

## First/Second Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

### Applied Chemistry for ME Stream

Time: 3 hrs.

Max. Marks: 100

**Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. VTU Formula Hand Book is permitted.

3. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Define Chemical fuel. Explain the classification of fuel with examples.	7	L1,2	CO1
	b.	Define GCV and NCV. Explain the determination of calorific values of a solid fuel using bomb calorimeter.	7	L3	CO1
	c.	The 0.85g of coal sample (carbon = 90% H <sub>2</sub> = 5% and ash = 5%) was subjected to combustion in a bomb calorimeter mass of water taken in the calorimeter was 2000g and the water equivalent of the calorimeter was 600g. The rise in temperature was found to be 3.5°C. Calculate the gross and net calorific values of the sample. (Latent heat of steam = 2.454kJ/g ; specific heat of water = 4.2kJ/kg °C)	6	L4	CO1
OR					
Q.2	a.	What is Fuel cell? Explain the construction and working of Methanol – Oxygen fuel cell.	7	L3	CO1
	b.	Explain the construction, working and application of PV cell.	6	L3	CO1
	c.	What are Green Fuels? Explain the production of hydrogen by electrolysis of water and mention its advantages.	7	L1,2	CO1
Module – 2					
Q.3	a.	Define Metallic Corrosion. Describe the electrochemical theory of corrosion taking Iron as an example.	7	L2	CO2
	b.	What is Anodizing? Explain the process of anodizing of Aluminium.	6	L2	CO2
	c.	What is CPR? A thick brass sheet of area 400 inch <sup>2</sup> is exposed to moist air. After 2 years of period, it was found to experience a weight loss 375g due to corrosion. If the density of brass is 8.73tg/cm <sup>3</sup> . Calculate CPR in mpy and mmpy.	7	L2	CO2
OR					
Q.4	a.	What is meant by metal finishing? Mention the technological importance of metal finishing.	6	L1	CO2
	b.	Define electrolessplating? Explain the electroless plating of Nickel.	7	L2	CO2
	c.	Explain the electroplating of chromium as hard and decorative.	7	L2	CO3

**Module – 3**

<b>Q.5</b>	<b>a.</b>	Explain the synthesis, properties and application of CPVC.	<b>7</b>	<b>L3</b>	<b>CO3</b>
	<b>b.</b>	What is composite? Explain the properties and industrial application of carbon based reinforced composites.	<b>7</b>	<b>L2</b>	<b>CO3</b>
	<b>c.</b>	Explain the synthesis, properties and industrial application of PMMA.	<b>6</b>	<b>L2</b>	<b>CO3</b>

**OR**

<b>Q.6</b>	<b>a.</b>	What are lubricants? Explain the properties and applications of lubricants.	<b>6</b>	<b>L2</b>	<b>CO3</b>
	<b>b.</b>	Explain the synthesis, properties and application polyester.	<b>7</b>	<b>L2</b>	<b>CO3</b>
	<b>c.</b>	In a polymer, 100 molecules have molecular mass $10^3$ g/mol, 250 molecules have molecular mass $10^4$ g/mol, and 300 molecules have molecular mass $10^5$ g/mol. Calculate the number average and weight average molecular mass of the polymer.	<b>7</b>	<b>L2</b>	<b>CO3</b>

**Module – 4**

<b>Q.7</b>	<b>a.</b>	Define phase rule, explain the following terms with an example phase, components and degree of freedom.	<b>7</b>	<b>L1</b>	<b>CO4</b>
	<b>b.</b>	Explain the estimation of FAS potentiometrically using platinum and calomel electrode as potentiometric sensors.	<b>7</b>	<b>L2</b>	<b>CO4</b>
	<b>c.</b>	Explain the determination of pH of beverages using pH sensor glass electrode.	<b>6</b>	<b>L3</b>	<b>CO4</b>

**OR**

<b>Q.8</b>	<b>a.</b>	Explain the lead – silver two components system along with phase diagram.	<b>7</b>	<b>L2</b>	<b>CO2</b>
	<b>b.</b>	Explain the estimation of copper present in a solution by using optical sensor method.	<b>7</b>	<b>L2</b>	<b>CO4</b>
	<b>c.</b>	Explain the determination of pH using glass electrode as pH sensing electrode.	<b>6</b>	<b>L2</b>	<b>CO4</b>

**Module – 5**

<b>Q.9</b>	<b>a.</b>	Explain the synthesis of nonomaterial by co-precipitation method.	<b>7</b>	<b>L2</b>	<b>CO5</b>
	<b>b.</b>	Explain composition, properties and applications of stainless steel and Brass.	<b>7</b>	<b>L2</b>	<b>CO5</b>
	<b>c.</b>	Explain the following size dependent properties. i) Surface area    ii) Catalytic    iii) Thermal properties of nanomaterial.	<b>6</b>	<b>L2</b>	<b>CO5</b>

**OR**

<b>Q.10</b>	<b>a.</b>	Explain the properties and application of Graphene.	<b>7</b>	<b>L2</b>	<b>CO5</b>
	<b>b.</b>	Explain the synthesis of Nano material by Sol-gel method.	<b>6</b>	<b>L2</b>	<b>CO5</b>
	<b>c.</b>	Explain the properties and applications of perovskities.	<b>7</b>	<b>L2</b>	<b>CO5</b>