



**DOON UNIVERSITY, DEHRADUN**  
**Mid Semester Examination, 4<sup>th</sup> Semester, 2018**  
 Academic Year 2017-18 (Even Semester)

**School of Physical Sciences (SoPS) Department name: Chemistry**  
**Programme Name: Generic Elective, Integrated M.Sc. 5 Years**  
**Course Title: Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional**  
**Group Organic Chemistry-II Course Code: CYG-252**

*Time Allowed 2.00 Hours*

*Maximum Marks: 30*

*Note: Attempt All Questions from Sections A, B and C. (All terms have their usual meaning)*

**Part A: Organic Chemistry**

[15 Marks]

**SECTION: A**

*(Marks: 3)*

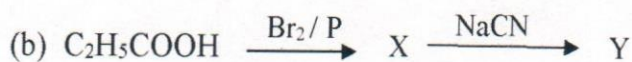
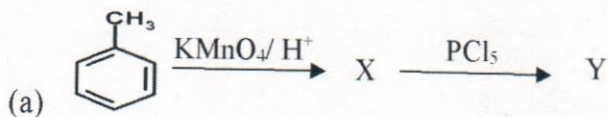
1. Acetamide is treated separately with the following reagents. Which one of these would give methyl amine? [1]
  - a)  $\text{PCl}_5$
  - b)  $\text{NaOH} + \text{Br}_2$
  - c) Sodalime
  - d) Hot conc.  $\text{H}_2\text{SO}_4$
  
2. Complete the following reaction:  $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{HOCH}_3 \rightarrow \underline{\hspace{2cm}} + \text{HOC}_2\text{H}_5$  [1]
  - a)  $\text{CH}_3\text{COCH}_3$
  - b)  $\text{CH}_3\text{COCH}_2\text{CH}_3$
  - c)  $\text{CH}_3\text{COOCH}_3$
  - d)  $\text{CH}_3\text{COOCH}_2$
  
3. When \_\_\_\_\_ reacts with  $\text{NaOH}$ , the product is sodium benzoate [1]
 

a) Benzoic acid	c) Benzaldehyde
b) Benzene	d) Phenol

**SECTION: B**

*(Marks: 6)*

4. Differentiate between esterification and transesterification with examples. [2]
  
5. Identify X and Y in the following reactions: [2 x 2]



**SECTION: C**

(Marks: 6)

6. Elaborate:

[1 x 3]

- (a) Perkin Condensation
- (b) Reformatsky Reaction
- (c) Hofmann's Rearrangement

7. Give an account of nucleophilic substitution reactions with at least two examples each in case of acid chlorides, acid anhydrides and esters. [3]

**Part B: Physical Chemistry**

[15 Marks]

**SECTION: A**

(Marks: 3)

8. From the Gibbs phase rule for a 2-component system, at constant pressure, within a 2-phase region of the equilibrium phase diagram: [1]

- a) T and composition can be independently varied
- b) Choosing a T fixes the equilibrium compositions
- c) Neither T nor composition can be varied
- d) 2 phases cannot be in equilibrium

9. If two liquids A and B form minimum boiling azeotropes at some specific composition then [1]

- a) A-B interactions are stronger than those between A-A and B-B
- b) Vapour pressure of solutions increases because more number of molecules of liquids A and B can escape from the solution.
- c) Vapour pressure of solutions decreases because less number of molecules of only one liquids can escape from the solution.
- d) A-B interactions are weaker than those between A-A and B-B

10. The critical solution temperature is the temperature at which [1]

- a) Partially miscible liquids become completely miscible
- b) Partial miscibility only increases
- c) Partially miscible liquids become completely immiscible

d) Partial miscibility only decreases

**SECTION: B**

*(Marks: 6)*

11. Discuss the vapour properties of two immiscible liquids and the process of steam distillation used in their purification. [2]
12. a) State the distribution law and under what conditions the law is valid. [1]
- b) Draw the graph you would expect for total vapour pressure and boiling temperature if a mixture of X and Y showed a large positive deviation from Raoult's Law. [1]
13. a) A substance has a vapor pressure of 77.86 mm Hg at 318.3 K and a vapor pressure of 161.3 mmHg at 340.7 K. Calculate its heat of vaporization in kJ/mol. [1]
- b) Calculate the number of component and degree of freedom in [1]
- (i) an aqueous solution of sodium chloride and
- (ii)  $2\text{KClO}_3(\text{s}) \longrightarrow 2\text{KCl}(\text{s}) + 3\text{O}_2(\text{g})$

**SECTION: C**

*(Marks: 6)*

- 14 a) A substance Z has its triple point at 18 °C and 0.5 atm, its normal melting point is 10 °C and boiling point is 200°C. Sketch the phase diagram for this one component system.
- b) Explain different types of partial miscible liquids system. Discuss the effect of impurities on partial miscibility of liquids. [1+2]
15. A mixture of nitric acid and water shows a large negative deviation from Raoult's Law. Pure water boils at 100°C. Pure nitric acid boils at 86°C. An azeotropic mixture of nitric acid and water contains 68% by mass of nitric acid, and boils at 120.5°C.
- a) What is an azeotropic mixture? What would happen if you boiled a mixture of this composition?
- b) Use your diagram to explain what would happen if you fractionally distilled dilute nitric acid containing about 15% nitric acid by mass. Be clear about what you would collect from the top of the fractionating column, and what would be left in the flask. [1+2]