

FECAMDS

ABIA STATE UNIVERSITY, UTURU

DEPARTMENT OF PHYSICS

2018/2019 FIRST SEMESTER EXAMINATION

PHY 101: GENERAL PHYSICS I

INSTRUCTIONS: Answer All Questions. TIME: 2hrs

1. Define Fundamental and Derived units. Give 3 examples for each.
2. Arrange the following prefixes in descending order and write down their values (i) micro
(ii) femto (iii) giga (iv) centi (v) pico
3. (i) State 3 applications of dimensional analysis. (ii) Using the method of dimension derive the unit of viscosity.
4. Suppose the period of oscillation T of a simple pendulum depends on the mass, M of the pendulum bob, the length L of the thread and the acceleration due to gravity, g . Use the method of dimensions to find the correct relations. Assume

$$T = KM^x L^y g^z$$

where K is a dimensionless constant.

5. The distance covered by a car at a time t is given by

$$x = 10t + 8t^4$$

with x in meters and t in seconds. Calculate the instantaneous velocity and acceleration after 2 seconds

6. Define the following: (i) Kinematics (ii) Dynamics (iii) Average speed (iv) Displacement (v) Velocity

7. A stone is thrown with a velocity of 10 ms^{-1} at an angle of 45° to the horizontal. Calculate the (i) time of flight (ii) maximum height attained and (iii) range (take $g = 10 \text{ m/s}^2$).

8. An electron enters a region with a speed $5 \times 10^6 \text{ m/s}$ and is slowed down at the rate of $-1.25 \times 10^{14} \text{ m/s}^2$. How far does the electron travel and what is the total time taken?

9. A vector lying in the x-y plane has x-component of 12 units and y-component of 16 units. What is the magnitude of the vector and the angle it made with the horizontal

10. Given two vectors: $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$, $\mathbf{b} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ and $\mathbf{c} = 3\mathbf{i} + 6\mathbf{j} - 4\mathbf{k}$. Calculate (i) $\mathbf{a} + \mathbf{b} + \mathbf{c}$ (ii) $(\mathbf{a} + \mathbf{b}) \cdot \mathbf{c}$.

11. Given two vectors: $\mathbf{a} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$, $\mathbf{b} = 2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$. Find (i) $3\mathbf{a} + 2\mathbf{b}$ (ii) $\mathbf{a} \times \mathbf{b}$.

12. If $\mathbf{p} = 7\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$ and $\mathbf{q} = 4\mathbf{i} + 5\mathbf{j} - 3\mathbf{k}$. Find (i) the scalar product ($\mathbf{p} \cdot \mathbf{q}$). (ii) The cosine of angle between \mathbf{p} and \mathbf{q} .

13. What is the weight of a 75kg astronaut (a) on earth, $g = 10 \text{ m/s}^2$ and (b) in the moon $g = 1.7 \text{ m/s}^2$

ZOMASHTI

14. Define the following terms: (i) impulse (ii) inertia of a body (ii) friction.
15. A block of mass 20kg is pulled with a force 10N at an angle 30° with the horizontal. Find the acceleration of the block.
16. (a) State the law of conservation of linear momentum. (b) The coefficient of restitution is defined as _____.
17. (a) A boy pulled a load of mass M, 20m along a horizontal plane with a constant force of 10N applied (i) parallel to the plane (ii) in the direction of angle 60° to the horizontal. Calculate the work done in each case
(b) State the principle of conservation of mechanical energy.
18. (a) List 4 forms of energy. (b) A block and tackle pulley system with velocity ratio 4 is 20% efficient. Calculate (i) the mechanical advantage (ii) the effort that can support a load of 80N.
19. State the formula for calculating the velocity ratio of each of the following: (a) block and tackle pulley (b) inclined plane (c) hydraulic press (d) wheel and axle (e) screw.
20. A 5.0kg object travelling at 1.0m/s collides head on with 10.0kg object initially at rest. Determine the velocity of each object after the impact if the collision is elastic.

ABIA STATE UNIVERSITY UTURU
DEPARTMENT OF MATHEMATICS
2018/2019 FIRST SEMESTER EXAMINATION
GENERAL MATHEMATICS 1 (MAT 101)

INSTRUCTIONS: (i) WRITE YOUR FULL NAME ON THE ANSWER BOOKLET

(ii) ANSWER FOUR QUESTIONS ONLY

TIME: 2hr

- ✓ 1. A Survey of 100 students in an institution shows that 80 students speak Hausa and 20 speak Igbo; while only a student speaks both languages.
(i) Represent the given information in a Venn diagram.
(ii) How many students speak neither Hausa nor Igbo.
(B) Let Set $A = \{1, 2, 3, 4\}$, generate the Power Set of A .
- ✓ 2. In how many ways can 6 security men be posted round a boxing ring during a fight? Prove that $0! = 1$
(B) Find and simplify the 4th term in the binomial expansion of $(a + 2x^3)^4$
- ✓ 3. Prove that the sum of a GP is $S_n = \frac{a(1-r^n)}{1-r}$, Hence show that $S_4 = (1+r^2)S_2$
(B) How many terms of the sequence 10, 12, 14... will add up to 190?
- ✓ 4. Prove by Mathematical Induction that $1 + 3 + 5 + \dots + (2n - 1) = n^2$
(B) Find the Partial fraction expansion of $\frac{8x+9}{(x+1)(x+2)}$
- ✓ 5. Prove the following identities
(i) $\sin^2 \theta + \cos^2 \theta = 1$ (ii) $\tan^2 \theta + 1 = \sec^2 \theta$
(B) Without tables nor calculator evaluate $\tan 315^\circ$ (show all workings)
- ✓ 6. Perform the operations and express your answers in standard form
(i) $(4 + 3i) + (6 + 4i)$ (ii) $(2 - 3i) - (4 - 5i)$ (iii) $\frac{3+4i}{6+3i}$
(iv) $\frac{1}{(2-i)^2}$

NB: ENSURE THAT YOU HAVE REGISTERED THIS COURSE WITH ICS TO AVOID
RESULT ISSUES.

Goodluck!!



FECAMDS

Abia State University, Uturu, Department of Pure and Industrial Chemistry
General Chemistry I (CHE 101) Examination 2018/2019 Academic Session
Instructions: Attempt only (3) questions; one (1) question from each section (Time 2½ Hours)
FOLLOW ALL INSTRUCTIONS GIVEN IN EACH SECTION
SUBMIT YOUR EXAM ADMIT CARD (STAMPED COURSE REGISTRATION AND PASSPORT)
FINISH QUESTION FROM ONE SECTION, GIVE A BLANK SPACE BEFORE ANOTHER SECTION

SECTION A: Answer either question 1 or 2

(Instruction: Use ONLY the following atomic weights in all calculation: H = 1.00794; O=15.9994; Ag = 107.870; N = 14.0067; C = 12.011; Ca = 40.078; Cl = 35.453)

- Q1.** (a) A solution is prepared by dissolving 12.21g AgNO_3 in a 500mL volumetric flask and diluting to volume. What is the molarity of the solution (4 marks)
(b) What is the name of a group of elements with atomic Nos. 58–71. Name the 1st two members (3 marks)
(c) Sketch the Modern Periodic Table (identify the Periods and Groups) (5 marks)
(d) Differentiate between molarity and molality. Write the equations for calculating them. (4 marks)
(e) Calculate the ppm by mass of calcium in a 3.05g pill that contains 305mg Ca. (4 marks)
(f) What is the molality of a solution prepared by mixing 302 g CaCl_2 with 721g of water? (4 marks)
(g) In not more than 3 sentences define nucleosynthesis. Use equations for the bombardment of nitrogen -14 nuclei with α particles for illustration (5 marks)
(h) Provide the half-life of: (i) Tritium (ii) carbon-14 (iii) carbon-15 (iv) potassium-40 (4 marks)
(i) How many stable isotopes has tin (Sn)? (1 marks) [Total 34 marks]

- Q2.** (a) (i) What is the mass percent of each element in glucose? (ii) How many grams of oxygen is in 53.64g of glucose? (8 marks)

- (b) Carbon 11, an artificial isotope, decays to a stable boron isotope. Write the equation. (2 marks)
(c) What is magic number? Write the magic numbers. (3 marks)
(d) What is the name given to elements with atomic numbers 90 – 103? Name the 1st two members (2 marks)
(e) Mention any four (4) radio-isotopes and their medical applications (and organs studied). (4 marks)
(f) Give the names of any four scientists that worked on the Periodic classification of elements (2 marks)
(g) Summarise the Dalton's Atomic Theory. State any three limitations of this theory. (7 marks)
(h) Give the names of any four (4) members of Group 18. (2 marks) [Total 34 marks]

SECTION B: Answer either question 3 or 4

- Q3** a. Define the following parameters with equations only: (i) Root Mean speed (ii) Mean free path (iii) Maxwell Boltzmann distribution Law (iv) Mean relative speed (v) Charles Law (vi) Equation of State for Ideal gases (vi) Compression factor (vii) Equation of State for real gases (viii) Van der Waal's equation (ix) Change in Gibb's free energy (x) Avogadro's principle [30mks]

- b. What type of chemical bonds are formed in (i) BF_3 (ii) MgCl_2 (iii) N_2H_2 (iv) Aluminium oxide [2 mks]
c. At high enough temperature how does entropy and enthalpy vary with each other [2 mks]

- Q4** a. Draw resonance hybrid structures for (i) CH_3COO^- (ii) SO_2 and (iii) nitrate ion [6 mks]
b. Using equations only describe the following experimental observations in gases (i) Relationship between pressure and volume (ii) The effect of temperature on pressure and volume (iii) The effect of the amount of gas on pressure and volume. [6 mks]
c. Using equations only (i) define the compression factor. (ii) Discuss its significance and (iii) Explain how it is interpreted. [6 mks]

- d. Using suitable and well defined equations outline the three (3) methods used to determine change in Gibb's free energy. [3 mks each]
- e. Define the values of pure compounds at standard states for (i) ΔH_f° (ii) ΔG° (iii) ΔS° [3 mks]
- f. Write plausible Lewis structure for nitrosyl chloride. [10 mks]

SECTION C: Answer either question 5 or 6

- Q5.** (a) (i) State two definitions of Osmotic pressure (2 marks)
- (ii) State four limitations of the depression of freezing point method (4 marks).
- (b) State the equations for determination of molecular mass using (i) lowering of vapour pressure
(ii) Elevation of boiling point (2 marks).
- (iii) Why are rain drops spherical? (Not more than one sentence) (1 marks)
- (c) A mixture of 0.2 mole of alcohol A and 0.5 mole of alcohol B has a total vapour pressure of 40 mmHg at 298K. If the mixture obeys Raoult's law, find the pure vapour pressure of B at 298K given that the pure vapour pressure of A is 20mmHg at 298K. (3 marks)
- (d) Given that 100 mL of 2.0×10^{-4} M $\text{Ca}(\text{NO}_3)_2$ was mixed with 100 mL of 2.5×10^{-4} M NaF.
- (i) What is the new concentration of Ca^{2+} after mixing? (ii) What is the new concentration of F^- after mixing? (iii) Will precipitation of CaF_2 occur after mixing? (K_{sp} of CaF_2 is 1.7×10^{-10}) (6 marks)
- (e) An ideal solution made up of benzene ($C_6\text{H}_6$) and Toluene ($C_6\text{H}_5\text{CH}_3$) has mole fraction of benzene as 0, 0.25, 0.5, 0.75 and 1.0 at various concentrations.
- (i) State the equations only for the number of moles, the mole fraction and the partial vapour pressures of the species. (3 marks)
- (ii) Calculate the mole fractions of Toluene. (2 marks)
- (iii) Calculate the respective partial vapour pressures of benzene and Toluene given that the pure vapour pressures are 3.6×10^4 and 1.12×10^4 Nm $^{-2}$ for benzene and Toluene respectively. (5 marks)
- (iv) Calculate the total vapour pressure of the solution at these concentrations. (4 marks)
- (v) Sketch on one paper a fully labeled vapour pressure-composition curve for the ideal solution. (2 marks) (Total = 34 marks)

- Q6.** (a) In one sentence each, define (i) Molarity (ii) Molality (iii) surface tension (3 marks). (iv) State two mathematical expressions for Raoult's law (2 marks).
- (b) State the equations for determination of molecular mass using (i) osmotic pressure (ii) Depression of freezing point. (2 marks). (iii) 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). (4 marks).
- (c) Write the solubility products constant expression for the following: (i) Silver ethanedioate (ii) Silver carbonate (iii) Lead (II) sulphate (iv) Barium sulphate. (4 marks).
- (d) The solubility product of lead (II) sulphate is 1.6×10^{-8} mol 2 dm $^{-6}$. Calculate the solubility of lead (II) sulphate in: (i) Pure water (ii) 0.1M Lead (II) nitrate solution (iii) 0.01M sodium sulphate solution (8 marks).
- (iv) Why is Lead (II) sulphate more soluble in (i) than in either (ii) or (iii) (2 marks).
- (e) Given the reaction $A(g) + B(g) + C(g) \rightarrow D(g)$; It was discovered that:
- (i) 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 $^{-3}$. (7 marks)
- (ii) Now if the reverse reaction was studied, and the rate equation was found to be; Rate = $K[D]^2$. State the equation to calculate the time it will take 50% of D to react. If the initial concentration was doubled, how would this time respond? (2 marks) (Total = 34 marks)

201MA024 FECAMIDS

ABIA STATE UNIVERSITY UTURU
FACULTY OF BIOLOGICAL AND PHYSICAL SCIENCES
FIRST SEMESTER EXAMINATION 2018/2019 SESSION
BIO 101: Introductory biology 1. Register your courses online

Answer question 1 (i-x) answers only (objective) and any other two questions (theory) from section A., then turn overleaf for Section B. Total time allowed for Sections A and B. 2 hours

SECTION A

1. i. Sister chromatids are joined at the _____.
ii. RNA contains instructions for the genes. True or False.
iii. The driving force in evolution is _____.
iv. Lower organisms that are neither plants or animals are termed _____.
v. The AIDS virus attacks the _____.
vi. During cell division the _____ is the centre for spindle fibre formation.
vii. The semi-fluid material that surrounds the organelles is called the _____.
viii. Identical pairs of chromosomes are said to be _____.
ix. _____ is the study of biotic and abiotic components of the environment.
x. Is binary fission sexual or asexual mode of reproduction?

2. (a) Tabulate the differences between prokaryotes and eukaryotes
(b) Draw and label a prokaryotic cell.
3. (a) Aided by a labelled diagram summarize the characteristics of the cell cycle
(b) Distinguish between animal and plant cytokinesis (no drawing required)
4. (a) Using annotated diagrams describe interphase and the first meiotic division.
(b) In tabular form compare mitosis and meiosis (no diagram required)

FECAMDS

ABIA STATE UNIVERSITY, UTURU
FACULTY OF BIOLOGICAL SCIENCES,
FIRST SEMESTER EXAMINATION 2018/2019 SESSION

BIO 101: Introductory Biology 1

(SECTION B)

Instructions: Answer all the 10 subjective questions (Give answers only).

- i. The branch of biology concerned with naming organisms is known as _____
- ii. Binomial system of classification was introduced in 1735 by _____
- iii. Plants response to stimulus of light is called _____
- iv. The hereditary information which is passed on from cell to cell during cell division is known as _____
- v. There is presence of ribosomes in Rough endoplasmic reticulum. True/False
- vi. The cellular structure which mRNA molecules bind to start protein synthesis is _____
- vii. Organisms with the presence of a "True Nucleus" is called _____
- viii. The bacteria responsible for Typhoid fever is called _____
- ix. In lower plants, the male gametes are ciliated and known as _____
- x. The alternation of gametophyte with sporophyte and vice versa is called _____

Instructions: Answer question 1 and any other one (2 or 3)

1. a. Draw and correctly label a typical plant cell
b. What is the main function of the following cell organelles?
 - i. Ribosome
 - ii. Mitochondria
 - iii. Nucleus
 - iv. Chloroplast
 - v. Endoplasmic reticulum
2. a. Arrange these systematic structure from ascending to descending order; Family, Class, Kingdom, Genus, Order, Species
b. i. List the characteristics of living things
ii. Briefly discuss any five characters listed above
3. a. i. Classify lower plants into three main groups with two examples each
b. Define the following: (i) Conjugation (ii) Asexual reproduction (iii) Apomixis (iv) Fertilization (v) Sexual reproduction