oxidation increases.  Therefore correct order of stability is  <math>\text{Cr}^{3+}/\text{Cr}^{2+} &lt; \text{Fe}^{3+}/\text{Fe}^{2+} &lt; \text{Mn}^{3+}/\text{Mn}^{2+}</math></p>	<p>1</p> <p><math>\frac{1}{2}</math></p>

SECTION C		
13.	$r = \frac{\sqrt{3}}{4} a$ $143.1 = \frac{\sqrt{3}}{4} a$ $a = 330.4 \text{ pm}$ $\rho = \frac{zM}{a^3 N_A}$ $\rho = \frac{2 \times 93}{(330.4 \times 10^{-10})^3 \times 6.023 \times 10^{23}}$ $\rho = 8.58 \text{ g/cm}^3$	1/2  1/2 1/2  1/2  1/2 + 1/2
14.(a)	Molecules of benzoic acid dimerise in benzene, the number of particles are reduced.	<b>1</b>
(b)	The intermolecular interactions between ethanol and acetone are weaker/ the escaping tendency of ethanol and acetone molecules increases on mixing / the vapour pressure increases.	<b>1</b>
(c)	Due to osmosis, a bacterium on fruit loses water, shrivels and dies.	<b>1</b>
15.	$\begin{array}{c} \text{CH}_3 \\   \\ \text{A : CH}_3\text{-CH-CH}_2\text{-OH} \end{array}$ $\begin{array}{c} \text{CH}_3 \\   \\ \text{B : CH}_3\text{-CH-COOH} \end{array}$ $\begin{array}{c} \text{CH}_3 \\   \\ \text{C : CH}_3\text{-CH} = \text{CH}_2 \end{array}$ $\begin{array}{c} \text{CH}_3 \\   \\ \text{D : CH}_3\text{-CH-CH}_3 \\   \\ \text{OH} \end{array}$ <p>A and D are position isomers.</p>	<b>1</b>  1/2  1/2  1/2  1/2

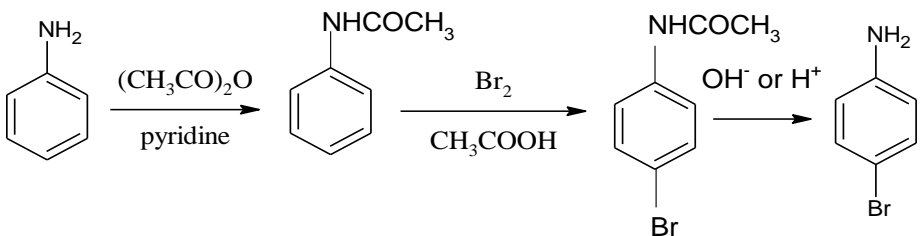
16.	<p><math>C_6H_5CH_2Cl</math> will undergo <math>S_N1</math> reaction faster.  The carbocation formed by <math>C_6H_5CH_2Cl</math> gets stabilized through resonance.  Greater the stability of carbocation, greater will be its ease of formation from the respective halide.</p> 	$\frac{1}{2}$ $\frac{1}{2}$ 1  1
OR		
	$\begin{array}{c} \text{Cl} \\   \\ \text{CH}_3\text{-CH-CH}_2\text{Cl} \end{array}$ $\text{CH}_2\text{Cl-CH}_2\text{-CH}_2\text{Cl}$ $\text{CH}_3\text{-CH}_2\text{-CHCl}_2$ $\begin{array}{c} \text{Cl} \\   \\ \text{CH}_3\text{-C-CH}_3 \\   \\ \text{Cl} \end{array}$ The following isomer will exhibit enantiomerism: $\begin{array}{c} \text{Cl} \\   \\ \text{CH}_3\text{-CH-CH}_2\text{Cl} \end{array}$ IUPAC name: 1,2-Dichloropropane.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$  $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
17.(a)		1
(b)	$\text{HOOC-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-COOH}$	1

(c)		1
18.(i)	It is unstable at cooking temperature.	1
(ii)	Excessive hydrogencarbonate can make the stomach alkaline and trigger the production of even more acid. Metal hydroxides being insoluble do not increase the pH above neutrality.	1
(iii)	Aspirin has anti blood clotting action.	1
19.(a)	Amylopectin.	1
(b)	C- 2	1
(c)	Two peptide linkages.	1
	<b>OR</b>	
	(1) Glucose does not give 2,4- DNP test.	1
	(2) Glucose does not give Schiff's test.	1
	(3) The pentaacetate of glucose does not react with hydroxylamine.	1
	(4) Glucose does not form the hydrogensulphite addition product with NaHSO <sub>3</sub> . (Any three points )	
20.	$2N_2O_5(g) \rightarrow 2N_2O_4(g) + O_2(g)$ <p>At t = 0      0.5 atm      0 atm      0 atm</p> <p>At time t      0.5 - 2x atm      2x atm      x atm</p> $P_t = P_{N_2O_5} + P_{N_2O_4} + P_{O_2}$ $= (0.5 - 2x) + 2x + x = 0.5 + x$ $x = p_t - 0.5$ $P_{N_2O_5} = 0.5 - 2x$ $= 0.5 - 2(p_t - 0.5)$ $= 1.5 - 2p_t$ <p>At t = 100 s ; p<sub>t</sub> = 0.512 atm</p> $P_{N_2O_5} = 1.5 - 2 \times 0.512 = 0.476 \text{ atm}$ $k = \frac{2.303}{t} \log \frac{p_i}{p_A}$ $k = \frac{2.303}{100s} \log \frac{0.5 \text{ atm}}{0.476 \text{ atm}}$ $k = \frac{2.303}{100s} \times 0.0216 = 4.98 \times 10^{-4} s^{-1}$	<p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>1</p>
	<b>OR</b>	1
	The Arrhenius equation: $k = Ae^{-E_a/RT}$ Taking log on both sides: $\log k = \log A - \frac{E_a}{2.303RT}$	

	<p>For reaction (i) <math>\log k_1 = \log A - \frac{E_a(1)}{2.303RT}</math></p> <p>For reaction (ii) <math>\log k_2 = \log A - \frac{E_a(2)}{2.303RT}</math></p> <p>Subtracting (i) from (ii)</p> $\log \frac{k_1}{k_2} = \frac{E_a(1) - E_a(2)}{2.303RT}$ $= \log \frac{k_1}{k_2} = \frac{24.9 \times 1000}{2.303 \times 8.3 \times 300} = 4.342$ $\frac{k_1}{k_2} = \text{anti log}(4.342) = 2.198 \times 10^4$	1  1
21.		
(a)	Negative charge is developed on the sol. Sol is represented as $AgI / I^-$	$\frac{1}{2}$ $\frac{1}{2}$
(b)	Adsorption of reactants on the solid surface of the catalysts increases the rate of reaction.	1
(c)	$Na_3PO_4$ Hardy-Schulze rule	$\frac{1}{2}$ $\frac{1}{2}$
22.		
(a)	Leached gold complex is treated with Zinc and gold is recovered by displacement method $2Au[(CN)_2]^- (aq) + Zn(s) \rightarrow 2Au(s) + [Zn(CN)_4]^{2-} (aq)$	$\frac{1}{2}$ $\frac{1}{2}$
(b)	Zirconium iodide is decomposed on a tungsten filament; electrically heated to 1800 K. Pure Zr metal is deposited on the filament. $ZrI_4 \rightarrow Zr + I_2$	$\frac{1}{2}$ $\frac{1}{2}$
(c)	Silica is added to the ore and heated. It helps to slag off iron oxide as iron silicate $FeO + SiO_2 \rightarrow FeSiO_3(\text{slag})$	$\frac{1}{2}$ $\frac{1}{2}$
<b>OR</b>		
(a)	NaCN is used as depressants to separate two sulphide ores ( ZnS and PbS) in Froth Floatation Method.	(1)
(b)	Carbon monoxide forms a volatile complex of nickel, nickel tetracarbonyl.	(1)
(c)	Coke is used as a reducing agent to reduce zinc oxide to zinc.	(1)
23.		
(a)	$Co^{2+} : [Ar]3d^7$ $Sc^{3+} : [Ar]3d^0$ $Cr^{3+} : [Ar]3d^3$ $Co^{2+}$ and $Cr^{3+}$ have unpaired electrons. Thus, they are coloured in aqueous solution. $Sc^{3+}$ has no unpaired electron. Thus it is colourless.	1
(b)	Metal copper has high enthalpy of atomisation and enthalpy of ionisation. Therefore the high energy required to convert $Cu(s)$ to $Cu^{2+}(aq)$ is not balanced by its hydration enthalpy.	1

(c)	Due to lanthanoid contraction the size of lanthanoid ion decreases regularly with increase in atomic size. Thus covalent character between lanthanoid ion and OH <sup>-</sup> increases from La <sup>3+</sup> to Lu <sup>3+</sup> . Thus the basic character of hydroxides decreases from La(OH) <sub>3</sub> to Lu(OH) <sub>3</sub>	1						
24. (a) (b) (c)	<p>Isomer A: [Cr(NH<sub>3</sub>)<sub>4</sub> BrCl]Cl            Isomer B: [Cr (NH<sub>3</sub>)<sub>4</sub> Cl<sub>2</sub>]Br</p> <p>Hybridisation of Cr in isomer A and B is d<sup>2</sup>sp<sup>3</sup>.</p> <p>Number of unpaired electrons in Cr<sup>3+</sup>(3d<sup>3</sup>) is 3</p> <p>Magnetic moment = <math>\sqrt{n(n+2)}</math>  <math>= \sqrt{3(3+2)} = 3.87 \text{ BM}</math></p> <p>(deduct half mark for wrong unit/unit not written)</p>	<p>1/2            1/2            1            1</p>						
25.(a)	<p>A = AgNO<sub>2</sub></p> <p>B = </p> <p>C = </p> <p>D = CHCl<sub>3</sub> + KOH, Heat.</p>	<p>1/2            1/2            1/2</p>						
(b)	<table border="1"> <thead> <tr> <th>Experiment</th> <th>Aniline</th> <th>Benzylamine</th> </tr> </thead> <tbody> <tr> <td>Azo dye test: Dissolve the amine in HCl, cool it and then add cold aqueous solution of NaNO<sub>2</sub> and then solution of β - naphthol</td> <td>A brilliant orange red dye is observed.</td> <td>No dye is formed.</td> </tr> </tbody> </table>	Experiment	Aniline	Benzylamine	Azo dye test: Dissolve the amine in HCl, cool it and then add cold aqueous solution of NaNO <sub>2</sub> and then solution of β - naphthol	A brilliant orange red dye is observed.	No dye is formed.	1
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(i)								
(ii)	<table border="1"> <thead> <tr> <th>Experiment</th> <th>Methylamine</th> <th>Dimethylamine</th> </tr> </thead> <tbody> <tr> <td>Carbylamine test: To the organic compound add chloroform and ethanolic potassium hydroxide and heat</td> <td>A foul smelling substance (isocyanide)</td> <td>No reaction.</td> </tr> </tbody> </table> <p>(or any other suitable test)</p>	Experiment	Methylamine	Dimethylamine	Carbylamine test: To the organic compound add chloroform and ethanolic potassium hydroxide and heat	A foul smelling substance (isocyanide)	No reaction.	1
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(c)	A = CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> NH <sub>2</sub> B = CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> OH	½ ½
<b>OR</b>		
(a)(i)	In strongly acidic medium, aniline is protonated to form the anilium ion which is meta directing.	1
(ii)	Aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.	1
(b)(i)	$\text{CH}_3\text{-COOH} \xrightarrow{\text{NH}_3, \Delta} \text{CH}_3\text{-CO-NH}_2 \xrightarrow{\text{NaOH} + \text{Br}_2} \text{CH}_3\text{NH}_2$	1
(ii)		1
(c)	p- Nitroaniline < Aniline < p- Toludine.	1
26.(a)	E <sub>cell</sub> decreases.	1
(b)	Anode: Cl <sub>2</sub> ↑ Cathode : H <sub>2</sub> ↑	½ ½
(c)	$\text{Cu}^{2+}(\text{aq.}) + \text{Ni}(\text{s}) \rightarrow \text{Ni}^{2+}(\text{aq.}) + \text{Cu}(\text{s})$ $E_{\text{cell}}^0 = E_{\text{cathode}}^0 - E_{\text{anode}}^0$ $E_{\text{cell}}^0 = 0.34 - (-0.25)$ $E_{\text{cell}}^0 = 0.59\text{V}$ $E_{\text{cell}} = E_{\text{cell}}^0 - \frac{2.303RT}{nF} \log \frac{[\text{Ni}^{2+}]}{[\text{Cu}^{2+}]}$ $E_{\text{cell}} = 0.59 - \frac{0.059}{2} \log \frac{[0.01]}{[0.1]}$ $E_{\text{cell}} = 0.6195\text{V}$	½ ½ ½ + ½
<b>OR</b>		
(a)	$\Lambda_{m(\text{CaCl}_2)}^0 = \lambda_{\text{Ca}^{2+}}^0 + 2\lambda_{\text{Cl}^-}^0$	1
(b)	Conductivity of NaCl decreases on dilution as the number of ions per unit volume decreases.	1

	Whereas molar conductivity of NaCl increases on dilution as on dilution the interionic interactions are overcome and ions are free to move.	1
(c)	$G^* = \kappa R$ $\kappa = \frac{1.29}{100} = 0.0129 \text{ S cm}^{-1}$ $\Lambda_m = \frac{1000 \kappa}{C}$ $\Lambda_m = \frac{1000 \times 0.0129}{0.1}$ $\Lambda_m = 129 \text{ S cm}^2 \text{ mol}^{-1}$	 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
27.		
(a)	(i) S atom in SF <sub>4</sub> is not sterically protected as it is surrounded by only four F atoms, so attack of water molecules can take place easily. In contrast, S atom in SF <sub>6</sub> is protected by six F atoms. Thus attack by water molecules cannot take place easily.	1
	(ii) Chlorine water produces nascent oxygen (causes oxidation) which is responsible for bleaching action. $Cl_2 + H_2O \rightarrow 2HCl + [O]$	1
	(iii) Due to inert pair effect Bi(V) can accept a pair of electrons to form more stable Bi (III). (+3 oxidation state of Bi is more stable than its +5 oxidation state).	1
(b)	(i) Phosphorus undergoes disproportionation reaction to form phosphine gas. $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$	1
	(ii) On partial hydrolysis, XeF <sub>6</sub> gives oxyfluoride XeOF <sub>4</sub> and HF. $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$	1
	<b>OR</b>	
(a)	N. Bartlett first prepared a red compound O <sub>2</sub> <sup>+</sup> PtF <sub>6</sub> <sup>-</sup> . He then realised that the first ionisation enthalpy of molecular oxygen was almost identical with Xenon. So he carried out reaction between Xe and PtF <sub>6</sub> .	1
(b)	(i) I <sub>2</sub> < F <sub>2</sub> < Br <sub>2</sub> < Cl <sub>2</sub> (ii) NH <sub>3</sub> > PH <sub>3</sub> > AsH <sub>3</sub> > SbH <sub>3</sub> > BiH <sub>3</sub>	1 1
(c)	(i) $2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$	1
	(ii) $2Fe^{3+} + SO_2 + 2H_2O \rightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$	1

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