BC-003-2011022   Seat No. _____

B. Sc. (Biochemistry) (Sem. I) (CBCS) Examination
March – 2021
Physical And Chemical Aspects of Biochemistry : Paper BC - 101
(New Course)

Faculty Code : 003
Subject Code : 2011022

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions : (1)   Answer any five of the following questions.
(2)   All questions carry equal marks.

1   (A)   Answer the following questions briefly.   4
  (1)   Draw the structure of water molecules.
  (2)   Define covalent bonds.
  (3)   What kind of bonds are present in sodium chloride crystals ?
  (4)   Name the three subatomic particles of the atom.

  (B)   Comment : Nitrogen is able to form triple bonds.   **2**

  (C)   Write the role of hydrogen bonds in water.   **3**

  (D)   Describe nucleophiles with suitable examples.   **5**

2   (A)   Answer the following questions briefly :   4
  (1)   Describe the term atomic number Z.
  (2)   Atoms of which element has identical atomic number Z and mass number A values ?
  (3)   How many electrons are present in the valance shell of helium ?
  (4)   Which type of bonds are most difficult to break (require very high energy) ?

  (B)   Describe importance of hydrophobic interactions.   **2**

  (C)   Illustrate disulphide bond formation and give its significance.   **3**

  (D)   Discuss properties of water.   **5**

3 **(A)** Answer the following questions briefly :   4
       (1) Define high energy compounds.
       (2) Cytochrome-C receives electron during electron transport, is it getting oxidized or reduced ?
       (3) Define reducing agents with examples.
       (4) What are the electrical potentials of the two electrodes : Cathode and Anode ?

    (B) Write importance of Nernst equation.   2

    (C) Describe Second law of thermodynamics.   3

    (D) Write a note on Electrochemical cells.   5

4 **(A)** Answer the following questions briefly :   4
       (1) Write the two examples of high energy compounds.
       (2) Describe the first law of thermodynamics.
       (3) Define the term reduction.
       (4) Which high energy bonds are present in ATP structure ?

    (B) Define redox potential and its importance in biological reactions.   2

    (C) Write different definitions of oxidation reaction.   3

    (D) Derive Nernst equation.   5

5 **(A)** Answer the following questions briefly :   4
       (1) Define pH.
       (2) What would be the pH of 0.1 M HCl solution ?
       (3) What do you understand by the term pOH ?
       (4) What is Ka ?

    (B) Define weak acids and write two examples of weak acids.   2

    (C) Write the properties of acids and bases.   3

    (D) Describe principle and working of pH meter.   5

6 **(A)** Answer the following questions briefly :   4
       (1) What is the importance of physiological buffers ?
       (2) Describe the meaning of ionic strength of buffers.
       (3) What would be the pH of 0.01 N NaOH solution ?
       (4) What are strong acids and bases ? Write their examples.

(B) Write two examples of physiological buffers. 2

(C) Define buffers and buffering capacity with examples. 3

(D) Derive Henderson Hasselbalch equation and write its significance. 5

7 (A) Answer the following questions briefly : 4
    (1) How adsorption is different from absorption ?
    (2) If temperature increases, what effect it would have on adsorption ?
    (3) What would happen to RBCs if they are suspended in hypotonic salt solution ?
    (4) Define viscosity.

(B) Define and write examples of isotonic solutions. 2

(C) Why diffusion occurs faster in air as compared to the liquid medium ? What effect temperature and concentration difference have on the process of diffusion of methylene blue in water ? 3

(D) Discuss different factors affecting adsorption phenomenon. 5

8 (A) Answer the following questions briefly : 4
    (1) Write examples of substances that act as strong adsorbing agents.
    (2) If 0.1 M glucose and 0.5 M glucose solutions are separated by a semi permeable membrane, water molecules will move from and towards which solution ?
    (3) Define hypertonic solutions.
    (4) If a person had his RBC count doubled to 10 million/cmm as compared to the normal value of 5 million/cmm. What effect it would it have on viscosity of the blood ?

(B) By which process the respiratory gases oxygen and carbon dioxide are exchanged in lungs and transported in the blood ? 2

(C) Write importance of adsorption in catalysis. 3

(D) Write a detailed note on biological importance of diffusion. 5

9 (A) Answer the following questions briefly : 4
   (1) What would be the normality of 1M NaOH solution ?
   (2) Describe what you understand by 1 mole substance.
   (3) You are provided with cubes of iron, aluminium and gold having identical size of 10 cm^3 and the surfaces of all the cubes were painted black with a paint. How will you find out which one of the three cubes is made from pure gold without removing the paint ?
   (4) How many moles of ATP would be present in 100 ml solution of 50 mM ATP solution ?

   (B) How will you make 50 ml of 10% (v/v) solution of ethanol from a 90% (v/v) stock solution of ethanol ? 2

   (C) The concentration of glucose in a blood of a diabetic patient was found to be 180 mg/dl. Calculate and express the glucose concentration in the patient's blood as moles/liter (Mol wt. glucose = 180). 3

   (D) Define density and specific gravity of solutions with suitable examples. 5

10 (A) Answer the following questions briefly : 4
   (1) Calculate the normality of 0.5 N H$_2$SO$_4$.
   (2) Which of the following would have lowest density ? Concentrated sulfuric acid, water or sunflower oil ?
   (3) Define saturated solutions. How would you make 100 ml of saturated solution of glucose ?
   (4) How will you make 25 ml of 1 mg/ml working solution of Saffranine from a 10 mg/ml stock solution of Saffranine ?

   (B) Write difference between molar and molal solutions. 2

   (C) What will be the osmolarity of a solution that has 1 M Sucrose, 0.5 M KCl and 2 M Ferric chloride present in it. 3

   (D) You are provided with sodium hydroxide pellets, electronic balance, different glass wares and distilled water in the laboratory. How will you prepare the following solutions ? (1) 1000 ml of 0.1% (w/v) solution of NaOH and (2) 200 ml solution of 1 M NaOH. 5