B.SC. ZOOLOGY
SEMESTER- 3RD
ORGANIC, INORGANIC AND PHYSICAL THEORY
BSC-731

Duration: 3 Hrs.   **Marks: 70**

Part : A (Objective)   = 20
Part : B (Descriptive) = 50

[**PART-B : Descriptive**]
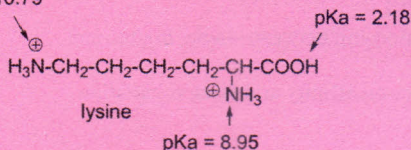
Duration: 2 Hrs. 40 Mins   **Marks: 50**

[Answer question no. One (1) & any four (4) from the rest]

1. i. Calculate the isoelectric point (pI) of the following amino acid   2+2+3+3=10
    pKa = 10.79

    pKa = 2.18

    $H_3N-CH_2-CH_2-CH_2-CH_2-CH-COOH$
                      $\oplus NH_3$
    lysine

    pKa = 8.95

    ii. Why carboxylic acids can exist as dimers?
    iii. Define chelates and discuss formation of chelates in living system.
    iv. What happens when a drop of HCl is added to a mixture of sodium acetate
    and acetic acid?

2. i. What will be the products formed when D-Glucose is reacted with   3+3+4=10
           a. $NaBH_4$ b. Bromine water   c. $H_2N-NH-C_6H_5$
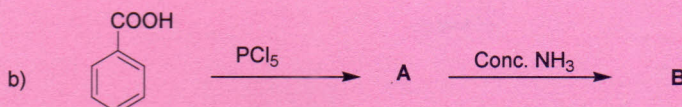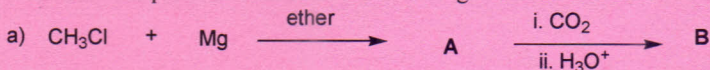   ii. What is Wohl degradation method? Explain with examples.
    iii. What is meant by mutarotation? Explain how D-glucose can undergo
    cyclization in their aqueous solutions. What will be the product formed when □-
    D-Glucose is treated with excess of $(CH_3CO)_2O$ in presence of pyridine?

3. i. What are the products formed in the following chemical reactions   2+3+5=10

    a) CH_3Cl +   Mg $\xrightarrow{\text{ether}}$ A $\xrightarrow[\text{ii. } H_3O^+]{\text{i. } CO_2}$ B

    b) $\xrightarrow{PCl_5}$ A $\xrightarrow{\text{Conc. } NH_3}$ B
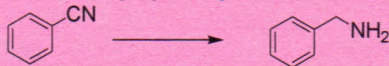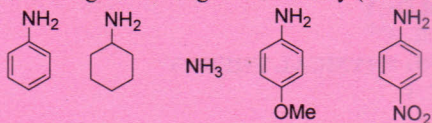
    ii. What are carbohydrates and how they are classified? Explain with examples.
    iii. Define fat and oil. What is saponification of oil? Discuss about the chemical
    essence of the soap and the detergent.

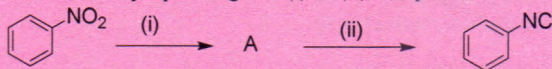**4.** i. Write the proper reagent of the following transformation   2+2+3+3=10

ii. Arrange according to the basicity (decreasing order).

iii. How to identify the primary, secondary and tertiary amines. Explain

iv. Write the proper reagents (i) & (ii) and product 'A' of the following reaction

5. i. Explain the factors affecting the magnitude of CFS. Define optical isomerism   3+3
and mention the conditions necessary to show optical isomerism.

ii. Discuss minerals and ores with examples. Define metallurgy.   4

6. i. Write down the nomenclature of the following compounds   2
    (a) $K_4[Fe(CN)_6]$ (b) $[Co(NH_3)_4Cl_2]Cl$

ii. Define atomic radius and express the relationship between single, double and   3
triple bonds.

iii. Describe ionization enthalpy. Define Electron affinity and discuss variation   3+2
of electron affinity in a period

7. i. Explain the osmotic pressure method for the determination of molar mass of a   5
solute. What is the advantage of this method over other methods?

ii. What are abnormal molar mass and van't Hoff factor? Relate van't Hoff   5
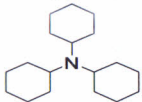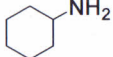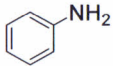factor to the degree of dissociation and association?

8. i. Define buffer capacity. Derive Henderson-Hasselbalch equation.   5

ii. Define Kohlrausch's law. How it is used to determine the value of $\lambda_{infinity}$ of
acetic acid?   5

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[PART-A : Objective]

Choose the correct answer from the following: 1X20=20

1. Which of the following has the smallest size
   a. Al^{3+}
   b. Al^{2+}
   c. Al^{+}
   d. Al

2. The outermost electronic configuration of the element with highest value of electron affinity is
   a. ns^2np^3
   b. ns^2np^4
   c. ns^2np^5
   d. ns^2np^6

3. Which of the following bonds will be most polar?
   a. N-Cl
   b. O-F
   c. C-F
   d. N-N

4. Which of the ions will contain maximum number of unpaired electron?
   a. Fe^{3+}
   b. Mn^{3+}
   c. V^{2+}
   d. Cu^{2+}

5. In forming Cr^{+} ion, the orbital from which electron will be first ejected is
   a. 4s
   b. 3d
   c. 3p
   d. 4p

6. $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ are the example of
   a. Conformation isomerism
   b. Ionisation isomerism
   c. Hydrate isomerism
   d. Ligand isomerism

7. α-D-glucose and β-D-glucose can exist as
   a. Enantiomers
   b. Optical isomers
   c. Anomers
   d. Racemic mixtures

8. Which among the following is an aldopentose
   a. Glyceraldehyde
   b. Dihydroxy acetone
   c. Erythrose
   d. Arabinose

9. When propionic acid is treated with aqueous sodium bicarbonate, CO_2 is liberated. The C of CO_2 comes from
   a. Methyl group
   b. Carboxylic acid group
   c. Methylene group
   d. Bicarbonate group

10. $CH_3-CO-O-CO-CH_3$ is the structural formula of
    a. Ethanamide
    b. Ethyl acetate
    c. Acetyl oxide
    d. Acid anhydride

11. An example of a heterocyclic amine is
    a.

    b.

    c.

    d.

12. An example of a basic amino-acid is
    a. Lysine
    b. Valine
    c. Leucine
    d. Glycine

13. The conversion of nitro group to amine group can be obtained by reduction with
    a. $LiAlH_4$
    b. $NaBH_4$
    c. $NaBH_3CN$
    d. Zn-HCl

14. The optimum reaction temperature for diazotization reaction is
    a. 15-20 °C
    b. 10-15 °C
    c. 05-10 °C
    d. 0-5 °C

15. Colligative properties depend upon
    a. Type of solute particles
    b. The number of solute particles
    c. Both the type and number of solute particles
    d. None of the above

16. Which of the following is **not** a colligative property?
    a. Osmotic pressure
    b. Elevation of boiling point
    c. Freezing point
    d. Relative lowering of vapour pressure

17. A solution whose pH does not change on adding a small amount of acid or alkali is
    a. Acid solution
    b. Basic solution
    c. Buffer solution
    d. Neutral solution

18. The hydrogen ion concentration of a neutral solution is
    a. 1×10^{-7} g ion/litre
    b. 1×10^{-11} g ion/litre
    c. 2×10^{-7} g ion/litre
    d. 2×10^{-14} g ion/litre

19. How Specific conductivity of an electrolytic solution does vary with dilution?
    a. Increases
    b. Decreases
    c. Remains constant
    d. No specific trend

20. A molal solution is one that contains one mole of a solute in
    a. 1000 g of the solvent
    b. 1 L of the solvent
    c. 1 L of the solution
    d. 22.4 L of the solution

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UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA

[PART (A) : OBJECTIVE]

Duration : 20 Minutes

Serial no. of the
main Answer sheet

Unveiling Excellence

Course : _____

Semester : _____ Roll No : _____

Enrollment No : _____ Course code : _____

Course Title : _____

Session : _____ 2017-18 _____ Date : _____

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Instructions / Guidelines

➢ The paper contains twenty (20) / ten (10) questions.

➢ Students shall tick (✓) the correct answer.

➢ No marks shall be given for overwrite / erasing.

➢ Students have to submit the Objective Part (Part–A) to the invigilator just after completion of the allotted time from the starting of examination.

Full Marks	Marks Obtained
20	

Scrutinizer's Signature   Examiner's Signature   Invigilator's Signature