

**University of Mumbai**

Curriculum Scheme: Rev2019 ('C' Scheme)

All Programs

Examination: FE Semester II, FH2022

Course Code: FEC203

Course Name: Engineering Chemistry- II

Time: 2hour

**Max. Marks: 60**

NOTE: All Questions are Compulsory.

Atomic Weights: C = 12, H = 1, O = 16, N = 14, S = 32

**I. Multiple Choice Questions:**

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry 2 marks each.
1.	As per the principle of spectroscopy one of the following is the type of energy present in a molecule:
Option A:	Ultrasonic energy.
Option B:	Electronic energy.
Option C:	Solar energy.
Option D:	Geo-thermal energy.
2.	One of the following is an example, explaining principle of green chemistry of Energy efficient chemical synthesis.
Option A:	Synthesis of Carbaryl.
Option B:	Synthesis of Indigo.
Option C:	Synthesis of adipic acid.
Option D:	Synthesis of Benzimidazole.
3.	A cell is constructed from Ni <sup>2+</sup> / Ni and Cu <sup>2+</sup> /Cu half cells. The standard potential of the cell is ----- . Given E <sup>0</sup> Ni = - 0.257 V and E <sup>0</sup> Cu = 0.337 V
Option A:	0.594 V.
Option B:	0.008 V.
Option C:	- 0.594 V.
Option D:	- 0.008 V.
4.	Nobel metals do not undergo oxidation corrosion because it forms _____
Option A:	Unstable oxide film.
Option B:	Non-porous oxide film.
Option C:	Porous stable film.
Option D:	Volatile oxide film.
5.	A sample of coal has following composition by mass C =70 %, O = 8 %, H = 10 %, N = 3 %, S = 2%, Ash = 7 %. Calculate H.C.V. using Dulong's formula
Option A:	8277.80 kcal/kg.
Option B:	8805.80kcal/kg.
Option C:	8877.80 kcal/kg.
Option D:	8205.80 kcal/kg.
6.	Coating of tin on iron is an example of .....
Option A:	Anodic coating.
Option B:	Cathodic coating.
Option C:	Galvanizing.
Option D:	Sherardizing.

## II. Descriptive Questions:

<b>Q2</b>	<b>Solve any Four Questions out of Six: 4 Marks each</b>
<b>A</b>	Define Spectroscopy. Also explain the origin of spectrum with diagram.
<b>B</b>	The standard emf of the following cell is 0.462 V. $\text{Cu(s) / Cu}^{2+}(\text{aq})(1\text{M}) // \text{Ag}^{+}(\text{aq})(1\text{M}) / \text{Ag(s)}$ Write the cell reaction. If the standard potential of Cu electrode is 0.337 V, what is the standard potential of Ag electrode?
<b>C</b>	What is the principle of cathodic protection? What are the two types of cathodic protection? Discuss any one with the help of a suitable diagram.
<b>D</b>	Explain how corrosion of iron article takes place in acidic medium.
<b>E</b>	Calculate the percentage atom economy for the following reaction with respect to cinnamaldehyde. $\text{C}_6\text{H}_5\text{CHO} + \text{CH}_3\text{CHO} \rightarrow \text{C}_6\text{H}_5\text{CH-CHCHO} + \text{H}_2\text{O}$ Given Atomic Weights: C = 12, H = 1, O = 16.
<b>F</b>	What are 'oxygenates' used in the fuel industry? Where and why are they added? Explain by giving examples.

<b>Q3</b>	<b>Solve any Four Questions out of Six: 4 Marks each</b>
<b>A</b>	Explain the conventional and green route of manufacturing indigo dye. Mention the green chemistry principles involved.
<b>B</b>	What is a Reference electrode? Explain any one Reference electrode with suitable diagram and representation.
<b>C</b>	Give the classification of spectroscopy on atomic and molecular basis (Tree Diagram). Explain the selection rule no.2. $\Delta l = + - 1$ of spectroscopy for electron transitions.
<b>D</b>	By Kjeldahl's method 3 gm of coal sample was analyzed. The ammonia evolved was absorbed in 40 ml of 0.5 N H <sub>2</sub> SO <sub>4</sub> . After absorption, the excess H <sub>2</sub> SO <sub>4</sub> required 18.5 ml of 0.5N KOH for neutralization. A coal sample was subjected to ultimate analysis 2.45 g of coal on combustion in a Bomb-Colorimeter gave 0.67 of BaSO <sub>4</sub> . Calculate percentage of Nitrogen and Sulphur.
<b>E</b>	Explain Differential aeration corrosion with diagram and reactions.
<b>F</b>	Calculate the minimum weight and volume of air required for the complete combustion of 1 kg of fuel containing C= 80%, H= 6%, O=8%, S= 1.5%, H <sub>2</sub> O= 1.0%, N= 1.5% and ash= rest. (Molecular weight of air = 28.94 gm).

<b>Q4</b>	<b>Solve any Four Questions out of Six:</b>	<b>4 Marks each</b>
<b>A</b>	How do the following factors affect the rate of corrosion? (i) Relative areas of anodic to cathodic part  (ii) Position of metal in galvanic series.	
<b>B</b>	Explain the working Catalytic converter with the help of any two chemical reactions and diagram.	
<b>C</b>	Give in tabular form the relation between electromagnetic spectrum, types of spectroscopy and corresponding energy changes.	
<b>D</b>	What is Biodiesel? Give the trans-esterification reaction of the preparation of Biodiesel and two advantages of biodiesel.	
<b>E</b>	Differentiate between Electrolytic and Galvanic cell.	
<b>F</b>	Calculate the volume of air required for complete combustion of $1\text{m}^3$ of gaseous fuel having the following composition: $\text{CO} = 5\%$ , $\text{C}_2\text{H}_4 = 10\%$ , $\text{CH}_4 = 40\%$ , $\text{N}_2 = 2.5\%$ , $\text{H}_2 = 35\%$ , $\text{CO}_2 = 2\%$ , $\text{O}_2 = 2.5\%$ Given Atomic Weights: C = 12, H = 1, O = 16, N = 14.	