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Revision:-2015 Course Title :-Engineering Chemistry-I	Course Code: TED(15) 1004			
Qst. No.	**Scoring Indicator**	**Split up score**	**Sub Total**	**Total**
	Part A			
I 1	Any two properties like high strength, high elasticity or elastic modulus, high hardness high thermal conductivity…. etc	2x1	2	
2	Heating steel to beyond redness(1123k) and sudden cooling by plunging into water or Oil+ any one property like hardness and brittleness	1 1/2 1/2	2	
3	Definition Any one example like mixture of acetic acid and sodium acetate or NH_4Cl and NH_4OH	1 1/2 ½	2	10
4	Brass-Cu and Zn, Solder-Pb and Sn	1+1	2	
5	Any two of salts like $CaCl_2$, $MgCl_2$, $CaSO_4$, $MgSO_4$	2	2	
II	Part B			
1(a)	Arrhenius Acid-statement+ 1example Base-statement +1 eg	1½ 1½	3	6
(b)	Weight of HCl in 100ml= 0.365 g Weight in 1 litre(w) =3.65g Mol.wt (m) = 36.5 Molarity (M) = W/m =3.65/36.5=0.1M or find M=1000w/mV HCl $\rightarrow$ H^+ +Cl- 1mole 1mole 0.1 mole 0.1 mole $[H^+]$ = 0.1 moles/l pH= -log $[H^+]$ = -log 10^{-1} =1	1 ½ ½ 1	3	6
2 (a)	Add calculated amount of slaked lime $(CaOH)_2$ to hard water Soluble bicarbonates are converted into insoluble carbonate $Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2\ CaCO_3 + 2H_2O$	1 1 1	3	6
(b)	Correct names of 4 steps (screening, sedimentation, filtration and chlorination) In correct sequence with Specification	1 2	3	
3(a)	Name any two methods like Laser ablation, CVD, Arc discharge method, etc Explanation of any one method	1 2	3	6
(b)	Electron- unit negative charge ($1.602x10^{-19}$C), mass-1/1840 of H atom or $9.01x10^{-31}$Kg Proton- unit positive charge ($1.602x10^{-19}$C), mass-same as that of H atom or $1.67x10^{-27}$K	1 1		

4 (a)	Any 3 purposes like 1) to increase the hardness, to increase corrosive resistance, change colour, to lower M.P etc	3x1	3	6
(b)	Process in which metallic particles bind together to form strong coherent body without liquifaction, (heating just below M.P) in an atmosphere of H_2 gas.	3	3	
5 (a)	Definition Eq.wt of $Ca(OH)_2$= Molecular wt/ acidity=74/2=37	2 1	3	6
(b)	Standard solution- solution of known strength or contains known weight in known volume of the solution Normal solution- solution of strength 1N or contains 1 gram eq.wt of solute in 1 litre	1½ 1½	3	
6(a)	Sterilization- process of destructing harmful micro -organisms and making water safe to drink $CaOCl_2 + H_2O \rightarrow Cl_2 + Ca(OH)_2$ or explanation $Cl_2 + H_2O \rightarrow HCl + HOCl$ $HOCl \rightarrow HCl + [O]$	1 2	3	6
(b)	Temporary- due to bicarbonates of Ca and Mg, easily removed by boiling Permanent- due to chlorides and sulphates of Ca and Mg, can not be easily removed , removed by special methods like ion exchange method	1 1/2 1 1/2	3	
7 (a)	Any three physical properties like malleability, ductility, electrical conduction etc	3		6
(b)	Any three impurities like Si, S, Mn, P, O, N etc & effect	3		
	PART C Module 1			
III (a)	Homogenous catalysis – reactants and catalysts are in the same phase Heterogenous catalysis – reactants and catalysts are in different phase One example each	1 1/2 1 1/2 2	5	15
(b)	CNTs- explanation Any three applications like strengthners of composites, molecular sized test tubes or capsules for drug delivery, flat panel display, integrated circuits, tips of AFM, nanofilters	2 3	5	
(c)	Atomic no. definition Mass no definition No. of electrons in Cl=17, protons=17, neutrons =18 No. of electrons in H=1, protons=1, neutrons =0	1 1 1 1/2 1 1/2	5	
IV (a)	Nanomaterials- materials of size in the nano range (1nm-100nm) atleast in one dimension Any four applications like, detection and treatment of tumour, treatment of rheumatic arthritis, targeted drug delivery, DNA mapping of new borns, protein detection etc	1 4	5	15
(b)	Promotor- increase the activity of the catalyst, any one eg like asbestose acts as a promotor to Pt in contact process $2SO_2 + O_2 \xrightarrow{Pt(asbestose)} 2SO_3$ or $N_2 + 3H_2 \xrightarrow{Fe(Mo)} 2NH_3$ (Habour process) Poison- decrease the activity of the catalyst, any one eg like As_2O_3acts as a poison to Pt catalyst in contact process , or hydrogen sulphide acts as a poison to catalyst Fe in Habour process	1 1/2 1 1 1/2 1	5	

(c)	Atom- smallest chemically indivisible particle that can take part in chemical reactions Atom contains same no. of positively charged protons and negatively charged electrons, s neutral Any three differences between atom and molecule	1 1 3	5	
V.(a)	Lewis acid – definition Lewis base-definition Acids-BF_3 and Ni^{2+} Bases-Cl^- and NH_3	1 1/2 1 1/2 1 1	5	
(b)	~~Definition of pH~~ Weight of NaOH in 500ml=0.02 g Weight in 1 litre(w) =0.04g Mol.wt of NaOH (m) =40 Molarity of NaOH = W/m = 0.04/40= 0.001M or find using 1000 w/mV $NaOH \rightarrow Na^+ + OH^-$ 1 mole 1mole 0.001moles 0.001moles $[OH^-] = 10^{-3}$moles/l or find out [H+] and pH $pOH = -\log[OH^-]$ $= -\log 10^{-3} = 3$ pH+pOH = 14 pH=14-3 =11	~~1~~ 1 1 1 ~~1~~ 1	5	15
(c)	Indicator –definition CH3COOH x NaOH - Pphenolphthalein H_2SO_4 x K_2CO_3 - Methylorange HNO_3x KOH - Phenolphthalein or Methylorange	2 3x1	5	
VI (a)	Definition of conjugate acid-base pair- One example like (HCl and Cl-) Conjugate acid of H_2O: H_3O^+, conjugate base : OH^- Conjugate acid of HSO_4^- : H_2SO_4, conjugate base : SO_4^{2-}	2 1 1 1	5	
(b)	Weight of H_2SO_4 in 500ml=2.45 g Weight in 1 litre(w) =4.9g Eq.wt of H_2SO_4 =49 Normality of H_2SO_4 =W/E = 4.9/49= 0.1N V1N1=V2N2 V1=20ml, N1=0.2N, N2=0.1N V2=V1N1/N2 = 20x0.2/0.1 = 40 ml	1 ½ 1 ½ 1 1	5	15

		2 3	5	
(c)	pH definition Any three applications	1 3	5	
VII(a)	Desalination- Removal of dissolved salts from saline water and making water safe to drin Explanation of Reverse osmosis- Figure	1		
(b)	Figure Cation exchange resin-RCOOH or E-H, contains replaceable H Exchange reaction in tank 1, $2RCOOH + Ca^{2+}$(or Mg^{2+})$\rightarrow(RCOO)_2Ca+2H^+$ or expln Anion exchange resin- RNH_3OH or E-OH, contains replaceable OH^- Exchange reaction in tank 2, $RNH_3OH + Cl^- \rightarrow RNH_3Cl+OH^-$ or expln $H^+ + OH^- \rightarrow H_2O$	1 ½ 1 ½ 1 1	5	15
(c)	Any three advantages of hard water Two advantages	3x1 2x1	5	
VIII(a)	Potable water- definition Any four characteristics	1 4x1	5	
(b)	Any 5 points of comparison between soft water and hard water like causes, action towards soap solution, advantages or disadvantages	5x1	5	15
(c)	Coagulation: Removal of colloidal sized impurities like clay, silica etc by adding chemicals called coagulants. Eg for coagulants, alum, sodium aluminate, ferrous sulphate, ferric chloride etc Filtration- explanation of sand filter Figure for sand filter	1 1/2 ½ 2 1	5	
IX (a)	Heat treatment: definition Annealing- heating steel to moderate high temperature and cooling slowly in a planned manner Tempering: Heating Quenched steel to 550K and keeping at that temp for sometime & cooling slowly	1 2 2	5	15
(b)	Alloy ,definition Explanation of fusion method Figure	1 3 1	5	
(c)	Any three advantages like, high rate of production, no material wastage, high dimensional accuracy, complex shapes can be produced etc Any two disadvantages like toxicity , explosivity, pyrophoricity etc	3 2	5	
X (a)	Explanation of blending " compacting	2½ 2½	5	
(b)	Powder metallurgy-definition Any three applications	2 3	5	15

(c)	Cast iron- Fe containing 2-5% carbon;, Wrought iron – Fe with less than 0.2 % Steel - Fe with 0.2 to 2% Cast iron: any two properties like, hard, brittle, M.P 1200^{0}C, etc. Wrought iron: any two properties like soft, malleable, M.P 1500^{0}C etc	1 1 1 1 1	5	