

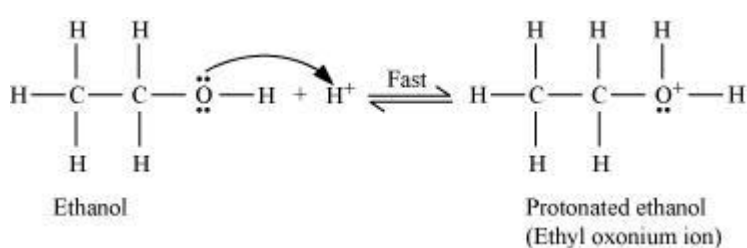
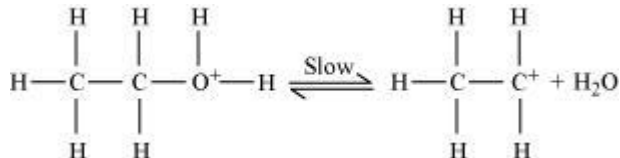
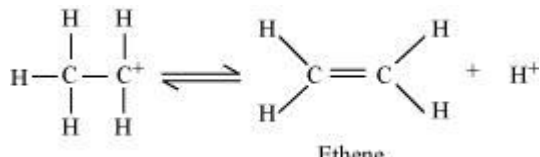
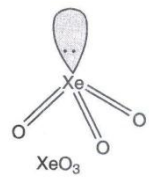
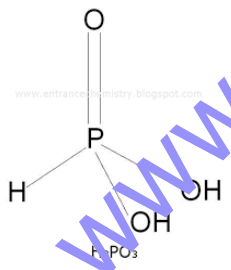
**Class: XII**  
**Chemistry**  
**Marking Scheme 2018-19**

**Time allowed: 3 Hours**

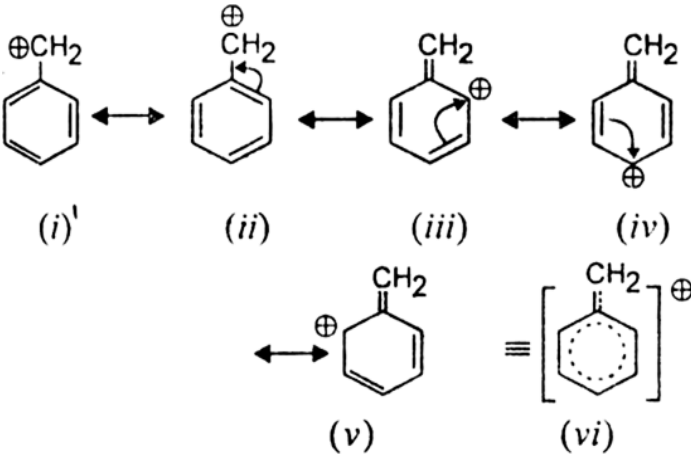
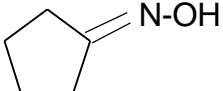
**Maximum Marks: 70**

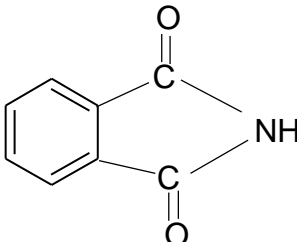
Q No	SECTION A	Marks
1.	On heating ZnO , it loses oxygen and there is excess of $Zn^{2+}$ ions in the crystal.	1
	<b>OR</b>	
	When silicon is doped with phosphorous (group 15 element), the increase in conductivity is due to the delocalised negatively charged electrons.	1
2.	Associated colloids	1
3.	$t_{2g}^3 e_g^3$	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> – hydroxyvalerate</i>	1
	<b>SECTION B</b>	
6.	$HBr \rightarrow H^+ + Br^-$ $i = 1 - \alpha + n\alpha$ $n = 2$ $i = 1 + \alpha$ $\Delta T_f = iK_f m$ $\Delta T_f = (1 + \alpha) 1.8 \times \frac{8.1}{31} \times \frac{1000}{100}$ $\Delta T_f = 3.53$ $T_f^0 = 0^\circ C$ $\Delta T_f = T_f^0 - T_f'$ $T_f' = -3.534^\circ C$	$\frac{1}{2}$ $\frac{1}{2}$  $\frac{1}{2}$  $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	<b>OR</b>	
	Mole fraction of water, $\chi_{H_2O} = 0.88$ Mole fraction of ethanol, $\chi_{C_2H_5OH} = 1 - 0.88$ $= 0.12$ $\chi_{C_2H_5OH} = \frac{n_2}{n_1 + n_2} \dots\dots\dots(1)$	$\frac{1}{2}$

	<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 (<math>\text{C}_2\text{H}_5\text{OH}</math>) = 7.57 m</p> <p><b>Alternatively,</b></p> <p>Mole fraction of water = 0.88  Mole fraction of ethanol = <math>1 - 0.88 = 0.12</math>  Therefore 0.12 moles of ethanol are present in 0.88 moles of water.  Mass of water = <math>0.88 \times 18 = 15.84 \text{ g}</math> of water.  Molality = number of moles of solute (ethanol) present in 1000 g of solvent (water)  <math>= 12 \times 1000 / 15.84</math>  <math>= 7.57 \text{ m}</math>  Molality of ethanol (<math>\text{C}_2\text{H}_5\text{OH}</math>) = 7.57 m</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
7.(a)	Reaction : Hell-Volhard-Zelinsky reaction.	$\frac{1}{2}$
(b)	IUPAC : 2-Bromopropanoic acid.	$\frac{1}{2}$
	Reaction : Rosenmund reduction reaction.	$\frac{1}{2}$
	IUPAC : Benzaldehyde.	$\frac{1}{2}$
	<b>OR</b>	
	i) 2-Methylbut-2-enal	$\frac{1}{2}$
	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3-\text{CH}=\text{CH}-\text{CHO} \end{array}$	$\frac{1}{2}$
	ii) Pent-2-enal	$\frac{1}{2}$
	$\text{CH}_3-\text{CH}_2-\text{CH}=\text{CH}-\text{CHO}$	$\frac{1}{2}$
8.(a)	Tert-butyl peroxide acts as a free radical generating initiator(catalyst)	<b>1</b>
(b)	$\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$	$\frac{1}{2}$
	$\text{C}_6\text{H}_5 - \text{CH} = \text{CH}_2$	$\frac{1}{2}$

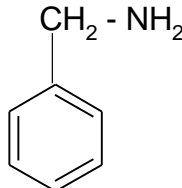
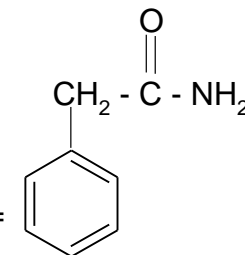
9.	<p>Step 1 : Formation of protonated alcohol.</p>  <p>Ethanol</p> <p>Protonated ethanol (Ethyl oxonium ion)</p> <p>Step 2 : Formation of carbocation.</p>  <p>Step 3: Formation of ethane by elimination of a proton.</p>  <p>Ethene</p>	<p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p>
10.	<p>(i) Zero order reaction</p> <p>(ii) Slope represents <math>-k</math> ; Intercept represents <math>[R]_0</math></p> <p>(iii) <math>\text{mol L}^{-1} \text{s}^{-1}</math></p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2} + \frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
11.(a)	 <p>XeO<sub>3</sub></p>	1
(b)	 <p>H<sub>3</sub>PO<sub>3</sub></p>	1
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.</p> <p>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</p> <p><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.	$r = \frac{\sqrt{3}}{4} a$ $143.1 = \frac{\sqrt{3}}{4} a$ $a = 330.4 \text{ pm}$ $\rho = \frac{zM}{a^3 N_A}$ $\rho = \frac{2 \times 93}{(330.4 \times 10^{-10})^3 \times 6.023 \times 10^{23}}$ $\rho = 8.58 \text{ g / cm}^3$	$\frac{1}{2}$   $\frac{1}{2}$ $\frac{1}{2}$  $\frac{1}{2}$  $\frac{1}{2} + \frac{1}{2}$
14.(a)	Molecules of benzoic acid dimerise in benzene, the number of particles are reduced.	1
(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.	1
(c)	Due to osmosis, a bacterium on fruit loses water, shrivels and dies.	1
15.	<p style="text-align: center;"> <math>\begin{array}{c} \text{CH}_3 \\   \\ \text{A : CH}_3\text{-CH-CH}_2\text{-OH} \end{array}</math> </p> <p style="text-align: center;"> <math>\begin{array}{c} \text{CH}_3 \\   \\ \text{B : CH}_3\text{-CH-COOH} \end{array}</math> </p> <p style="text-align: center;"> <math>\begin{array}{c} \text{CH}_3 \\   \\ \text{C : CH}_3\text{-CH} = \text{CH}_2 \end{array}</math> </p> <p style="text-align: center;"> <math>\begin{array}{c} \text{CH}_3 \\   \\ \text{D : CH}_3\text{-CH-CH}_3 \\   \\ \text{OH} \end{array}</math> </p> <p>A and D are position isomers.</p>	1   $\frac{1}{2}$  $\frac{1}{2}$  $\frac{1}{2}$  $\frac{1}{2}$

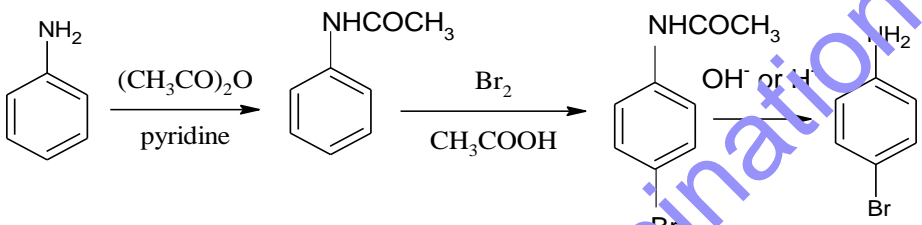
16.	<p><math>C_6H_5CH_2Cl</math> will undergo <math>S_N1</math> reaction faster.          The carbocation formed by <math>C_6H_5CH_2Cl</math> gets stabilized through resonance.          Greater the stability of carbocation, greater will be its ease of formation from the respective halide.</p>  <p style="text-align: center;">(i)      (ii)      (iii)      (iv)</p> <p style="text-align: center;">(v)      (vi)</p>	$\frac{1}{2}$ $\frac{1}{2}$ 1  1
	<p style="text-align: center;">OR</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center;"> <math>\begin{array}{c} Cl \\   \\ CH_3-CH-CH_2Cl \end{array}</math> </p> <p><math>CH_2Cl-CH_2-CH_2Cl</math></p> <p><math>CH_3-CH_2-CHCl_2</math></p> <p style="text-align: center;"> <math>\begin{array}{c} Cl \\   \\ CH_3-C-CH_3 \\   \\ Cl \end{array}</math> </p> <p>The following isomer will exhibit enantiomerism:</p> <p style="text-align: center;"> <math>\begin{array}{c} Cl \\   \\ CH_3-CH-CH_2Cl \end{array}</math> </p> <p>IUPAC name: 1,2-Dichloropropane.</p> </div> <div style="width: 45%; text-align: right;"> <math>\frac{1}{2}</math>  <math>\frac{1}{2}</math>  <math>\frac{1}{2}</math>    <math>\frac{1}{2}</math>  <math>\frac{1}{2}</math>  <math>\frac{1}{2}</math> </div> </div>	         
17.(a)		1
(b)	$HOOC-CH_2-CH_2-CH_2-CH_2-COOH$	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
	OR	
	(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> $p_{N_2O_5} = 1.5 - 2 \times 0.512 = 0.476 \text{ atm}$ $k = \frac{2.303}{t} \log \frac{p_i}{p_A}$ $k = \frac{2.303}{100s} \log \frac{0.5 \text{ atm}}{0.476 \text{ atm}}$ $k = \frac{2.303}{100s} \times 0.0216 = 4.98 \times 10^{-4} \text{ s}^{-1}$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p>
	OR	1
	<p>The Arrhenius equation: <math>k = Ae^{-E_a/RT}</math></p> <p>Taking log on both sides: <math>\log k = \log A - \frac{E_a}{2.303RT}</math></p>	

	<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)	<p>Negative charge is developed on the sol.</p> <p>Sol is represented as <math>AgI / I^-</math></p>	$\frac{1}{2}$ $\frac{1}{2}$
(b)	Adsorption of reactants on the solid surface of the catalysts increases the rate of reaction.	1
(c)	<p><math>Na_3PO_4</math></p> <p>Hardy-Schulze rule</p>	$\frac{1}{2}$ $\frac{1}{2}$
22.		
(a)	<p>Leached gold complex is treated with Zinc and gold is recovered by displacement method</p> $2Au[(CN)_2]^- (aq) + Zn(s) \rightarrow 2Au(s) + [Zn(CN)_4]^{2-} (aq)$	$\frac{1}{2}$ $\frac{1}{2}$
(b)	<p>Zirconium iodide is decomposed on a tungsten filament; electrically heated to 1800 K. Pure Zr metal is deposited on the filament.</p> $ZrI_4 \rightarrow Zr + I_2$	$\frac{1}{2}$ $\frac{1}{2}$
(c)	<p>Silica is added to the ore and heated. It helps to slag off iron oxide as iron silicate</p> $FeO + SiO_2 \rightarrow FeSiO_3 (\text{slag})$	$\frac{1}{2}$ $\frac{1}{2}$
	<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)	<p><math>Co^{2+} : [Ar]3d^7</math> <math>Sc^{3+} : [Ar]3d^0</math> <math>Cr^{3+} : [Ar]3d^3</math></p> <p><math>Co^{2+}</math> and <math>Cr^{3+}</math> have unpaired electrons. Thus, they are coloured in aqueous solution. <math>Sc^{3+}</math> has no unpaired electron. Thus it is colourless.</p>	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)	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	½ ½						
(b)	Hybridisation of Cr in isomer A and B is d <sup>2</sup> sp <sup>3</sup> .	1						
(c)	Number of unpaired electrons in Cr <sup>3+</sup> (3d <sup>3</sup> ) is 3 Magnetic moment = $\sqrt{n(n+2)}$ = $\sqrt{3(3+2)} = 3.87 \text{ BM}$ (deduct half mark for wrong unit/unit not written)	1						
25.(a)	A = AgNO <sub>2</sub>  B =   C =   D = CHCl <sub>3</sub> + KOH , Heat.	½  ½  ½						
(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 (or any other suitable test)</td><td>A foul smelling substance (isocyanide)</td><td>No reaction.</td></tr></tbody></table>	Experiment	Methylamine	Dimethylamine	Carbylamine test: To the organic compound add chloroform and ethanolic potassium hydroxide and heat (or any other suitable test)	A foul smelling substance (isocyanide)	No reaction.	1
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Carbylamine test: To the organic compound add chloroform and ethanolic potassium hydroxide and heat (or any other suitable test)	A foul smelling substance (isocyanide)	No reaction.						



(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> ↑	½
	Cathode : H <sub>2</sub> ↑	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 ½ + ½
<b>OR</b>		
(a)	$\Lambda_{\text{m}}^0(\text{CaCl}_2) = \lambda_{\text{Ca}^{2+}}^0 + 2\lambda_{\text{Cl}^-}^0$	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)	<p>(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.</p> <p>(ii) Chlorine water produces nascent oxygen (causes oxidation) which is responsible for bleaching action.  <math>\text{Cl}_2 + \text{H}_2\text{O} \rightarrow 2\text{HCl} + [\text{O}]</math></p> <p>(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).</p>	1 1 1
(b)	<p>(i) Phosphorus undergoes disproportionation reaction to form phosphine gas.  <math>\text{P}_4 + 3\text{NaOH} + 3\text{H}_2\text{O} \rightarrow \text{PH}_3 + 3\text{NaH}_2\text{PO}_2</math></p> <p>(ii) On partial hydrolysis, XeF<sub>6</sub> gives oxyfluoride XeOF<sub>4</sub> and HF.  <math>\text{XeF}_6 + \text{H}_2\text{O} \rightarrow \text{XeOF}_4 + 2\text{HF}</math></p>	1 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)	<p>(i) I<sub>2</sub> &lt; F<sub>2</sub> &lt; Br<sub>2</sub> &lt; Cl<sub>2</sub></p> <p>(ii) NH<sub>3</sub> &lt; PH<sub>3</sub> &gt; AsH<sub>3</sub> &gt; SbH<sub>3</sub> &gt; BiH<sub>3</sub></p>	1 1
(c)	<p>(i)  <math>2\text{NaOH} + \text{Cl}_2 \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}</math></p> <p>(ii)  <math>2\text{Fe}^{3+} + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Fe}^{2+} + \text{SO}_4^{2-} + 4\text{H}^+</math></p>	1 1

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