SUMMER– 17 EXAMINATION

Model Answer

Subject Code: 17103

Important Instructions to 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 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 constant values 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.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Attempt any NINE of the following:**	**18**
	(a)	**State the number of sub-shells in K,L,M,N shells.**	**2**
		The number of subshells present in K, L, M, N, shells are	
		Shell | Number of subshells K | 1 (1s) L | 2 (2s,2p) M | 3 (3s,3p,3d) N | 4 (4s,4p,4d,4f)	1 /2 Mark each
		(**Note:- Consider either number or names of the sub-shells)**	
	(b)	**Why atom is electrically neutral?**	**2**
		Atom of an element is electrically neutral because it contains equal number of proton & electrons. In other words in an atom of an element number of positive charges (protons) are equal to number of negative charges (electrons) . Hence they cancel each other & as a result atom becomes charge-less or neutral.	2

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1	(c)	**Define valency. Write their types.**	2
		Valency:- The number of electrons donated (lose) or accepted (gain) or shared by atom of an element in order to complete its octet & attain stability is called as Valency.	1
		Types of Valency :	
		1. Electro valency **2**. Co valency **3**. Co-ordinate valency	1
		Note- (Any two type ½ mark each)	
	d)	**Define ionization and electrolysis.**	2
		Ionization: Any process of formation of ions is called as ionization. It may occur in gaseous state or fused state or solution state. OR The process of splitting up or breaking up of a substance into charged ions is called as Ionization.	1
		Electrolysis: The process of chemical decomposition of an electrolyte by a passage of electric current is called as electrolysis.	1
	(e)	**Define cathode and anode.**	2
		Cathode: The electrode which is connected to the negative terminal (pole) of a battery is called as cathode. It is a negative electrode.	1
		Anode: The electrode which is connected to the positive terminal (pole) of a battery is called as anode. It is a positive electrode.	1
	(f)	**State Faraday's first law of electrolysis.**	2
		Faraday's first law of electrolysis:- It states that the weight (W) of the substance deposited or liberated at the electrode during electrolysis is directly proportional to the quantity of electricity (Q) that is passed through electrolyte solution.	2

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1	(g)	**A current of 4 amperes is passed-through CuSO4 solution for one hour. Calculate the weight of copper deposited at cathode.** **(E.C.E. of Cu=0.000326gm/coul.)** Given:- c = 4 amp t = 1 hour= 3600 sec. z =0 .000326 gm/coul. To Calculate:- w = Weight of substance deposited =? According to Faraday's first law **w = z c t** = 0 .000326 x 4 x 3600 = 4.6944 g **Weight of substance deposited = 4.6944 g**	**2** 1/2 1/2 1
	(h)	**Define the terms:** **(i) Tensile strength** **(ii) Hardness** i) **Tensile strength:** It is the ability or capacity of a metal to carry the load without breaking. ii) **Hardness:** It is the property of a metal to resist wear, abrasion and penetration .	**2** 1 1
	(i)	**Define alloy. Write it's types.** **Alloy :** It is a homogenous mixture of two or more elements one of which must be metal is called as alloy. **Types of alloy :** 1. Ferrous alloy 2. Non ferrous alloy	**2** 1 1

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Q. No.	Sub Q. N.	Answer	Marking Scheme
1	(j)	**Write two purpose of making alloy.** **Purposes of making alloy :** 1. Improve hardness of metal 2. Lower the melting point 3. Increase the tensile strength 4. Increase corrosion resistance 5. To get good casting 6. Modify colour 7. Reduce malleability & ductility 8. Modify chemical activity	**2** 1 Mark each
	(k)	**Name any four synthetic rubber.** **1.** Butyl rubber **2.** Buna N **3.** Buna S **4.** Thikol **5.** Neoprene	**2** 1/2 Mark each
	(l)	**Give the classification of thermal insulating materials with one example each.** **Types of thermal insulating material** | **Example** 1. Inorganic thermal insulating material | Glass wool, asbestos, talc, slag 2. Organic thermal insulating material | Wool, silk, jute, paper, rubber, thermacole	**2** 1 Mark each

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Q. No.	Sub Q. N.	Answer	Marking Scheme
2		**Attempt any FOUR of the following**	**16**
	a)	**Write four assumptions of Bohr's atomic theory.** **(any four points)** **1**. An atom consists of dense positively charged central part called as **nucleus.** **2.**The electrons are revolving around the nucleus in a fixed circular paths are called Orbit or shell. **3**. Electron can revolve around the nucleus in certain permitted Orbits called as **stationary state.** **4.** Each stationary state has definite amount of energy hence called **energy level.** **5.** Electrons in the energy level nearest to the nucleus has **Lower energy** while the electrons which are far away from the nucleus have **Higher energy**. **6.** An excited electron can jump from **lower to higher** energy level by **absorbing** some energy in form of **Photon or bundle of packets**. When the excited electron can jump from **higher to lower** energy level, then it **looses** some energy. **7.** The angular momentum of electron (mvr) must be integral multiple of h/2π.Hence **mvr = nh/2π.** **8.** The energy of an electron can change only when it moves from one level to another. **9.** According to bhor, the various orbits or shells or energy levels are designated by the letter K, L, M, N, O, P etc. for n=1,2,3,4,5,6.	**4** 1 Mark each
	b)	**Explain the formation of $CaCl_2$ molecule.** 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 Ca atom acquires (Ca^{++} Charges) two positive charges & attain stable configuration like Ar (2, 8, 8). Similarly two chlorine atoms gain one electron each & acquire -1 charge & form $2Cl^-$ ions. The oppositively charged ions (Ca^{++}& $2Cl^-$) combine together by electrostatic force of attraction to form neutral molecule of $CaCl_2$.	**4** 2

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		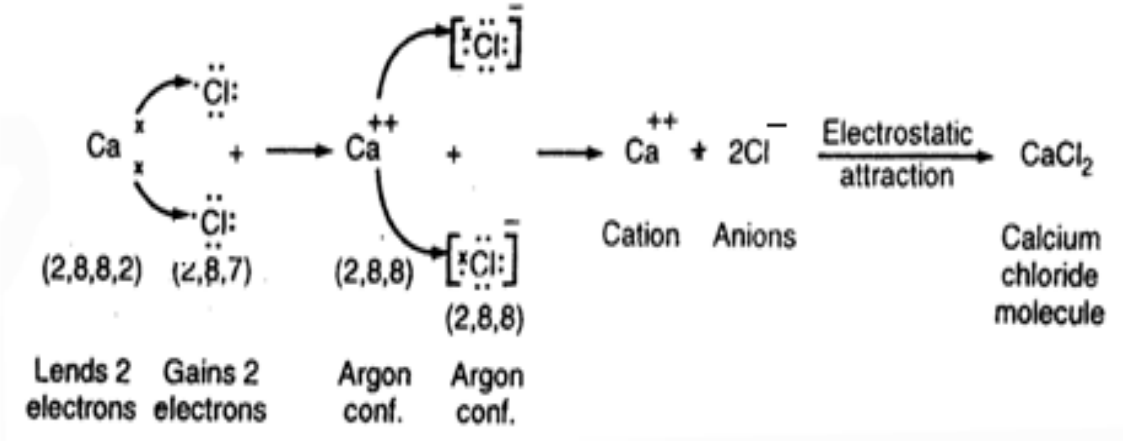	**2**
	C)	**Write electronic configuration** $_{19}K^{39}$, $_{24}Cr^{52}$, $_{20}Ca^{40}$, $_{6}C^{12}$ Electronic configuration of above elements are as follows:- **i)** $_{19}K^{39}$ **:** $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^1$ **ii)** $_{24}Cr^{52}$ **:** $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^1$, $3d^5$ **iii)** $_{20}Ca^{40}$ **:** $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^2$ **iv)** $_{6}C^{12}$ **:** $1s^2$, $2s^2$, $2p^2$	**4** 1 mark each

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2.	**d)**	**Describe electrolysis of $CuSO_4$ solution using copper electrodes.**	**4**
		In the aqueous solution of $CuSO_4$ using copper electrodes, there are Cu^{++}, SO_4^{--},H^+&OH^- ions in the solution. Under the influence of electric field,Cation(Cu^{++} ,H^+) goes to cathode & anion (SO_4^{--}, OH^-) goes to anode.	
		According to activity series, both the cations Cu^{++} & H^+ travel towards cathode & Cu^{++} ions get discharged in preference to H^+ ions as Cu^{+2} ions have low discharge potencial.	**2**
		At Anode, both the anions SO_4^{--} & OH^- migrate but the easiest process is the copper anode dissolves into the solution with liberation of electrons as it forms Cu^{++} ions.	
		The Schematic representation of electrolysis of $CuSO_4$ is as follows:-	
		Cathode process Ionisation Anode process $CuSO4$ $\downarrow\uparrow$ To From $Cu^{++} + 2e^- \rightarrow Cu \leftarrow Cu^{++} + SO_4^{--} \rightarrow Cu \rightarrow Cu^{++} + 2e^-$ (metal) Cathode anode $H^+ + OH^-$ $\downarrow\uparrow$ H_{2O}	**2**

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2.		1) The deposition of Cu metal at copper Cathode. 2) The liberation of Cu++ ions at anode. 3) The Cu^{++} ions produced at anode and no SO_4^{--} ions discharged, unite with each other to form $CuSO_4$ solution. Hence the strength of $CuSO_4$ solution in the cell remains the same.	
	e)	**Define degree of Ionisation. Explain the factors affecting degree of Ionisation.**	**4**
		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**- The compounds like strong acids, bases & salts have high degree of ionization as they are highly ionised in the solution.e.g.HCl, HNO_3(Strong acids), Strong bases(NaOH, KOH) & strong salts (Nacl, KCl)etc.while the weak acids & weak bases have low degree of ionization as they are feebly ionized in solution. 2. **Nature of Solvent**- The effect of solvent is due to high dielectric constant.The polar solvents like water & ammonia tends to separate the ions & they act as strong ionizing solvent. The Non-polar solvents like CS_2 & benzene have no tendency to separate the ions. **3. Concentration of the solution-** Degree of Ionisation is inversely propotional to concentration. As concentration increases, degree of ionization decreases & vice a versa. **4. Temperature of solution-** Degree of Ionisation is directly proportional to temperature. As temperature increases, degree of ionization increases. **(Three marks for any three factors)**	**3**

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2.	**f)**	**Define PH & POH. Calculate the pH of a solution which contains 1.54×10^{-2} of strong acid.**	**4**
		pH: It is define as the negative logarithm to the base ten of $[H^+]$ ion concentration. $pH = -\log_{10}[H^+]$	**1**
		pOH : It is define as the negative logarithm to the base ten of $[OH^-]$ ion concentration. $pOH = -\log_{10}[OH^-]$	**1**
		Given:- $[H^+] = 1.54 \times 10^{-2}$ **mole/lit**	
		$pH = -\log [H^+]$	**1**
		$= -\log [1.54 \times 10^{-2}]$	
		$= -[(\log 1.54) + (\log 10^{-2})]$	
		$= -[(0.1875) + (-2)]$	
		$= 2 - 0.1875$	
		pH= 1.8125	**1**
3.		**Attempt any FOUR of the following.**	**16**
	a)	**Difference between Calcination and Roasting.**	**4**

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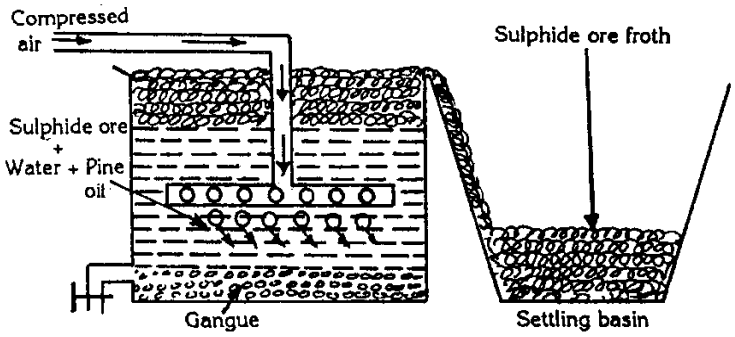
Calcination	**Roasting**
1)Process of heating the ore strongly in absence of air below its M.P.	1)Process of heating the ore strongly in presence of air below its M.P.
2)This process is used to convert carbonate & hydroxide into their oxides	2) This process is used to convert sulphide into oxide & sulphate.
3)Purpose is to remove the 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 highly porous.	4) In roasting, the mass becomes less porous.
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. Decomposition reaction takes place	6.Oxidation reaction takes place

1 mark each

(Any four points)

b) **Describe the method used for concentration of sulphide ore.** **4**



1

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		Process : 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 a 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.	3
	c)	**Give the composition, properties and application of Babbit metal.**	4
		Composition: Sn = 88% Sb = 8% Cu =4%	2
		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.	1
		Uses : **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

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	d)	**Difference between thermosetting and thermosoftening.**	**4**

Thermo setting	**Thermo softening**
1 The plastics who possess three dimensional complicated structure with cross linkages are called as thermo setting plastics	1 The plastics who possess linear long chain structure without cross linkages are called as thermo softening plastics
2 They are formed by condensation polymerization	2 They are formed by addition polymerization
3 They consist of polymers of higher molecular weight	3 They consist of polymers of smaller molecular weight
4 They are harder, stronger & more brittle	4 They are softer, weaker &less brittle
5 They have high tensile strength	5 They have low tensile strength
6 Their inter molecular bonds are strong covalent bonds	6 Their inter molecular bonds are weak
7 They do not soften on heating	7 They soften on heating
8 They are insoluble in organic solvent	8 They are soluble in organic solvent
9 They cannot be reshaped and reused	9 They can be reshaped and reused
10 They cannot be reclaimed from the waste	10 They can be reclaimed from the waste
11 Examples- Bakelite, Polyester, Nylon66, Urea formaldehyde,Silicon plastic	11 Examples- Polythene, Polystyrene, PVC, Teflon

1 Mark each

(Any four differences)

e) **Describe the valcanisation of rubber.** 4

Vulcanization :- "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**

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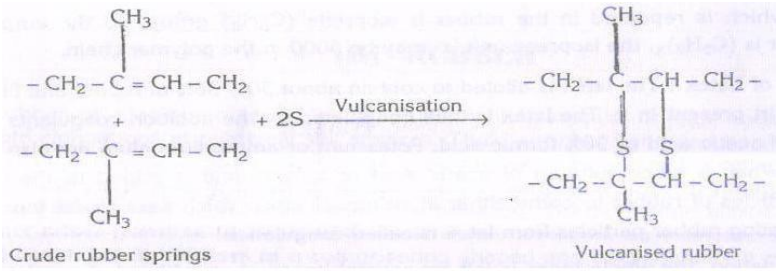
		Most of all the processes of vulcanization is addition of 'sulphur'. Heating the raw rubber with sulphur to a high temperature, sulphur combines chemically at double bonds in the rubber molecule of different rubber springs.	1
		Reaction: 	2
	f)	**Write the preparation, properties and applications of glasswool.**	4
		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.	2
		Properties :- (Any Two) 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.	½ mark each
		Applications : (Any Two) 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.	½ mark each