TED(10)-1016 AB Reg No.....

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SECOND SEMESTER DIPLOMA EXAMINATION IN ENGINEERING

TECHNOLOGY-OCTOBER, 2011

APPLIED SCIENCE-II (Chemistry)

(Common except DCP and CABM)

(Maximummarks:50) [*Time*:$1^1/_2$ hours]

PART-A

(Maximum marks:4)

(Answer the following questions in one or two sentences. Each question carries 2 marks).

Marks

I. a) Can we store copper sulphate in iron vessel. Why ? 2

b) Why photochemical smog is called ? 2

PART-B

(Answer any two questions. Each question carried 8 marks)

II. a) (i) What is activity series ?

(ii) Is it safe to stir silver nitrate ($AgNo_3$) solution with copper spoon, substantiate your answer.

(Given : $E^0Ag^+/Ag = +0.84$ V , $E^0\ Cu^{2+}/Cu = +0.34$ V) 4

b) "Galvanic corrosion is similar to generation of electric current in an electrochemical cell." Prove the statement with suitable example. 4

III. a) State the significance of the numbers in the polymer names-Nylon-6,6 and Nylon 6.Write the monomers used for making Nylon6,6 and Nylone-6 4

b) What are ceramic matrix composites? List any two properties and uses of it? 4

IV. a) Physical and Chemical adsorption respond differently to a rise in temperature. What is the difference and why is it so? 4

b) Complete the following 4

Name of fuel	Constituents	Uses
Producer gas	……(1)……	Running gas engines
……(2)……	Carbon monoxide and hydrogen	As a fuel
CNG	Methane, small quantities of ethane and propane	……(3)……
LPG	……(4)……	Domestic fuel

PART-C

(Answer one full question from each unit. Each question carries 15 marks)

UNIT –i

V. a) Explain electrolysis by taking molten sodium choloride as an example 4

b) Formulate the galvanic cell in which the following reaction taking place:

$2Cr(s) + 3\,Cd^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Cd(s)$

(Given : $E^0Cr^{3+}/CR = -0.74$ V, $E^0\,Cd^{2+}/Cd = -0.40$ V)

(i) Which is the electrodes – positively and negatively charged ?

(ii) Write the reaction take place at each of the electrodes

(iii) Calculate the emf of all the cell 4

c) Arrange the following metal in order in which they displace each other and explain

Al, Cu , Fe, Mg and Zn

(Given E^0 values of $Al^{3+}/Al = -1.66$V

$Cu^{2+}/Cu = +0.34$ V

$Fe^{3+}/Fe^{2+} = +0.77$ V

$Mg^{2+}/Mg = -2.37$ V

$Zn^{2+}/Zn = -0.76$ V 4

d)What is surface chemistry? Give any two process which deals in surface chemistry ? 4

VI. a) Name the phenomenon taking place in the following process and elucidate

(i) Silica gel placed in atmosphere saturated with water

(ii) Anhydrous calcium chloride ($CaCl_2$) placed in the atmosphere saturated with water ? 4

b) A cell is prepared by dipping a copper rod in 1M CuSO4 solution and a nickel rod in M NiSO4 solution. The standard reduction potentials of copper and nickel electrodes are +0.34 V and -0.25 V respectively :

1) What will be the cell reaction ?
2) What will be the standard emf of a cell ?

3) Which electrode will be positive ?
4) How will be the cell represented? 4

c) Can we store:

1) Copper sulphate solution in Zinc vessel
2) Copper sulphate solution in Silver vessel
3) Give suitable explanation
(Given E^0 Cu^{2+} /Cu = +0.34 V, E^0 Zn^{2+} / Zn = -0.76 V , and E^0Ag^+/Ag = +0.80 V) 4

d) How is underground iron pipes are protected ? Explain the theory behind it 3

UNIT –ii

VII. a) What are polymers ? How are they classified based on their structure ? 4

b) The fuels used in rocket for their propulsion are called propellants

1) How are propellants classified based on the physical state and one example each ?
2) Name the type of propellants used in SLV-3 and ASLV rockets 4

c) What you mean by Green chemistry ? How will it helps to reduce environmental pollution ? 4

d) Given reason:
Number of organic compounds is so large when compared to inorganic compounds. 3

OR

VIII. a) What is isomerism? Write down the isomers of following compounds:
(i) C_4H_4 (ii) C_2H_6O 4

b) Name the monomers and used of the following polymers:
(i) Silicon rubber (ii) Buna –N
(iii) Bakelite (iv) Nylon-6 4

c) When pH of the rain water drops below 5.6 is called acid rain

1) What are the major compounds responsible for acid rain ?
2) How does the statues and monuments in India are affected by acid rain ? 4

d) What are primary and secondary fuels ? Gives two example for each category ? 3

ANSWERS

PART-A

I. a) No. Iron is above in the series. So it will displace the lower metal copper from solution.

b) It is formed in presence of sunlight by photochemical reactions. Day of summer months when the intensity of solar radiation is very high ,ozone and oxides of nitrogen in presence of sunlight produces photochemical smog.

PART-B

II. a) (i) The arrangement of elements in the decreasing order of activity is called activity series or electrochemical series.

(ii) No. E^0 value of Cu is +0.34 V and E^0 value of Ag is +0.84 V. So copper is higher in the series and silver is lower. Thus copper displaces silver from the solution.

b) In galvanic corrosion a galvanic cell is set up in the two dissimilar parts of the same metal. One part acts as anodic area and other part acts as cathodic area. The presence of moisture act as electrolyte.

III. a) It represents the number of carbon atoms in Nylon-6,6 and Nylon-6

Monomer of Nylon-6,6 : Adipic acid, Hexa methylene diamine

Nylon-6 : Caprolactum

b) Ceramic matrix composite is a composite material in which matrix is ceramic. They are ductile and interaction of ceramic and filler is strong. Used in household material.

IV. a) **Physical adsorption** decreases with increases in temperature from starting it self.

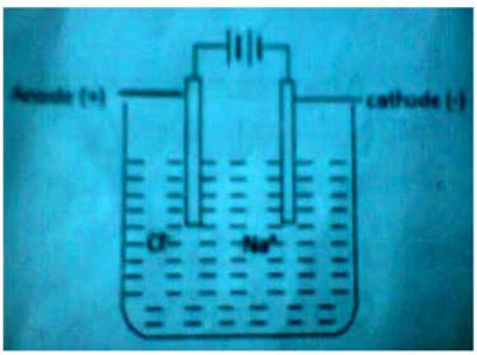
Chemical adsorption first increase then decreases with rise in temperature. It is due to activation energy.

b)

1) Carbon monoxide, Nitrogen
2) Water gas
3) Automobiles
4) N-Butane,iso-butane,propane

PART-C

V. a) Electrolysis is the decomposition of an electrolyte by passage of electricity. When electricity passed through molten NaCl, It will dissosciate to Na^+ and Cl^- ions and move toward cathode (-) and anode (+) respectively.



At cathode : $Cl^- - 1^{e-}$ → Cl (oxidation)

At anode : $Na^+ + 1^{e-}$ → Na (reduction)

b) $Cr / Cr^{3+} // Cd^{2+} / Cd$

(i) Chromium (Cr) is negative

Cadmium (Cd) is positive

(ii) At anode : $Cr \rightarrow Cr^{3+} + 3e^-$

At cathode : $Cd^{2+} + 2e^- \rightarrow Cd$

(iii) emf = $E^0_{cathode} - E^0_{Anode}$

= -0.40-(-0.74) = <u>+0.34 V</u>

c) Al^{3+} / Al = -1.66V — Higher element can displace

Cu^{2+} / Cu = +0.34 V — Lower elements. So Mg can

Fe^{3+} / Fe^{2+} = +0.77 V — Displace all other elements

Mg^{2+} / Mg = -2.37 V — Fe cannot displace any

Zn^{2+} / Zn = -0.76 V — Element

d) It is the branch of chemistry which deals with interactions taking place at the surface of molecules.

Eg : Adsorption , Desorption are surface processes

VI. a) (i) **ADSORPTION :** Adsorption of water take place on the surface of silica gel

(ii) **ABSORPTION:** Water vapour uniformly absorbed by anhydrous $CaCl_2$

b) Given Ni = -0.25 V

Cu = +0.34 V

(i)At anode : Ni → $Ni^{2+} + 2e^-$ (Oxidation)

At cathode : $Cu^{2+} + 2e^{-} \rightarrow Cu$ (Reduction)

(ii) emf = $E^0_{cathode} - E^0_{Anode}$

= +0.34 –(- 0.25) =0.59 V

(iii) Copper electrode (Cathode)

(iv) Ni / Ni^{2+} // Cu^{2+}/ Cu

c) given $E^0\ Cu^{2+}/Cu$ = **+0.34 V**

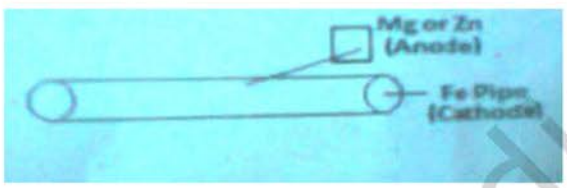
$E^0\ Zn^{2+}$ / Zn = **-0.76 V**

$E^0 Ag^{+}/Ag$ = **+0.80 V**

(i) No. Zn is higher n series so it displaces lower element copper.

(ii) Yes. Because Ag (silver) is lower in series so it cannot displace copper.

d) Underground pipes are protected by cathodic protection, in which cathode (Fe pipe) is protected by sacrificing reactive metal like Zink or Magnesium plate (anode) which is connected with iron pipe through a wire.



Anode : $Zn \rightarrow Zn^{2+} + 2^{e-}$

Cathode : $\frac{1}{2}O_2 + H_2O + 2^{e-} \rightarrow 2OH$

VII. a) They are molecules with large molecules mass formed by linkage of several monomers. Based on structure, there are three types : Linear Eg :PVC

Branched Eg : LDPE

cross linked Eg : Bakelite

b) (i)

1) Solid propellant Eg : Gun powder
2) Liquid propellant Eg : Methyl nitrate
3) Hybride propellant Eg : Acrylic rubber and liquid N_2O_4

(ii) Solid propellants in first and third stage liquid propellant in second and fourth stage.

c) it is the development and implementation of chemical products and process that reduces pollution and hazard.

- It reduces production of chemical waste.

- Use of liquid CO_2 instead of 'cancer causing ' Chemical for dry cleaning.
- Use of H_2O_2 for bleaching clothes and paper instead of toxic chorine.

d) It is the following properties of carbon.

1) **Isomerism :** Same molecular formula different properties
2) **Catenation property :** Self linking property of carbon
3) Te**tra Covalency:** Sharing of four valence electrons
4) **Possibility to form multiple bonds :** Double bond and triple bond
5) **Strength of C-C bond :** C-C bond is stronger than other bond

VIII. a) It is the phenomenon of having same molecular formula but different physical and chemical properties.

(i) CH_3- CH_2- CH_2- CH_3 And CH_3- $\underset{\displaystyle CH_2}{\underset{|}{CH}}$- CH_3

(ii) CH_3- O- CH_3 and CH_3- CH_2-OH

b)

1) Dimethyl silicon chloride
2) Butadiene and Vinyl cynide (acrylonitrile)
3) Phenol and Formaldehyde
4) Caprolactum

c) (i) HNO_3, H_2SO_4

(ii) Statues and monuments in India are of mainly marble, Limestone etc. They react with acid and chemical change takes place.

d) **Primary fuels :** They are obtained from the nature.

Eg : Wood , Petroleum, natural gas

Secondary fuels : They are artificial or prepared from primary fuel.

Eg : Petrol, Diesel