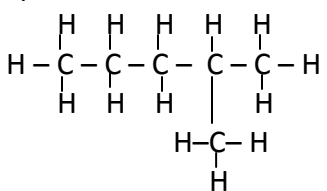

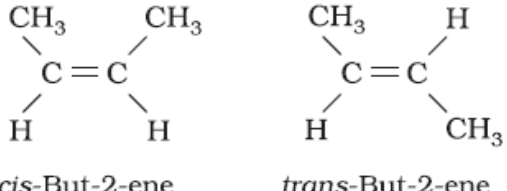


# FIRST YEAR HIGHER SECONDARY EXAMINATION SEPTEMBER– 2021

**SUBJECT: CHEMISTRY**

**Qn. Code: FY 325**

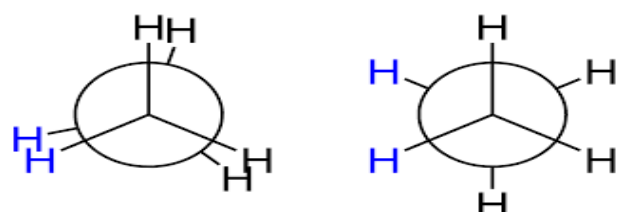
Qn. No.	Sub qns.	Answer Key/Value Points	Score	Total									
<b>Answer any 6 questions from 1 to 12. Each carries 2 scores. (6 x 2 = 12)</b>													
1.	(a) (b)	3p 5s	1 1	2									
2.		(a) $Cu - 1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$ This is due to the extra stability of the completely filled $d^{10}$ electronic configuration.	1 1	2									
3.		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Molecule</th> <th style="width: 40%;">Structure</th> <th style="width: 35%;">Bond angle</th> </tr> </thead> <tbody> <tr> <td>BF<sub>3</sub></td> <td>Trigonal planar (Planar triangular)</td> <td>120°</td> </tr> <tr> <td>BeCl<sub>2</sub></td> <td>Linear</td> <td>180°</td> </tr> </tbody> </table>	Molecule	Structure	Bond angle	BF <sub>3</sub>	Trigonal planar (Planar triangular)	120°	BeCl <sub>2</sub>	Linear	180°	1 1	2
Molecule	Structure	Bond angle											
BF <sub>3</sub>	Trigonal planar (Planar triangular)	120°											
BeCl <sub>2</sub>	Linear	180°											
4.		<p>The postulates of Kinetic Molecular Theory are:</p> <ol style="list-style-type: none"> <li>1. Every gas contains a large number of minute and elastic particles (atoms or molecules). The actual volume of the molecules is negligible compared to the volume of the gas.</li> <li>2. There is no force of attraction between the gas particles.</li> <li>3. The particles of a gas are in constant and random motion in straight line. During this motion they collide with each other and also with the walls of the container.</li> <li>4. The pressure of a gas is due to the wall collisions of the particles.</li> <li>5. All collisions are perfectly elastic. i.e. the total energy of particles before and after collisions remains the same.</li> <li>6. At any particular time, different particles of a gas have different speed and hence different kinetic energy.</li> <li>7. The average kinetic energy of gas molecules is directly proportional to absolute temperature.</li> </ol> <p style="text-align: center;"><b>[Only 2 postulates required]</b></p>	2	2									
5.		<p>Hess's law states that the total enthalpy change for a physical or chemical process is the same whether the reaction taking place in a single step or in several steps.</p> <p><b>Or,</b> the total enthalpy change for a process is independent of the path followed.</p>	2	2									
6.	(a) (b)	$K_c = \frac{[NH_3]^2}{[N_2][H_2]^3}$ $K_c = \frac{[HI]^2}{[H_2][I_2]}$	1 1	2									
7.		<p>Solution which resists the change in pH on dilution or with the addition of small amount of acid or alkali is called Buffer solution.</p> <p>E.g. A mixture of acetic acid and sodium acetate, a mixture of NH<sub>4</sub>OH and NH<sub>4</sub>Cl etc.</p> <p style="text-align: center;"><b>(Only one example is required)</b></p>	1 1	2									

8.	(i)	Sodium hydrogencarbonate or Sodium bicarbonate [NaHCO <sub>3</sub> ]	1	2
	(ii)	Soda ash OR, Anhydrous Sodium Carbonate OR, Na <sub>2</sub> CO <sub>3</sub> ]	1	
9.		CH <sub>3</sub> -CH <sub>2</sub> -CH <sub>2</sub> -OH [Propan-1-ol OR, n-propyl alcohol] and	1	2
		CH <sub>3</sub> -CH(OH)-CH <sub>3</sub> [Propan-2-ol OR, Isopropyl alcohol]	1	
10.		Complete structural formula of 2-Methyl pentane is 	1	2
		Its condensed structural formula is: CH <sub>3</sub> -CH <sub>2</sub> -CH <sub>2</sub> -CH(CH <sub>3</sub> )-CH <sub>3</sub> OR, CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH(CH <sub>3</sub> )CH <sub>3</sub>	1	
11.	(a)	A is C <sub>6</sub> H <sub>6</sub> OR, Benzene OR, 	1	2
	(b)	B is CH <sub>3</sub> -CH <sub>3</sub> OR, Ethane	1	
12.		Geometrical isomers of But-2-ene are cis-but-2-ene and trans-but-2-ene. 	2	2
		<i>cis</i> -But-2-ene <i>trans</i> -But-2-ene		
<b>Answer any 8 questions from 13 to 28. Each carries 3 scores. (8 x 3 = 24)</b>				
13.	(i)	Avogadro number is 6.022x10 <sup>23</sup>	1	3
	(ii)	No. of moles (n) = $\frac{\text{Given mass in gram (w)}}{\text{Molar mass (M)}}$ = 180/18 = 10 moles	1	
			1	
14.	(i)	Molarity is defined as the no. of moles of solute dissolved per litre of the solution. Or, Molarity = $\frac{\text{No. of moles of solute}}{\text{Volume of solution in litre}}$	1	3
	(ii)	It states that if two elements can combine to form more than one compounds, the different masses of one of the elements that combine with a fixed mass of the other element, are in small whole number ratio.	2	
15.	(a)	This is due to the increase in no. of shells and shielding effect.	1	3
	(b)	In fluorine, the incoming electron is added to the 2 <sup>nd</sup> shell, while in chlorine, it is added to the 3 <sup>rd</sup> shell. Because of the smaller size of the second shell, the electronic repulsion is greater in F. So it does not easily add electrons and hence its electron gain enthalpy is less negative.	2	
16.	(i)	s block, p block, d block and f block elements.	1	3
	(ii)	It states that the properties of elements are the periodic functions of their atomic numbers.	2	

17.	(i)	Bond order is defined as one half of the difference between the number of electrons in the bonding and the anti-bonding orbitals. OR, Bond order (B.O) = $\frac{1}{2} [N_b - N_a]$	1	3
	(ii)	The bond order of He <sub>2</sub> molecule is zero. So it does not exist.	2	
18.	(i)	1	1	3
	(ii)	Here P <sub>1</sub> = 760 mm of Hg, V <sub>1</sub> = 600 mL, T <sub>1</sub> = 25 + 273 = 298 K, P <sub>2</sub> = ?, T <sub>2</sub> = 20 + 273 = 293 K, V <sub>2</sub> = 660 mL From combined gas law equation, $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ $\frac{760 \times 600}{298} = \frac{P_2 \times 660}{293}$ $P_2 = \frac{760 \times 600 \times 293}{298 \times 660} = \underline{\underline{679.32 \text{ mm of Hg}}}$	1 1	
19.	(i)	(a) Boyle's law (b) It states that at constant temperature, the volume of a fixed mass of gas is inversely proportional to its pressure. Or, V $\propto$ 1/p (at constant temperature and no. of moles) Or, pV = a constant (at constant temperature and no. of moles)	1 1	3
	(ii)	The ideal gas equation is PV = nRT.	1	
20.	(i)	Open system	1	3
	(ii)	It states that energy can neither be created nor be destroyed. Or, the total energy in the universe is always a constant. Or, the total energy of an isolated system is always a constant. Or, the mathematical equation $\Delta U = q + w$	2	
21.	(i)	Extensive properties are properties which depend on the amount of matter present in the system.	1	3
	(ii)	Mass, volume	2	
22.	(i)	0	1	3
	(ii)	$\begin{array}{ccccccc} +1 & -2 & +1 & -2 & & 0 & +4 & -2 \\ 2 \text{ Cu}_2\text{O} & + \text{ Cu}_2\text{S} & \longrightarrow & 4 \text{ Cu} & + \text{ SO}_2 \end{array}$ Here the oxidation number of Cu decreases and that of sulphur increases. So Cu is reduced and S is oxidised. Oxidising agent: Cu in both Cu <sub>2</sub> O and Cu <sub>2</sub> S [Or, Cu] Reducing agent: S in Cu <sub>2</sub> S [Or, S]	1 1	
23.	(i)	(a) Mn(II)O (b) Fe(II)O	$\frac{1}{2}$ $\frac{1}{2}$	3
	(ii)	Oxidation is the process of increase in the oxidation number of an element and reduction is the process of decrease in the oxidation number of an element.	2	
24.	(i)	(A) CO + H <sub>2</sub>	1	3
	(ii)	Hard water does not form lather with soap. While soft water forms lather with soap easily.	1	
	(iii)	In presence of light, H <sub>2</sub> O <sub>2</sub> decomposes slowly as follows: $2\text{H}_2\text{O}_2(\text{l}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$ So it is stored in wax-lined glass or plastic vessels in dark.	1	

25.	(i)	These are hydrides formed by p-block elements. They are also known as covalent hydrides. E.g. CH <sub>4</sub> , NH <sub>3</sub> , H <sub>2</sub> O and HF	1	3	
	(ii)	Electron deficient hydride: B <sub>2</sub> H <sub>6</sub> Electron precise hydride: CH <sub>4</sub> Electron rich hydrides: NH <sub>3</sub> , HF	2		
26.	(i)	K/Rb/Cs	1	3	
	(ii)	1. Li is much harder and has high melting point and boiling point. 2. Li is the least reactive but the strongest reducing agent among all the alkali metals. 3. It forms only monoxide with oxygen. 4. LiCl is deliquescent and crystallizes as a hydrate (LiCl.2H <sub>2</sub> O). But the other alkali metal chlorides do not form hydrates. <b>[Any 2 required]</b>	2		
27.	(i)	I. Lime stone	a. Calcium Carbonate	$\frac{1}{2} \times 4 = 2$	3
		II. Slaked lime	b. Calcium Hydroxide		
		III. Plaster of Paris	c. Calcium Sulphate $\frac{1}{2}$ H <sub>2</sub> O		
		IV. Quick lime	d. Calcium Oxide		
(ii)	The purpose of adding gypsum is to slow down the process of setting of the cement, so that it gets sufficiently hardened.	1			
28.	(i)	(a) 2-Methylpentan-3-ol	1	3	
		(b) 4-Oxopentanoic acid	1		
	(ii)	-NH <sub>2</sub> , -Cl	1		
<b>Answer any 6 questions from 29 to 40. Each carries 4 scores. (6 x 4 = 24)</b>					
29.	(i)	It states that "it is impossible to determine simultaneously, the exact position and momentum (or velocity) of a moving microscopic particle like electron". Or, the mathematical equation, $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$	2	4	
	(ii)	Lyman series, Balmer series, Paschen series, Brackett series and Pfund series. <b>[Any 4 required]</b>	2		
30.	(i)	The important conclusions obtained by Rutherford from his Alpha ray scattering Experiment are: 1. Since most of the $\alpha$ -particles passed through the foil without any deviation, most space in the atom is empty. 2. A few positively charged $\alpha$ - particles were deflected. This is because the positive charge of the atom is concentrated in a very small volume at the centre called nucleus. 3. The volume occupied by the nucleus is negligibly small as compared to the total volume of the atom. The radius of the atom is about $10^{-10}$ m, while that of nucleus is $10^{-15}$ m. <b>[Any 2 required]</b>	2	4	
	(ii)	Demerits of Rutherford atom model are: 1. It cannot explain the stability of the atom. 2. He cannot explain the electronic structure of atom.	2		

31.	(i)	<p>The important postulates of this theory are:</p> <ol style="list-style-type: none"> <li>1) The shape of the molecule depends on the number of valence shell electron pairs (VSEPRs) around the central atom.</li> <li>2) The valence shell electron pairs repel each other.</li> <li>3) In order to reduce the repulsion, the electron pairs stay at maximum distance.</li> <li>4) Presence of lone pairs of electron causes distortion in the expected geometry of the molecule.</li> <li>5) The repulsion between two lone pairs of electrons is different from those between two bond pairs or between a lone pair and bond pair. The repulsion decreases in the order lone pair - lone pair &gt; lone pair - bond pair &gt; bond pair - bond pair.</li> <li>6) As the angle between the electron pairs increases, the repulsion decreases.</li> </ol> <p style="text-align: center;"><b>[Any 2 required]</b></p>	2	4
	(ii)	<p>Intermolecular hydrogen bond and intramolecular hydrogen bond. E.g. for molecule that shows intermolecular hydrogen bond is HF or NH<sub>3</sub> or H<sub>2</sub>O or alcohol (R-OH) E.g. for molecule that shows intramolecular hydrogen bond is o-nitrophenol.</p>	2	
32.	(i)	(C) sp <sup>3</sup>	1	4
	(ii)	<p>The important characteristics of hybridisation are:</p> <ol style="list-style-type: none"> <li>1. The number of hybrid orbitals formed is equal to the number of atomic orbitals undergo hybridization.</li> <li>2. The hybrid orbitals are always equivalent in energy and in identical shape.</li> <li>3. The hybrid orbitals are more effective in forming stable bonds than the pure atomic orbitals.</li> <li>4. The hybrid orbitals are directed to some fixed positions in space. So the type of hybridization gives the shape of the molecule.</li> </ol> <p style="text-align: center;"><b>[Any 2 required]</b></p>	1	
	(iii)	<p>M.O configuration is = <math>\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \pi 2p_x^2 \pi 2p_y^2 \pi^* 2p_x^1 \pi^* 2p_y^1</math>.</p> <p>Due to the presence of unpaired electrons, O<sub>2</sub> molecule is paramagnetic. OR, the Molecular orbital diagram of O<sub>2</sub> molecule with unpaired electrons.</p>	2	
33.	(i)	Here the number of moles of reactants and products are same. So pressure has no effect in this reaction.	2	4
	(ii)	<p>Le Chatlier's principle. It states that whenever there is a change in concentration, pressure or temperature of a system at equilibrium, the system will try to readjust in such a way so as to cancel the effect of that change.</p>	1 1	
34.	(i)	<p>According to Arrhenius concept acids are substances which give hydrogen ion (H<sup>+</sup>) or hydronium ion (H<sub>3</sub>O<sup>+</sup>) in aqueous solution and bases are substances which give hydroxyl ion (OH<sup>-</sup>) in aqueous solution. E.g. for acids: HCl, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub> etc. E.g. for bases: NaOH, KOH, NH<sub>4</sub>OH etc.</p>	2	4

	(ii)	(a) $\text{H}_2\text{O}$ :- Conjugate acid: $\text{H}_3\text{O}^+$ , Conjugate base: $\text{OH}^-$ (b) $\text{NH}_3$ :- Conjugate acid: $\text{NH}_4^+$ , Conjugate base: $\text{NH}_2^-$	1 1	
35.	(i)	Diborane is the simplest boron hydride with molecular formula $\text{B}_2\text{H}_6$ .	1	4
	(ii)	2 centre – 2 electron bonds and 3 centre – 2 electron bonds (banana bonds) OR, B-H bonds and B–H–B bonds	1	
	(iii)	Glass and cement	2	
36.	(i)	CO forms a highly stable complex with haemoglobin (carboxy haemoglobin). This decreases the oxygen carrying capacity of blood, which will result in headache, weak eyesight, nervousness and even death. So CO is highly poisonous.	2	4
	(ii)	Diamond, Graphite, Fullerene ( <b>Any 2 required</b> )	2	
37.	(i)	Nitrogen (N), Sulphur (S), Chlorine (Cl), Bromine (Br), Iodine (I). <b>(Any 2 required)</b>	2	4
	(ii)	<b>Homolysis</b>	<b>Heterolysis</b>	
		It is a type of bond fission in which each of the bonded atoms gets one of the electrons of the shared pair.	Here the bond breaks in such a manner that the shared pair of electrons remains with one of the parts.	
		Here the movement of a single electron takes place.	Here the movement of a pair of electron takes place.	
As a result of homolysis free radicals are formed.	As a result of heterolysis, positive and negative ions are formed.	<b>(Any 2 required)</b>		
38.	(a)	A is $\text{CH}_3\text{-CHBr-CH}_3$ (2-Bromopropane) and B is $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{Br}$ (1-Bromopropane).	1	4
	(b)	The major product is $\text{CH}_3\text{-CHBr-CH}_3$ (2-Bromopropane).	1	
	(c)	It is decided according to Markownikoff's rule.	2	
		The rule states that when an unsymmetrical reagent is added to an unsymmetrical alkene, the negative part of the reagent gets attached to the carbon containing lesser number of hydrogen atoms.		
39.	(i)	 <p style="text-align: center;">Eclipsed conformation      Staggered conformation</p>	2	4
	(ii)	Staggered conformation is stabler than eclipsed form due to minimum repulsive forces between the electron clouds of C-H bonds.	2	
40.	(i)	Green house gases are $\text{CO}_2$ , methane, water -vapour, chlorofluorocarbons (CFC's), nitrous oxide and ozone. <b>[Any 2 required]</b>	2	4
	(ii)	The harmful effects of acid rain are: ❖ Acid rain is harmful for agriculture, trees and plants. ❖ It causes respiratory ailments and skin cancer in human beings and animals.	2	

	<ul style="list-style-type: none"><li>❖ It affects plants and animal life in aquatic ecosystem.</li><li>❖ It corrodes water pipes resulting in the dissolution of heavy metals into the drinking water.</li><li>❖ Acid rain damages buildings and other structures made of stone or metal. <b>[Any 2 required]</b></li></ul>		
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