Sample Question Paper
CLASS XI
CHEMISTRY THEORY (043)

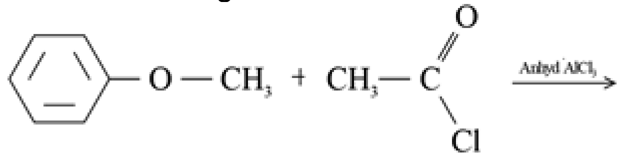
MM:70 **Time: 3 hours**

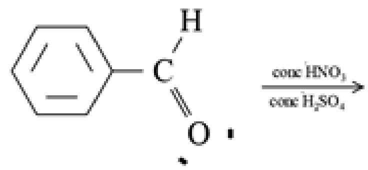
General Instructions:
Read the following instructions carefully.
a) There are 35 questions in this question paper with internal choice.
b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
d) SECTION C consists of 5 short answer questions carrying 3 marks each.
e) SECTION D consists of 2 case- based questions carrying 4 marks each.
f) SECTION E consists of 3 long answer questions carrying 5 marks each.
g) All questions are compulsory.
h) Use of log tables and calculators is not allowed.

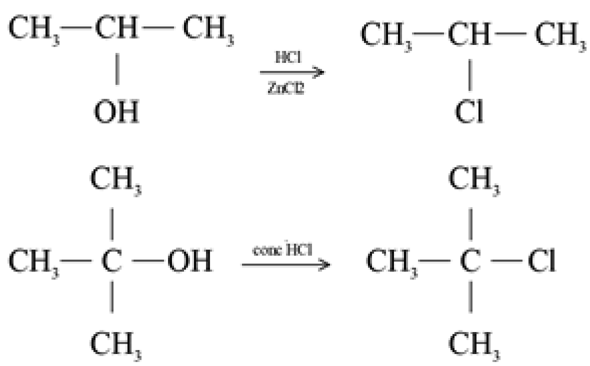
Q.No	**Section A**
1	45.4 L of Dinitrogen at STP reacted with 22.7L of Dioxygen, and 45.4L of Nitrous oxide was formed. The reaction is given below: $2N_2(g) + O_2(g) \rightarrow 2N_2O(g)$ Recognize the law being obeyed in this experiment. (a)Law of Multiple proportion (b) Avogadro'sLaw (c) Law of Conservation of mass (d)Gay Lussac's Law of Gaseous volumes.
2	A metallic ion M^{2+} has an electronic configuration of $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$ and the ionic weight is 56 amu.The number of neutrons in its nucleus is (a)30 (b)32 (c)34 (d)42
3	The equilibrium constant of following reactions is: $N_2 + H_2 \rightleftharpoons 2NH_3$ $\mathbf{K_1}$ $N_2 + O_2 \rightleftharpoons 2NO$ $\mathbf{K_2}$ $H_2 + 1/2\ O_2 \rightleftharpoons 2H_2O$ $\mathbf{K_3}$ Identify the correct expression for the equilibrium constant (**K**) of the following Reaction, $4NH_3 + 5O_2 \rightleftharpoons 4NO + 6H_2O$ (a)$\mathbf{K_1^{6} K_3^{2} / K_2^{3}}$ (b) $\mathbf{K_2 K_3^{3} / K_1^{3}}$ (c) $\mathbf{K_2^{2} K_3^{6} / K_1^{2}}$ (d) $\mathbf{K_2^{3} K_3 / K_1}$

4	The values of standard electrode potentials of some halogen species are given as: (a)$E^{\circ}_{F_2/F^-}=2.85V$; (b)$E^{\circ}_{Cl_2/Cl^-}=1.36V$; (c)$E^{\circ}_{Br_2/Br^-}=1.06V$; (d)$E^{\circ}_{I_2/I^-}=0.53V$ The correct order of reducing power of above species would be: a. $a>b>c>d$ b. $a<b<c<d$ c. $d<c<a<b$ d. $d>c>a>b$
5	In which of the following molecules,carbon will behave as a nucleophilic centre: a. HCOCl b. CH_3NCS c. CH_3MgBr d. CH_3SCH_3
6	Select the species with least bond order : a. C_2 b. O_2 c. N_2^+ d. O_2^{2-}
7	Atomic number of the element with the symbol Uuu is : a. 100 b. 111 c. 110 d. 101
8	Compare the given compounds,and select the one in which nitrogen can be estimated by Kjeldahl's method. a.Azo compounds b.Nitrobenzene c.Pyridine d.Benzylamine
9	Choose the correct statement related to formation of Nitronium ion as an electrophile : a. Sulphuric acid acts as an acid and Nitric acid acts as a base. b. Sulphuric acid acts as a base and Nitric acid acts as an acid. c. Sulphuric acid and Nitric acid both act as acids. d. HSO_4^- acts as conjugate acid and $H_2NO_3^+$ acts as a conjugate base.

10	Which of the following is an example of a redox reaction? (a)$XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$ (b) $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$ (c) $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$ (d) $XeF2 + PF_5 \rightarrow [XeF]^+PF_6$
11	Identify the correct expression for internal energy change for an adiabatic process. a. $\Delta U = 0$ b. $\Delta U = -q$ c. $\Delta U = W$ d. $\Delta U = +q$
12	The conformation of Ethane,with maximum torsional angle is- a. Staggered b. Eclipsed c. Skew d. Gauch
13	The correct inference with respect to Lassaigne's test is- a. The formation of Prussian blue colour indicates the presence of N b. The formation of yellow colour indicates the presence of S c. The formation of Red colour indicates the presence of N and P d. The formation of Violet colour indicates the presence of N
14	The mean C-H bond enthalpy in methane is 416 kJ/mol .The enthalpy of atomization for methane molecule would be- a. -1664 kJ/mol b. +104 kJ/mol c. + 1664 kJ/mol d. -104 kJ/mol
15	Given below are two statements labeled as Assertion (A) and Reason (R) **Assertion (A)**: For the following reaction, $2SO_2(g)+O_2(g) \rightleftharpoons 2SO_3(g); \Delta H=193.2kJ$,increase in temperature favours the decomposition of SO_3. **Reason(R)**:Increase in temperature favours endothermic reactions. Select the most appropriate answer from the options given below: a. Both A and R are true and R is the correct explanation of A b. Both A and R are true but R is not the correct explanation of A. c. A is true but R is false.

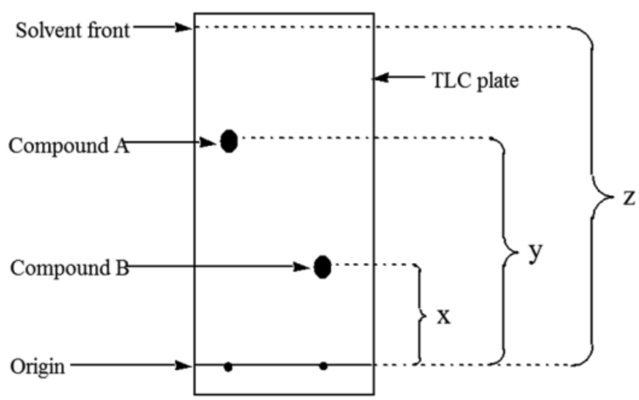
	d. A is false but R is true.
16	Given below are two statements labeled as Assertion (A) and Reason (R) **Assertion (A)** : The H-N-H bond angle in NH_3 is smaller than H-O-H bond angle in H_2O **Reason (R)** : Nitrogen has one lone pair and oxygen has two lone pairs. a. Both A and R are true and R is the correct explanation of A . b. Both A and R are true but R is not the correct explanation of A. c. A is true but R is false. d. A is false but R is true.
17	Given below are two statements labeled as Assertion (A) and Reason **Assertion (A) :** In differential extraction method, the same solvent is repeatedly used for extraction of the compound. **Reason (R) :** Two compounds with different solubilities in the same solvent can be separated by this method. a. Both A and R are true and R is the correct explanation of A . b. Both A and R are true but R is not the correct explanation of A. c. A is true but R is false. d. A is false but R is true.
18	Given below are two statements labeled as Assertion (A) and Reason **Assertion (A)** : The number of radial nodes in 3s and 4p orbitals is not equal. **Reason (R)** :The number of radial nodes in any orbital depends upon the values of '*n*' & 'l' which are different for 3s and 4p orbitals. a. Both A and R are true and R is the correct explanation of A . b. Both A and R are true but R is not the correct explanation of A. c. A is true but R is false. d. A is false but R is true
	<u>Section B</u>
19	Calculate the molarity of the solution obtained by dissolving 120g of urea [Mol wt.=60] in 880g of water. The density of the solution is 1.15g/mL.
20	Write the electronic configuration of element with atomic no. 25 and assign the position to the given element in the periodic table.
21	Complete the following reactions : a. 

	b. 
22	(a)Determine the number of sub-shells associated with n=5. (b) How many electrons will be present in the subshells having m_s value of +½ for n=5? **OR** Explain the difference between Absorption and Emission spectrum.
23	Balance the following redox reaction: $MnO_4^{2-} \rightarrow MnO_4^- + MnO_2$ (Acidic medium) OR Balance the following redox reaction: $MnO_4^- + I^- \rightarrow I_2 + MnO_2$(Basic medium)
24	An alkene C_6H_{10} on ozonolysis gives the following products : Propanone, ethandial and methanal. Formulate the alkene and Write its IUPAC name .
25	(a)Give the expression for de Broglie relation. (b)Comment on the significance of de Broglie relation for macroscopic particles.
	Section C
26	Calculate the enthalpy of combustion of ethylene given that the enthalpy of hydrogenation of ethylene , combustion of hydrogen and ethane are -135.6 kJ/mol , -286.2kJ/mol and -1560.6 kJ/mol respectively at 298 K.
27	Explain the following : a. Mg has larger first ionization enthalpy than Al. b. Zn is not considered as a transition element. c. Second electron gain enthalpy of oxygen is positive. OR Arrange the following according to the property mentioned in bracket: a. N , O , F (increasing order of electron gain enthalpy) b. N^{3-} , O^{2-} , F^- (increasing order of effective nuclear charge) c. Group 17 elements (increasing order of reactivity)

28	An aliphatic compound ‘X’ undergoes cyclic polymerisation to form aromatic compound ‘Y’ and ‘X’ also gives ethanal on warming with mercuric sulphate and dilute sulphuric acid at 333K . ‘Y’ reacts with Cl_2 in the presence of UV light to form gammaxane. Write all the chemical equations involved.
29	An electron is emitted from a metal surface with a velocity of $5.84 \times 10^5\ ms^{-1}$,when a photon of wavelength 4×10^{-7} m strikes on it.Calculate a.Energy of photon in eV. b.K.E of emitted electron. c.Work function in eV. [$h=6.626 \times 10^{-34}$Js;$c=3 \times 10^8$m/s;1eV=1.602×10^{-19}J]
30	Consider the following reactions and answer the questions given below:  a)Mention the type of fission taking place in the substrate molecules. b)Write the intermediate formed in both the cases. c) Identify the more stable intermediate giving reason.
	<u>Section D</u>
31	Read the passage carefully and answer the questions that follow: In our day to day life,we come across various mixtures of substances.Often in these mixtures the amount of one of the components is more than the other .To have a quantitative comparison,we express distribution of one substance into that of other by the term ‘Concentration’. The concentration of a solution is expressed in many ways molarity, molality, mole fraction, g/litre ,ppm , ppb, and % .However,for pure substances,concentration term is meaningless, rather we talk about their percentage purity .Molarity is the number of moles of solute dissolved per litre of solution whereas molality is number of moles of solute per kilogram of solvent. Mole fraction on the other hand is the ratio of moles of any component to the total moles of all components in the solution.Moreover ,the temperature dependent terms are less preferred to

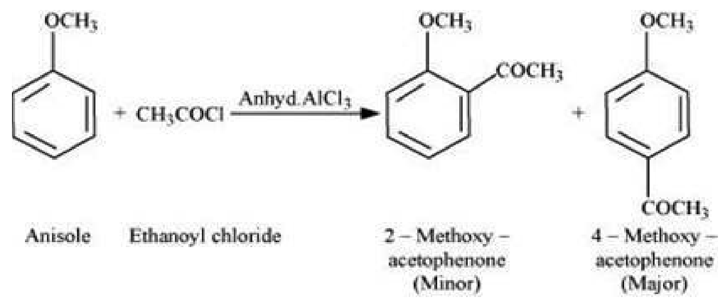
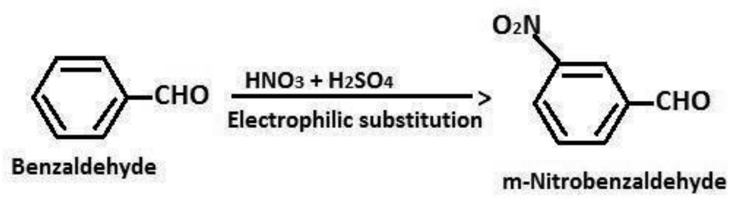
	express concentration. a.Give two concentration terms which are independent of temperature.Give reason in support of your answer. b.Mention the concentration term which is generally used to express- (i)composition of medicines in tablet form. (ii)Increased level of pollutants in air.
32	Read the passage carefully and answer the questions that follow : The process of rusting involves solid metal iron reacting with gaseous oxygen in presence of moisture to form solid hydrated ferric oxide. Going by the phase change, it is obvious that randomness (entropy) is decreasing as gaseous oxygen is consumed and solid oxide is being formed. This doesn't seem to support spontaneity. However the process of rusting is a self – supporting reaction as the surplus energy generated in the reaction (-1648 kJ mol^{-1}) becomes dispersed to the surroundings as 'heat' and raises the entropy of the surrounding. On calculation ,overall entropy (system + surroundings) ΔS total is found to be (4.98$kJmol^{-1}K^{-1}$). Huge gain in entropy by surrounding makes the rusting reaction spontaneous. $\Delta G = \Delta H - T\,\Delta S = [\,-1648 - 298 \times 4.98]$, ΔG = Gibbs free energy ΔG = - 2840 kJ/mole , negative ΔG makes the reaction spontaneous. This is in accordance with the Second Law of Thermodynamics which tells us that on the transformation of energy from one form to another form ,entropy always increases and free energy always decreases. a.Is rusting of iron feasible at all temperatures ? Explain. b.State second law of thermodynamics . **OR** Define Entropy. c.Why is free energy a better way of predicting feasibility of a reaction as compared to entropy?
	<u>Section E</u>
33	a. Discuss the shape of AsF_5 using VSEPR theory. b. Draw the Lewis dot structure of NO_2. c. Explain the hybridization of $AlCl_4^-$ d. Give an example of polyatomic species having zero dipole moment .

	e. What type of hydrogen bond is present in 2-Hydroxybenzoic acid .
34	a.A 0.1 M solution of Formic acid [HCOOH] has Ka=1.77x 10^{-4}.Calculate (i) pH of the solution (ii)Percent dissociation of HCOOH. b.State Henry's law. c. For the reaction,$H_2(g)$ +$Br_2(g)$⇌ 2HBr(g),The equilibrium amounts of H_2, Br_2 and HBr is 0.45mole, 0.39mole and 3 moles respectively at 25℃ Calculate (a)Kc (b) Kp, for the reaction at the given temperature.[R=0.0821Latm/K/mol] **OR** **a.**The value of Kc for the reaction ,4A⇌2B + 2C,is 2 x 10^{-4} .At a given time,the composition of reaction mixture is [A]=[B]=[C]=5 x 10^{-5} M. Predict whether at this composition, the reaction will favour the formation of A. Justify your answer. b.Define common-ion effect. c.The Ksp of $BaSO_4$ is 1.0 x 10^{-10}.Predict whether the precipitation will take place or not,when 40 mL of 1.0 x 10^{-5} $BaCl_2$ solution is mixed with 40 mL of 5.0 x 10^{-6} M Na_2SO_4 Solution.

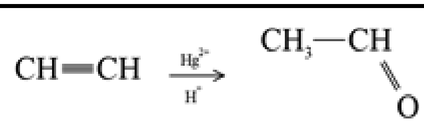
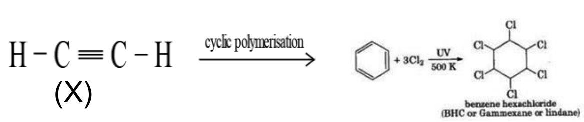
35	a Write the structure for two functional isomers having the molecular formula $C_4H_{10}O$. b.Give structure and IUPAC name for isobutyl alcohol. c. For the complete neutralization of ammonia gas obtained from 2.8 g of inorganic compound,required 20 millimoles of H_2SO_4 .Calculate the percentage of nitrogen in the sample. [At.mass N=14u;S=32u;O=16u;H=1u] OR a. In the Carius method of estimation of Sulphur 0.2 g of organic compound contains 40% of sulphur by mass. Calculate the amount of $BaSO_4$ precipitated during this estimation.[At.mass Ba=137u;S=32u;O=16u;] b.Interpret the information given in the figure and answer the questions that follow .  i)Identify the method of purification of mixture . ii)Calculate Rf value for both the components if X = 1.5 cm,Y = 3.2 cm,Z = 5.3 cm iii)Which component has a greater degree of adsorption.

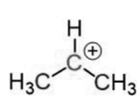
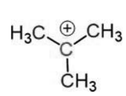
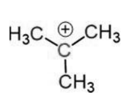
Marking Scheme of Sample Question Paper
Chemistry XI
2022-23

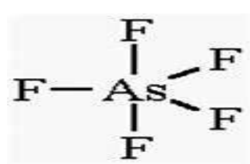
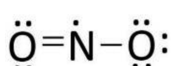
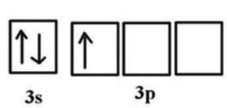
Q.No.	Sub part	**Value points**	Step wise marks	Total marks
1		(d)	1	1
2		(a)	1	1
3		(c)	1	1
4		(b)	1	1
5		(c)	1	1
6		(d)	1	1
7		(b)	1	1
8		(d)	1	1
9		(a)	1	1
10		(c)	1	1
11		(c)	1	1
12		(a)	1	1
13		(a)	1	1
14		(c)	1	1
15		(d)	1	1
16		(a)	1	1
17		(d)	1	1
18		(d)	1	1
19		Mass of Urea=120g Mass of water=880g Total mass of solution=880+120=1000g Voume of solution = $\frac{\text{mass}}{\text{Density}} = \frac{1000g}{1.15g/mL} = \frac{1000}{1.15}$ mL Molarity of solution = $\frac{\text{Mass of solute}}{\text{Molar mass of solute}} \times \frac{1000}{\text{Volume of solution (in mL)}}$	 1/5 1/5	2

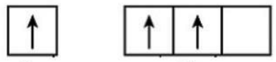
<table>
<tr><td></td><td></td><td>$= \frac{120g}{60g} \times \frac{1000}{1000mL} \times 1.15$
=2.30M</td><td>½
½</td><td></td></tr>
<tr><td>20</td><td></td><td>Electronic configuration=$3d^5\ 4s^2$
Period = 4
Group = 7</td><td>1
½
½</td><td>2</td></tr>
<tr><td>21</td><td>a</td><td>
</td><td>1</td><td>2</td></tr>
<tr><td></td><td>b</td><td>
</td><td>1</td><td></td></tr>
<tr><td>22</td><td>a</td><td>No. of subshells=5</td><td>1</td><td>2</td></tr>
<tr><td></td><td>b</td><td>No. of electrons present in the subshells having m_s value of +½ for n=5 is 25 [No. of electrons $=2n^2/2$</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>OR</td><td></td><td></td></tr>
<tr><td></td><td></td><td><table>
<tr><td>Emission Spectrum</td><td>Absorption Spectrum</td></tr>
<tr><td>It is obtained when radiation from the source is directly analyzed in the spectroscope.</td><td>It is obtained when the white light is first passed through the substance and the transmitted light is analyzed in the spectroscope.</td></tr>
<tr><td>It consists of bright coloured</td><td>It consists of dark lines in</td></tr>
</table></td><td>1
1</td><td>2</td></tr>
</table>

		lines separated by dark spaces. | the otherwise continuous spectra. (OR Any other suitable point may also be marked)		
23		$\overset{+6}{MnO_4^{2-}} \rightarrow \overset{+4}{MnO_2} + \overset{+7}{MnO_4^-}$ Oxidation half reaction $[MnO_4^{2-} \rightarrow e^- + MnO_4^-] \times 2$ —(i) Reduction half reaction $MnO_4^{2-} + 4H^+ + 2e^- \rightarrow MnO_2 + 2H_2O$—(ii) Adding (i) and (ii) $3MnO_4^{2-} + 4H^+ + 2e^- \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$	½ ½ ½ ½	2
		OR		
		$\overset{+7}{MnO_4^-} + \overset{-1}{I^-} \rightarrow \overset{+4}{MnO_2} + \overset{+7}{I_2}$ [Basic medium] Oxidation half reaction $[2I^- \rightarrow 2e^- + I_2] \times 3$ —(i) Reduction half reaction $[MnO_4^- + 2H_2O + 3e^- \rightarrow MnO_2 + 4OH^-] \times 2$—(ii) Adding (i) and (ii) $2MnO_4^- + 6I^- + 4H_2O \rightarrow 3I_2 + 2MnO_2 + 8OH^-$	½ ½ ½ ½	
24		$(H_3C)_2$-C=CH-CH=CH_2 4-Methylpenta-1,3-diene	1 1	2
25	a	de-Broglie relation $\lambda = h/mv$	1	2
	b	For macroscopic particles,since the mass is too large,the associated wavelengths are so short that their wave properties cannot be detected.	1	
26		Given: i)C_2H_4 (g) + H_2(g) → C_2H_6 (g), ΔH = -135.6 kJ/mol ii) H_2 (g) + ½ O_2 (g) → H_2O (l), ΔH = -286.2 kJ/mol iii) C_2H_6 (g) + 7/2 O_2 (g) → $2CO_2$(g) + $3H_2O$ (l), ΔH = -1560 kJ/mol To find:	½ ½ ½	

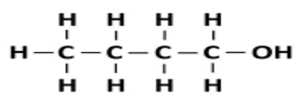
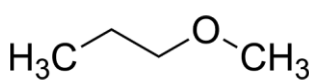
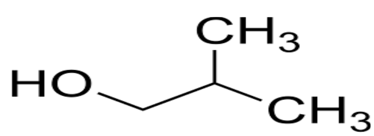
		$C_2H_4 (g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O (l), \Delta H = ?$ Eq (i) + Eq(iii) – Eq(ii) = -135.6 + (-1560) - (-286.2) = -1409.4 kJ/mol	½ ½ ½	3
27	a	More penetration effect of s-orbital as compared to that of p-orbital / completely filled s-subshell in Mg	1	3
	b	Zn has completely filled d-orbital in atomic as well asionic state.	1	
	c	Energy has to be provided to overcome the repulsion between **O^-** and incoming electron.	1	
		or		
	a	N < O < F	1	3
	b	$N^{3-} < O^{2-} < F^-$	1	
	c	I < Br< Cl < F	1	
28		  (X) (Y)	1 1+1	3

29	a	Energy of photon (E) = $h\nu = \frac{hc}{\lambda}$ $= \frac{6.626 \times 10^{-34}\ Js \times 3 \times 10^{8}\ ms^{-1}}{4 \times 10^{-7}\ m}$ $= 4.97 \times 10^{-19}$ J $= \frac{4.97 \times 10^{-19}}{1.6 \times 10^{-19}}\ eV = 3.10\ eV$	½ ½	3
	b	Kinetic energy of emission = ½ mv^2 $= ½ \times 9.1 \times 10^{-31}$ Kg $\times (5.84 \times 10^{5}\ ms^{-1})^2$ $=1.55 \times 10^{-19}$ J $= \frac{1.55 \times 10^{-19}}{1.6 \times 10^{-19}}\ eV = 0.968\ eV$	½ ½	
	c	Work function = E – KE = (3.10 – 0.968) eV = 2.132 eV	½ ½	
30	a	Hetrolytic fission	1	3
	b	  For reaction 1 For reaction 2	½+½	
	c	 is more stable	½ ½	

		due to more number of **α** - hydrogen atoms / more numberof hyperconjugative structures / More +I effect due to 3 methyl groups.		
31	a	Molality , Mole fraction As they do not involve calculations using volume .	½ + ½ 1	4
	b (i)	Percentage by Mass	1	
	(ii)	Parts per million (ppm)	1	
32	a	Yes , it is feasible at all temperatures . According to the equation $\Delta G = \Delta H - T\Delta S$ Since reaction is exothermic , ΔH is negative ΔS_{total} is positive , therefore , ΔG is negative at all temperatures .	1 1	4
	b	A spontaneous process is an irreversible process and may only be reversed by some external agency. OR Entropy is the measure of disorder or randomness of the system.	1	
	c	For the calculation of free energy change (ΔG) , we don't need to have any measurements or parameters involving surrounding, everything can be measured with respect to the system.	1	
33	a	As has 5 valence electrons/5 bond pairs.  Trigonal bipyramidal	1	5
	b		1	
	c	Electronic configuration of Al : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$ 		

		In $AlCl_4^-$  3 Cl atoms share 1 electron each and chloride ion shares lone pair in the empty orbital making hybridisation sp3.	1	
	d	$BeCl_2$/ BF_3/ CH_4/CCl_4 or any other suitable example.	1	
	e	Intramolecular hydrogen bonding.	1	
34	a	$HCOOH \leftrightharpoons HCOO^- + H^+$ Initial 0.1 0 0 Final 0.1-x x x $Ka = (x)^2 / (0.1-x)$ $1.77 \times 10^{-44} = (x)^2 / 0.1$ as $x << 0.1$ M $x = 0.0042M = [H^+]$ (i) $pH = -\log [H^+]$ $= -\log 0.0042$ $= 2.4$ (ii) To calculate percentage dissociation: $[H^+] = c\alpha$ $0.0042 = 0.1 \times \alpha$ $\alpha = 0.042$ % dissociation $= 0.042 \times 100$ $= 4.2$ %	½ ½ ½ ½	5
	b	Henry's Law : The mass of a gas dissolved by a liquid is proportional to the pressure of the gas upon the liquid.	1	
	c	$H_2 (g) + Br_2 (g) \leftrightharpoons 2HBr(g)$ $[H_2] = 0.45 / V$ mol/L (V is the volume of the vessel) $[Br_2] = 0.39/ V$ mol/L		

		$[HBr] = 3.0 / V$ mol/L $Kc = [HBr]^2 / [H_2][Br_2]$ $= (3.0 / V)^2 / (0.45 / V \times 0.39 / V)$ $= (3.0)^2 / (0.45 \times 0.39) = 51.28$ $Kp = Kc (RT)^{\Delta n}$ ($\Delta n = 0$) $Kp = Kc = 51.28$	½ ½ ½ ½	
		OR		
	a	For the reaction,the reaction quotient (Q) is given by $Qc = [B][C] / [A]^2$ As $[A] = [B] = [C] = 5 \times 10^{-5}$ $Qc = (5 \times 10^{-5})(5 \times 10^{-5}) / (5 \times 10^{-5})^2$ $= 1$ As Qc > Kc , the reaction will proceed in the reverse direction.	1 1	5
	b	Common Ion Effect : It is a shift in equilibrium on adding a substance that provides more of an ionic species already present in the dissociation equilibrium.	1	
	c	40 ml of 1.0×10^{-5} M $BaCl_2$ is mixed with 40 ml of 5.0×10^{-6} M Ba_2SO_4 After mixing , molarity of Ba^{2+} $M_1V_1 = M_2V_2$ $1.0 \times 10^{-5} \times 40 = M2 \times 80$ $[Ba^{2+}] = (1.0 \times 10^{-5}) / 2 = 5 \times 10^{-6}$ M After mixing ,molarity of SO_4^{2-} $= ½ (5 \times 10^{-6}) = 2.5 \times 10^{-6}$M	½ ½	

		Ionic product of $BaSO_4 = [Ba^{2+}][SO_4^{2-}]$ $= (5\times10^{-6} \times 2.5\times10^{-6})$ M $= 7.5 \times10^{-6}$ M Given Ksp = 1×10^{-10} Since Ksp > ionic product No precipitation will take place.	½ ½	
35	a	 Butan-1-ol or any other isomeric monohydric alcohol. 	½ ½	5
	b	 2-Methylpropan-1-ol	1 1	
	c	20 millimoles of Sulphuric acid neutralizes 40 millimoles of Ammonia. 40 millimoles of NH_3 contains = $40\times10^{-3}\times 14$ g of Nitrogen Percentage of N in the organic compound $= (40\times10^{-3}\times 14 \times 100) / 2.8$ = 20 %	½ ½ ½ ½	
		OR		
	a	Amount of Sulphur in organic compound $= (0.2 \times 40)/ 100 = 0.08$ g 32 g S present in 233 grams of $BaSO_4$ 0.08 g S present in = $(233 \times 0.08) / 32$ g of $BaSO_4$ = 0.5825 g of $BaSO_4$	½ ½ ½ ½	

	b	(i) Thin Layer Chromatography (ii) R_f (For component A) = Y/Z = 3.2 cm / 5.3 cm = 0.603 cm R_f (For component B) = X/Z = 1.5 cm / 5.3 cm = 0.283 cm (iii) Component B	1 ½ ½ 1	5