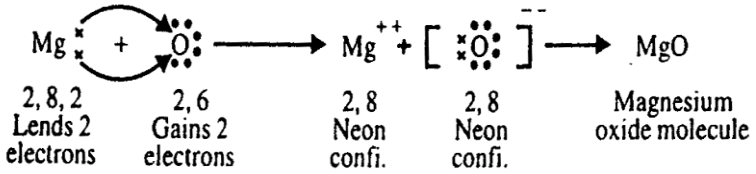
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
		Important Instructions to examiners: 1) The answers should be examined by key words and not as word-to-word as given in themodel answer scheme. 2) The model answer and the answer written by candidate may vary but the examiner may tryto assess the understanding level of the candidate. 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills). 4) While assessing figures, examiner may give credit for principal components indicated in thefigure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn. 5) Credits may be given step wise for numerical problems. In some cases, the assumed constantvalues may vary and there may be some difference in the candidate's answers and model answer. 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding. 7) For programming language papers, credit may be given to any other program based on equivalent concept.		

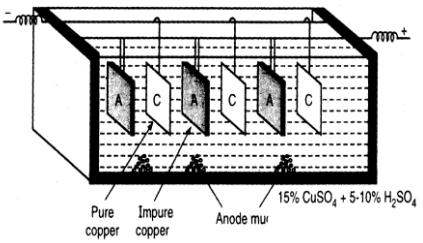
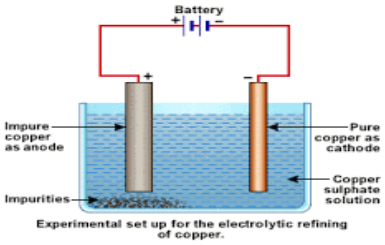
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.		**Answer any nine of the following:**		18
	a)	**Define i) Atomic number ii) Atomic mass number**		2
		Atomic number (Z): It is defined as; "the number of protons present in the nucleus, which exactly balances the number of electrons present in the extra nuclear part."	1	
		Atomic Mass Number (A):-It is defined as; "the sum of the number of protons & neutrons present in the nucleus of an atom of an element."	1	
	b)	**State Hund's rule of maximum multiplicity.**		2
		It states that "when several orbital of the same type (energy) are available then the electrons first fill all the orbitals with parallel spin before pairing in any one orbital".	2	
	c)	**Define valency. Name the types of valencies.**		2
		Valency: "The number of electrons an atom can lose or gain or share so as to complete its octet (outermost shell) & become stable is called as valency".	1	
		Types of Valency:- 1) Electro valency 2) Co-valency	½ mark each	
	d)	**State the factors affecting degree of ionization**		2
		Factors affecting degree of ionization:- 1. Nature of Solute 2. Nature of Solvent 3. Concentration of the solution 4. Temperature	½ mark each	

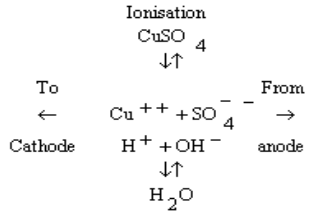
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	e)	**Define electrolyte. Give one example of strong and weak electrolyte.**		2
		Electrolyte: - The substance in fused state or in aqueous solution liberates ions & allows the electric current to pass through it, resulting in the chemical decomposition is known as electrolyte.	1	
		Example:		
		i) Strong electrolyte – HCl, HNO_3, KOH, NaOH ii) Weak electrolyte - CH_3COOH, H_2CO_3, NH_4OH	½ mark each	
	f)	**State Faraday's second law of electrolysis.**		2
		Faraday's second law of electrolysis: This law states that, when the same quantity of electricity is passed through the different electrolyte solutions which are connected in series, the amount of the substance deposited or liberated at the electrodes are directly proportional to their chemical equivalents.	2	
	g)	**Calculate the pH of solution whose hydrogen ion concentration is 5.5 x 10^{-5}gm ion per litre.**		2
		Given:- $[H^+] = 5.5 \times 10^{-5}$gm ion per litre	½	
		pH = ?		
		pH = - $\log_{10}$ [H^+]	½	
		$= - \log_{10} [5.5 \times 10^{-5}]$		
		$= - [(\log_{10} 5.5) + (\log_{10} 10^{-5})]$	½	
		$= - [(0.7404) + (-5)]$		
		$= [5- 07404]$		
		pH = 4.25	½	

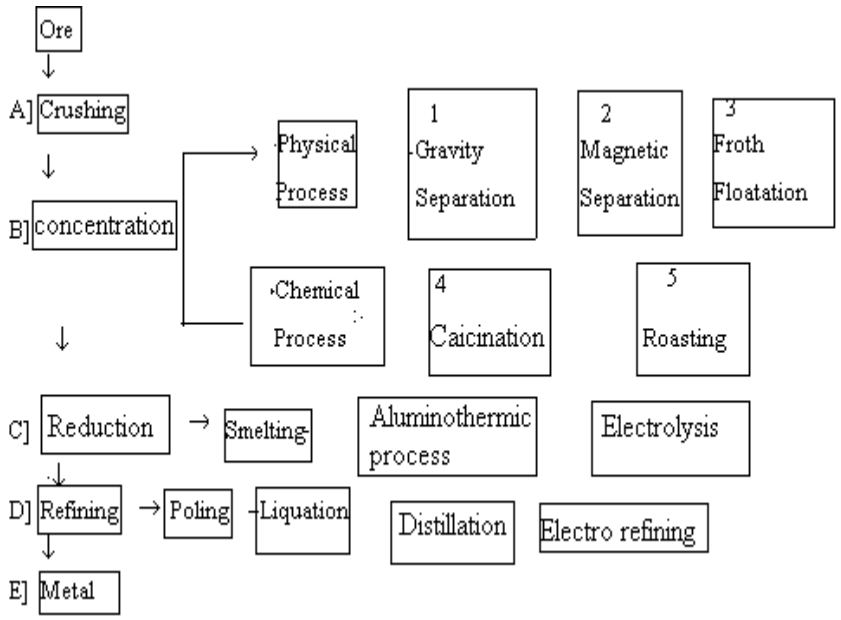
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	h)	**Define the term flux. Give the example of acidic and basic flux.**		2
		Flux: - 'A substance which is used to remove the gangue from ore is called as flux'.	1	
		Basic flux: CaO	½	
		Acidic flux: SiO_2	½	
	i)	**Define Alloy. Give the classification of Alloy with one example of each.**		2
		Alloy:- It is defined as a homogeneous mixture of two or more elements in which one must be a metal.	1	
		Classification of Alloys :-		
		Ferrous Alloys :- **Examples:** steel alloy, plain carbon steel, magnetic steel, stainless steel etc.	½	
		Non - Ferrous Alloys :- **Examples:** Brass, Bronze, Duralumin etc.	½	
	j)	**Give the composition and uses of Wood's metal.**		2
		Composition:- Bi=50% Pb = 25% Sn = 12.5% Cd = 12.5%	1	
		Uses: (Any two) It is used in i) Safety plugs of pressure cookers ii) Safety plugs of Boilers iii) Fire alarms iv) Automatic water sprinklers v) Soft solder vi) For casting of dental work	½ Mark each	

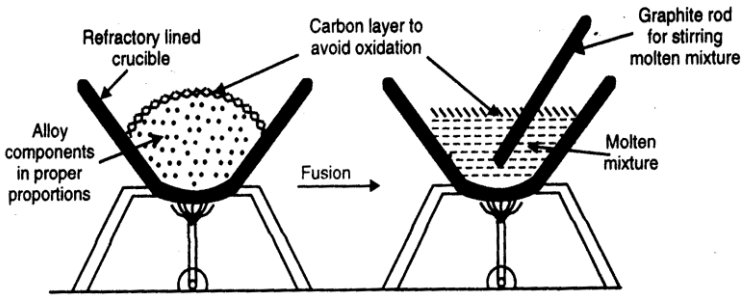
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	k)	**Define polymerization. Give the types of polymerization.**		2
		Polymerization: - "The process in which a large number of small molecules (monomers) link together to form a large molecule (polymer) under specific conditions of temperature, pressure & catalyst is known as polymerization.	1	
		Types of polymerization:- i) Addition polymerization. ii) Condensation polymerization.	½ mark each	
	l)	**"PVC plastics are used Chemical Industries". Give reasons.**		2
		PVC plastics are used in Chemical Industries because it has high chemical resistance, corrosion resistance and durability.	2	
2		**Answer any four of the following.**		16
	a)	**Give the assumption of Bohr's theory of atomic structure.**		4
		1. An atom consists of a dense positively charged central part called as **Nucleus.**		
		2. The electrons revolve around the nucleus in fixed circular paths are called **orbit or shell**. The electrostatic force of attraction between nucleus & electron balanced by the centrifugal force. Hence the electrons do not fall into the nucleus and therefore atom remains stable.		
		3. Electron can rotate only in certain permitted orbits known as **stationary state.**	1 mark each	
		4. Each stationary state is having definite amount of energy hence called as **energy level.**		
		5. Electrons in the energy level nearest to the nucleus have **lower** energy while those are at **greater** distance from the nucleus have **higher** energy.		
		6. As long as the electron stays in the same energy level, the energy remains constant. The energy of an electron can change only when it moves from one level to another.		
		7. When the excited electron jumps from **lower to higher** energy level, it **absorbs or gain** energy.When the excited electron jumps from **higher to lower** energy level, it **emits or loses** energy.		
		8. The angular momentum of an electron (mvr) must be an itegral multiple of h/2π. Hence **mvr = nh/2π**		
		(Any four points can be considered for four marks)		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.	b)	**Explain the formation of MgO molecule with electronic diagram. State the type of valency.** **Explanation:-** In the formation of magnesium oxide molecule, two electrons are transferred from magnesium atom to oxygen atom. By the loss of 2 electrons it acquires +2 charge (Mg^{++}) & attains stable configuration like Ne (2, 8). Oxygen atom acquires -2 charge by the gain / takes of $2e^-$s from magnesium atom & attain stable configuration like Neon (2, 8). These two equal & oppositely charged ions (Mg^{++} & O^{--}) combine together by electronstatic force of attraction & form neutral MgO molecule  Type of valency is **Electrovalency.**	2 1 1	4
	c)	**Define isotopes and isobars. Give any two characteristics and examples of each.** **Isotopes:-** The different atoms of the same elements having same atomic number but different atomic mass numbers are called isotopes. **Characteristics of isotopes:-** 1. They have same atomic number but different atomic mass numbers 2. They have same number of electrons & protons but different number of neutrons. 3. They occupy same place in periodic table 4. They have same electronic configuration 5. They have same chemical properties. **Examples of isotopes:-** 1. $_{17}Cl^{35}$ and $_{17}Cl^{37}$ 2. $_{8}O^{16}$, $_{8}O^{17}$ and $_{8}O^{18}$ 3. $_{6}C^{12}$, $_{6}C^{13}$ and $_{6}C^{14}$ 4. $_{27}Co^{57}$ and $_{27}Co^{60}$ 5. $_{1}H^{1}$, $_{1}H^{2}$ and $_{1}H^{3}$	1 1 ½ ½	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.		**Isobars:-** The atoms of the different elements having same atomic mass numbers but different atomic number are called isobars.	1	
		Characteristics of isobars:- 1. They have same atomic mass number but different atomic numbers 2. They have different number of electrons, protons & neutrons. 3. They occupy different places in periodic table 4. They have different electronic configuration 5. They have different chemical properties.	½	
		Examples of isobars:- 1. $_{28}Ni^{64}$ and $_{30}Zn^{64}$ 2. $_{18}Ar^{40}$, $_{19}K^{40}$ and $_{20}Ca^{40}$ 3. $_{92}U^{235}$, $_{93}Np^{235}$ and $_{94}Pu^{235}$ 4. $_{82}Pb^{210}$ and $_{83}Bi^{210}$	½	
	d)	**Why Copper is electrorefined? Describe the process of electrorefining of copper with suitable diagram.**		4
		Blister copper contains 3 to 4 % of impurities like Ag, Au, Pt, Cr, Ni, Fe, S etc. Presence of all these impurities in copper reduces its electrical conductivity. So when copper metal is to be used for preparation of electrical wires & cables it is electro refined because this process gives 99.99% pure copper metal.	1	
			1	
		OR		
		 Experimental set up for the electrolytic refining of copper.		

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.		1. It is carried out in the large lead lined tank. 2. Impure Copper is placed into large plates which are suspended into tank at intervals & acts as anode. 3. Cathodes are thin plates of pure copper & each is suspended between two plates of anode. 4. The electrolyte is 15% $CuSO_4$ containing 5-10% free H_2SO_4 solution. 5. By the passage of electric current, Cu from the anode with traces of more active metals like Zn, Fe, Ni present as impurities go into the solution as metallic ions, whereas less active metals like Ag, Au & Pt are not ionized but crumbles down from the anodes & settle below the anode as anode mud. 6. At the applied voltage, Cu^{++} ions alone are discharged at the cathode & thus pure copper is deposited on the cathodes. 7. Electro – refined copper is about 99.99% pure.	1	
		Cathode reaction $Cu^{++} + 2e^- \rightarrow Cu \downarrow$  **Anode reaction** $Cu \rightarrow Cu^{++} + 2e^-$	1	
	e)	**Give any four assumptions of Arrhenius theory of electrolytic dissociation.** **Arrhenius theory of electrolytic dissociation :-** 1. The molecules of an electrolyte when dissolved in water split up into two kinds of charged particles, positively charged particle known as cation, negatively charged particle known as anion. 2.Cations are metallic radicals obtained by lose of electrons from metallic atoms. Anions are non-metallic radicals obtained by gain of electrons from non-metallic atoms or groups of non-metals. 3. In solution, total numbers of cations (positive charges) is equal to the total number of anions (negative charges) & hence the solution as a whole is electrically neutral. 4. The cations & anions present in the solution reunite together forming the original electrovalent compound. Therefore it is reversible type of process. 5. The number of positive or negative charges on cation or anion corresponds to the valency of the parent element or radical from which the ion is derived.	1 mark each	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2	**f)**	**A solution of metal salt was electrolysed for 10 minutes with a current of 1.5 ampere the weight of metal deposited 0.685 gm. What is electrochemical equivalent weight of metal?**		**4**
		Given: c = 1.5 amperes t = 10 minutes = 600 seconds w = weight of metal deposited = 0.685 gm	**1**	
		According to Faraday's First law, we have, W = z c t	**1**	
		0.685= z x 1.5 x 600 z = 0.685 / 1.5 x 600 = 0.00076111 or (7.611 X 10^{-4}) gm/ coulomb	**1**	
		Electrochemical equivalent weight of metal is 0.00076111 gm/coulomb	**1**	
3		**Answer any four of the following:**		**16**
	a)	**Define Metallurgy. Draw the flow chart for extraction of metal.** **Metallurgy: -** It is a process of extraction of metals from their ores economically & profitably.	**1**	**4**
		Flow chart for extraction of Metal from the ore  	**3**	

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>3.</td><td>b)</td><td>Describe the fusion method for preparation of Alloy with suitable diagram.
1) It is used for preparation of binary alloys.The component metal having higher M.P. is melted first in a crucible & the other component having lower melting points are added to in the required quantity.
2) The molten mixture is stirred using graphite rods to get uniform alloy.
3) The molten metals are at high temp & hence react with atmospheric oxygen to form oxide, hence to prevent oxidation the surface of molten mass is covered with charcoal powder.
4) The molten mass is then allowed to cool which gives required alloy.e.g Brass
 
</td><td>2

2</td><td>4</td></tr>
<tr><td></td><td>c)</td><td>Distinguish between calcination and roasting.
<table><tr><th>Calcination</th><th>Roasting</th></tr><tr><td>1)Process of heating the ore strongly in absence of air below its M.P.</td><td>1)Process of heating the ore strongly in excess of air below its M.P.</td></tr><tr><td>2)This process is used to convert carbonate & hydroxide into their oxides</td><td>2) This process is used to convert sulphide into oxide & sulphate.</td></tr><tr><td>3)Purpose is to remove the moisture & volatile impurities from the ore</td><td>3) Purpose is to remove moisture & oxidation of ore & the impurities like S,P,As etc.</td></tr><tr><td>4)In calcination, the mass becomes porous, so that it can be easily reduced to metallic state.</td><td>4) In roasting, the sulphide ore chemically changed into suitable form (oxides &sulphates) can be reduced to metallic state.</td></tr><tr><td>5) Process done in hearth of a reverberatory furnace when the doors are kept closed.</td><td>5) Process done in hearth of a reverberatory furnace when the doors are kept opened.</td></tr></table>(Any four points)</td><td>1 Mark each</td><td>4</td></tr>
</table>

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>3.</td><td>d)</td><td>State drawbacks of natural rubber.
Drawbacks of Natural Rubber:- (Any four)
i) During summer, the raw rubber becomes soft & sticky while in cold weather it becomes hard & brittle.
ii) It has low tensile strength.
iii) It is too weak to be used in heavy duty operation.
iv) It has a large water absorbing capacity.
v) On stretching, it undergoes permanent deformation.
vi) It is affected by solvent like gasoline, benzene, carbon tetrachloride, vegetable oils etc.
vii) It gets tarnished in air due to oxidation as result; its durability is considerably decreased.</td><td>1 Mark each</td><td>4</td></tr>
<tr><td></td><td>e)</td><td>Write any four uses of rubber based on its differrent properties. (Any four)
<table>
<tr><th>Properties of rubber</th><th>Related uses</th></tr>
<tr><td>1. Elasticity</td><td>For preparation of rubber bands, balloons, tubes for all vehicles</td></tr>
<tr><td>2 .High abrasion resistance</td><td>For preparation of tyres of all vehicles, shoe sols & shoe heels, conveyer belts, floor tiles ,rubber mats</td></tr>
<tr><td>3. Shock absorbing</td><td>For preparation of sports goods, toys, helmets, goggles, for mounting heavy machines, to reduce noise & vibrations</td></tr>
<tr><td>4.Excellent Electrical insulator</td><td>For insulation of electrical wires and cables , For hand gloves of electrician</td></tr>
<tr><td>5 .High Chemical resistance</td><td>Rubber lined tanks are used for storing corrosive chemicals rubber hoses are used for transmission of corrosive chemicals ,rubber gaskets & seals are used for sealing.</td></tr>
<tr><td>6 .Hardness</td><td>Rubber gaskets are used for sealing pressure cookers, refrigerators ,ovens, cabinet doors, autoclaves etc.</td></tr>
<tr><td>7 .Excellent thermal & sound insulator</td><td>Sponge insulator in auditoriums, theaters, in different filters.</td></tr>
<tr><td>8. Airproof</td><td>For preparation of balloons, tubes, air pillows, cushions, mattresses.</td></tr>
<tr><td>9 .Waterproof</td><td>For preparation of rain coats.</td></tr>
</table></td><td>1 Mark each</td><td>4</td></tr>
</table>

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
3.	**f)**	**How glass wool is prepared? Give its properties and uses.** **Preparation :-** i) Molten mass of alkali free glass is passed through sieve holes of 0.0005 cm diameter ($5x10^{-4}$cm). ii) The glass filaments obtained are the thrown over a rapidly rotating drum to get wool like form. **Properties :- (Any Three)** 1) Its thermal conductivity is low 2) It is fire proof & non-combustible. 3) It has low thermal & electrical conductivity. 4) It is resistant to chemicals. 5) It is soft, flexible, has low density. 6) It is waterproof. 7) Its tensile strength is very high. 8) It is light in weight. **Applications : (Any Three)** 1) It is used in air filters as a dust filtering material. 2) It is used as sound absorber (sound - proofing). 3) Being resistant to chemicals it is used for filtering hot, corrosive liquids like acids, alkali etc. 4) It is widely used as thermal insulating material in domestics & industrial appliances such as motors, ovens, refrigerators. 5) It is used in the manufacturing fiber glass by reinforcing with plastic resins.	**1** **1 ½** **1 ½**	**4**