

Roll No.....	SAMPLE PAPER MID TERM (I) PAPER	Total no. of pages: 1
Syllabus: Unit-I & Unit-II		
Time: 60 min.	Engineering Chemistry 2FY 1-03	Max. marks: 10
B.Tech. II Sem.2023-24 Mid Term I (Branch: Computer Science & Engineering : Section A & B)		

Q.N.	CO Mapped	Blooms Taxonomy Level	Question	Marks
1	CO1	Apply	Justify the role of water at Industrial level.	1
2	CO3	Understand	Give examples of : (a) Primary and Secondary solid fuels. (b) Primary and Secondary liquid fuels	1
3	CO3	Apply	Differentiate between HCV & LCV. The mathematical expression between LCV and HCV.	1+1
4	CO3	Apply	2.0 gm of coal sample on ultimate analysis gives 1.1 gm of CO ₂ and 0.45 gm of water. Calculate the percentage of carbon and hydrogen in coal sample.	1+1
5	CO2	Apply	1 How the degree of hardness expressed and why in that form ? 2. Name the boiler troubles? Explain disadvantages of any two boiler troubles. 3. A water sample has the analytical report as under (in ppm): MgSO ₄ =60 ppm, Ca(HCO ₃) ₂ = 81, MgCl ₂ = 47.5, CaCl ₂ = 55.5, SiO ₂ =20, NaCl= 58.5. Calculate the Temporary and Permanent hardness of water in terms of CaCO ₃ equivalent.	1+1+2

SOLUTIONS: SAMPLE PAPER MID TERM (I) PAPER

1. Water engineering plays a critical role in shaping our drinking water systems, ensuring that the water we drink is clean and safe for consumption. Effective water engineering can provide significant advantages, including cleaner drinking water, healthier communities, efficient use of water, and cost savings.

2.

Fuel	Primary	Secondary
Solid	Wood	Coke
Liquid	Petroleum	Petrol / Gasolin

3. The total amount of heat energy produced on complete combustion of unit mass or unit volume of a fuel and the products of combustion are cooled/condensed at room temperature, is called **Gross / Higher calorific value (GCV/HCV)**.

The total amount of heat energy produced on complete combustion of unit mass or unit volume of a fuel and the products of combustion are allowed to escape, is called **Net / Lower calorific value (NCV/LCV)**.

$$LCV = HCV - \text{Latent heat of water vapour produced}$$

$$LCV = HCV - \text{mass of hydrogen} \times 9 \times \text{latent heat of steam}$$

4.

$$\% \text{ of Carbon} = \frac{12}{44} * \text{mass of CO}_2 * 100$$

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Mass of coal sample

$$\% \text{ of Carbon} = \frac{12}{44} * 1.1 * 100$$

$$\text{.....} = 15\%$$

2.0

$$\% \text{ of Hydrogen} = \frac{2}{18} * \text{mass of H}_2\text{O} * 100$$

.....

Mass of coal sample

$$\% \text{ of Hydrogen} = \frac{2}{18} * 0.45 * 100$$

$$\text{.....} = 2.5\%$$

2.0

5.

Name of the hardness causing salts	Amount of the hardness causing salts(mg/Lit)	Molecular weight of hardness causing salts	Amounts equivalent to CaCO ₃ (mg/L)
MgSO ₄	60	120	$60 \times 100 / 120 = 50$
Ca(HCO ₃) ₂	81	162	$81 \times 100 / 162 = 50$
MgCl ₂	47.5	95	$47.5 \times 100 / 95 = 50$
CaCl ₂	55.5	111	$55.5 \times 100 / 111 = 50$
SiO ₂	20	Both does not produce any hardness in water	
NaCl	58.5		

Temporary hardness in terms of CaCO₃ equivalent = Ca(HCO₃)₂ = 50 ppm

Permanent hardness in terms of CaCO₃ equivalent = MgSO₄ + MgCl₂ + CaCl₂ = 150 ppm