SUMMER– 2018 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 two postulates of Bohr's atomic model.** 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.** 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 integral multiple of h/2π. Hence **mvr = nh/2π.**	**2** 1 Mark each

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Q. No.	Sub Q. N.	Answer	Marking Scheme
1.	**(b)**	**Define Isotopes. Give two applications of carbon isotopes.**	**2**
		Isotopes: The different atoms of the same elements having same atomic number but different atomic mass number are called isotopes.	1
		Applications of Carbon isotopes : (any two)	
		1. C^{12} being most abundant in nature as backbone of life on earth. **C^{12}** participates in all metabolic processes including respiration and photosynthesis.	½ mark each
		2. Fossil fuels are created from dead carbon based organic matter.	
		3. All our energy needs are satisfied by carbon base crude oil and natural gas deposits.	
		4. **C^{13}** has application in NMR, as it has nuclear spin, which respond to radio frequency signal.	
		5. In Earth science (C^{13}) it is used to determine identity of water sources.	
		6. C^{14} is the radioactive isotope of carbon, used in radiocarbon dating technique. It is used to determine the age of carbon containing materials which are up to 60,000 years old.	
	(c)	**Define: i) Valency ii) Valence electrons.**	**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
		Valence electrons:-The electrons present in the outermost orbit of an atom determine the valency of an atom and hence called valence electrons.	1
	(d)	**Define Electrolyte. Write its types.**	**2**
		Electrolyte: "The substance which is in fused state or in aqueous solution liberates ions and allows the electric current to pass through it, resulting in the chemical decomposition, is known as an electrolyte."	1
		Types: 1. Strong electrolyte 2. Weak electrolyte	½ mark each

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1	(e)	**Why the blue colour of $CuSO_4$ turns colourless during electrolysis of $CuSO_4$ solution by platinum electrode.**	**2**
		The platinum electrodes are inert. Hence does not dissolve into the solution. The Cu^{++} ions (blue) 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
	(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
	(g)	**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
	(h)	**Define: (i) Ore (ii) Flux**	**2**
		Ore: The mineral from which the metal is conveniently and economically extracted is known as **ore**.	1
		Flux: 'A substance which is used to remove the gangue from ore is called flux'.	1
	(i)	**Give composition of Duralumin.**	**2**
		Composition of Duralumin:- Al = 95% , Cu = 4% , Mg = 0.5%, Mn = 0.5%	2

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1	(j)	**Give the classification of Alloys with example of each.**	**2**
		Classification of Alloys :- **1. Ferrous Alloys :-** e.g. steel alloy , plain carbon steel ,magnetic steel , stainless steel. **2. Non - Ferrous Alloys :-** e.g. Brass, bronze, duralumin.	1 Mark each
	(k)	**Define: i) Plastics ii) Polymers.**	**2**
		i) Plastics: Plastics are basically, the synthetic organic materials of high molecular weight, which can be moulded into any desired shape by the application of heat and pressure in the presence of catalyst.	1
		ii) Polymers: Many units or monomers joined together to form a long chain structure called polymers.	1
	(l)	**Distinguish between natural rubber and synthetic rubber.**	**2**
		Natural rubber / **Synthetic rubber** 1. It is an elastic material obtained from a milky emulsion (latex) of rubber trees. / 1. It is a rubber-like product obtained by some chemical reaction. 2. It is a polymer of isoprene molecule. / 2. It is a polymer of substances having unsaturated nature. 3. It is non-resistant to oxidation. / 3. It is highly resistant to oxidation. 4. It becomes soft and sticky by application of heat. / 4. It becomes soft and sticky by application of heat. 5. Its tack property is high. / 5. Its tack property is low. 6. It is soluble in organic solvents. / 6. It is insoluble in organic solvents. 7. It is plastic in nature. / 7. It is elastic in nature. **(Consider any two points)**	1 Mark each

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Q. No.	Sub Q. N.	Answer	Marking Scheme
2		**Attempt any FOUR of the following:**	**16**
	(a)	**Differentiate between orbits and orbitals.**	**4**

Orbits	**Orbitals**
1. It is fixed path along which the electrons revolve around the nucleus.	1. 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.	2. Orbitals are designated by letters s, p, d, f.
3. Orbit is circular paths or elliptical in shape.	3. 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.	4. 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.	5. The number of orbitals relative to energy level are n_2=1, 4, 9, 16 etc.

1 Mark each

(Consider any four points)

(b) **Write the orbital electronic configuration of the following:** **4**

i) $_{10}Ne^{20}$ ii) $_{14}Si^{28}$ iii) $_{19}K^{39}$ iv) $_{29}Cu^{63}$

Electronic configuration of above elements are as follows:-

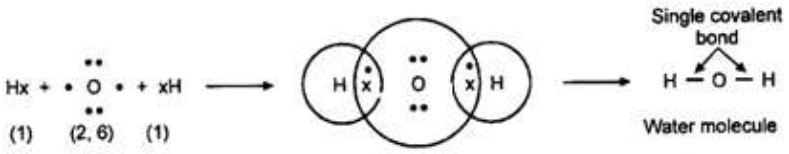
1 mark each

i) $_{10}Ne^{20}$: $1s^2$, $2s^2$, $2p^6$

ii) $_{14}Si^{28}$: $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$

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

iv) $_{29}Cu^{63}$: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1, 3d^{10}$

Q. No.	Sub Q. N.	Answer	Marking Scheme
2	(c)	**Explain the formation of water molecule and name the type of bonding**.	**4**
		Formation of Water Molecule: H (Z = 1) $1S^1$ (1) O (Z = 8) $1S^2$, $2S^2$, $2P^4$ (2, 6) Water molecule (H_2O) contains two atoms of hydrogen & one atom of oxygen. Each hydrogen atom is in short of 1 electron of complete its duplet & oxygen atom is in short of 2 electrons to complete its octet. In the formation of water molecule, oxygen atom completes its octet by sharing one electron each with two hydrogen atoms. Similarly, each hydrogen atom completes its duplet by sharing one electron with oxygen atom. Thus, **two separate single co-valent bonds** are formed between hydrogen & oxygen atoms.	2
			1
		Type of bonding: Single co-valent bonding.	1
	(d)	**Define degree of ionization. Explain the effect of concentration and temperature on degree of ionization.**	**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
		Effect on Degree of ionization:- 1. **Concentration of the solution-** Degree of Ionization is inversely proportional to concentration. As concentration increases, degree of ionization decreases & vice a versa. 2. **Temperature of solution**- Degree of Ionization is directly proportional to temperature. As temperature increases, degree of ionization increases.	1 ½ mark each

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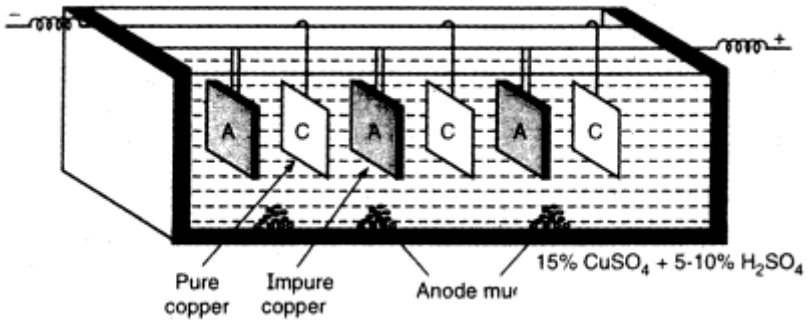
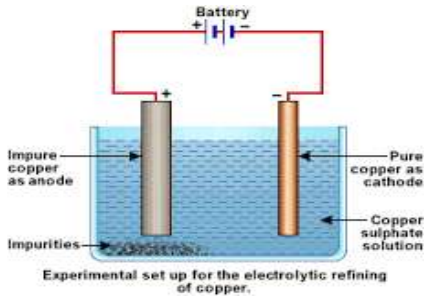
Q. No.	Sub Q. N.	Answer	Marking Scheme
2.	**(e)**	**Explain electro-refining of blister copper:** 1. It is carried out in the large lead lined tank. 2. Impure Copper is placed into large plates which are suspended into tank at intervals & acts as anode. 3. Cathodes are thin plates of pure copper & each 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.  **or**  Experimental set up for the electrolytic refining of copper.	**4** 2 2
	(f)	**A current of 4 amperes flowing for 45 minutes deposits 1.062 gm of metal at cathode. Calculate the equivalent weight of the metal. (Given 1 Faraday = 96500 C)**	**4**

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2.		**Given:** c : 4 amperes t : 45 minutes : 45 x 60 = 2700 seconds w : 1.062 gm 1 Faraday : 96500 C	1
		To calculate: Eq. Weight (CE)	
		According to Faraday's first law:	
		w = z c t	2
		Therefore, z = w / ct z = 1.062 / 4 x 2700 z = 1.062 / 10800 E.C.E. z = 0.00009833 g/c	
		Now, C.E. = 96500 x E.C.E. C. E. = 96500 x 0.00009833 C.E. = 9.4888 gm	1
3.		**Attempt any FOUR of the following:**	**16**
	(a)	**Draw a Stepwise detail flow chart for extraction of metal from its ore.**	**4**
		Ore ↓ A] Crushing ↓ B] Concentration or Ore Dressing ↓ C] Reducting ↓ D] Refining ↓ E] Metal → Physical Process : - 1 Gravity Separation, 2 Magnetic Separation, 3 Froth Floatation → Chemical Process : - 4 Calcination, 5 Roasting → Smelting – Aluminothermic Process – Electrolysis → Poling – Liquation – Distillation – Electrolytic refinig	4

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3.	**(b)**	**Define the terms:** **i) Hardness ii) Toughness iii) Brazing iv) Machinability** **i) Hardness:-** Hardness is the property of metal possessed by a material which enables it to resist penetration or abrasion or scratching by other material. Diamond is the hardest of known materials. **ii) Toughness:-** Is the property of metal to resist repeated shock and vibration which enables it to withstand bending without Fracture. **iii) Brazing:-** A method of joining metal surfaces by introducing molten non – ferrous alloy with melting point above 400^0C between them, is known as brazing. **iv) 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.	**4** 1 mark each
	(c)	**State the purpose of making alloys, with example of each.** **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 any four purposes with relevant example)**	**4** 1 mark each

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Q. No.	Sub Q. N.	Answer	Marking Scheme
3.	**(d)**	**Differentiate between thermosetting and thermo-softening plastics.**	**4**

Thermosetting	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

(Note:-Consider any four points)

(e) **Write the drawback of natural rubber. Name the method used to overcome these drawback**. **4**

Drawback of natural rubber:

1. It has low tensile strength.
2. It is too weak to be used in heavy duty operation.
3. During summer, the raw rubber becomes soft and sticky, while in cold weather it becomes hard and brittle.
4. On stretching, it undergoes permanent deformation.
5. It has a large water absorbing capacity.

1 mark each

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3.		6. It is affected by solvents like gasoline, benzene, carbon tetrachloride, vegetable oils etc. 7. It gets tarnished in air due to oxidation. As a result, its durability is considerably by vulcanization. **(Note:- Consider any three drawbacks)** The method used to overcome these drawbacks is **Vulcanisation.**	1
	(f)	**What is glass-wool? Give its properties and applications.**	**4**
		Glass wool: It is fibrous wool like material, which is made up of fine filament of glass like ordinary wool is known as glass wool.	1
		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.	1 ½
		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 ½