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.		**Attempt any nine of the following:**		18
	a)	**Distinguish between orbit & orbital (Any two points).**		2

Sr. No.	Orbit	Orbital
1)	It is fixed path along which the electrons revolve around the nucleus.	It is the region in the space where the probability of finding an electron is maximum.
2)	Orbits are designated by letters K, L, M, N, O, P.	Orbitals are designated by letters s, p, d, f,
3)	Orbit is circular paths or elliptical in shape.	The orbitals have different geometrical shapes. e.g. s-Spherical, p-dumb bell shaped.
4)	The maximum number of electrons in an orbit is given by $2n^2$ rule.	Orbital can contain maximum two electrons with opposite spins (↑↓)
5)	The number of orbits from the nucleus are n=1, 2, 3, 4, 5, 6 etc.	The number of orbitals relative to energy level are n^2=1, 4, 9, 16 etc.

1 Mark each

b) **State Hund's Rule of Maximum Multiplicity.** 2

It states that "when several orbitals 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) **Distinguish between positive electrovalency and negative electrovalency (Any two points).** 2

Positive electrovalency	**Negative electrovalency**
1."The valency obtained by the loss of valency electrons from the atom of metallic element, so as to complete its last shell is known at positive electrovalency."	1."The valency obtained by the gain of electrons by the atoms of non – metallic elements, so as to complete their octets is known as negative electrovalency."
2.Atoms are transferred to cations (positive ions)	2. Atoms are transferred to anions. (negative ions)
3. Metals are electropositive elements.	3. Non-metals are electronegative elements.
4. e.g. $Na \rightarrow Na^+ + 1e^-$	4. e.g. $Cl + 1e^- \rightarrow Cl^-$

1 mark each

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	d)	**State two assumptions of Arrhenius theory of ionization.** 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 reunit together forming the original electrovalent compound. Therefore it is reversible type of process. e.g NaCl $\rightleftharpoons$ $Na^+ + Cl^-$ 5. The number of positive or negative charges on the cations or anions corresponds to the valency of the element or radical from which the ion is derived.	1 mark each	2
	e)	**Name the four factors which affect degree of ionization.** Factors affecting degree of ionization:- 1. Nature of Solute 2. Nature of Solvent 3. Concentration of the solution 4. Temperature	½ mark each	2
	f)	**State Faraday's Second Law of Electrolysis.** **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	2
	g)	**Why blue colour of copper sulphate solution turns to colourless after its electrolysis using platinum electrodes?** The platinum electrodes are inert. Hence does not dissolve into the solution.		2

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.		The Cu^{++} ions (blue in colour) present in the solution are discharged on the surface of cathode & OH^- are discharged on the surface of anode while H^+ and SO_4^{2-} ions remains in the solution. As a result of this electrolysis, blue coloured $CuSO_4$ solution is slowly converted into colorless H_2SO_4 solution.	2	
	h)	**Define: i) Ore ii) Gangue**		2
		i) Ore: The mineral from which the metal is conveniently and economically extracted is known as **ore**.	1	
		ii) Gangue :- Ores obtained from earth's crust are always associated with impurities like sand, clay, rocks etc. & these **unwanted impurities associated with the ores** are known as 'gangue' or 'matrix'.	1	
	i)	**Write the two purposes of making alloys with one example of each.**		2
		The purposes of making an alloy with example: **1. Improve hardness of metal** e.g. Pure gold & silver are soft. Hence they are hardened by the addition of a small amount of copper in them. **2. Lower the melting point** e.g. Wood's metal is an alloy of Bi, Pb, Sn, Cd. It has the M.P. 71^0C which is much lower than those of its constituents. **3. Increase the tensile strength** e.g. The addition of 1% carbon increase the tensile strength of pure iron by about 10 times. **4. Increase corrosion resistance** e.g. Pure iron is corroded fastly but its alloy stainless steel resist corrosion. **5. To get good casting** e.g. Bronze (an alloy of Cu & Zn) and Duralumin possess good casting property. **6. Modify colour** e.g. Brass is an alloy of copper (red) and zinc (silvery white) and is yellow in colour. **7. Reduce malleability & ductility** e.g. a small amount of copper is added to gold and silver to reduce their malleability and ductility. **8.Modify chemical activity** e.g. Sodium is highly reactive element, but when it is alloyed with mercury to form an alloy called sodium- amalgam , it becomes less reactive. **(consider relevant examples)**	1 Mark each	

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answer</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>1.</td><td>j)</td><td>Give composition of Duralumin.

Composition of Duralumin:-

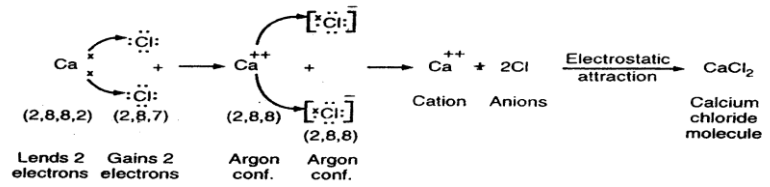
Al=95% , Cu=4% , Mg=0.5%, Mn=0.5%</td><td>½ mark each</td><td>2</td></tr>
<tr><td></td><td>k)</td><td>Give two properties and related applications of plastics.

<table>
<tr><th>Sr. No</th><th>Properties</th><th>Applications</th></tr>
<tr><td>1)</td><td>Low specific gravity & high tensile strength.</td><td>In aircrafts, motorcars & structural industries.</td></tr>
<tr><td>2)</td><td>Combination with metals.</td><td>Wheels of automobiles plastics cover dash boards.</td></tr>
<tr><td>3)</td><td>Resistance to wear & tear & abrasion resistance.</td><td>For making machinery parts such as gears pulleys.</td></tr>
<tr><td>4)</td><td>Poor electrical conductivity.</td><td>In electronic industry.</td></tr>
<tr><td>5)</td><td>High Chemical resistance & corrosion resistance.</td><td>In Chemical industries PVC plastic used in place of stainless steel.</td></tr>
<tr><td>6)</td><td>Bad conductor of Heat</td><td>Handles of electric irons, kettles, pressure cookers, frying pan etc.</td></tr>
<tr><td>7)</td><td>Hard & shock absorbing capacity.</td><td>In machinery to reduce noise & vibrations.</td></tr>
<tr><td>8)</td><td>Clear, transparent, translucent, opaque nature.</td><td>Decorative knobs for radio, automobile & house hold appliances, wind screens for automobiles, aircrafts ,optical lenses etc.</td></tr>
<tr><td>9)</td><td>Water proof</td><td>Water bottles, raincoats, buckets, water tanks etc.</td></tr>
</table></td><td>1 mark each</td><td>2</td></tr>
<tr><td></td><td>l)</td><td>Define: i) Elasticity ii) Tack.

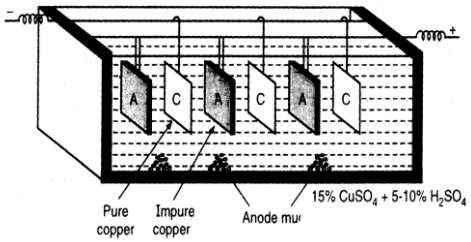
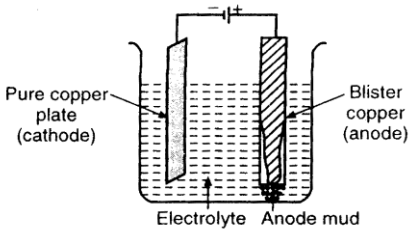
i) Elasticity:-“Elasticity is the property by which a material undergoes deformation under stress. & regains its original shape on the removal of the stress.”

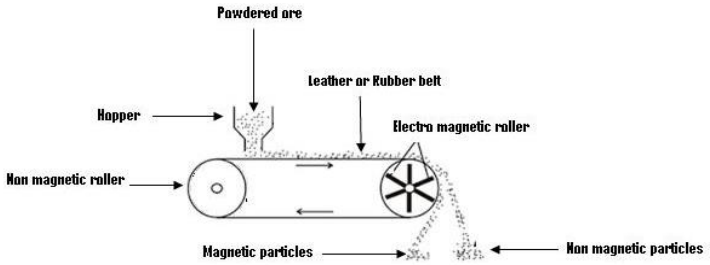
ii) Tack:-Tack is the property of rubber by which two or more surfaces can stick to each other.</td><td>1

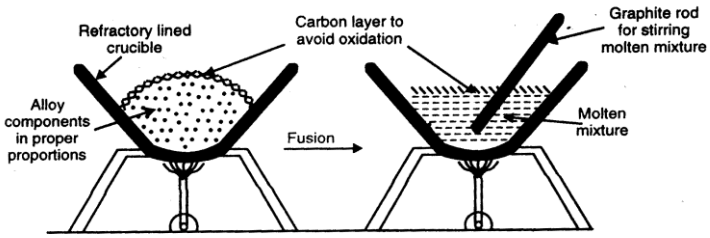
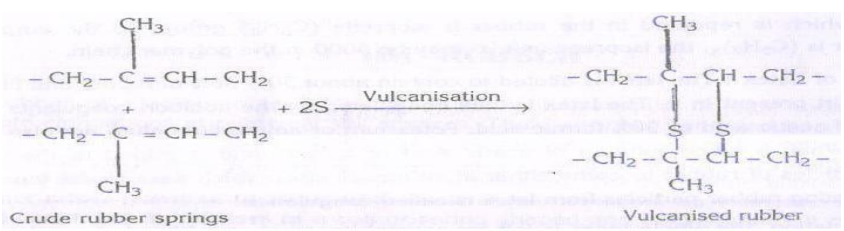
1</td><td>2</td></tr>
</table>

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.		**Attempt any four of the following:**		16
	a)	**Write orbital electronic configuration of $_{13}Al^{27}$, $_{20}Ca^{40}$, $_{24}Cr^{52}$, $_{10}Ne^{20}$.** a) $_{13}Al^{27}$ =$1s^2, 2s^2, 2p^6, 3s^2, 3p^1$ b) $_{20}Ca^{40}$ = $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$ c) $_{24}Cr^{52}$= $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1, 3d^5$ d) $_{10}Ne^{20}$=$1s^2, 2s^2, 2p^6$	1 mark each	4
	b)	**Describe formation of $CaCl_2$ molecule with diagram and name the type of bonding.** $Ca\ (Z = 20) = (2, 8, 8, 2)$ $Cl\ (Z = 17) = (2, 8, 7)$ **Explanation:-**In the formation of calcium chloride molecule 2 electrons are transferred from calcium atom to two chlorine atoms. By the loss of two electrons, the Calcium atom acquires two positive (Ca^{++}) charges& attain stable configuration like Ar (2, 8, 8). Similarly two chlorine atoms gain one electron each & acquire -1 charge & form $2Cl^-$ ions. The oppositely charged ions (Ca^{++} & $2Cl^-$) combine together by electrostatic force of attraction to form neutral molecule of $CaCl_2$.  Type of Bond is **Electrovalent bond.**	2 1 1	4
	c)	**Define: i) Isotopes ii) Isobars iii) Atomic number iv) Atomic mass number.** **i) Isotopes:**The different atoms of the same elements having same atomic number but different atomic mass number are called isotopes.	1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.		**ii) Isobars:**The atoms of the different elements having same atomic mass number but different atomic number are called isobars.	1	
		iii) Atomic number: 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	
		iv) Atomic Mass Number: It is defined as; "the sum of the number of protons & neutrons present in the nucleus of an atom of an element."	1	
	d)	**State Faraday's first law of electrolysis. When 0.3956 g of copper was deposited by a current of 0.4 ampere in 50 mins. What is ECE of copper?**		4
		Faraday's first law of electrolysis: This law states that the weight of a substance liberated or deposited at the electrode is directly proportional to the quantity of electricity passed through the electrolyte solution.	1	
		Given: i) w = weight of copper deposited = 0.3956 g ii) c = 0.4 ampere iii) t = 50 minutes = 50x60= 3000 seconds	1	
		According to Faraday's First law, we have,		
		W = zc t	1	
		0.3956 = z x 0.4 x 3000		
		z = 0.3956 / 0.4 x 3000		
		z = 0.0003296 or (3.296 X 10^{-4}) g / coulomb	1	
		Electrochemical equivalent weight of copper is 0.0003296 g /coulomb		
	e)	**Explain electrorefining of blister copper with diagram.** **Explanation:** 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.		4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.		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.	2	
			2	
		OR		
				
	f)	**Define pH. Calculate pH of acidic solution having $2.5x10^{-3}$ gram ions per litre of hydrogen ion concentration.**		4
		pH: It is the negative logarithm to the base 10 of hydrogen ion concentration.	1	
		Given: $[H^+] = 2.5 \times 10^{-3}$gram ions per litre	1	
		pH = - $\log_{10}$ [H^+] = - $\log_{10}$ [2.5 x 10^{-3}] = - [($\log_{10}$2.5) + ($\log_{10}$ 10^{-3})] = - [(0.3979) + (-3)] = [3- 0.3979] pH = 2.60	1 1	

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3		**Attempt any four of the following:**		**16**
	a)	**Describe electromagnetic separation process with example.**		
		Principle- This method is based upon magnetism		**4**
		Process –In this process powdered ore is allowed to fall through hopper on leather or rubber belt which is constantly moving over two rollers one of which is electromagnetic in nature. The magnetic particles present in the ore when come in contact with the magnetic field of the electromagnetic roller they get attracted towards the roller and hence get collected near the roller, while non-magnetic particles present in the ore are not attracted towards the roller hence fall away from the roller.	**2**	
		e.g. 1.concentration of magnetic ore like Haematite which contains non-magnetic impurities	**1**	
		2. concentration of non-magnetic ore like Tinstone which contains magnetic impurities		
		(consider any one example)		
			1	
	b)	**Define: i) Tensile strength ii) Soldering iii) Castability iv) Machinability.**		**4**
		1. Tensile Strength: - Is the ability to carry a load without breaking.**Or** A tensile strength of a metal is its ability to resist pull without breaking.	1	
		2. Soldering: - A method of joining the metals surfaces by introducing a molten non-ferrous alloy with melting point below 400^0C between them, is known as soldering.	1	
		3. Castability: - The process of pouring molten metal into a mould& allowing it to solidify is known as casting and the ability of metal to get casted is called as castability.	1	
		4. Machinability: - Is the property due to which a material can be easily cut by cutting tools to produce a desired shape & surface finish on its surface.	1	

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
3.	c)	**Explain fusion method for preparation of alloy with example.** 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 temperature & 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 i) **Preparation of brass**: It is an alloy of Cu and Zn. Copper is melted (M.P. 1089^{o}C) first and the required quantity of Zinc (M.P. 419^{o}C) is added to molten copper to get brass. ii) **Preparation of bronze**: It is an alloy of Cu and Sn. Copper is melted (M.P. 1089^{o}C) first and the required quantity of Tin (M.P. 232^{o}C) is added to molten copper to get bronze.  **(consider any one example)**	**2** **1** 1	**4**
	d)	**Describe vulcanization of rubber. Why is rubber vulcanized?** **Vulcanization of rubber:-**"The process which involves addition of sulphur or H_2S to crude (raw) natural rubber at high temp & pressure to improve properties of crude natural rubber is called vulcanization."  	1 1	4

<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>Vulcanisation of rubberis necessary for

i) Stiffening of rubber.
ii) Preventing intermolecular movement or sliding of rubber springs.
iii) To improve the hardness, abrasion resistance, chemically resistant.
iv) Makes the rubber tough, strong, usable from – 40 ^{o}C to100 ^{o} C
v) To improve electrical insulation property.
(Any two)</td><td>2</td><td></td></tr>
<tr><td></td><td>e)</td><td>Distinguish between thermosoftening and thermosetting plastics.

<table>
<tr><th>Thermosoftening plastics</th><th>Thermosetting Plastics</th></tr>
<tr><td>i) They are formed by addition plymerisation.</td><td>i) They are formed by condensation polymerization.</td></tr>
<tr><td>ii) Linear long chain polymers with limited cross links.</td><td>ii) Three dimensional structure with cross linkages.</td></tr>
<tr><td>iii) Smaller molecular weight.</td><td>iii) Higher molecular weight.</td></tr>
<tr><td>iv) Softened on heating & reshaped & reused.</td><td>iv) Do not soften on heating & reshaped & reused.</td></tr>
<tr><td>v) Reclaimed form wastes.</td><td>v) Can not be reclaimed from wastes.</td></tr>
<tr><td>vi) Intermolecular bonds are weaker.</td><td>vi) Intermolecular bonds are stronger.</td></tr>
<tr><td>vii) Softer, weaker, less brittle.</td><td>vii) Harder, stronger & more brittle.</td></tr>
<tr><td>viii) Soluble in organic solvents.</td><td>viii) Insoluble in organic solvents.</td></tr>
<tr><td>xi) e.g. Polyethylene, Polystyrene PVC.</td><td>xi) e. g. Bakelite, Polyesters, silicone Plastics.</td></tr>
</table>
(consider any four points)</td><td>1 Mark each</td><td>4</td></tr>
<tr><td></td><td>f)</td><td>Define thermocole. Give its properties and applications.

Thermocole: It is foamed plastic.</td><td>1</td><td>4</td></tr>
</table>

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
3.	**f)**	**Properties :- (any three)** i) It is soft, spongy, porous, low density. ii) Its thermal & electrical conductivity is low. iii) It is quite shock - proof. iv) It is quite strong through extremely light. v) It is chemically inert & resists ageing. vi) It can be used upto 55^0C. vii) It is white in colour and water proof. **Applications : (Any three)** 1) It is used for decorative purposes. 2) It is used as ideal packing material for packing glassware, delicate electronic & electrical equipments. 3) It is used as thermal insulator in refrigerators & air conditioners. 4) It is widely used for preparation of various scientific models. 5) It is used for protecting screens in radars. 6) It is used for storing ice, ice creams & medicines. 7) It is used as a float for swimming.	**½ mark each** ½ mark each	