Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 1st Semester Final Examination, 2016
Subject: Communicative English (Theory)
Course Code: ENG-101

Full Marks: 35 **Time: 2 hours**

(Figures in the right margin indicate full marks. Answer all the questions from each section. Use separate answer script for each section. **Split answer is not allowed**.)

Section-A

1. Use right form of verb in the following sentences : 5
   a) I have already (move) to a new house.
   b) It is many years since I (come) to Dhaka.
   c) The principal desired the notice to be (hang).
   d) I fancy I (turn) pale.
   e) She proceeded as through I (not speak).

2. Change the following sentences as directed : 5
   a) He had written three books before 1971. (Change voice)
   b) He was laughed at by all his friends. (Change voice)
   c) "Write and don't talk" said the teacher. (Change speech)
   d) The student wanted to know from the teacher if Malaysia was in Asia. (Change speech)
   e) Rome was not built in a day. (Change voice)

3. A lot of people do not eat a balanced diet and, as a result, they suffer from malnutrition and different health problems. Now, write a letter to the editor of an English daily encouraging people to eat balanced diet. 7

Section-B

4. Complete the following sentences: 5
   a) He tells the matter as if he .....
   b) The old farmer cannot visit a small town let alone .....
   c) It is high time we ..... our eating habit.
   d) The plane will take off in time provided .....
   e) The officer was sympathetic to the police lest .....

5. Write a paragraph on any of the following: 5
   a) Usefulness of Smartphone for learning.
   b) Change in people's food habit

6. Read the passage bellow and answer the questions that follow: 8

The Maginot Line was one of the largest military structures ever built, second only to the Great Wall of China. It was a series of bunkers, forts, turrets, and obstacles that spanned more than 450 miles of France's border with Germany. Built between 1930 and 1940, it was one of the world's most impressive forts, yet it proved to be almost useless.

The Maginot Line was named after the man who argued for its construction, French Minister of War André Maginot. André Maginot had fought with the French against the Germans in the First World War. Much of this conflict took place along the Western Front, which was a line of trenches across which the two sides faced one another. Both sides dug in deep and each lost many men over little ground. Conditions were horrid for all and there was a **stalemate** for many years as neither side was able to move the other.

Maginot never forgot these awful conditions. He wanted to build a line of defenses that would give the French an advantage in a similar conflict. He feared, rightfully so, that the Germans would attack France again. Germany's population nearly doubled France's. The line of defenses that Maginot pictured would allow a smaller French army to hold off a larger German force. In 1929, Maginot convinced the French Parliament to fund his vision.

Though calling it a line makes it seem thin, the Maginot Line was in fact quite deep. It was fifteen miles wide at some points and varied in structure. There were outposts disguised as houses. These were manned by troops and rigged with explosives. There were antitank rails and obstacles. These were planted in the ground to prevent tanks and trucks from passing. There were bunkers armed with mounted machine guns and anti-tank guns. These were for pushing back attackers. And there were many large and small fortresses along the line. Each had mess halls, lots of supplies, and air conditioning. The Maginot line would give the French a supreme edge in the case of a head-on invasion by the Germans.

Unfortunately for the French, the Germans did not attack head-on. They positioned a decoy army in front of the line to distract the French. While the French waited, the Germans snuck a larger force through Belgium. Belgium is France's northeastern neighbor. The French did have some defenses along their border with Belgium, but this part of the Maginot line was weak. The Germans made quick work of these defenses. Within five days of their initial attack they were well into France.

Once they were in France, the Germans attempted to seize the main forts along the Maginot Line. They were not successful. The forts had proved to be strong, but they failed to hold back the Germans. The Germans had taken Paris, France's capital city. Soon after the French commander ordered his men to stand down. He commanded the French defenders to leave their bases along the Maginot Line. These soldiers were then taken to POW camps.

While the Maginot Line did not work in the way that the French had hoped, they did benefit by having built it. Belgium and England were strong allies. England had pledged to protect Belgium. Belgium declared itself a neutral country, one which wanted to stay out of wars. When Germany invaded Belgium to bypass the Maginot Line, they violated Belgium's neutrality. This led to England entering the war sooner.

Though the Maginot Line is no longer used militarily, many of the buildings remain. Some of the forts are now wine cellars or mushroom farms. One was turned into a disco club. Today the Maginot Line is often used as a metaphor. People may refer to a failed project in which someone placed a lot of hope as a Maginot Line. Also, the Maginot Line lives on as the best-known symbol of the common saying that "generals always fight the last war."

a) Which of the following statements is true?
   i. The Maginot Line provided absolutely no benefit to the French.
   ii. The Maginot Line is still used by the French army today.
   iii. Maginot's experience during WWI led to his support for the line.
   iv. The French were betrayed by the Belgians during World War II.

b) Which best describes the weakness of the Maginot Line?
   i. It was built from cheap material and could not resist attack.
   ii. Poor screening let spies take control of the forts from inside.
   iii. The line was not fortified along France's border with Belgium.
   iv. The French underestimated the power of newer German tanks.

c) Which of the following is a false statement?
   i. Andre Maginot fought against the French in the First World War.
   ii. Andre Maginot served as the Minister of war for France.
   iii. The Maginot Line is named after Andre Maginot.
   iv. After WWI, Andre Maginot believed that Germany would attack France again.

d) Which best defines the meaning of the word 'stalemate' as used in the second paragraph?
   i. When troops lose morale because they miss their families.
   ii. When two sides are locked in a draw.
   iii. When breathing is made difficult by foul odour.
   iv. When one side has a large advantage over the other.

e) How did French lose control of the Maginot Line?

f) What made England getting involved in the WWII?

g) Fill in the blank: Today the Maginot Line is referred as an ..... of a lost project.

h) True or false? If false, provide correct information.
   The Maginot Line was the largest army defense construction ever built.

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st Year 1st Semester Final Examination, 2016
Subject: Mathematics-I
Course Code: MTH-101(T)

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **any Five (5)** questions from each section. Use separate answer script for each section. Split answer is discouraged.)

Section-A

1. a) Define the following matrices with example. 3
   i) Symmetric matrix
   ii) Orthogonal matrix
   iii) Identity matrix
   b) Find the inverse of the matrix A, where 4

$$A=\begin{pmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{pmatrix}$$

2. a) A diet is to include at least 140 milligrams of vitamin A and at least 145 milligrams of vitamin B. These requirements can be obtained from two types of food. Type X contains 10 milligrams of vitamin A, 20 milligrams of vitamin B per pound. Type Y contains 30 milligrams of vitamin A and 15 milligrams of vitamin B per pound. If type X food costs \$12 per pound and type Y food costs \$8 per pound, how many pounds of each type of food should be purchased to satisfy the requirements at the minimum cost? 7

3. a) Solve the following system of linear equations 3

$$x+2y+z=8$$
$$2x+3y+2z=14$$
$$3x+2y+2z=13$$

   b) Describe the graphic method of solving a linear programming problem. 4

4. a) Draw the graph of the function 3

$$f(x)=\begin{cases}\dfrac{|x|}{x} & when\ x\neq 0\\ 0 & when\ x=0\end{cases}$$

   Hence find its domain and range
   b) Determine the slope of the graph of $y=x^2+1$ at the point (2, 5) and use it to find the equation of the tangent line to $y=x^2+1$ at $x=2$. 4

5. a) Find the differential coefficient of 3

$$y=(\sin x)^{\cos x}+(\cos x)^{\sin x}$$

   b) If $y=\tan^{-1}x$ then by using Leibnitz theorem prove that 4

$$(1+x^2)y_{n+1}+2nxy_n+n(n-1)y_{n-1}=0$$

6. a) If $f(x)=x^3+x^2-5x-5$ then 4
   i) find the intervals on which f is increasing and the intervals on which f is decreasing
   ii) Sketch the graph of f
   iii) Find the local extrema of f
   b) Expand the function $f(x)=e^x$ in powers of $(x-1)$. 3

Section B

7. a) If $u = x^3 + y^3 + z^3$ then prove that 3

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 3u$$

b) Let $f(x, y) = x^2 y + 5y^3$ 4

i) find the slope of the surface $z = f(x, y)$ in the x-direction at the point (1, -2)

ii) Also find the slope of the surface $z = f(x, y)$ in the y-direction at the point (1,-2)

8. a) Integrate the following (any one) 3

i) $\int \frac{\sqrt{x^2 - 25}}{x} dx$ assuming $x \geq 5$

ii) $\int \frac{dx}{\sin x + \cos x}$

b) 4

Show that $\int_0^{\frac{\pi}{2}} \log \sin x \, dx = \int_0^{\frac{\pi}{2}} \log \cos x \, dx = \frac{\pi}{2} \log \frac{1}{2}$

9. Give the geometrical interpretation of $\int_a^b f(x)dx$. Show that the area between the parabola $y^2 = 4x$ and the straight line $y = 2x - 4$ is 9 square units. 7

10. a) Obtain the area of the surface that is generated by revolving the portion of the curve $y = x^2$ between $x = 1$ and $x = 2$ about y-axis. 5

b) Evaluate the double integral I, where 2

$$I = \int_1^2 \int_0^1 x^3 y^2 \, dx \, dy$$

11. a) Determine the equation of the curve $2x^2 + 3y^2 - 8x + 6y - 7 = 0$ when the origin is transferred to the point (2, -1) 3

b) Prove that the following equation represent two straight lines. Find also their point of intersection and the angle between them. 4

$3y^2 - 8xy - 3x^2 - 29x + 3y - 18 = 0$

12. a) Define direction cosine of a line. Prove that the sum of squares of the direction cosines of every line is one. 4

b) If a line makes angles α, β, γ with the axes, then show that 3

$\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2$

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 1st Semester Final Examination, 2016
Subject: Elementary Food Science
Course Code: EFS-101

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where Question **1** and **6** are compulsory. Use separate answer script for each section. Split answer is discouraged.)

Section-A

1. Define and classify food in details with example. 5

2. a) What is milk sugar? How it is digested in our body? 4
   b) Make a list of different carbohydrate rich food found from plant sources. 3
   c) Why carbohydrates are known as quick energy source in living organisms? 3

3. a) What do you know about essential amino acids and non-essential amino acids? 3
   b) Briefly describe about different types of protein with their example. 5
   c) Which types of protein is good for rapid body building? 2

4. a) What is cholesterol? Illustrate its chemical structure. 3
   b) Differentiate between mono unsaturated fatty acid and poly unsaturated fatty acid. 3
   c) Write the chemical properties of fat and its rancidity. 4

5. a) Why vitamins are act as a guard in our body? 2
   b) Discuss on the biochemical functions of vitamin and mineral in disease prevention. 6
   c) How water work as a nutrient? 2

Section-B

6. What are the phytochemicals and anti-nutrients? Classify them with example. 5

7. a) Define Recommended Dietary Allowances and write its application in nutritional science. 3
   b) Compare between Body Mass Index and Basal Metabolic Rate. 3
   c) Which factors have an influence on BMI? 4

8. a) What is metabolism? 2
   b) How do you expand energy each day? 4
   c) Why it is important to maintain balance energy in our body? 4

9. a) Define hidden hunger and state its symptoms. 4
   b) How do you prevent the negative impact of hidden hunger? 2
   c) What are pigments? Compare between different types of pigments according to its properties. 4

10. Write short notes on followings (any four) 2.5x4
    i. Balanced diet
    ii. Basal metabolic rate
    iii. Quality attributes of food
    iv. Anti-oxidants
    v. Dietary fiber

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 1st Semester Final Examination, 2016
Subject: Human Biology
Course Code: HBL-101

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where Question **1** and **6** are compulsory. Use separate answer script for each section. Split answer is discouraged.)

Section-A

1. a) Define homeostasis. What do you mean by the negative feedback and positive feedback control? Explain with example. 5

2. a) What is cell? Why it is considered as a basic unit of life? 3
   b) Write down the chemical composition of cell. 3
   c) Enumerate the physiological importance of nucleus and lysosomes. 4

3. a) Define glomerular filtration rate. Differentiate between glomerular filtrate and urine. 4
   b) Why is insulin used to measure GFR? 3
   c) Calculate plasma clearance valve of creatinine from the following data 3
      i. Urinary valve 800 ml/24hrs
      ii. Urinary concentration of creatinine =125 mg/dl
      iii. Plasma concentration of creatinine =3.4 mg/dl
4. a) Narrate the role of respiratory system in human body. 3
   b) Describe the mechanism of transport of CO_2 from tissue to the lung. 7

5. a) What do you mean by puberty? Write the factors that influence the onset of puberty. 2
   b) What is sparmatogenesis? State the role of hormone in its regulation with diagram. 5
   c) Write the name of gonadotropin. Enlist the reproductive hormone in male and female. Give the physiological effects of testosterone. 3

Section-B

6. Define succus entericus. Write its composition and functions. 5

7. a) Differentiate between ECF and ICF. 3
   b) Write the distribution of total body water. Why TBW is lower in women than man?
   c) What do you mean by water balance in the human body? Explain renin-angiotensin mechanism of water balance. 4

8. a) Why ptyalin cannot act on un-boiled starch? Give the composition and functions of saliva. 5
   b) Define digestive juice. Give example with their daily secretion rate. 2
   c) What is alimentary system? List the name of the parts of digestive tract with their functions. 3

9. a) Define blood. Give its composition. 3
   b) Name the blood group system. Why ABO system is called classical blood group? Why blood grouping system is important? 4
   c) What is circulatory system? Write down the types of circulatory system with their functions. 3

10. a) Define and classify Diuresis. Write the causes and clinical consequences of diuresis. 5
    b) Briefly discuss the role of kidney in acid-base balance in a normal human body. 5

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st Year 1st Semester Final Examination, 2016
Subject: Physics-I
Course Code: PHC-101(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 script for each section. Split answer is discouraged.)

Section-A

1. a) Define the terms Young's modulus, bulk modulus and Poisson's ratio. 3
   b) What are the fundamental assumptions in kinetic theory regarding a perfect gas? 2

2. a) Write down the physical significance of surface tension in our daily life. 2
   b) What do you mean by the terms 'Stream-lined flow' and 'Turbulent flow' of fluid? Establish a relationship between surface tension and surface energy. 4
   c) Derive an expression for surface tension of a liquid inside a capillary tube according to capillary rise method. 4

3. a) State the principle of equipartition of energy. 2
   b) Show that the pressure exerted by a perfect gas is two-third of the kinetic energy of the gas molecules in a unit volume. 6
   c) Why C_P is greater than C_V? 2

4. a) State First law of thermodynamics and apply it in isothermal and adiabatic process. 2
   b) State Carnot's Theorem. Show that Entropy remains constant in a reversible Carnot cycle. 6
   c) What do you mean by the term "Degrees of Freedom" for gas molecules? State Maxwell's equi-partition of energy theorem. 2

5. a) At what points on the path of a simple harmonic motion (SHM) are the velocity and acceleration maximum? At what points are they minimum? 2
   b) Establish the differential equation of simple harmonic motion and solve it. 5
   c) If the displacement equation of a SHM be $x = a\sin(wt + \phi)$. Show that the velocity v and acceleration f satisfy $\omega^2 v^2 + f^2 = a^2\omega^4$ 3

Section-B

6. Establish a relationship between different elastic modulus in terms of Poisson's ratio for elastic substances. Show from the first principles that Poisson's ratio lies between -1 to 0.5 for elastic substances. 5

7. a) Explain the energies possess by a flowing liquid in stream –lined motion and hence state Bernoulli's equation. 4
   b) Derive Poisseuille's equation for the rate of flow of a viscous liquid flowing through a capillary tube of small bore maintained at constant pressure difference. 6

8. a) Derive the adiabatic equation, $TV^{\gamma-1} = \text{constant}$ where the symbols have their usual meanings. 4
   b) Define Mean free path for gas molecules and hence derive and expression of mean free path in terms of molecular diameter and the number of molecules per unit volume. 3
   c) Show that the translational kinetic energy of gas molecules depends on temperature, no matter what types of molecules they are. 3

9. a) What is the basic difference between interfaces and beats? 2
   b) What do you mean by transverse and longitudinal wave motion? Distinguish between progressive wave and stationary wave by bringing some important factors into account. 5
   c) How does the velocity of sound in air vary with pressure and humidity? 3

10. a) Explain the terms emissive power and absorptive powers of a body. 3
    b) State and explain Steafan's law of black body radiation. 4
    c) State and explain equation of continuity 3

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 1st Semester Final Examination, 2016
Subject: Inorganic Chemistry (Theory)
Course Code: ICM-101

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer Four (4) questions from each section. **1 & 6** questions are compulsory. Use separate answer script for each section. **Split answer is not allowed.**)

Section-A

1. Derive Henderson-Hassel balch equation for basic buffer solution. 5

2. a) What is pH? 2
   b) Calculate the pH of the solution after: 2
      i) 0.01 moles of HCl is added to 500 cm^3 of water.
      ii) 0.01 moles of NaOH is added to 500 cm^3 of water.
   c) Explain buffer with its works. 2
   d) Calculate the pH of a buffer solution which contains the weak monoprotic acid, propanoic acid (CH_3CH_2COOH), in concentration 0.1 M and sodium propanoate in concentration 0.05 M. K_a of propanoic acid is 1.26×10^{-5} mol/dm^3. 4

3. a) Define hydration energy. 2
   b) Why NaCl is dissolved in water but CH_4 is not? Explain the answer. 3
   c) Define valency. Briefly explain about variable covalency with example 5

4. a) Classify covalent bond. 2
   b) Explain the formation of covalent bond of CO_2 and NH_3 molecules. 4
   c) Explain the formation of co-ordination bond of H_2O_2 and CO molecules. 4

5. a) What are conjugated acid-base pairs? Give examples. 2
   b) Define acids and bases according to Lewis concept. 2
   c) Write down some limitations of Arrhenius concept of acid-bases. 2
   d) What is indicator? Discuss the mechanism of color change by indicator in acid-base reaction. 4

Section-B

6. a) Explain why the Group I elements are: 3
      i) Univalent.
      ii) Strong reducing agents.
   b) Explain with example the Lewis acid-base concept. 2

7. a) Why inert gases are unreactive? Explain with electronic configuration. 3
   b) Mention two uses of Helium gas. 2
   c) How do the Alkali metals react with oxygen? 2
   d) Write the reaction of O_2 with Li, Na, K and Cs. 3

8. a) Write down the similarities and dissimilarities between hydrogen and alkali metal group. 3
   b) Write down different uses of hydrogen. 3
   c) Describe about Lans process and basch process of hydrogen production. 4

9. a) Write down some properties of alkali metal group. 2
   b) Write down some uses of Be and Mg. 2
   c) Describe the extraction process of Radium. 3
   d) How the following products can be produced? (Give only reactions). Na_2O, Na_2O_2, NaOH, $NaHCO_3$, NaCN, $BeCl_2$. 3

10. Write short notes on (any two) 10
    a) Compounds of Carbon
    b) Frasch process
    c) Drude and Laurentz theory

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 1st Semester Final Examination, 2016
Subject: Introductory Human Nutrition
Course Code: IHN-101

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer any **Five (5)** questions from each section. Use separate answer script for each section. Split answer is discouraged.)

Section-A

1.	a)	What is nutrition?	2
	b)	What are the types of malnutrition? How does malnutrition take place in children?	5
2.	a)	Define health. Write down the roles of feed to maintain good health.	4
	b)	Define balanced diet. What are the considering factors to prepare a balanced diet?	3
3.	a)	What do you mean by low birth weight? Explain the causes of low birth weight.	4
	b)	Why is low birth weight a concern?	3
4.	a)	What is weaning?	1
	b)	Why weaning is important for children? What are the consequences of starting weaning too lately or too early?	6
5.	a)	Briefly discuss the different physiological changes occurred among adolescent boys' and girls'.	4
	b)	Draw and level the conceptual framework of malnutrition adopted by UNICEF.	3
6.	a)	What do you understand by geriatric nutrition? How will you measure the nutritional status of geriatric person?	4
	b)	What are the considerable nutrients to prepare diet for geriatric person?	3

Section-B

7.	a)	Define maternal protein energy malnutrition and micronutrient malnutrition.	2
	b)	How does maternal PEM affect child's growth and development?	5
8.	a)	Give the nutritional comparison between breast milk and cow's milk.	4
	b)	Mention the advantages of consuming breast milk for up to two years of age.	3
9.	a)	What is colostrum?	2
	b)	Why colostrum is essential for newborn child? Explain in details.	5
10.	a)	Which nutrients should consider to prepare a complementary food for children and why?	4
	b)	Write the differences between complementary feeding and supplementary feeding.	3
11.	a)	Narrate the Barker's hypothesis or fetal origins of disease hypothesis.	5
	b)	Indicate the feeding methods for LBW infants.	2
12.	a)	Describe the factors that contribute to poor eating habit and what are the consequences of it?	4
	b)	What are the differences between infectious disease and deficiency disease? Write the name of six deficiency diseases.	3

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 1st Semester Final Examination, 2016
Subject: Physical Chemistry (Theory)
Course Code: PCM-101

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer Four (4) questions from each section. **1 & 6** questions are compulsory. Use separate answer script for each section. **Split answer is not allowed.**)

Section-A

1. What are colloids? Write the differences between Lyophilic and Lyophobic sols. 5

2. a) What are ideal and real solutions? 3
   b) How you can determine molecular mass of a solute from elevation of boiling point? 4
   c) State colligative properties of solution. 3

3. a) Define enthalpy of reaction and heat of solution. Discuss with example. 4
   b) What do you mean by molarity, normality and molality of solutions? 3
   c) What is the molality of a 5.86 M ethanol (C_2H_5OH) solution whose density is 0.927 g/ml. 3

4. a) Write two limitations of Arrhenius theory. 2
   b) What is Ostwald's Dilution law? 4
   c) Express Henderson-Hasselbalch equation. 3
   d) What is the concentration of Cl^- in a solution containing 0.2 M NaCl, 0.5 M HCl, 0.3 M $NaNO_3$ and 0.05 M KCl? 1

5. a) Write the differences between order and molecularity of reaction. 4
   b) Derive an expression for the rate constant of a first order reaction 6

Section-B

6. Calculate the molarity and normality of H_2SO_4 solution having 70 gm H_2SO_4 is present in 500 ml water. 5

7. a) Discuss the effect of temperature in equilibrium constant thermodynamically. 6
   b) The equilibrium constant K_P for the reaction 4

$$C_2H_4\,(g) + H_2\,(g) \rightleftharpoons C_2H_6\,(g)$$ is 5.04×10^{17} atm^{-1} at 25° C. Calculate ΔG^o.

8. a) Define osmotic pressure. 2
   b) What is the osmotic pressure of a solution prepared by adding 13.65 g of sucrose to enough water to make 250 ml of solution at 25° C? (MW sucrose = 342 g) 3
   c) Mention three significance of osmosis in living organisms. 3
   d) Write the basic difference between osmosis and reverse osmosis. 2

9. a) State first and second law of thermodynamics. 2
   b) Discuss in detail about transition state theory. 4
   c) For a first order reaction $t_{1/2}$ is 100 sec. How long will it take for the reaction to be completed 75%? 4

10. Write short notes on:
    a) Reverse osmosis 4
    b) Ultrafiltration 3
    c) Dialysis 3

Course Code: PCM-101

Full Marks: 70 **Time: 3 Hours**

Figure in the right margin indicate full marks.
(Answer **FOUR** questions from each section where question no. **1** and **6** are compulsory. Use separate answer script for each section. Split answer is not allowed)

Section: A

1. a) Explain the term "Enthalpy". 2

   b) Differentiate true solution. colloidal solution and suspension. 3

2. a) What is thermodynamical equilibrium constant? Derive the expression showing the effect of temperature on chemical equilibrium. 6

   b) The equilibrium constant Kp for the reaction $2NH_3(g) = 3H_2(g) + N_2(g)$ is 1.22×10^{-3} at 297K and 2.16 at 498K. Calculate ΔH for the reaction. 4

3. a) Write a short definition of each of the following terms: i) Rate of a reaction; ii) Order of a reaction; iii) Molecularity of a reaction; iv) Half-life 4

   b) Deduce the rate expression for second-order reaction. 4

   c) The half-life of a substance in a first order reaction is 15 minutes. Calculate the rate constant 2

4. a) What are colloids? 2

   b) Describe one method for the preparation of colloids with a neat diagram. 5

   c) What is meant by peptization? Give a suitable example. 3

5. a) Write down short notes on: i)Hess's law of constant heat summation; ii)Kc and Kp 6

   b) Given that energies for H–H, O=O and O-H bonds are 104, 118 and 111 $Kcalmol^{-1}$, respectively. Calculate the heat of reaction: $H_2(g) + \frac{1}{2}O2(g) \longrightarrow H_2O(g)$ 4

Section: B

6. a) Define surface tension. What is the effect of temperature on surface tension? 3

   b) What is common ion effect? 2

7. a) How can you determine the molecular weight of a solute from elevation of boiling point? 5

   b) Write down the Raoult's law of depression of freezing point? 2

   c) The vapour pressure of ether (MW=74) is 442 mmHg at 293K. 3g of the compound 'A' is dissolved in 50g of ether and the vapour pressure is reduced to 426 mmHg. Calculate the mol mass of 'A'. Assume that the solution is very dilute. 3

8. a) Define molar conductance, equivalent conductance and specific conductance. What are the effects of concentration on them? 6

   b) Define osmosis and dialysis. Write down the biological importance of osmosis. 4

9. a) Discuss in details the Faradays law of electrolysis. 5

   b) Write down the Arrhenius theory of electrolytic dissociation. 3

   c) Why the mobilities of hydrogen ion and hydroxyl ion in aqueous solution is abnormally high. 2

10. a) Derive the relation between emf and free energy. 5

    b) What is buffer solution? Write down the mechanism of acidic and basic buffer solution. 5