

ABIA STATE UNIVERSITY, UTURU
FACULTY OF BIOLOGICAL SCIENCES
2022/2023 SESSION FIRST SEMESTER EXAMINATIONS
BIO 101: INTRODUCTORY BIOLOGY I

(SECTION B)

Instruction: Answer Questions i---x (Give Answers Only)

The study of fresh water and marine algae is called i

ii are chlorophyll bearing plants with thallus-like plant body

The difference in the genetic make-up of a species and to the genetic variations within a single species is known as iii

iv refers to the biological community of organisms that interact with each other as well as their environment in a particular region.

Bacteria are single-celled microorganisms with v cells

Bacteria have cell membrane and a cell wall that is often made of vi

The cell wall of fungi are primarily composed of vii

A virus is non-cellular infectious particle made up of either viii or ix

The study of Bryophytes is referred to as x

Answer Any Two Questions From This Part

- 1 (a) Outline four (4) general characteristics of algae
 - (b) What are the three (3) major photosynthetic pigments in algae?
 - (c) Enumerate five (5) roles of algae in biotechnology
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- 2 (a) Outline five economic importance of bryophytes.
 - (b) Highlight the conservation measures of biodiversity
 - (c) List six (6) threats to biodiversity loss and explain any three listed
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- 3 (a) List and explain the three principal methods of reproduction in plants
 - (b) List three major classes of Bryophytes
 - (c) Briefly explain the relevance of bacteria to man

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Abia State University, Uturu

Department of Industrial Chemistry

2022/2023 Academic Session First Semester Examination

CHE 101 EXAMINATION Time: 3h

Instruction: Attempt any three (3) questions

SECTION A (Use the atomic weights as given)

Atomic weights: C=12.011; Cl=35.453, H = 1.00784, O =15.999, Ag = 107.8682, N =14.0067, S=32.065, F= 18.998403, Fe = 55.845

- Q1(a) Find the mass percentage of oxygen in Fe_2O_3 [5 mks].
(b) What is the molar mass of (i) glucose and (ii) sucrose? Include the correct units [8 mks].
(c) A solution is prepared by dissolving 21.20g AgNO_3 in a 500ml volumetric flask and diluting to volume. What is the molarity of the solution? [6 mks].
(d) A compound of sulfur and fluorine contains 29.7% S and 70.3% F (percentages are by mass). What is the empirical formula of the compound? [5 mks]. [Total = 24 marks].

Q2 i. Briefly explain 3 types of radioactive you know [6 mks]

- ii. With the aid of a diagram explain the effect of an electric field on nuclear radiation [6 mks]
iii. Write a balanced equation for the decay of Gadolinium 150 and identify the nuclide produced [8 mks]
iv. Briefly explain what you understand by the rate of radioactive decay [4 mks]. [Total = 24 marks],

SECTION B

Q3(a). Using mathematical expression, state the following gas laws; Boyles law, Charles law, Avogadros law, Ideal gas law

- (b)i. A gas occupies 12.3L at a pressure of 40.0mmHg. What is the volume when the pressure is increased to 60.0mmHg?
(b)ii. The inflation of flat tyres is a clear example of law
(c)i. A 27 °C gas has a volume of 6L, what will be the volume at 150 °C?
(c)iii. If the pressure of a gas is decreased by one-half, how large will the volume change be?
[Total = 24 marks].

Q4(a). Which molecule is nonpolar? Show how you arrived at your answer. (a) SO_3 (b) CH_2Cl_2 (c) NH_3 (d) FNO [NB: EN for S = 2.5, O = 3.5, C = 2.5, H = 2.1, Cl = 3.0, N = 3.0, F = 4.0] [3mks]

- (b). From the following species, the one with a triple covalent bond is? Draw the structure for the correct answer. (a) NO_3^- ; (b) CN^- ; (c) CO_2 ; (d) AlCl_3 [3mks]
(c). The formal charges on the O atoms in the ion $[\text{ONO}]^+$ is? Show your workings (a) -2; (b) -1; (c) 0; (d) +1 [4mks]
(d). In one sentence explain why BF_3 with incomplete octet structure is the preferred structure. Show the structure.[4mks]

SIR JIK

EGBUCHELEM JOHN KINGSLEY.

ABIA STATE UNIVERSITY, UTURU
DEPARTMENT OF PHYSICS
2022/2023 FIRST SEMESTER EXAMINATION
PHY 101: GENERAL PHYSICS I

INSTRUCTIONS: ATTEMPT ANY SEVEN (7) QUESTIONS. TIME: 2hrs

1. (a) Write down the 3 fundamental quantities in Mechanics and their S.I units. (3 marks)
(b) State 3 applications of dimensional analysis. (3 marks)
(c) Using dimensional analysis derive the units of (i) Force (ii) pressure. (4 marks)
2. (a) Define the following (i) a projectile (ii) range (iii) trajectory (iv) maximum height (v) time of flight (5 marks)
(b) A ball is thrown upward with initial velocity of 25m/s. Find the time it takes the ball to reach its highest point and the distance to this highest point. (Take $g = 9.8\text{ms}^{-2}$) (5 marks)
3. (a) Write down two properties each for vector addition and vector multiplication. (4 marks)
(b) Given two vectors: $\mathbf{a} = 2\mathbf{i} + \mathbf{j} - 3\mathbf{k}$, $\mathbf{b} = \mathbf{i} - 3\mathbf{j} + \mathbf{k}$. Find (i) $3\mathbf{a} + 2\mathbf{b}$ (ii) the dot product of \mathbf{a} and \mathbf{b} (iii) the cross product of \mathbf{a} and \mathbf{b} (6 marks)
- 4a) State Newton's laws of motion (3 marks)
(b) Define the following (i) impulse (ii) momentum (iii) inertia (iv) weight (4 marks)
(c) Calculate the force exerted on the engine of a car of mass 10kg to maintain a forward acceleration of 8m/s^2 if the car is acted upon by a constant resistive force of 1000N. (3 marks)
- 5a. (i) Write down the expression of the center of mass of a system consisting of n particles. (ii) Locate the centre of mass of three particles $m_1 = 5.0\text{kg}$, $m_2 = 7\text{kg}$ and $m_3 = 10\text{kg}$ located at (4, 3), (2, 5) and (-1, 2) respectively, coordinates in metres. (5 marks)
- (b) i. For two bodies that had an elastic collision write down the mathematical expressions for their final velocities. ii. An object of mass 7kg travelling at 10m/s collides head on with 5kg object travelling at 12m/s. If the collision is elastic, use your answer in (i) to determine the final velocities of the two objects. (5 marks)
6. a) Define the following: (i) a machine (ii) mechanical advantage (iii) velocity ratio and (iv) efficiency of a machine. (4 marks)
b) i) A body of mass 2kg is released from a height 20m calculate its velocity at the ground and when it is 10m from the ground. (ii) Calculate the power of a pump which lifts 200kg of water through vertical distance of 2m in 2 seconds. (Take $g = 9.8\text{m/s}^2$) (6 marks)
7. a) State Newton's universal gravitation. Use this law to derive Kepler's period law. (6 marks)
b. Estimate the speed and the period of a satellite close to the earth's surface. It's radius of orbit is $6.4 \times 10^6\text{m}$. (Use the following: $G = 6.67 \times 10^{-11}\text{Nm}^{-2}$, Mass of the earth $M_E = 5.97 \times 10^{24}\text{kg}$) (4 marks)
- 8.a) (i) Differentiate between static and dynamic equilibrium, (ii) State the conditions for equilibrium. (4 marks)
b. State two advantages of friction, two disadvantages of friction and two ways friction can be minimized. (6 marks)
- 9) a. State Hooke's law and define (i) elasticity (ii) Pressure (iii) Density (4 marks)
b. A mass of 2kg attached to the end of a vertical wire of length 2m and diameter 2mm extended the wire by 1mm. Calculate the work done in stretching the wire and the young modulus of the wire. ($g = 9.8\text{ms}^{-2}$) (6 marks)

Ω_m

$$\begin{aligned} U &= KE \\ Y &= KE^2 \\ F &= KE \end{aligned}$$

$$T = \frac{F}{m}$$

- (e). Identify three extensive properties and three intensive properties among the listed parameters thus; viscosity, volume, free energy, temperature, pressure, density, mass. [6mks]
(f). Draw Lewis structure for two different molecules with the formula C₃H₄ and using FC show the structure with the correct arrangement [4 mks]. [Total = 24 marks].

SECTION C:

- Q5.** (a) (i) State two definitions of Osmotic pressure. (ii) In not more than two sentences, what do you understand by common ion effect?
(b) (i) Define surface tension and state one reason for its occurrence in liquids.
(c) Write and identify half-reaction equations for the oxidation and reduction processes for the following redox reactions:
(i) When copper foil is added to concentrated trioxonitrate (V) acid, the solution becomes pale blue and brown fumes of nitrogen (IV) oxide are produced.
(ii) Acidified potassium dichromate in solution reacts with Iron (II) sulphate to produce chromium (III) sulphate and Iron (III) sulphate.
(iii) Obtain a balanced redox equation each for reactions (i) and (ii) above
(d) An aqueous solution has hydroxide ion concentration of 10⁻¹¹M. (i) What is the hydrogen ion concentration of this solution? (ii) What is the pH? (iii) Is this solution acidic, basic or neutral? (iv) What is [OH⁻] in 0.01M HCl. [Total = 24 marks].

- Q6.** (a) State (i) two mathematical expression for Raoult's law. (ii) Four limitations of the depression of freezing point method for determination of relative molecular mass.
(b) Given the reaction A(g) + B(g) + C(g) → D(g); It was discovered that: The rate at which D was formed was increased by a factor of 4 when the initial concentration of C was increased by a factor of 2; The rate at which D was formed was increased by a factor of 2 when the initial concentration of A was increased by a factor of 2; Altering the initial concentration of B, did not affect the rate at which D was formed. Considering these three statements, Write the rate law and deduce units for the rate constant if concentration is in mol dm⁻³.
(c) (i) Calculate the total vapour pressure of a mixture of methanol (64g) and ethanol (92g) at 298K given that the pure vapour pressure of methanol is 90 mmHg and ethanol is 45 mmHg (C = 12, H = 1, O = 16).
(ii) What is the change in oxidation number of chromium from Cr₂O₇²⁻ to Cr³⁺.
(d) (i) The hydrogen ion concentration of a fruit juice is 3.3 × 10⁻² M. What is the pH of the juice? Is it acidic or basic? (ii) If a solution has a pH of 7.41, determine its H⁺ concentration. [Total = 24 marks].

GOODLUCK

SIR J.K EGBUCHULEM JOHN KINGSLEY

ABIA STATE UNIVERSITY UTURU
FACULTY OF BIOLOGICAL SCIENCES
SECOND SEMESTER EXAMINATION 2021/2022 SESSION
BIO 101: INTRODUCTORY BIOLOGY
SECTION A

Answer objective questions (i to x) and any other two questions from section A, then turn to section B. Time allowed for Sections A & B - 2 hours

OBJECTIVE:

- i. The semi-fluid material in which organelles are embedded is called -----
- ii. Is binary fission sexual or asexual?
- iii. Chromosomes that look alike are said to be -----.
- iv. Other names for unicellular and multi-cellular cells are ----- and (v)-----
- vi. All living things are made up of -----
- vii. -----is the structure that carries out specific activities in the cell.
- viii. The part of the endoplasmic reticulum with attached ribosomes is called-----ix ----- regulates what enters and leaves a cell.
- x. The prokaryote responsible for food spoilage and infection is called -----

THEORY

1. (a) Using a clearly labelled diagram give a detailed account of the cell cycle.
(b) Explain 'Cytokinesis'
2. (a) Define a prokaryote.
(b) Draw and label a prokaryotic cell structure.
(c) Mention 5 characteristics of prokaryotes.
3. (a) Tabulate the similarities and differences among the class Turbellaria, Trematoda and Cestoda
(b) List one excretory organ and excretory product of a named annelid, mollusc and arthropod .

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SIR J.K EGBUCHULEM JOHN KINGSLEY

ABIA STATE UNIVERSITY UTURU
 DEPARTMENT OF MATHEMATICS
 MAT 101 – GENERAL MATHEMATICS I
 2022/2023 FIRST SEMESTER EXAMINATION
 INSTRUCTIONS: (i) Write your full Name and Matric Number
 (ii) Answer any FOUR (4) questions

TIME: 2 hrs

$$a+d + \\ a+2d + \\ a+$$

- 1(a) Show that S_n , the sum of the first n terms of an arithmetic progression, with a as first term and d as common difference is given by

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

- (b) If α and β are roots of $x^2 - 3x + 1 = 0$, find
 (i) $\alpha^2 + \beta^2$ (ii) $\alpha - \beta$

- 2(a) Perform the indicated operations and express your result in standard form.

$$(i) (4 + 3i) + (6 + 4i) \quad (ii) \frac{3+4i}{6+3i}$$

- (b) Find the modulus, arguments, and principal argument of each of the following:
 (i) i (ii) $-\sqrt{5}$.

- 3(a) By Principle of Mathematical Induction, prove that the sum of the squares of the first n odd integers is

$$\frac{1}{3}n(2n-1)(2n+1).$$

- (b) What is the sum of the 10th term of the GP 4, 8, 16, ...

- 4(a) In a class of 50 students, 18 offered Mathematics, 21 offered Chemistry while 16 offered Biology. 7 students offered Mathematics and Chemistry, 8 students offered Mathematics and Biology, 9 students offered Chemistry and Biology while 5 students offered the three subject combinations. With the help of a Venn diagram, find:

- (i) the number of students that offered Mathematics but offered neither Chemistry nor Biology.
 (ii) the number of students who did not offer any of the three subject combinations.

- (b) If there are 10 airlines operating between Uturu and Lagos, in how many ways can a traveller fly from Uturu to Lagos and return with same airline.

- 5(a) Express $\frac{x^2-11}{(x+2)^2(3x-1)}$ in partial fractions

- (b) Calculate the coefficient of x^3y^4 in $(2x - 3y)^7$.

- 6(a) How many 2-digit numbers can be formed from the three numerals 2, 5, 6?
 (b) In how many ways can the President form a cabinet of 6 men and 3 women from a list of 8 male candidates and 5 female candidates?
 (c) Show that $r! nC_r = {}^n P_r$.

$$a + a+d + a+2d$$