

Time: 2 hours

Max. Marks 60

- N.B. 1. Question No.1 is compulsory.
 2. Attempt any three from Q.2 to Q.6
 3. Draw a neat diagram and write chemical reactions where necessary.
 4. Figures to the right indicate full marks.
 5. Atomic weights: H = 1, C = 12, N = 14, O = 16.

Q.1 Answer any five from the following.

(15 Marks)

- a** Explain why gold, silver, platinum do not undergo corrosion.
b A coal sample was subjected to ultimate analysis. 1.5 g of coal sample on combustion in bomb calorimeter produced 0.24g of BaSO₄. Calculate the % of sulphur.
c Explain the principle "prevention of wastes" of green chemistry.
d Define spectroscopy and give any two differences between absorption and emission spectra.
e What is knocking? What are the effects of knocking of gasoline?
f Calculate the standard emf of a cell reaction at 25°C,
 $\text{Cr(s)}|\text{Cr}^{3+}_{(1M)}||\text{Co}^{2+}_{(1M)}|\text{Co(s)}$
 $E^\circ\text{Co} = -0.280\text{V}$, $E^\circ\text{Cr} = -0.74\text{V}$
g Distinguish between galvanizing and tinning.

Q.2 a Define corrosion? Explain the mechanism of corrosion by absorption of oxygen with diagram and reactions. **6**

b What is green fuel? Give the preparation method of bio-diesel and also mention its advantages. **5**

c Write a note on oxygenates and role of catalytic converter. **4**

Q.3 a How do the following factors affect the rate of corrosion: **6**
 (i) Relative areas of anodic to cathodic part.
 (ii) Position of metal in galvanic series.
 (iii) Purity of metal.

b Calculate higher and lower calorific value of coal sample containing C-80%, O-3%, H-7%, S-3.5%, N=2.1% and the remaining is ash. **5**

c Differentiate between Electrolytic and Galvanic cell. **4**

- Q.4 a** Calculate the volume and weight of air required for complete combustion of 1m^3 of gaseous fuel having the following composition: $\text{CO} = 10\%$, $\text{C}_3\text{H}_8 = 12\%$, $\text{CH}_4 = 30\%$, $\text{N}_2 = 3\%$, $\text{H}_2 = 40\%$, $\text{CO}_2 = 3\%$, $\text{O}_2 = 2.0\%$ (Molecular weight of air = 28.949). **6**
- b** Write a traditional and greener pathway for the synthesis of carbaryl. Write the name of the principle associated with this synthesis. **5**
- c** What is the selection rule? Explain any two Selection rules. **4**
- Q.5 a** Define spectroscopy and electromagnetic spectrum show the various regions of electromagnetic spectrum with the help of diagram. **6**
- b** Calculate the percentage atom economy for the following reaction with respect to acetanilide. **5**
- $$\text{C}_6\text{H}_5\text{NH}_2 + (\text{CH}_3\text{CO})_2\text{O} \longrightarrow \text{C}_6\text{H}_5\text{NHC}_6\text{H}_4\text{COCH}_3 + \text{CH}_3\text{COOH}$$
- Given Atomic Weights: C = 12, H = 1, O = 16, N = 14
- c** Explain impressed current cathodic protection of corrosion control. **4**
- Q.6 a** What is an electrochemical cell? Give construction and working of any one reference electrode with the help of diagram and reactions. **6**
- b** Define Octane and Cetane number. 2.4999 g of coal sample was taken in a silica crucible and heated in an oven maintained at 110°C for one hour. The weight after heating was 2.368g. Calculate the percentage moisture content in the coal. **5**
- c** Explain mechanism of electrochemical corrosion by the evolution of hydrogen with the help of a diagram. **4**
