

Faculty of Engineering and Technology			
Ramaiah University of Applied Sciences			
Department	Chemistry	Programme	Bachelor of CSE / CE / EEE
Semester / Batch	01/2017		
Course Code	BSC105B	Course Title	Engineering Chemistry
Course Leader(s)	Dr. T. Niranjana Prabhu, Dr. Sheetal R Batakurki, Dr. Y.C. Sunil Kumar, Dr. Jyotsna Kumar, Dr. Manikanda Prabhu, Dr. Jineesh A.G., Dr. Vishnuvardhan T. K., Mr. Anathatramaiah		

Assignment - 01			
Register No		Name of Student	

Sections		Marking Scheme	Max Marks	First Examiner Marks	Second Examiner Marks
Part-A	A1.1	Current State of electric- vehicles battery technology.	4		
	A1.2	Discussion on the given limitations of electric vehicles with respect to batteries and methods to overcome these limitations	4		
	A1.3	Justification of the stance	2		
		Part-A Max Marks	10		
Part B .1	B1.1	Identification of the types of corrosion that happen in ruptured pipelines and interpretation of the chemical reactions	4		
	B1.2	Suggestion and discussion on any two important corrosion control methods	6		
		Part-B 1 Max Marks	10		
Part B .2	B2.1	Identification of the strongest reducing agent with justification	2		
	B2.2	Identification of the strongest oxidizing agent with justification	2		
	B2.3	Balanced equation for half-cell B and C	2		
	B2.4	Calculation of the voltage when half cells B and C are connected	2		
	B2.5	Calculation of the voltage when half cells C and D are connected	2		
		Part-B 2 Max Marks	10		
Part B .3	B3.1	Identification of oxidation, reduction, oxidizing agent and reducing agent in the extraction of iron from hematite	4		
	B3.2	Reasoning for blackening of Silver article, Identification of oxidation, reduction, oxidizing agent and reducing agent in the blackening of silver articles	6		
		Part-B 3 Max Marks	10		
Part B .4	B4.1	Identification of the phenomena and the chemical name of the green powdery substance present on the bronze propeller	2		
	B4.2	Illustration of chemical reactions	4		
	B4.3	Any two chemical treatment to remove green fuzz	4		

		Part-B 4 Max Marks	10		
		Total Assignment Marks	50		

Course Marks Tabulation				
Component – 1 (B) Assignment	First Examiner	Remarks	Moderator	Remarks
A				
B.1				
B.2				
B.3				
B.4				
Marks (Max 50)				
Marks (out of 25)				
Signature of First Examiner			Signature of Moderator	

Please note:

1. Documental evidence for all the components/parts of the assessment such as the reports, photographs, laboratory exam / tool tests are required to be attached to the assignment report in a proper order.
2. The First Examiner is required to mark the comments in RED ink and the Second Examiner's comments should be in GREEN ink.
3. The marks for all the questions of the assignment have to be written only in the **Component – 1 (B): Assignment** table.
4. If the variation between the marks awarded by the first examiner and the moderator lies within +/- 3 marks, then the marks allotted by the first examiner is considered to be final. If the variation is more than +/- 3 marks then both the examiners should resolve the issue in consultation with the Chairman BoE.

Assignment

Term - 1

Instructions to students:

1. The assignment consists of 5 questions: Part A – 1 Question, Part B- 4 Questions.
2. Maximum marks is 50.
3. The assignment has to be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to 20.
5. Restrict your report for Part-A to 3 pages only.
6. Restrict your report for Part-B to a maximum of 17 pages.
7. The printed assignment must be submitted to the course leader.
8. **Submission Date: , 2017**
9. **Submission after the due date is not permitted.**
10. **IMPORTANT:** It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
11. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

Introduction to the Course:

This course aims at enhancing the basic understanding of chemistry with reference to engineering systems. This course deals with topics on electrochemistry, fuels, metallurgy, air pollution and its control, corrosion science, metal finishing, polymers and nanomaterials.

PART A

(4+4+2 = 10 Marks)

The first technological step towards creation of the electric vehicles was taken in 1827 by Ányos Jedlik when he built the first viable electric motor. The very next year he used it to power a tiny car. Electric cars gradually improved and became popular, but when the internal combustion engine matured sufficiently, electric vehicles were replaced by fuel-powered vehicles because of the higher ranges provided by them. Only railed electric vehicles, like trains, survived because they did not need any charge storage on board. However, now fast forward to the 21st century, electrical vehicles are making a definite comeback. Many advantages are associated with the use of electric vehicles such as non-use of fossil fuel, eco-friendly, efficiency, safety, low maintenance, high acceleration, etc. However these electric vehicles are also limited by their high initial cost, frequent charging and cabin heating. While electric vehicles cars manufactured by Tesla is becoming popular in western countries, India is not yet ready for the adoption of this vehicle.

Debate on the statement “**Electric vehicles will be the future of India’s Automobile Industry**”.

Your debate should emphasize on

- 1.1 Current Status of electric- vehicles battery technology.
- 1.2 Limitations of electric vehicles with respect to batteries and methods to overcome these limitations.
- 1.3 Justification of your stance.

PART – B

B.1

(4+6=10 Marks)

Near New Mexico, in August 2000, there was a sudden release of gas after the rupturing of a transmission pipeline of 70 cm diameter, operated by a reputed Natural oil and gas company. Released gas burnt for 60 minutes causing many casualties and estimated loss of USD 998,296. Vigor force of rupturing and volatile ignition of the explosive gas blew out large pieces of pipe line and created a crater of 15 meter wide. Although no significant external corrosion was visible on the ejected pipe pieces but on close inspection it was found that due to corrosion the thickness of pipeline wall was reduced up to 42% at several locations (Figure 1 and 2).



Figure 1. Cross section of ruptured pipe



Figure 2. Inside view of ruptured pipe

B1.1 Identify the types of corrosion that happen in ruptured pipelines and interpret the reasons with chemical reactions.

B1.2 Suggest and discuss any two important corrosion control methods that can be adopted in oil and gas pipe line systems.

B.2

(2+2+2+2+2 = 10 Marks)

In any electrochemical process, electrons flow from one chemical substance to another, driven by an oxidation–reduction (redox) reaction. The reductant is the substance that loses electrons and is oxidized in the process; the oxidant is the species that gains electrons and is reduced in the process. The associated potential energy is determined by the potential difference between the valence electrons in atoms of different elements. Because it is impossible to have a reduction without an oxidation and vice versa, a redox reaction can be described as two half-reactions, one representing the oxidation process and one the reduction process.

Four half-cells are constructed by placing strips of the four metals A, B, C, and D in 1.0 M solutions of their ions A^+ , B^{2+} , C^{3+} , and D^{2+} respectively at 298K. The potentials produced when various combinations of these half-cells are connected have been given in Table 1.

Table 1: Potential differences of various combinations of electrodes

Anode	Cathode	E^0 Cell
A	B	0.20 V
A	C	0.36 V
D	A	0.14 V

B2.1 Identify the strongest reducing agent among these metals and justify.

B2.2 Identify the strongest oxidizing agent among these metals and justify.

B2.3 Write the balanced equation for the cell reaction that would occur when half-cells B and C are connected.

B2.4 Calculate the voltage produced when half-cells B and C are connected to produce a spontaneous reaction.

B2.5 Calculate the voltage produced when half-cells C and D are connected to produce a spontaneous reaction.

B.3

(5+5= 10 Marks)

B3.1 Iron is present in hematite, magnetite and goethite etc. Among these minerals, hematite is the ore of iron which is widely used to extract iron. Extraction of iron from hematite requires coke and this reaction is an exothermic reaction. Identify the oxidation, reduction, oxidizing agent and reducing agent by determining the oxidation states of the elements in the reactants and products involved in the extraction of iron from hematite ore.

B3.2 Articles made up of silver blackens when they are exposed to atmosphere [Figure 3]. This phenomenon is due to a redox reaction. Identify the reason behind this reaction. Also identify the oxidation, reduction, oxidizing agent and reducing agent by determining the oxidation states of the elements in the reactants and products involved in the reaction.



Figure 3. Blackened silver article

B.4

(2+4+2+2=10Marks)

Traditionally copper- tin alloys are known as “Bronze” which is a well-known term from the period of Bronze Age. Bronze have shown superior resistance to corrosion in polluted seawater comparative to any other copper alloy and that is why they are mainly used for the manufacturing of ship parts like shafts, valve components, subsea clamps, sea cocks, pumps, propellers etc. In a case study of shipwrecks of ship “A” which was capsized and sank in heavy weather off the coast decades ago, it was found that the disfigured bronze propeller of ill-fated ship was covered with blue - green flakey substance similar to green fuzzy fungus (Figure 4 and 5).



Figure 4 and 5: Large propeller of the underwater shipwreck in sea

B4.1 Identify the phenomena and the chemical name of the green powdery substance present on the bronze propeller.

B4.2 Illustrate the chemical reactions involved in the formation of green fuzz.

B4.3 Discuss any two chemical treatment to remove the green fuzz.
