Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
		Important Instructions to the Examiners: 1) The Answers should be examined by key words and not as word-to-word as given in the model answer scheme. 2) The model answer and the answer written by candidate may vary but the examiner may try to 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 the figure. The figures drawn by the candidate and those in the 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 constant values may vary and there may be some difference in the candidate's Answers and the model answer. 6) In case of some questions credit may be given by judgment 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.	a)	**Define Orbit and Orbital.** **Orbit :** Electrons revolve around the nucleus in fixed circular path called 'orbit'. **Orbital: -** The region in the space around the nucleus, where the probability of finding an electron is maximum, is known as orbital.	1 1	2
	b)	**State the number of subshells in K, L, M, N Shells.** **Shells** — **Sub Shells** K (n=1) — 1s L (n=2) — 2s, 2p M (n=3) — 3s, 3p, 3d N (n=4) — 4s, 4p, 4d, 4f	2	2
	c)	**State Hunds Rule of Maximum multiplicity.** **Statement:-** Hunds Rule 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	2
	d)	**State any two points 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 reunite together forming the original electrovalent compound. Therefore it is reversible type of process. 5. The number of positve or negative charges on cation or anion corresponds to the valency of element or radical from which the ion is derived. **(Note: State any two points)**	1 mark each	2

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	e)	**Define degree of ionization. Name the factors affecting degree of ionization.**		2
		Degree of Ionization: - The fraction of the total number of molecules of an electrolyte that ionizes in solution called the degree of ionization.	1	
		Factors Affecting Degree Ionization:- 1. Nature of solute 2. Nature of Solvent 3. Concentration of the solution 4. Temperature of solution	1	
	f)	**Differentiate between Strong Electrolytes & Weak Electrolytes**		2
		Strong Electrolytes / **Weak Electrolytes** 1. Electrolyte which is highly ionized in solution is known as strong electrolyte. / 1. Electrolyte which is weakly ionized in solution is known as weak electrolyte. 2.They have high degree of ionization / 2. They have low degree of ionization 3. They are good conductor of electricity. / 3. They are poor conductor of electricity. 4. They produce more number of ions. / 4. They produce less number of ions. 5. e.g. strong acids – HCl, HNO_3, Strong bases – KOH, NaOH / 5. e.g. Weak acids CH_3COOH, H_2CO_3, weak base NH_4OH **(Note: Any two points)**	1mark each	
	g)	**Calculate the pH of a solution which contains 1.54 x 10^{-2} mole/lit of strong acid.**		2
		pH = - log [H^+]	1	
		=- log [1.54 x 10^{-2}]		
		= - [(log 1.54) + (log 10^{-2})]		
		= - [(0.1875) + (-2)]		
		= 2 - 0.1875		
		pH = 1.8125	1	

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	h)	**Define the terms: Tensile Strength, Ductility.**		2
		Tensile Strength: - It is the ability of metal to carry a load without breaking.	1	
		Ductility: - It is the property of metal which allows it to be drawn into wires without breaking.	1	
	i)	**Write the two purposes of making alloys with one example each.**		2
		1. To improve the 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. To lower the melting point:-** Pure metals are having high melting point. It can be lowered by addition of alloying elements. e. g. Wood's metal has the M.P. 71^0C which is much lower than those of its constituents. **3. To increase the tensile strength:-** e. g. The addition of 1% carbon increases the tensile strength of pure iron by about 10 times. **4. To increase corrosion resistance:-** e. g. Pure iron is corroded fastly but its alloy stainless steel resists corrosion. **5. To get good castings:-** e. g. Bronze possesses good casting property. **6**. **To modify color:-** e. g. Brass is an alloy of Copper (red) and Zinc (silvery white) and is yellow in colour. **7**. **To reduce malleability and ductility:-** e. g. A small amount of Copper is added to gold and silver to reduce their malleability and ductility. **(Note: Any two purposes and any relevant example)**	1 mark each	
	j)	**Define Flux and Slag.**		2
		Flux - A substance which is used to remove matrix or gangue is known as flux.	1	
		Slag: - Flux reacts with gangue to form fusible mass known as Slag.	1	

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	k)	**Give four examples of synthetic rubber.** 1) Buna – S 2) Buna – N 3) Buty rubber 4) Neoprene 5) Thiokol **(Note: Any Four examples)**	½ mark each	2
	l)	**Write two applications of thermosetting plastics.** **Thermosetting plastics are used for.** **1.** Making handles of electric irons, kettles, pressure cookers, frying pan etc. 2. Decorative knobs for radio, automobile & house hold appliances, wind screens for automobiles, aircrafts, optical lenses etc. 3. In Chemical industries in place of stainless steel. 4. In machinery to reduce noise & vibrations. 5. In electronic industry. 6. Wheels of automobiles plastics cover dash boards. 7. For making machinery parts such as gears pulleys. 8. In aircrafts, motorcars & structural industries. **(Note: Any two applications)**	1mark each	2
2.		**Attempt any FOUR of the following.**		16
	a)	**Define atom and state fundamental particals of an atom with their properties.** **Atom:-**"It is the smallest particle of an element which can not be further subdivided & which can take part in all chemical changes." **OR** "It is the smallest partical of an element which is electrically neutral'' **Fundamental particals of an atom :** Electron , proton and neutron	1	4

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.			3 Mark	

Peroperties	**Electron**	**Proton**	**Neutron**
Discovered by	J.J. Thomson	Rutherford	Chadwick
Symbol	e	p	n
Nature	Negatively charged	Positively charged	Neutral
Location in atom	Extra nuclear part (outside)	Inside the nucleus	Inside the nucleus
Relative Charge	-1	+1	0
Relative : Mass in amu	0.000555	1.007825	1.008665

(Note: Any three properties of fundamental particles of an atom)

b) **State Aufbau principle.Write electronic configuration of $_{19}K^{39}$**

$_{11}Na^{23}$ — 4

Aufbau principle — 2

Statement:-It states that "the electron always enters the various orbitals in the order of increasing energy." i.e. lower energy orbitals are occupied first. — 1

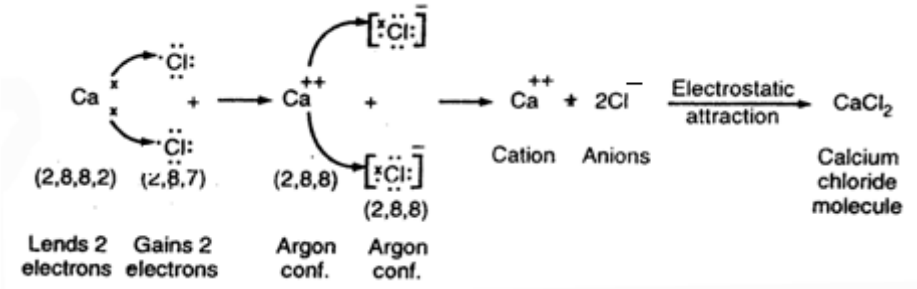
i) $_{19}K^{39}$: $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^1$ — 1

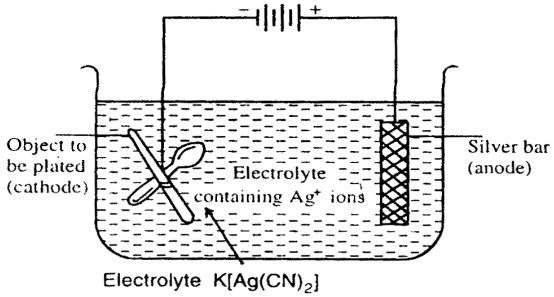
ii) $_{11}Na^{23}$: $1s^2$, $2s^2$, $2p^6$, $3s^1$

c) **Describe the formation of $CaCl_2$ with diagram and predict valency of Ca and Cl.** — 4

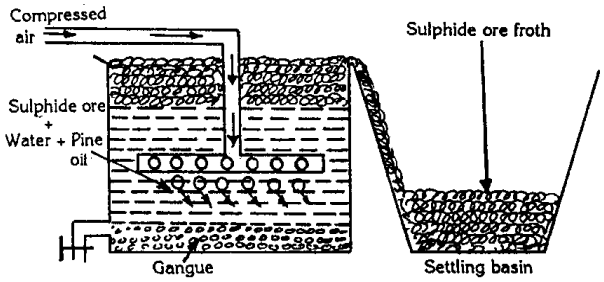
Explaination:

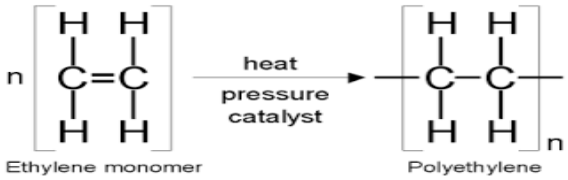
1. In the formation of calcium chloride molecule 2 electrons are transferred from calcium atom to two chlorine atoms.

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.	d)	2. By the loss of two electrons, the Ca 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.	1	4
		3. The appositively charged ions (Ca^{++}& $2Cl^-$) combine together by electrostatic force of attraction to form neutral molecule of $CaCl_2$. 	2	
		Valency of Ca and Cl: Valency of Ca (calcium) is +2 and valency of Cl Chlorine) is -1.	1	
		State Faraday's laws of electrolysis.		
		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.	2	
		Formula : W = z c t		
		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 is series, the amount of the substance deposited or liberated at the electrodes are directly proportional to their chemical equivalents.	2	
		Formula : $W_1 / W_2 = E_1 / E_2$		

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.	e)	**Describe with labelled diagram the process of electroplating of silver.** **Diagram:**  **Process:** 1. Electroplating of silver on iron – spoon is carried out in a rectangular tank of steel. 2. Iron spoon, which is to be electroplated, is cleaned thoroughly by boiling with caustic soda in order to remove the grease & dirt. 3. Further it is washed with water until free from caustic soda & carefully polished. 4. The iron spoon is then made as cathode. 5. The anode consists of pure silver metal plate. The anode & cathode both are suspended in the electrolyte in the cell of potassium argento-cyanide K [Ag $(CN)_2$] . 6. On passing the direct electric current at the applied voltage, the iron spoon gets plated with a smooth & brighter deposit of silver. Silver anode gets slowly dissolved in solution by giving Ag^+ ions. Ionisation $K[Ag(CN)_2] \downarrow K^+ + [Ag(CN)_2]$ To ← Cathode: $Ag^+ + e^- \rightarrow Ag \downarrow$ From → anode: $Ag \rightarrow Ag^+ + e^-$ $Ag^+ + 2CN^-$ $H^+ + OH^- \downarrow\uparrow H_2O$	1 2 1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.	f)	**A given quantity of electricity is passed through two cells containing $CuSO_4$ and $AgNO_3$ solutions respectively.If 0.99 gm of silver and 0.29 gm of copper are deposited, find the equivalent weight of silver when that of copper is 31.6.** **Given :-** Weight of Ag deposited = 0.99 gm. Weight of copper deposited = 0.29 gm. Equivalent weight of Cu = 31.6 gm. **Equivalent weight** of Ag = ? (x) According to Faraday's second law of electrolysis, $\frac{\text{wt. of Ag deposited}}{\text{wt. of Cu depostied}} = \frac{\text{Eq. wt. of Ag(x)}}{\text{Eq. wt. of Cu}}$ $\therefore \frac{0.99}{0.29} = \frac{\times}{31.6}$ $\therefore \times = \frac{0.99 \times 31.6}{0.29}$ $\therefore$ Eq. wt. of Ag = 107.8 gm. **Equivalent weight of silver is 107.8 gm.**	1 1 1 1	4
3.		**Attempt any FOUR of the following.**		16
	a)	**With the help of figure explain the froth floatation process.** **Froth Floatation Process: -** This process is especially suitable for the concentration of sulphide ores. This process is based on the principle of differential wetting characteristics of the ore & gangue particles with water & oil. The ore is preferentially wetted by oil & the gangue particles by water. e.g. galena PbS (galena), Cu-pyrites [$CuFeS_2$] In this process, the powdered sulphide ore is mixed with water & pine oil. The whole mixture is then stirred vigorously by passing compressed air. The oil forms froth with air bubbles. The sulphide ore particles get attached with the Froth & floats on the surface, while the gangue or earthy impurities are wetted by water & sink to the bottom of the tank. The Floating froth is then skimmed off into settling basins from where by filter press a concentrated ore is recovered.	3	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3.			1	
	b)	**Differentiate between calcination and roasting.** **Calcination** vs **Roasting** 1)Process of heating the ore strongly in absence of air below its M.P. / 1)Process of heating the ore strongly in presence of air below its M.P. 2)This process is used to convert carbonate & hydroxide into their oxides / 2) This process is used to convert sulphide into oxide & sulphate. 3)Purpose is to remove moisture & volatile impurities from the ore / 3)Purpose is to remove moisture & oxidation of ore & the impurities like S,P,As etc. 4)In calcination, the mass becomes porous, so that it can be easily reduced to metallic state. / 4) In roasting, the sulphide ore chemically changed into suitable form (oxides & sulphates) can be reduced to metallic state. 5) Process done in hearth of a reverberatory furnace when the doors are kept closed. / 5) Process done in hearth of a reverberatory furnace when the doors are kept opened. 6) Reaction is decomposition. / 6) Reaction is oxidation. **(Any four points)**	**1 Mark each**	**4**
	c)	**Give the composition, properties and uses of babbit metal** **Composition:** Sn = 88% Sb = 8% Cu =4% **Properties:** i) It is silvery white, soft metal alloy. ii) It has very low coefficient of friction. iii) It has very high corrosion and wear and tear resistance. iv) It can take high polish. v) It does not tarnish easily vi) It distributes the load uniformly.	**2** **1**	**4**

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
3.		**Applications:** **i)** It is used for making engine bearing. **ii)** It is also used as a common bearing metal in cast iron boxes. (**Any two properties & two applications**)	**1**	**4**
	d)	**Define polymerization. Explain addition polymerization with at least one example.** **Polymerization:** The process of formation of polymers from monomers is known as polymerization.	**1**	
		OR "The process in which a large number of small molecules (monomers) linking together to form a large molecule (polymer). Under specific conditions of temp, pressure & catalyst is known as polymerisation.		
		Example formation of polythene plastic by addition polymerization: In this process double between carbon atoms break & form unstable ethylene molecules. Unstable molecules combine together in large number & form polythene.	**3**	
		 Ethylene monomer Polyethylene		
		OR $n(C_2H_4) \longrightarrow (C_2H_4)_n$		
		(Note: Any relevant example of addition polymerisation)		

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
3.	**e)**	**Define abrasion resistance. Write two uses of rubber depending upon it.** **Abrasion resistance: -** It is defined as the property of rubber due to which it resist wearing away of the surfaces due to friction. **Uses of rubber depending upon abrasion resistance.** 1. It is used for cycles, aeroplane & automobile tyres. 2. It is used for shoe soles & shoe heels 3. It is used for preparation of conveyor belts 4. It is used for floor tiles, rubber mats **(Any two uses)**	**1** **3**	**4**
	f)	**Write the properties and applications of thermacole** **Properties :- (Any Two)** 1) It is light in weight 2) It is spongy, porous & has foam like structure. 3) It has low thermal & electrical conductivity. 4) It is resistant to chemicals & ageing 5) It is quite strong, has low density. 6) It is waterproof. 7) It absorbs shocks and vibrations. 8) It is stable up to 55^{o} C **Applications : (Any Two)** 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.	**2** **2**	**4**