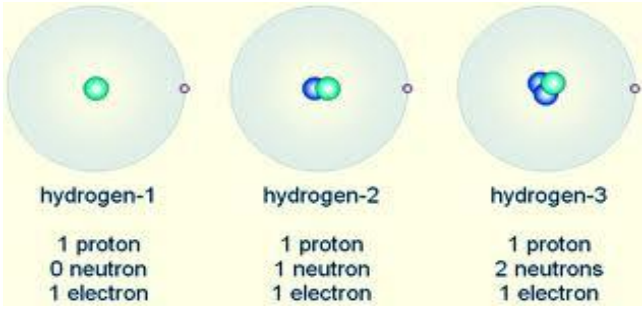
WINTER– 2018 EXAMINATION

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.

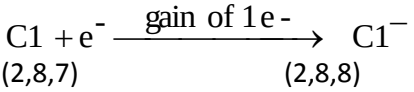
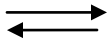
Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Attempt any nine of the following:**	**18**
	(a)	**Name isotopes of hydrogen. Draw their atomic diagram.**	**2**
		Isotopes of hydrogen: $_1H^1$ Hydrogen, $_1H^2$ Deuterium, $_1H^3$ Tritium	1
		Atomic diagram: 	1
	(b)	**State the maximum number of electrons that can occupy K, L, M and N energy level if 'n' is principal quantum number of that element.**	**2**

Energy Level	Maximum Number of Electrons
K (n=1)	2
L (n=2)	8
M (n=3)	18
N (n=4)	32

½ mark each

WINTER– 2018 EXAMINATION
Model Answer

17103

Q. No.	Sub Q. N.	Answer	Marking Scheme
1	(c)	**Chlorine is electronegative give reason and explain with electronic configuration.**	2
		Reason: Chlorine gains one electron from another atom so as to complete its octet therefore chlorine is electronegative.	1
		Explanation: Chlorine (Cl) has electronic configuration (2,8,7). When Chlorine gains one electron from another atom to complete its octet, its electronic configuration becomes (2,8,8)	1
		Or 	
	(d)	**Define: 1) Electrode 2) Electrolyte**	2
		Electrode: An electrode is a small piece of metal or other substance that is used to take an electric current to or from the source of power.	1
		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
	(e)	**Give two postulates of Arrhenius theory of ionization.**	2
		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.	1 mark each
		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  $Na^+ + Cl$	
		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.	

WINTER– 2018 EXAMINATION

Model Answer

17103

Q. No.	Sub Q. N.	Answer	Marking Scheme
1	(f)	**State Faraday's second law of electrolysis.**	**2**
		Statement: 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
	(g)	**Calculate the pH of solution having H^+ ion concentration 5.5×10^{-5} moles per litre.**	**2**
		$pH = - \log [H^+]$ $= - \log [5.5 \times 10^{-5}]$ $= - [(\log 5.5) + (\log 10^{-5})]$ $= - [(0.7403) + (-5)]$ $= 4.25$ $pH = 4.25$	½ mark each step
	(h)	**Define the terms 1) Flux 2) Slag.**	**2**
		Flux: 'A substance which is used to remove the gangue from ore is called flux'.	1
		Slag: A fusible chemical compound formed by combination of the added flux and the gangue present in the ore.	1
	(i)	**Define concentration of ore. Name different methods of concentration.**	**2**
		Concentration of ore: The concentration of ore means the removal of gangue or matrix from crushed ore.	1
		Methods: (any two) i) Gravity separation ii) Electromagnetic separation iii) Froth floatation iv) Calcination v) Roasting	½ mark each

WINTER– 2018 EXAMINATION

17103

Model Answer

Q. No.	Sub Q. N.	Answer	Marking Scheme
1	(j)	**Write composition of Wood's metal.**	**2**
		Composition:-	½ mark each
		Bi=50%	
		Pb = 25%	
		Sn = 12.5%	
		Cd = 12.5%	
	(k)	**Name the type of plastic with one example each.**	**2**
		i) Thermosetting plastic:	½
		Examples: Nylon 6:6, Bakelite or Phenol formaldehyde, Urea formaldehyde, Epoxy resin etc.	½
		ii) Thermoplasts or Thermo softening plastic: -	½
		Examples: Polyethylene, Teflon, Poly vinyl chloride, Polystyrene etc.	½
	(l)	**Write any two drawback of natural rubber.**	**2**
		Drawbacks of natural rubber:	
		1. It has low tensile strength.	1 mark each
		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.	
		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.	

WINTER – 2018 EXAMINATION

17103

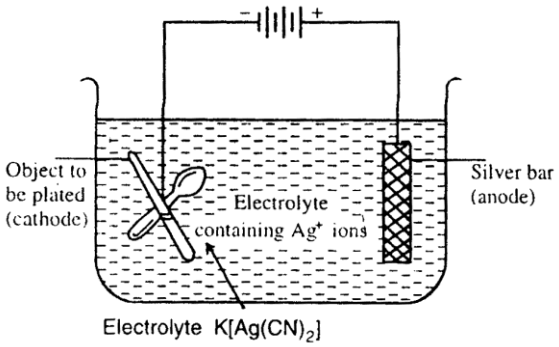
Model Answer

Q. No.	Sub Q. N.	Answer	Marking Scheme
2.		**Attempt any four of the following:**	**16**
	(a)	**Write four postulates of Bohr's atomic theory.** 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.	**4** 1 mark each
	(b)	**State Hund's rule. Write electronic configuration of $_7N^{14}$, $_{18}Ar^{40}$.** **Hund's rule**: 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". **Electronic configuration:** a) $_7N^{14}$ = $1s^2$, $2s^2$, $2p^3$ b) $_{18}Ar^{40}$ = $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$	**4** 2 1 1
	(c)	**Define : i) Atomic number ii) Atomic mass number iii) Energy level iv) Sub energy level** **i) 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." **ii) 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." **iii) Energy level:** Bohr's stationary orbits with definite amount of energy are called energy level. **iv) Sub energy level:** The close grouping of number of energy levels in the main energy level is called sub energy level.	**4** 1 mark each

WINTER– 2018 EXAMINATION

17103

Model Answer

Q. No.	Sub Q. N.	Answer	Marking Scheme
2	**(d)**	**State Faraday's first law of electrolysis and derive its mathematical expression.**	**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.	2
		If 'W' grams is the weight of a substance deposited or liberated at an electrode during the electrolysis and Q be the quantity of electricity passed through the electrolyte, then $W \alpha Q$ …….. 1 But, $Q = c \times t$ $W \alpha c \times t$……. 2	½ mark each
		Where Q = number of coulombs, c = current in amperes, t = time in second $W = z \times c \times t$ ……. 3	
		where z is electrochemical equivalent (e.c.e.) of substance In above equation, when c = 1 ampere and t = 1 second then, W = z……. 4	
	(e)	**Describe with labeled diagram the process of electroplating of silver.**	**4**
			1
		1. Electroplating of silver on iron – spoon is carried out in a rectangular steel tank. **2.** Iron spoon, which is to be electroplated, is cleaned by boiling with caustic soda in order to remove the grease & dirt.	

WINTER– 2018 EXAMINATION

Model Answer 17103

Q. No.	Sub Q. N.	Answer	Marking Scheme
2.		**3**. Further it is washed with water & carefully polished.	1
		4. The iron spoon is then made as cathode & the anode consists of pure silver metal plate.	
		5. The anode & cathode both are suspended in the electrolyte potassium argento-cyanide $K[Ag(CN)_2]$ in the cell.	
		6. On passing the direct electric current, at the applied voltage, the iron spoon gets plated with silver. Silver anode gets slowly dissolve in solution by giving Ag^+ ions.	
		The schematic representation is :	
		Ionization:	
		$K[Ag(CN)_2] \longrightarrow K^+ + [Ag(CN)_2^-]$	1
		$[Ag(CN)_2^-] \longrightarrow Ag^+ + 2CN^-$	½
		At Cathode:	
		$Ag^+ + e^- \longrightarrow Ag$	½
		At Anode:	
		$Ag \longrightarrow Ag^+ + e^-$	
	(f)	**Show the chemical reaction of electrolysis of aqueous $CuSO_4$ solution using copper electrodes.**	**4**
		Chemical reactions:	
		Dissociation:	
		The aqueous solution of $CuSO_4$ produces following ions by dissociation in cell.	
		$CuSO_4 \rightleftharpoons Cu^{++} + SO_4^{--}$	2
		$H_2O \rightleftharpoons H^+ + OH^-$	
		Cathode Reaction:	1
		$Cu^{++} + 2e^- \longrightarrow Cu \downarrow$	
		Anode Reaction:	1
		$Cu \longrightarrow Cu^{++} + 2e^-$	

WINTER– 2018 EXAMINATION

17103

Model Answer

Q. No.	Sub Q. N.	Answer	Marking Scheme
3.		**Attempt any four of the following:**	**16**
	(a)	**Differentiate between calcination and roasting.**	**4**

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

(consider any four points)

(b) **4**

Define Hardness, tensile strength, toughness, machinability

i) **Hardness:-** It is the property of a metal to resist wear abrasion and penetration

OR

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) 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 mark each

iii) Toughness: - Is the property of metal to resist repeated shock and vibration which enables it to withstand bending without Fracture.

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.

WINTER– 2018 EXAMINATION

17103

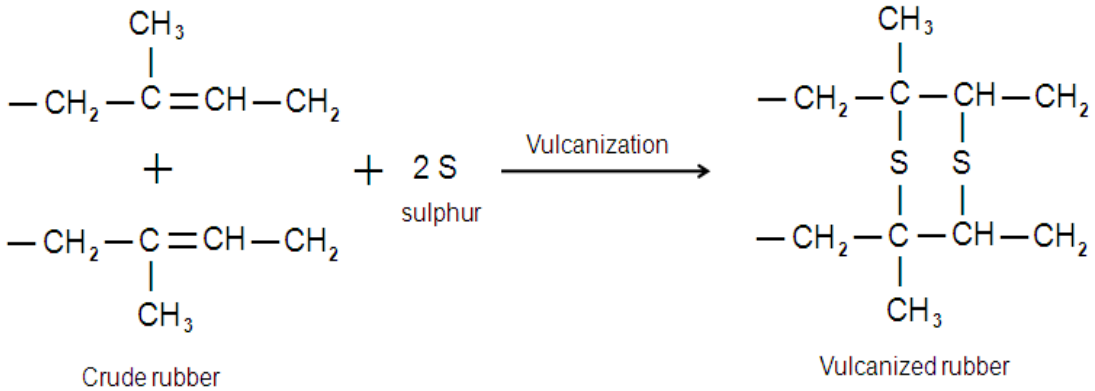
Model Answer

Q. No.	Sub Q. N.	Answer	Marking Scheme
3.	**(c)**	**Explain any four purposes of making an alloy with at least one suitable example in each case.** **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)	**4** 1 mark each
	(d)	**Define polymerization. Explain addition polymerization with at least one example.** **Polymerization: -** "The process in which a large number of small molecules (monomers) linking together to form a large molecule (polymer) under specific conditions of temperature, pressure & catalyst is known as polymerization. **Explanation:** **Addition Polymerization:** It is the process in which the monomers undergo repeated addition, resulting in the formation of long chain polymer without the elimination of any other molecule. i) Only monomers having C = C in their structure undergo this type of polymerization. ii) It is fast and exothermic reaction. iii) It requires a catalyst. iv) No byproduct is obtained. v) It yields polymer having linear chain structure.	**4** 1 2

WINTER – 2018 EXAMINATION

17103

Model Answer

Q. No.	Sub Q. N.	Answer	Marking Scheme
3.		**Example:** **n (C_2H_4) ethylene** —polymerisation (heat, light, pressure and catalyst)→ **(C_2H_4)$_n$ polyethylene** (consider relevant examples)	1
	(e)	**Name and describe the process which increases the stiffness of rubber.**	**4**
		Name: Vulcanization process is used to increase stiffness of rubber.	1
		Explanation: "The process which involves addition of Sulphur or H_2S to crude (raw) natural rubber at high temperature and pressure to improve properties of crude natural rubber is called vulcanization". Most of all processes of vulcanization is addition of 'sulphur'. Heating the raw rubber with sulphur to high temperature, sulphur combines chemically at double bonds in the rubber molecule of different rubber springs.	2
		Chemical reaction (Mechanism):  Crude rubber — Vulcanized rubber	1

WINTER– 2018 EXAMINATION

Model Answer

17103

Q. No.	Sub Q. N.	Answer	Marking Scheme
3	**(f)**	**Write the properties and applications of thermocole.** **Properties :- (any four)** 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 four)** 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.	**4** 2 2