



**UNIVERSITY OF COLOMBO – Sri Lanka
FACULTY OF TECHNOLOGY**

BBST (Hons) Degree in Environmental Technology, Agriculture Technology,
Instrumentation and Automation Technology
First Year – Semester I – End Semester Examination – November 2019

**FT 1005 Chemistry
(Theory)**

$R=0.0821 \text{ L atm/mol K, } F=96500 \text{ C mol}^{-1}$

Answer **all 4** questions

Time: Two hours

1. i. Describe the terms “dipole-induced dipole interaction” and “induced dipole-induced dipole (London) interactions”. [Marks 20]

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- ii. State the Charles’ law and express it in the form of an equation.

[Marks 10]

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iii. Tabulate the differences between ideal gasses and real gases.
[Marks 20]

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iv. A sample of hydrogen gas was in a rigid container found to have a pressure of 125 kPa when the temperature was 23°C. What can its pressure be when the temperature is 11°C?
[Marks 20]

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- v. The mass of an empty rigid container is 47.392 g and 47.816 g when filled with acetone vapor at 100 °C and 745 mm Hg. If the volume of the container is 247.3 mL, calculate the molar mass of acetone?

[Marks 30]

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2. i. State the phase rule.

[Marks 20]

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- ii. Illustrate and explain the significant points of the phase diagram of water.

[Marks 20]

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iii. The vapour pressure of pure liquid A at 293 K is 68.8 kPa and that of pure liquid B is 82.1 kPa. These two compounds form an ideal liquid and gaseous mixtures. Consider the equilibrium composition of a mixture in which the mole fraction of A in the vapour is 0.612.

a) Calculate the composition of the liquid mixture.

[Marks 30]

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b) Calculate the total pressure of the vapour

[Marks 20]

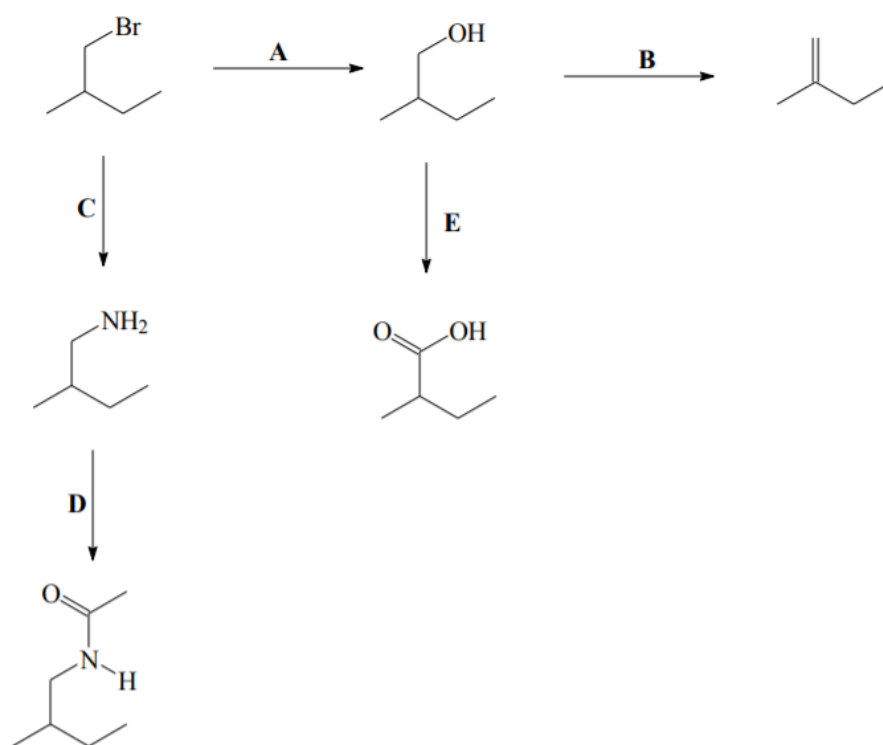
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3. i. What are cycloalkanes explain giving four examples. [Marks 20]

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- ii. Consider the following sequence of reactions. Determine the reagents A, B, C, D and E which are needed to obtain the given products.

[Marks 30]



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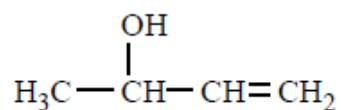
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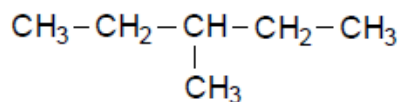
iii. Give the IUPAC names of the following compounds. [30 Marks]

a.



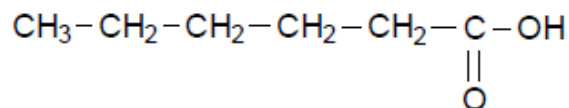
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b.



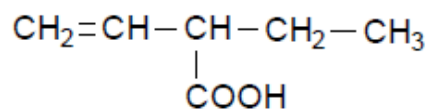
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c.



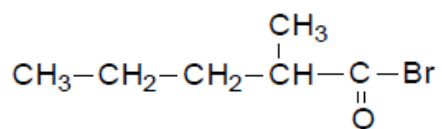
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d.



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e.



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iv. Illustrate the structures of the following compounds

[Marks 20]

a. 3-bromo-2-chloro-5-ethyl-4,4-dimethyloctane

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b. 4,4-difluoro-3-methylbut-1-ene

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c. 3-fluoro-4-isopropyl-2-methylheptane

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d. propan-1-amine

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4. i. Explain the term Adiabatic Process [Marks 10]

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ii. 60J of work is done on a gas and the gas loses 150J of heat to its surroundings. State whether the gas is heated or cooled after this process [Marks 20]

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iii. If a system undergoes an enthalpy change (ΔH) of -110 kJ/mol and entropy change (ΔS) of +200 J/mol.K at 27°C, calculate the change in Gibbs free energy of the system. [Marks 20]

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- iv. A sample of 350g of water is heated from 11.5°C to 18.0°C. The specific heat of water is 4.184 J g⁻¹ °C⁻¹. Calculate the heat change. [Marks 20]

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- v. A rigid cylinder fitted with a frictionless piston contains 3.00 mol of He gas at P=1.00 atm and is in a large constant-temperature bath at 400 K. The pressure is reversibly increased to 5.00 atm. Calculate w, q, and Δu for this process. [Marks 30]

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