TIME: 3 HOURS

MAX. MARKS: 70

		Thidatoria	Б	nitwise We	eightage to	Different	t Forms of	Question :			Dis	tributi	ion of	Differ	entT	vpes o	5
	Unit/Guestions Type	to Content		ICG	02	short Ansv	ver	Assertion	Long			guest	cions o	over ti	ae Uni	its volu	
		Unit (Marks)	1 mark	2 mark	1 mark	2 mark	3 mark	Reason	Answer		1	5 7 7	5 5	, () ()	4 4 σ	- 	¢
1	. Some Basic Concepts of Chemistry	1			1×1= 1								1				
2	. Structure of Atom	5		1×2= 2			1×3= 3					1			1		
က	 Classification of Elements and Periodicity in Properties 	വ					1×3= 3	1×2= 2									
4	. Chemical Bonding and Molecular Structure	5				1×2= 2	1×3= 3							1			
2	. States of Matter	5							$1 \times 5 = 5$								
9	. Thermodynamics	9	1×1= 1			1×2= 2	1×3= 3				1			1	1		
7	. Equilibrium	9	1×1= 1			1×2= 2	1×3= 3				1			1	1		
∞	6. Redox Reactions	Q				1×2= 2	1×3= 3							1			
6). Hydrogen	5				1×2= 2	1×3= 3							1	1		
10). The s-Block Elements	5	1×1= 1		$1 \times 1 = 1$		1×3= 3				1		1		1		
11	. The <i>p</i> -Block Elements	5							$1 \times 5 = 5$	su							_
12	 Organic Chemistry - Some Basic Principles and Techniques 	7		1×2= 2					1×5= 5	ype Guestio		1					_
13	. Hydrocarbons	7	1×1= 1		1×1= 1		1×3= 3	1×2= 2		ет оf Дарана Справ	1		1		1	1	
14	. Environmental Chemistry	3			1×1= 1			1×2= 2		lmuV I fo			1			1	
	TOTAL	70	4	4	4	10	27	9	15	Total	4	2	4	ß	6	8 8	~

	3						
Sl. No.	Forms of Questions	Expected Length	Expected Time for Each Question	Total Number of Questions	Total Time Expected		
1.	MCQ (I)	-	2 minutes	4	08 minutes		
2.	MCQ (II)	-	3 minutes	2	06 minutes		
3.	SA (I)	one line	3 minutes	4	12 minutes		
4.	SA (II)	20-30 words	4 minutes	5	20 minutes		
4.	SA (III)	30-50 words	7 minutes	9	63 minutes		
6.	Assertion-Reason	-	3 minutes	3	09 minutes		
7.	Long Answer Type	70-100 words	15 minutes	3	45 minutes		
8.	Revision	-			17 minutes		
		TOTAL	-	30	180 minutes		

II. Expected Length of Answer and Time Required for Each Form of Question shall be as Follows :

III. Weightage to Difficulty Level of Questions

S1. No.	Estimated Difficulty Level of Questions	Percentage
1.	Easy	18
2.	Average	64
3.	Difficult	18

MODEL QUESTION PAPER

CHEMISTRY

Class XI

Time : 3 Hours

Maximum Marks: 70

General Instructions :

- (i) All the questions are compulsory.
- (ii) Questions 1 to 4, carry one mark each and questions 5 and 6, carry 2 marks.
- (iii) Questions 7 to 10 are short answer questions carrying one mark each.
- (iv) *Questions 11 to 15 are also short answer questions carrying two marks each.*
- (v) Questions 16 to 24 are also short answer questions carrying three marks each.
- (vi) Questions 25 to 27 are assertion- reason questions carry two marks each.
- (vii) Questions 28 to 30 are long answer questions and carry five marks each.
- (viii) Use log tables for calculations if necessary.

Note : Choose one correct option for questions 1 to 4.

1. The pressure volume work for an ideal gas can be calculated by using the expression;

$$\mathbf{w} = -\int_{V_i}^{V_f} p_{ex} dV$$

The work can also be calculated from the pV plot by using the area under the curve within the specified limit. When an ideal gas is compressed reversibly or irreversibly from volume V_i to V_f , which of the following is correct?

- (i) $W_{rev} = W_{irrev}$
- (ii) $W_{rev} < W_{irrev}$
- (iii) $W_{rev} > W_{irrev}$
- (iv) $W_{rev} = W_{irrev} + p_{ex}$. dV
- **2.** When hydrochloric acid is added to cobalt nitrate solution at room temperature, the following reaction takes place :

$$[\operatorname{Co}(\operatorname{H}_{2}\operatorname{O})_{6}]_{3}^{+}(aq) + 4\operatorname{Cl}^{-}(aq) \rightleftharpoons [\operatorname{Co}\operatorname{Cl}_{4}]^{2^{-}}(aq) + 6\operatorname{H}_{2}\operatorname{O}(l)$$

Pink blue

The solution is blue at room temperature. However, it turns pink when cooled in a freezing mixture. Based upon this information, which of the following expression is correct for the forward reaction?

- (i) $\Delta H > 0$
- (ii) $\Delta H < 0$
- (iii) $\Delta H = 0$
- (iv) The sign of ΔH cannot be predicted on the basis of this information.

(1)

(1)

- 3. Which of the following elements does not form hydride by direct heating with dihydrogen?
 - Be (i)
 - (ii) Mg
 - Sr (iii)
 - (iv) Ba
 - 4. Which of the following species should be aromatic in character?



Note : Choose two correct options for questions 5 and 6.

- 5. Identify the pairs which are of isotopes?
 - $^{12}_{6}
 m X$, $^{13}_{6}
 m Y$ (i) (ii) ${}^{35}_{17}$ X , ${}^{37}_{17}$ Y
 - (iii) ${}^{14}_{6}X$, ${}^{14}_{7}Y$
 - ${}^{8}_{4}X, {}^{8}_{5}Y$ (iv) (2)
- 6. Electrophiles are electron seeking species. Which of the following sets consist of electrophiles only.
 - (i) BF_3 , NH_3 , H_2O
 - (ii) $AlCl_3, SO_3, \overset{\oplus}{NO}_2$
 - (iii) $\stackrel{\oplus}{\text{NO}}_2$, $\stackrel{\oplus}{\text{CH}}_3$, $\text{CH}_3 \stackrel{\oplus}{\text{C}} = O$ (iv) $C_2H_5^{\Theta}, \dot{C}_2H_5, \overset{\oplus}{C}_2H_5$ (2)
- 7. How many significant figures should be present in the answer of the following calculations?

$$\frac{2.5 \times 1.25 \times 3.5}{2.01}$$
(1)

- 8. Complete the following reactions
 - (i) $O_2^{2-} + H_2O \longrightarrow$ (ii) $O_2^{-} + H_2O \longrightarrow$

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(1)

(1)

9. Give IUPAC name of the compound whose line formula is given below: (1)

$$CH_{3} \xrightarrow{C} CH_{3} CH_{3}$$

- 10. Green house effect leads to global warming. Which substances are responsible for green house effect? (1)
- **11.** Using molecular orbital theory, compare the bond energy and magnetic character of O_2^+ and O_2^- species. (2)
- 12. Consider the reaction given below :

$$CaCO_3$$
 (s) \longrightarrow CaO (s) + CO₂ (g)

Predict the effect of increase in temperature on the equilibrium constant of this reaction.

Given that $\Delta_f H^{\ominus}$ [CaO(s)] = -635.1 kJ mol⁻¹ $\Delta_f H^{\ominus} [CO_2(g)] = -393.5 \text{ kJ mol}^1$ $\Delta_{f} H^{\ominus} [CaCO_{3}(s)] = -1206.9 \text{ kJ mol}^{-1}$

- 13. pH of 0.08 mol dm⁻³ HOCl solution is 2.85. Calculate its ionization constant. (2)
- Nitric acid is an oxidising agent and reacts with PbO but it does not react 14. with PbO₂. Explain why? (2)
- Calculate the strength of 5 volume H_2O_2 solution. (2) 15.
- According to de Broglie, matter should exhibit dual behaviour, that is both **16**. particle and wave like properties. However, a cricket ball of 100g does not move like a wave when it is thrown by a bowler at a speed of 100km/h. Calculate the wavelength of the ball and explain why it does not show wave nature. (3)
- **17.** Explain why nitrogen has positive electron gain enthalpy whereas oxygen has negative, although first ionisation enthalpy of oxygen is lower than that of nitrogen. Justify your answer. (3)
- **18.** Write Lewis structure of the following compounds and show formal charge on each atom.

$$HNO_3, NO_2, H_2SO_4$$
 (3)

- Although heat is a path function, even then heat absorbed by the system 19. under certain conditions is independent of path. What are those conditions? Explain. (3)
- The solubility product of Al (OH)₃ is 2.7×10^{-11} . Calculate its solubility in g L⁻¹ 20. and also find out pH of this solution. (Atomic mass of Al is 27 u). (3)

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(2)

21. Calculate the oxidation number of each sulphur atom in the following compounds:

(a)
$$Na_2S_2O_3$$
 (b) $Na_2S_4O_6$ (3)

- 22. (i) Dihydrogen reacts with dioxygen to form water. Name the product and write its formula when the isotope of hydrogen, which has one proton and one neutron in its nuclus, is treated with dioxygen? (1)
 - (ii) Will the reactivity of both the isotopes of hydrogen be the same towards oxygen ? Justify your answer. (2)
- (i) Beryllium sulphate and magnesium sulphate are readily soluble in water whereas the sulphates of barium, calcium and strontium are only sparingly soluble. Explain.
 (2)
 - (ii) Why is the temperature maintained around 393 K during the preparation of plaster of paris? (1)
- $\label{eq:24. Give the reactions involved in the preparation of propane from the following:$
 - (i) $CH_3 CH = CH_2$
 - (ii) $CH_3 CH_2 CH_2 CI$
 - (iii) $CH_3 CH_2 CH_2 COO^{-} Na^{+}$
- **25.** *Assertion (A) :* The first ionization enthalpy of alkali metals decreases down the group.
 - *Reason (R)*: Increase in number of orbitals increases the shielding effect which outweighs the increasing nuclear charge, therefore, the removal of outermost electron requires less energy on moving down the group. (2)
 - (i) A and R both are correct but R is not the explanation of A.
 - (ii) A is false but R is correct.
 - (iii) A and R both are correct and R is the correct explanation of A.
 - (iv) A and R both are incorrect.
- **26.** *Assertion (A) :* Nitration of benzene requires the use of concentrated sulphuric acid and nitric acid.
 - **Reason (R)**: The mixture of acids produces the electrophile for the reaction.

(2)

(3)

- (i) A and R both are correct but R is not the explanation of A.
- (ii) A is false but R is correct.
- (iii) A and R both are correct and R is the correct explanation of A.
- (iv) A and R both are incorrect.
- **27.** *Assertion (A) :* Ozone is destroyed by solar radiations in upper stratosphere.

Reason (R) :Thinning of ozone layer allows excessive UV radiations to
reach the surface of earth.(2)

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- (i) A and R both are correct but R is not the explanation of A.
- (ii) A is false but R is correct.
- (iii) A and R both are correct and R is the correct explanation of A.
- (iv) A and R both are incorrect.
- **28.** (a) Liquids can be considered as very dense gases. When a liquid phase changes to gas phase, the liquid and the gas phases are in equilibrium and a surface separates the two phases. This surface is visible if both phases are in equilibrium and are below critical tempertaure and pressure. However, it is possible to interconvert liquid and gas wherein two phases are never present together.

With the help of a well-labled diagram show that CO_2 gas can be liquified by changing the pressure and temperature without passing through the situation when both gaseous and liquid CO_2 are at equilibrium. (3)

- (b) Arrange the following liquids in increasing order of their viscosities. Give reason for your answer. (2)Water, benzene, ethane-1,2-diol.
- **29.** (a) Explain why :
 - (i) BCl_3 is a Lewis acid.
 - (ii) Boric acid is a monobasic acid.
 - (b) Compound 'A' of boron reacts with excess NH_3 to give a compound 'B'. Compound 'B' on heating gives cyclic compound 'C'. Compound C is called inorganic benzene.
 - (i) Identify compounds 'A', 'B' and 'C'
 - (ii) Give the reactions involved in these processes. (3)
- **30.** (a) Write two important differences between inductive and resonance effects.

(2)

(2)

- (b) Give reasons to explain the following observations:
 - (i) Carbon number '2' in CH_3CH_2Cl has more positive charge than that in CH_3CH_2Br .
 - (ii) $CH_3-CH = CH-CH = CH_2$ (I) is more stable than $CH_3-CH = CH-CH_2-CH = CH_2$ (II). (3)

Guidelines for Evaluation (Marking Scheme)

- 1. (ii) (1)
- 2. (i) (1)
- 3. (i) (1)
- 4. (iv) (1)
 - For questions 5 and 6 two marks for both correct answers, otherwise zero mark
- 5. (i) and (ii) (2)
- 6. (ii) and (iii) (2)
- 7. Two (1)
- 8. (i) $O_2^{2^-} + 2H_2O \longrightarrow 2OH^- + H_2O_2$ (ii) $2O_2^- + 2H_2O \longrightarrow 2OH^- + H_2O_2 + O_2$ (1)
- 9. 4-Methylhept-5-en-2-one (1)
- 10. Trapping of heat by green house gases, namely carbon dioxide, methane, nitrous oxide, ozone and chlorofluorocarbons. (1)
- 11. According to molecular orbital theory electronic configurations of $O_2^{\,+}$ and $O_2^{\,-}$ species are as follows :

 $\begin{aligned} O_{2}^{*} &: (\sigma 1 \, s)^{2} \, (\overset{*}{\sigma} 1 \, s^{2}) (\sigma 2 \, s)^{2} \, (\overset{*}{\sigma} 2 \, s^{2}) \, (\sigma 2 \, p_{z})^{2} \, (\pi 2 \, p_{x}^{2}, \pi 2 \, p_{y}^{2}) \, (\pi^{*} 2 \, p_{x}^{1}) \\ O_{2}^{-} &: (\sigma 1 \, s)^{2} \, (\overset{*}{\sigma} 1 \, s^{2}) \, (\sigma 2 \, s)^{2} \, (\overset{*}{\sigma} 2 \, s^{2}) \, (\sigma 2 \, p_{z})^{2} \, (\pi 2 \, p_{x}^{2}, \pi 2 \, p_{y}^{2}) \, (\pi^{*} 2 \, p_{x}^{2}, \pi^{*} 2 \, p_{y}^{1}) \\ \text{Bond order of } O_{2}^{+} &= \frac{10 - 5}{2} \, = \frac{5}{2} \, = 2.5 \\ \text{Bond order of } O_{2}^{-} &= \frac{10 - 7}{2} \, = \frac{3}{2} \, = 1.5 \end{aligned}$

- Higher bond order of O_2^+ shows that its bond energy is more than that of O_2^- hence it is more stable than O_2^- . ($\frac{1}{2} \times 2$)
- Both the species have unpaired electrons. So both are paramagnetic in nature.

12.
$$\Delta_r \stackrel{\Theta}{H} = \Delta_f \stackrel{\Theta}{H} [CaO(s)] + \Delta_f \stackrel{\Theta}{H} [CO_2(g) - \Delta_f \stackrel{\Theta}{H} [CaCO_3(s)]$$

 $\Delta_r H^{\Theta} = +178.3 \text{ kJ mol}^{-1}$

Since reaction is endothermic, according to Le Chatelier's principle, increase of temperature will increase the value of *K*.

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- Use of correct formula (1/2)
- Correct substitution of values (1/2)
- Correct value of $\Delta_{\mathcal{H}}^{\Theta}$ (½)
- Correct interpretation (½)
- 13. pH of HOCl = 2.85

But, $-pH = \log [H^+]$

 $\therefore -2.85 = \log [\text{H}^+]$

 $\Rightarrow \overline{3}.15 = \log [\text{H}^{\dagger}]$

 \Rightarrow [H⁺] = 1.413 × 10⁻³

For weak mono basic acid $[H^*] = \sqrt{K_a \times C}$

$$\Rightarrow K_{a} = \frac{[H^{+}]^{2}}{C} = \frac{(1.413 \times 10^{-3})^{2}}{0.08}$$
$$= 24.957 \times 10^{-6} = 2.4957 \times 10^{-5}$$

- Correct calculations of [H⁺] (1)
- Correct calculations of K_{a} (1)
- 14. PbO is basic oxide and simple acid base reaction takes place between PbO and HNO_3 . On the other hand in PbO₂ lead is in +4 oxidation state and can not be oxidised further. Therefore no reaction takes place. Thus PbO₂ is passive, only PbO reacts with HNO₃.

 $2\text{PbO} + 4\text{HNO}_{3} \longrightarrow 2\text{Pb} (\text{NO}_{3})_{2} + 2\text{H}_{2}\text{O}$

- Correct reason (1½)
- Chemical equation (½)
- 15. 5 volume H_2O_2 solution means that hydrogen peroxide contained in 1 volume of this solution will decompose to give 5 volumes of oxygen at STP i.e. if 1L of this solution is taken, then 5 L of oxygen can be produced from this at STP. Chemical equation for the decomposition of H_2O_2 is $2H_2O_2(l) \longrightarrow O_2(g) + H_2O(l)$.

It shows that 68 g $\rm H_2O_2$ gives 22.7 L of $\rm O_2$ at STP, so 5 L oxygen will be obtained from :

$$\frac{68g \times 5L}{22.7L} = \frac{3400}{227} g H_2O_2 = 14.9 g \approx 15 g H_2O_2$$

i.e., 15 g H_2O_2 dissolved in 1 L solution will give 5 L oxygen or 1.5 g $H_2O_2/100$ mL solution will give 500 mL oxygen. Thus 15 g/L or 1.5% solution is known as 5V solution of H_2O_2 .

- Correct chemical equation (1)
- Correct Chemical formula (½)
- Correct value

16.
$$\lambda = \frac{h}{mv}$$

m = 100 g = 0.1 kg.
v = 100 km/h = $\frac{100 \times 1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{1000}{36} \text{ m s}^{-1}$
h = 6.626 × 10⁻³⁴ Js
 $\lambda = \frac{6.626 \times 10^{-34} \text{ Js}}{0.1 \text{ kg} \times \frac{1000}{36} \text{ ms}^{-1}} = 6.626 \times 10^{-36} \times 36 \text{ m}^{-1} = 238.5 \times 10^{-36} \text{m}^{-1}$

Since the wavelength is very small, the wave nature cannot be detected.

- Using correct formula(½)• Putting correct values(½)• Correct answer(½)
- Correct interpretation (1¹/₂)
- 17. The outermost electronic configuration of nitrogen $2s^2 2p_x^1 2p_y^1 2p_z^1$ is very stable due to half filled *p*-orbital. Addition of extra electron to any of the 2p orbital requires energy. Oxygen has 4 electrons in 2p orbitals and acquires stable configuration $2p^3$ after removing one electron. (3)

- Correct Lewis structure for each compound (½x3)
- Showing correct formal charge on atom(s) in each structure $(\frac{1}{2}\times 3)$

19. At constant volume

By first law of thermodynamics:

$$q_{V} = \Delta U + (-w)$$

but $(-w) = p\Delta V$
 $\therefore q_{V} = \Delta U + p\Delta V$

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(½)

 $\Delta V = 0$, since volume is constant.

$$\therefore q_{\rm w} = \Delta U + 0$$

 $\Rightarrow q_{_{U}} = \Delta U = \text{change in internal energy}$

At constant pressure

 $q_p = \Delta U + p \Delta V$

But, $\Delta U + p \Delta \dot{V} = \Delta H$

 $\therefore q_p = \Delta H$ = change in enthalpy.

So, at a constant volume and at constant pressure heat change is state function because it is equal to change in internal energy and change in enthalpy respectively which are state functions.

- Derivation for constant volume (1)
- Derivation for constant pressure (1)

(1)

Correct interpretation

20. Let S be the solubility of $Al(OH)_3$ in mol L^{-1} .

		Al (OH) ₃	\Rightarrow Al ³⁺ (aq)	+ 3OH ⁻ (aq)
Conc spec	centration of ies at t = 0 in mol L^{-1}	1	0	0
Conc spec: mol l	centration of various ies at equilibrium in L ⁻¹	1–S	S	3S
	$K_{\rm sp} = [AI^{3+}] [OH^{-}]^{3} = (S) (3)$	$(3S)^3 = 27 S^4$		
	$S^4 = \frac{K_{sp}}{27} = \frac{2.7 \times 10^{-11}}{27} =$	$=\frac{27\times10^{-11}}{27\times10}=$	1×10^{-12}	
	$S = 1 \times 10^{-3} \text{ mol } L^{-1}$			
(i)	Molar mass of Al (OH) ₃ i Solubility of Al (OH) ₃ in	is 78 g mol ⁻¹ . ' g L ⁻¹ = (1 × 10) = 78 × 1 = 7.8 × 1	Therefore, $D^{-3} \mod L^{-1} \times (7)^{-3} g L^{-1}$ $0^{-3} g L^{-1}$ $10^{-2} g L^{-1}$	78 g L^{-1})
• Pi	utting correct values in eq	uation		(1)
• Co	orrect answer			(1)
(ii)	pH of the solution $S = 1 \times 10^{-3} \text{ mol } L^{-1}$ $[OH^{-}] = 3S = 3 \times 1 \times 10^{-3} =$ $pOH = 3 - \log 3$ $pH = 14 - pOH = 11 + \log 3$	= 3 × 10 ⁻³ mol og 3 = 11.477	L^{-1} $71 \approx 11.5$	
• Us	sing correct formula			(1/2)
Correct answer				(1/2)

21.	(a) +	-2	(b) +5, 0, 0, +5	(1+2)
22.	(i)	Heavy water	, (D ₂ O)	[½ ×2]
	(ii)	No, the react	tivity of both the isotopes will not be the same	me. (1)
	Jus	tification:	The reactivity depends upon enthalpy of b dissociation. Due to the difference in the er of bond dissociation for two isotopes, the r reaction will be different.	oond nthalpy cate of (1)
23.	(i)	BeSO ₄ and M greater hydr the lattice er	AgSO ₄ are readily soluble in water because ation enthalpies of Be ²⁺ and Mg ²⁺ ions over athalpy factor.	come (2)
	(ii)	If the temper is further de	cature is raised above 393 K, plaster of par hydrated to form anhydrous calcium sulp	is hate. (1)
24.	(i)	$CH_3CH = CH$	$I_2 + H_2 \xrightarrow{Pt/Pd/Ni} CH_3CH_2CH_3$	
	(ii)	$\mathrm{CH_3CH_2CH_2}$	$Cl + H_2 \xrightarrow{Zn, H^+} CH_3CH_2CH_3 + HCl$	
	(iii)	$\mathrm{CH}_{3}\mathrm{CH}_{2}\mathrm{CH}_{2}$	$COO^{-}Na^{+} + NaOH \xrightarrow{CuO} CH_{3}CH_{2}CH_{3} + CH_{3}CH_{2}CH_{3} + CH_{3}$	+ Na ₂ CO ₃
	• 1	mark for eac	ch part for writing correct chemical	
	e	quation for tl	ne reaction	(1×3)

- 27. (ii)
- 28.(a) Suppose gas is at point 'A' on isotherm T_1 . First increase the temperature of the gas above critical temperature (T_c) keeping the volume constant. Suppose the gas reaches the point 'F' on isotherm T_2 where it is at volume V_1 and pressure p_1 . Now compress the gas upto Volume V_2 . In this compression the pressure and volume of the gas will move along the curve FG (Boyle law) at point G, let the pressure at point G be p_2 . Now start cooling the gas. As soon as gas will reach the point 'H' located on isotherm of critical temperature, it will liquify without passing



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(2)

through equilibrium state. The gas will not pass through two phases because volume (V_2) of the gas is less than critical volume i.e. molecules are closer to each other. Gas is at a higher pressure than critical pressure. Cooling slows down the molecular motion and intermolecular forces can hold the molecules together.

- Correct graph with proper labelling (1)
- Explanation

(2)

(b) benzene < water < ethane-1, 2-diol

Reason : Ethane-1, 2-diol has more hydogen bonding than water while in benzene hydrogen bonding is absent.

- Correct order (1)
 Correct reason (1)
- 29. (a) (i) BCl_3 is an electron deficient compound. In order to complete its octet, boron has a tendency to accept a pair of electrons.

$$BCl_3 + NH_3 \longrightarrow BCl_3 : NH_3$$
(1)

- (ii) It is not an acid according to proton concept, However it accepts one OH^{-} from water to form $B(OH_{4})^{-}$. (1)
- (b) (i) $A = B_2 H_6$; $B = B_2 H_6 \cdot 2NH_3$; $C = B_3 N_3 H_6$

(ii) **Reactions**:

$$B_{2}H_{6} + 2NH_{3} \longrightarrow B_{2}H_{6}.2NH_{3}$$
(1¹/₂)

A B
(1¹/₂)



30. (a) **Inductive effect**

- (i) Involves σ -electrons
- (ii) vanishes beyond third carbon atom
- (iii) Exhibited by even non-planar compounds
- (Any two) (1 mark each)

Resonance effect

- (i) involves π- electrons or lone pair of electrons
- (ii) present all along the length if system is conjugated
- (iii) Exhibited by only planar compounds

(2)

(b) Polarisation of $CH_{3}CH_{2}Cl$ and $CH_{3}CH_{2}Br$ can be shown as follows:

- Chlorine is more electronegative than bromine. Therefore C—Cl bond is more polar than C—Br bond. Hence inductive effect is greater on second carbon atom in CH₂CH₂Cl. (1)
- (c) Resonating structures of CH_3 -CH=CH-CH=CH₃

$$CH_{3}-CH=CH=CH_{2}+CH_{3}-CH=CH=CH=CH-CH_{2}$$
(1)

• Due to resonance effect, I is more stable. There is no conjugation in $CH_3CH = CH_2(CH_2)_2-CH = CH_2$ (½)