Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

Semester II Examination

August 2021

Max. Marks: 60 **Duration: 130 Minutes**
Class: FE **Semester: II**
Course Code: AS102 **Branch: ETRX/EXTC**
Name of the Course: Engineering Chemistry

Instructions:

1. **All Questions are Compulsory**
2. **Draw neat diagrams**
3. **Assume suitable data if necessary**
4. **Atomic weights : H=1, N=7, C=12, O=16**

Galvanic Series

Mg
Mg Alloys
Zn
Al
Cd
Al alloys
Steel
Cast Iron
High Ni cast iron
Pb-Sn solder
Pb
Sn
Ni-Mo-Fe alloys
Brasses
Monel
Silver solder
Cu
Ag
Ti
Graphite
Au
Pt

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Question No.		Max. Marks	CO
Q1	Give reasons for **any five** of the following : a. ZnO can behave as a semi-conductor b. It is dangerous for metals to be partly covered by dust and dirt c. Ethanol is blended to the extent of 10-15% with gasoline to be used in internal combustion engines d. Hydrocarbons which are good gasoline fuels are poor diesel fuels. e. Fuel cells can have a theoretical efficiency of 100% f. Carbon dioxide is used as a supercritical fluid in green Chemistry	15	AS102.2 AS102.3 AS102.4 AS102.5
Q2 (a)	What are the limitations of the first law and the need for the second law of thermodynamics?	3	AS102.1
Q2 (b)	How are intrinsic conducting polymers different from extrinsic conducting polymers?	3	AS102.4
Q2 (c)	State the Carnot Theorem and explain the following statement of the second law of thermodynamics: "*It is impossible for a system operating in a cycle and connected to a single heat reservoir to produce a positive amount of work in the surroundings"*	4	AS102.1
Q2 (d)	(i) Identify the green chemistry principles in the use of CFCs as refrigerants. Justify your answer (ii) Calculate the atom economy for synthesis of "A" in the following reaction : $C_6H_5NH_2 + (CH_3CO)_2O \rightarrow C_6H_5NHCOCH_3 + CH_3COOH$ A	2 3	AS102.5

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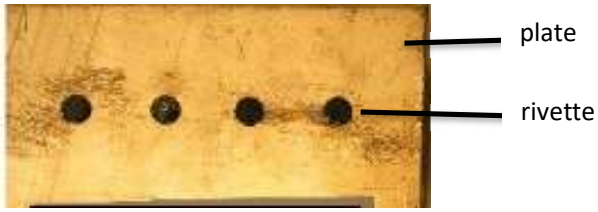
Question No.		Max. Marks	CO
Q3 (a)	What is the significance of Glass transition temperature in polymers? Illustrate the effect of structure of the polymer on this property with the help of examples.	3	AS102.3
Q3 (b)	What happens when a Ni spatula is used to stir a solution of $CuSO_4$? Justify your answer. Justify your answer. Write the relevant reactions, if any. ($E^o_{Ni^{2+}/Ni} = 0.025V$, $E^o_{Cu^{2+}/Cu} = 0.34V$) **Or** What happens when a Zn rod is partially immersed in HCl ? Write the reactions involved	3	
Q3 (c)	The picture of a plate and rivette system is given below. Four different plate and rivette systems from Aluminium, Copper and steel were made as follows and immersed in NaCl solution. Cu plate – Al rivette, Al plate – Steel rivette, Cu plate – Steel rivette, Steel plate - Al rivette Answer the following questions with the help of the galvanic series provided to you  (i) In each plate and rivette assembly, identify the part which will corrode. (ii) In which combination, will the corrosion be the highest and why?	2 2	AS102.3
Q3 (d)	(i) What are eutectics? List the applications of eutectics with the help of examples (ii) Outline the key requirements of a material to behave as an insulator.	3 2	AS102.2

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Question No.		Max. Marks	CO
Q4 (a)	What are biochemical fuel cells? How are they superior to conventional fuel cells? **Or** Outline different methods to improve the efficiency of fuel cells with the help of examples	3	AS102.4
Q4 (b)	Define **any three** of the following terms with respect to electrochemical cells : (i) Discharging (ii) Sensing electrode (iii) Cathode (iv) Open circuit voltage	3	
Q4 (c)	A sample of coal has the following composition by weight : C=90%, O-0.3%, S=0.5%, N=0.5%, Ash = 2.5%. The net calorific value was found to be 8965.28kcal / kg. Calculate the % H and find the gross calorific value of the coal sample.	4	AS102.4
Q4 (d)	A gaseous fuel has the following composition : C_3H_6 = 45%, C_2H_6= 15%, CO=20%, C_4H_{10} = 10%, O_2=5%, CO_2=3% and N_2=2%. Calculate the minimum weight and volume of air required for complete combustion for 5m^3 of this fuel at 78cm Hg and 23^OC	5	