

**Chittagong Veterinary and Animal Sciences University**  
**Faculty of Food Science and Technology**  
**BFST 1<sup>st</sup> Year 2<sup>nd</sup> Semester Final Examination, 2013**  
**Subject: Physics-II (Theory)**  
**Course Code: PHC-102 (T)**

**Full Marks: 70**

**Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where question no. **1** and **6** are compulsory. Use separate answer scripts for each section.)

**SECTION: A**

1. a) Define radioactivity. 01  
 b) Draw the I-V characteristics of a diode. 02  
 c) Connect a transistor in a circuit in common emitter configuration. 02
  
2. a) Write the characteristics of the light quanta "photon". 02  
 b) Derive the photoelectric equation, 04  

$$\frac{1}{2}mv_{max}^2 = h\nu - h\nu_0$$
 where the symbols have their usual meanings.  
 c) A photon of energy 4 eV imparts all of its energy to an electron that releases with 1.1 eV of kinetic energy. What is the work function of the metal? 02  
 d) Show Compton effect diametrically. 02
  
3. a) Write the postulates of special theory of Relativity. How does global positioning system (GPS) rely on special theory of Relativity? 03  
 b) Derive Lorentz transformation equations by taking the relativity into account and transform them to Galilean transformation equations. 07
  
4. a) Differentiate among conductor, semiconductor and insulator with energy band diagram. 04  
 b) Draw the circuit symbol of a diode and mention its biasing process. 02  
 c) Describe a half-wave rectifier using a crystal diode. 04
  
5. a) Discuss interference of light analytically and obtain the conditions of maximum and minimum intensities. 07  
 b) The inclined faces of a glass prism ( $\mu=1.5$ ) make angle of  $4^\circ$  with the base of the prism. The slit is 5cm from the biprism and is illuminated by light of wave length  $5860\text{\AA}$ . Find the fringe width observed at a distance of 70cm from the biprism. 03

**SECTION: B**

6. a) Draw LR circuit. 01  
 b) Define self-inductance. 01  
 c) Show that phase difference 03  

$$\delta = \frac{2\pi}{\lambda} \times (\text{path difference})$$
 where the symbols have their usual meanings.
  
7. a) Show that for two reflected rays to form Newton's rings, the apparent path difference between them is  $x=2\mu d \cos r$ , where the symbols have their usual meanings. 05  
 b) What do you mean by the term "Newton's Rings"? Why do the fringes circular in shape in Newton's Rings? 03  
 c) In a Newton's experiment, the diameter of 15<sup>th</sup> ring changes from 1.40cm to 1.25cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid. 02
  
8. a) State and explain ohm's law. Explain "The specific resistance of copper is  $16.2 \times 10^{-8} \Omega\text{m}^{-1}$ ". 2+2=4  
 b) What is drift speed? Derive an expression for the drift speed of electron in a conductor. 2+4=6



9. a) Show that length has relativistic effect and the relativistic length is less than the length measured at rest. 04
- b) Derive the equation  $E=mc^2$ , where the symbols have their usual meanings. 06
10. a) State Faraday's law and Lenz's law of electromagnetic induction. Show that electromagnetic induction is a consequence of principle of conservation of energy. 03
- b) Derive an expression for the magnetic field strength  $\mathbf{B}$ , for an infinitely long ideal solenoid. 04
- c) Explain Bohr's atomic model. Establish a relationship between half-life and decay constant for a radioactive nuclide. 03



**Chittagong Veterinary and Animal Sciences University**  
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**BFST 1<sup>st</sup> Year 2<sup>nd</sup> Semester Final Examination, 2013.**  
**Subject: Fundamentals of Food Engineering. (Theory)**  
**Course Code: FFE-102 (T)**

**Full Marks: 70**

**Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where question no. **1** and **6** are compulsory. Use separate answer scripts for each section. Split answer is not allowed. Graph paper will be supplied.)

**SECTION: A**

1. a) What is Food? Classify foods with examples. 02  
 b) What is the role of food scientist and food technologist in modern food industry? 03
  
2. a) Develop an equation for spoilage probability in food industry. 04  
 b) Estimate the spoilage probability of a 50 minutes process at 113<sup>0</sup>C when  $D_{113}=4$  minutes and the initial population is  $10^8$  per container. 02  
 c) Define F value,  $F_0$  value, D value and Z value. 04
  
3. a) What are the effects of heat treatment on composition and quality of foods? 05  
 b) Suppose a man collects 500 kg mangoes from different gardens. The sizes of mangoes are different, how will the man accumulate same size of mangoes if he wants to use drum screens? Describe about it. 05
  
4. a) How does hammer mill work? 04  
 b) Prove that  $D= 2.303/k$  and  $Q_{10}= 10^{(10/Z)}$  if  $(T_2- T_1) = 10^0C$ . 06
  
5. a) List the causes of food spoilage. 02  
 b) What do you mean by triple point of water and chemical potential? 02  
 c) A filtration system is being designed to filter 1000 gallon of slurry in 3 hours using a constant pressure of 60  $Ib_f/in^2$ . The necessary design conditions were established on a laboratory scale using a filter with 1  $ft^2$  surface area and 20  $Ib_f/in^2$ . The following results were obtained on a laboratory scale. 06

Filtration volume	Time (min.)
6	10
9.9	20
13	30
16	40
18	50

Determine the filter area required in the design situation which will provide the design condition.

**SECTION: B**

6. a) Define mixing? Classify it with example. 02  
 b) Differentiate between pasteurization and sterilization. 03
  
7. a) Enumerate the principles and methods of food preservation. 04  
 b) Give a flow chart for generalized food processing plant. 02  
 c) The influence of temperature on death rate of bacterial spores is illustrated by the following experimental data: 04

Temperature ( <sup>0</sup> F)	Rate constant (k)
220	0.0363
225	0.0685
230	0.133
235	0.247
240	0.455

Determine the activation energy and frequency factor involved in describing this reaction.



8. a) Give an overview of centrifugation. 02  
b) Derive the equation of  $R_i^2 = (\rho_1 R_1^2 - \rho_2 R_2^2) / (\rho_1 - \rho_2)$ . 04  
c) A liquid is being filtered at a pressure of  $40 \text{ lb}_f/\text{in}^2$  through  $3 \text{ ft}^2$  of filter. Initial results indicate that 8 minutes are required to filter  $10 \text{ ft}^3$  of liquid. Determine the time which will elapse until the rate of filtration drops to  $0.3 \text{ ft}^3/\text{minute}$ . 04
9. a) According to Kick and Rittinger how much energy is required to reduce the size of food product? 04  
b) If  $0.0125 \text{ m}$  diameter containing feed is entered to the crushing rolls to obtain the product diameter  $0.005 \text{ m}$  and the roller area is  $0.5588 \text{ m}^2$ . Assume the speed of the roll  $250 \text{ rpm}$  and facing length  $0.026 \text{ m}$ . calculate- 06  
i. Reducing ratio  
ii. Angle of nip  
iii. Capacity of crushing roll.
10. a) Show the components of double seaming in a figure. 03  
b) Suppose you have 5 tons fish. How will you process those fishes for keeping a longer time? Briefly describe about the process that you want to apply. 07



(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where question no. 1 and 6 are compulsory. Use separate answer scripts for each section.)

**SECTION: A**

1. a) Define first order and higher order differential equations with example. 02  
 b) Write the order and degree of the following differential equations. 03  
 i)  $\frac{d^2y}{dx^2} + a^2y = 0$       ii)  $[1 + (\frac{dy}{dx})^2]^{3/2} = k \frac{d^2y}{dx^2}$   
 iii)  $x^2(\frac{d^2y}{dx^2})^3 + y(\frac{dy}{dx})^4 + y^4 = 0$
  
2. a) Find the directional derivative of  $\phi = x^2yz + 4xz^2$  at (1,-2,-1) in the direction of  $2\mathbf{i} - \mathbf{j} - 2\mathbf{k}$  05  
 b) In what direction from the point (1, 3, 2) is the directional derivative of  $\phi = 2xz - y^2$  a maximum? What is magnitude of this maximum? 05
  
3. a) Define dot product and cross product of two vectors quantity with example. Find the constant 'a' such that the vectors  $2\mathbf{i} - \mathbf{j} + \mathbf{k}$ ,  $\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$  and  $3\mathbf{i} + a\mathbf{j} + 5\mathbf{k}$  are coplanar. 05  
 b) State the Gauss' divergence theorem. Using this theorem evaluate  $\iint_S (3xi + 2yj) \cdot d\mathbf{A}$  where S is the sphere  $x^2 + y^2 + z^2 = 9$ . 05
  
4. a) Solve the following differential equations(any two):  
 i)  $\frac{dy}{dx} + 2xy = 2e^{-x^2}$  2.5×2=5  
 ii)  $2x(y + 1)dx - ydy = 0$  where  $x = 0, y = 2$   
 iii)  $y(x + y + 1)dx + x(x + 3y + 2)dy = 0$   
 b) Under certain conditions, cane sugar is converted into dextrose at a rate, which is proportional to the amount unconverted at any time. If out of 75 grams of sugar at time  $t=0$ , 8 grams are converted during the first 30 minutes, find the amount converted in  $1\frac{1}{2}$  hours. 05
  
5. a) Find the value of  $\lambda$ , for which the differential equation  $(xy^2 + \lambda x^2y)dx + (x + y)x^2dy = 0$  is exact. Solve the equation for this value of  $\lambda$ . 04  
 b) Solve the following higher order differential equations(any two): 3×2=6  
 i)  $(D^2 + 5D + 4)y = 3 - 2x$   
 ii)  $(D^3 + 1)y = 3 + e^{-x} + 5e^{2x}$   
 iii)  $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 3x = \sin t$

**SECTION: B**

6. a) Write the name of four methods that are used in interpolation. 02  
 b) State Dirichlet's conditions for a Fourier series. 03
  
7. a) How can you understand that an interval [a, b] contains a root of the equation  $f(x)=0$ ? 02  
 b) Show that the equation  $x^3 + 3x^2 - 5x - 3 = 0$  has three roots. Find the intervals. 03  
 c) The population of a country in the decennial census was as under. Estimate the population for the year 1925. 05

year(x)	1891	1901	1911	1921	1931
population (in thousands)	46	66	81	93	101



8. a) Derive Newton's forward difference interpolation formula. 05  
b) From the set of tabulated points (1, -3), (3, 9), (4, 30) and (6, 132) obtain the value of y, when x=2 using Newton's divided-difference formula. 05
9. a) Discuss Simpson's rule for numerical integration. 05  
b) Evaluate  $\int_0^1 \frac{1}{1+x}$  with h=0.125 correct to 4 decimal places. 05
10. a) Define the following terms with examples. 03  
i) Periodic function  
ii) Even and odd functions
- b) Define Fourier series with Euler's Integral. Find the Fourier series expansion of the 07  
periodic function of period  $2\pi$

$$f(x)=x^2, \quad -\pi \leq x \leq \pi$$

Hence find the sum of the series

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$



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**BFST 1<sup>st</sup> Year 2<sup>nd</sup> Semester Final Examination, 2013**  
**Subject: Inorganic Chemistry (Theory)**  
**Course Code: ICM-102 (T)**

**Full Marks: 55**

**Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where question no. **1** and **6** are compulsory. Use separate answer scripts for each section.)

**SECTION: A**

- |    |    |   |   |
|----|----|---|---|
| 1. | a) | What is Titration?  | 1 |
|    | b) | Explain the terms acidity and basicity.   | 2 |
| 2. | a) | What do you mean by deformation or polarisation of ions?  | 2 |
|    | b) | State the factors affecting the polarisation of anion.  | 3 |
|    | c) | Describe the properties of ionic compound.  | 3 |
| 3. | a) | Balance the equation: $\text{Cu (s)} + \text{HNO}_3 \text{ (aq)} \longrightarrow \text{Cu(NO}_3)_2 \text{ (aq)} + \text{NO (g)} + \text{H}_2\text{O (l)}$ | 4 |
|    | b) | State the application of oxidation number of an element.  | 2 |
|    | c) | Define oxidising and reducing agents according to classical concept.  | 2 |
| 4. | a) | Distinguish between primary standard and secondary standard substances?   | 3 |
|    | b) | Deduce the Beer-Lambert law and discuss its applications.   | 3 |
|    | c) | Write down the theory of spectrophotometry and colorimetry.   | 2 |
| 5. | a) | Describe the relation between the degree of dissociation and concentration.   | 3 |
|    | b) | Determine whether the following solutions are acidic, basic or neutral:   | 2 |
|    |    | i) NaCl   |   |
|    |    | ii) CuSO <sub>4</sub>   |   |
|    | c) | Describe the Lewies concept of acids and bases.   | 3 |

**Section: B**

- |     |    |   |   |
|-----|----|---|---|
| 6.  |    | Describe about the laboratory hazards and first aid.  | 4 |
| 7.  | a) | Define with example of oxidation and reduction based on electronic concept.                       | 3 |
|     | b) | Explain the sentence "oxidation and reduction occur together" based on classical concept.         | 3 |
|     | c) | Define with example:  | 2 |
|     |    | i) Oxidation number   |   |
|     |    | ii) Valency   |   |
| 8.  | a) | State the classification of reactions in titrimetric analysis.                                    | 3 |
|     | b) | Sketch the line diagram of single beam atomic absorption spectrophotometer.                       | 3 |
|     | c) | Mention the functions of combustion flames.   | 2 |
| 9.  | a) | Define with example:  | 3 |
|     |    | i) Intermolecular force   |   |
|     |    | ii) Intramolecular force  |   |
|     | b) | What is hydrogen bond? Give some applications of hydrogen bond in our regular life.               | 3 |
|     | c) | Identify and count the number of bond of NH <sub>4</sub> Cl.                                      | 2 |
| 10. | a) | What is meant by buffer solution? Discuss with a suitable example the mechanism of buffer action. | 4 |
|     | b) | Derive the Henderson-Hasselbalch equation.  | 3 |
|     | c) | What is indicator?  | 1 |



**Chittagong Veterinary and Animal Sciences University**  
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**BFST 1<sup>st</sup> Year 2<sup>nd</sup> Semester Final Examination, 2013**  
**Subject: Biochemistry (Theory)**  
**Course Code: BCM-102 (T)**

**Full Marks: 70**

**Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Three (3)** questions from each section where question no. **1** and **5** are compulsory. Use separate answer scripts for each section.)

**SECTION: A**

- |    |   |   |
|----|---|---|
| 1. | a. Define protein. Classify proteins based on biological functions.   | 3 |
|    | b. What are the forces responsible for protein structure? Distinguish between alpha helix and beta pleated sheet.               | 3 |
|    | c. Draw primary structure of a protein using essential amino acids of an infant.  | 3 |
|    | d. Define the following terms: (i) Denaturation of protein (ii) T <sub>m</sub> of nucleic acids                                 | 2 |
| 2. | a. What are the structural and functional differences between homopolysaccharide and heteropolysaccharide?                      | 4 |
|    | b. What are the purposes of biosynthetic and bioenergetics steps in TCA cycle?  | 4 |
|    | c. How can you utilize Sangers and Edman degradation for sequencing of protein?   | 4 |
| 3. | a. What are lipids? Distinguish between fats and oils.  | 3 |
|    | b. What do you mean by ω-3 and ω-6 fatty acids? Discuss the sources and functions of ω-3 fatty acids.                           | 4 |
|    | c. Assume you store beef fat and soybean oil in two separate bottles for few days in a room. What will happen to them? Explain. | 2 |
|    | d. Define steroid. Write down the structural formula of the following lipids:<br>(i) Triacylglycerol (ii) Lecithin              | 3 |
| 4. | a. Who discovered DNA? What is replication? Describe DNA replication.   | 5 |
|    | b. Describe the structure of nitrogenous bases present in nucleic acids. Add a note on tautomerism.                             | 2 |
|    | c. DNA is more stable than RNA, Explain.  | 2 |
|    | d. Write down the function of tRNA and mRNA. "The backbone of nucleic acid is 3'-5' Phosphodiester Bridge" - Justify.           | 3 |

**Section-B**

- |    |  |        |
|----|--|--------|
| 5. | a. Define metabolism and fermentation. Enumerate major pathways of carbohydrates metabolism.   | 3      |
|    | b. What is the common end product of carbohydrates, proteins and fats metabolism? Describe the energy yielding steps of Krebs cycle.                                       | 4      |
|    | c. Write down the three possible catabolic fates of the pyruvate formed in the Payoff phase of glycolysis.   | 2      |
|    | d. What is the significance of alcohol intoxication?   | 2      |
| 6. | a. Define biocatalyst. Write down the modern classification of it with example.  | 3      |
|    | b. What is the regulatory enzyme of glycolysis? Describe the initiation step of glycolysis.  | 2      |
|    | c. Write down the salient features of active sites of enzymes.   | 3      |
|    | d. Define the RNA codons for following SLC (single-letter data base codes) F-L-M-V-D-W-E-R.  | 4      |
| 7. | a. Distinguish between transamination and deamination with example.  | 4      |
|    | b. Write down the specialized products formed by the following amino acids:<br>(i) Glycine (ii) Tryptophan (iii) Methionine (iv) Histidine                                 | 2      |
|    | c. Define beta oxidation. Calculate the ATP formation from a complete oxidation of stearic acid.   | 3      |
|    | d. NPN=2BUN. Explain.  | 2      |
|    | e. Define decarboxylation with example.  | 1      |
| 8. | Write short notes on any <b>six (6)</b> of the following: a. Mutarotation a. Carnitine<br>c. Chargaff's rule d. Zwitterion e. Epimer f. Steroid g. Glycolipids h. Micelles | 2×6=12 |



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**SECTION: A**

- |    |    |  |     |
|----|----|--|-----|
| 1. | a) | Convert to Decimal from<br>101010111101 <sub>(2)</sub>   | 1.5 |
|    | b) | Convert to Octal from<br>101011101101 <sub>(2)</sub>   | 1.5 |
|    | c) | What do you mean by 1's complement and 2's complement method?  | 02  |
| 2. | a) | Define network. Find out the benefits that a network provides to their users.                                  | 04  |
|    | b) | Differentiate between LANs and WANs.   | 02  |
|    | c) | i) Calculate the difference:<br>1100110100111-101011011101   | 04  |
|    |    | ii) Add the following binary numbers:<br>10110110.111001 and 1110011.10101                                     |     |
| 3. | a) | Write short note on Microcomputer and Supercomputer.   | 05  |
|    | b) | What do you mean by computer generation? Describe the characteristics of First and Fifth generation computers. | 05  |
| 4. | a) | Define Operating system(OS).   | 02  |
|    | b) | What are the primary functions that an operating system performs?  | 03  |
|    | c) | How the operating system communicates with CPU?  | 02  |
|    | d) | Distinguish between Digital computer and Analog computer.  | 03  |
| 5. | a) | What is Internet? Are Web and Internet the same? Justify your answer.  | 03  |
|    | b) | What is URL? Using a page at URL of Google, how you can find out information about the importance of computer. | 03  |
|    | c) | Write short notes on:<br>i) Volatile and Non-volatile memory<br>ii) Impact printer and Non-impact printer      | 04  |

**SECTION: B**

- |     |    |   |    |
|-----|----|---|----|
| 6.  | a) | Explain the importance of computer in today's society.  | 05 |
| 7.  | a) | What is a mouse? Describe the purpose of a mouse and the role it plays in computing.                  | 05 |
|     | b) | Describe the types of computer that are designed for use by a single person.                          | 05 |
| 8.  | a) | Differentiate between storage and memory.   | 02 |
|     | b) | Indicate some popular recordable optical technologies that allow home users to create their own data. | 05 |
|     | c) | How can you avoid RSIs (Repetitive Stress Injuries) while working with your keyboard and mouse?       | 03 |
| 9.  | a) | What is network topology? Discuss shortly three basic topologies (Bus, Ring and Star).                | 06 |
|     | b) | State the salient features of CRT, LCD and LED monitor.   | 04 |
| 10. | a) | A printer is said to have a resolution of 600dpi; what does this mean?                                | 02 |
|     | b) | What is a computer virus? List and explain the categories of viruses.                                 | 06 |
|     | c) | "Software brings the machine life"-Explain.   | 02 |