



RIVERS STATE UNIVERSITY
NKPOLU-OROWORUKWO, PORT HARCOURT, NIGERIA
DEPARTMENT OF PHYSICS
First Semester Examinations (Undergraduate)
2022/2023 Academic Session

PHY 101: GENERAL PHYSICS 1:

(MECHANICS, PROPERTIES OF MATTER & THERMAL PHYSICS)

(SCIENCE GROUP)

Time: 2 Hours

INSTRUCTIONS:

- ATTEMPT FOUR (4) QUESTIONS IN ALL AT LEAST ONE (1) FROM EACH SECTION
- SYMBOLS HAVE THEIR USUAL MEANING EXCEPT OTHERWISE STATED
- INDICATE UNITS (S.I) WHERE NECESSARY

SECTION A

1. (a) What is dimensional analysis? (3 ½ marks) 3 1/2
(b) By dimensional analysis show that the pressure head, P_h given by the expression,
$$P_h = \frac{dv}{dt} = \frac{pr^4}{l\eta}$$
(8 marks) 4
Where, v is volume, t is time, p is pressure, r is radius, l is length and η is coefficient of viscosity.
(c) List the three main applications of dimensional analysis (6 marks) 6
2. (a) With a schematic diagram only discuss the various regimes of physics known to you. (7 marks) 7
(b) What is Galilean transformation? Write out the inverse Galilean transformation equations, define all terms. (5 marks) 5
(c) What do you understand by Galilean invariance? Show that acceleration is invariant under Galilean transformation. (5 ½ marks) 3

SECTION B

3. (a) Define (i) Work, (ii) Energy (iii) Power as applied in Physics (6 marks) 6
(b) Identify six different forms of Energy and state their application. (3 marks) 3
(c) A car of mass 700kg moves with a constant speed of 36km/hr up an inclined plane scaled 1 in 7. If the horizontal distance from the starting point of the car to the point of the highest top of the inclined plane is 200m
(i) Calculate the workdone by the car to get to the top of the inclined plane (5 marks) 5
(ii) Estimate the power at which the car works. (3 ½ mark) 3
4. (a) Define the following as applied to rotational motion
(i) Angular velocity (ii) Centripetal force (iii) Torque (iv) Radius of gyration (8 marks) 8
(b) Given a uniform rod of length L and mass M , pivoted at a point X along the length of the rod, Show that the moment of inertial I of the rod is given as $I = m \frac{L^2}{3}$ (6 marks) 6

1b) Show that the pre
 $m = 700$
 $s = 36$
 $h = 200$

RIVERS STATE UNIVERSITY
Nkpolu-Oroworukwo, Port Harcourt
First Semester Examination (100 Level)
GST 147: Use of Library Study Skills & ICT

Instructions: Answer question one and any five. (1 hour)

Course Lecturer: Prof J.N.IGWELA

1. Explain the following in relation to librarianship.
(i) National library (ii) Preliminary pages. (iii) Library information resources. (20marks)
2. What are the seven practical steps involved in information retrieval in the Library.
3. What is OPAC.
4. Outline seven rules governing the use of library and information resources. (10 marks)
 - 5(a). Mention the type of information resources that can be consulted in the following situations.
 - (i) Names, Addresses of persons or organizations.....
 - (ii) Guides or links to information concepts in a books.....
 - (iii) Branches of knowledge.....
 - (iv) Operations of equipment and gadgets.....
 - (v) Summaries of original text report and articles....(5marks)
 - (b) What type of library performs each of the following functions below.
 - (i) Responsible for developing reading culture.....
 - (ii) Responsible for the issuance of ISBN and ISSN.....
 - (iii) Facilitate the provision of information services and resources to a community.....
 - (iv) Provides specialized information to users....
 - (v) Support the parent body in the area of learning, research and community services. (5marks)
6. Write short note on the following.
 - (i) Technical service. (ii) Databases. (10marks)
- 7(a). Mention five attributes of Reference materials
- (b). Outline the basic elements used for reference to books using APA format. (10marks)



INSTRUCTIONS: ATTEMPT ANY FOUR (4) QUESTIONS (AT LEAST ONE QUESTION FROM EACH SECTION)

SECTION A

1. a. (i) Differentiate between Newtonian and Non-Newtonian Fluids with two examples each. (4 marks)
(ii) State Newton's Law of viscosity and state the three principal parameters governing this law. (3 marks)
 - b. State Archimedes principle and by verifying this principle show that $F_B = \rho g h A$ where the symbols have their usual meaning. (4 marks)
 - c. A mass of 150kg is placed on the small piston of a hydraulic press with cross-sectional area 35mm^2 . What force F will be produced on the large piston of the hydraulic press with cross-sectional area of 1025mm^2 . (Take $g = 9.8\text{ms}^{-2}$) (6 ½ marks)
2. a. (i) Your parents needed the speed of the water in their bathroom upstairs to be relatively higher than the speed with which water is supplied to your house from your outside storage tank. In giving your opinion to a plumber employed by your parents, what would be the size of the pipe in your parent's bathroom upstairs relative to the size of the pipe that brings water from your water storage tank outside into the house? Mention the equation that is informing your opinion. (ii) In what condition of fluid flow is Bernoulli's equation valid? (4 marks)
 - b. It took you 30s to fill a $2.5 \times 10^{-2}\text{m}^3$ container with water from your kitchen faucet. If the faucet has an inside diameter of 2cm , what is the speed with which the water leaves the faucet? (6 marks)
 - c. You were tasked with estimating the viscosity of a molten plastic. To carry out this task, you passed the molten plastic through a tube that is 8cm long, with an inner diameter of 1.3mm , at a rate of $13\text{cm}^3/\text{min}$. If the pressure differential between the two ends of the tube is 18cm of mercury, what is the viscosity of the molten plastic. ($\rho_{\text{Mercury}} = 13.6\text{g/cm}^3$, $g = 9.81\text{m/s}^2$) (7 ½ marks)

SECTION B

3. a. Explain in not more than three sentences the concept of application of Physics in the following as it relates in our daily use (i) Ball-point pen (ii) Headphones/Earphones (iii) A boy on on car seat belt (iv) A man walking. (4 marks)
 - b. (i) State the postulates of Relativity of Simultaneity. (3 marks)
(ii) Define motion. Using the four quantities that are used to describe a linear motion, show that $v_f^2 = v_o^2 + 2ax$, where the symbols have their usual meanings. (4 marks)
 - c. The resultant of two forces P and Q is 260N . If the magnitude of P is 80N and the angle between P and Q is 50° . Find Q . (6 ½ marks)
4. a. (i) What is the difference between Kinematic and Dynamics. (2 marks)
(ii) Define instantaneous acceleration, projectile motion and state the principle of superposition of forces. (3 marks)

Handwritten calculations:

$$1.02 \times 10^{-5} \times \frac{1.328 \times 10^{-8}}{13} = 1.5 \times 10^{-14}$$

$$60\text{s} = 1\text{min}$$

$$x \cdot 5 = 6$$

$$13\text{cm} = 1\text{min}$$

$$0.13\text{m} = 60\text{sec}$$

$$g = \frac{289h}{9\sqrt{r}}$$

$$70.2$$

$$13\text{cm} = 1\text{min}$$

$$1.3 \times 10^{-3} = 60$$

$$0.18$$

$$18 = 20$$

$$0.04\text{m/s}^2$$

- b.(i) Differentiate between static and kinetic frictions. (2 marks)
(ii) Using a suitable free body diagram and necessary Newton's law equations, find an expression for the acceleration of a body of mass m kg sliding down on an inclined plane having angle θ° . (3 marks)
c. The coordinates of a boy running across the engineering car parking lot as a function of time t is given as $x = 20t^3 + 15t^2 + 10t + 5$, $y = 15t^3 - 10t^2 + 5t + 2.5$ and $z = 10t^3 + 5t^2 + 2.5t + 2$. Express the boy's position vector \vec{r} and velocity \vec{v} in unit vector notation and find the magnitude at $t = 0.5$ s. (7 ½ marks)

SECTION C

5. a.(i) Which of the known elastic moduli cannot be estimated for fluids and why? (ii) How would you know if a given torque is positive or negative? (4 marks)
b. Semi-trailer trucks have an odometer on one hub of the truck wheel. The hub is weighted so that it does not rotate, but it contains gears to count the number of wheel revolutions—it then calculates the distance traveled. If the wheel has a 1.15 m diameter and goes through 200,000 rotations, how many kilometers should the odometer read? (5 marks)
c. Steel has a Young's modulus of 2.1×10^{11} Pa. If you suspend a 6.12 kg mass vertically using a steel wire of length 1.6 m with a cross-sectional area of $1.3 \times 10^{-6} \text{ m}^2$, what would be the (i) stress in the wire (ii) strain in the wire (iii) extension produced in the wire by the mass ($g = 9.81 \text{ m/s}^2$) (8 ½ marks)
6. a. In a scientific sense, when is work said to be done? What is the relationship between work and energy? (NOT MATHEMATICAL!) (ii) State Kepler's 2nd law of planetary motion. What is the implication of this law relative to the speed of planetary orbit? (4 marks)
b. The RSU shuttle you boarded to the examination venue this morning was travelling at 15 ms^{-1} when it hit a pile of dirt and was brought to rest in a distance of 2 m. How large an average force is exerted on you by the seat belts of the shuttle as it is brought to a halt if you have a mass of 90 kg? (5 marks)
c. The earth has an approximate mass and radius of $6 \times 10^{24} \text{ kg}$ and 6400 km respectively while mount Everest is approximately 9.0 km high. Calculate how much less gravitational force you would experience at the summit of mount Everest relative to what you would experience at sea level if you have a mass of 100 kg. (Take $G = 6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$) (8 ½ marks)

$$102.85 F_2$$

$$7600 = 6400 + F_2^2 - F_2^2 \quad F = \frac{GM_1 M_2}{R^2}$$

$$600 = 6400 + F_2^2 - 102.85 F_2$$

$$600 - 6400 = F_2^2 - 102.85 F_2 \quad 20250$$

$$12000 = -102.85 F_2 \quad 10125$$

$$F_2 = \frac{F}{A} \quad \frac{mg}{A}$$

$$200 - F_2^2 = 102.85 F_2 \quad F = \frac{1}{2} mv^2$$

$$230900 \quad 230880 \quad \text{Stress} \quad 4617.46 \times 10^4$$

$$K(\Delta L)^2 F \quad 4617.46 \times 10^4$$

$$\frac{6.67 \times 10^{-11} \times 6 \times 10^{24}}{(6400)^2}$$

Examiners;

Prof. V. E. Omubo-Pepple

Dr. O. I. Horsfall

Dr. O. A. Davies

$$F = \frac{GM_1 M_2}{R^2}$$

$$FS = \frac{1}{2} mv^2$$

$$FS = \frac{1}{2} mv^2$$

$$\frac{\sigma}{\epsilon}$$

$$\frac{\Delta y}{\Delta L}$$

$$\text{kg} \times \text{ms}^{-2}$$

$$\frac{\text{kg} \times \frac{\text{m}}{\text{s}^2}}{\text{m}^2}$$

$$\text{kg/m/s}^2$$



RIVERS STATE UNIVERSITY

NKPOLU-OROWORUKWO, PORT HARCOURT.

DEPARTMENT OF MATHEMATICS

Course Code: MTH 113

Course Title: Coordinate Geometry & Vectors

Departments: BSc 100 Level (Mathematics & Physics)

Semester: First Semester 2022/2023 Academic Session

Total Marks: 70 marks

Credit Unit: 3

Exam Hours: 02hrs

DOE: 14:06:2023

Instructions: Attempt any FOUR Questions and show your Work Clearly. No Mobile Phone is allowed in the Examination Hall & Do all Rough Work inside your Answer Booklet.

Q1 (a) Without using Pythagoras theorem, show that $(4,4)$, $(3,5)$ and $(-1,-1)$ are the vertices of a right-angled triangle.

(b) The diagonals AC and BD of a rhombus intersect at $(5,6)$. If $A = (3,2)$, then find the equation of the diagonal BD

Q2 (a) A line drawn perpendicular to the line $y = 5x$ meets the coordinate axes at A and B . If the area of the triangle OAB is 10 Sq.units, where O is the origin. Find the equation of the drawn line.

(b) Find the values of p for which the straight lines $8px + (2 - 3p)y + 1 = 0$ and $px + 8y - 7 = 0$ are perpendicular to each other

Q3 (a) Show that the radii of the circles $x^2 + y^2 = 1$, $x^2 + y^2 - 2x - 6y = 6$ and $x^2 + y^2 - 4x - 12y = 9$ are in A.P

(b) (i) Find the area of the parallelogram formed by the lines $4y - 3x = 1$, $4y - 3x - 3 = 0$, $3y - 4x + 1 = 0$ and $3y - 4x + 2 = 0$

(ii) If m_1 and m_2 are the roots of the equation $x^2 + (\sqrt{3} + 2)x + (\sqrt{3} - 1) = 0$, then find the area of the triangle formed by the lines, $y = m_1x$, $y = m_2x$ and $y = 2$

Q4 (a) Find the equation of the parabola whose focus is $(4, -3)$ and vertex is $(4,1)$

(b) If $x^2 + 2hxy + y^2 = 0$ represents the equation of the straight lines through the origin which makes an angle α with the straight line $y + x = 0$. Find the expression for the angle.

Q5 (a) Two vertices of a triangle are $(4, -3)$ and $(-2, 5)$. If the orthocenter of the triangle is at $(1, 2)$, then find the coordinates of the third vertex of the triangle.

(b) (i) Find the equation of the ellipse whose focus is $(1, -1)$, directrix is $x - y - 3 = 0$ and eccentricity is $1/2$.

(ii) If the foci are the points $F_1(2,0)$ and $F_2(-2,0)$ and latus rectum is 6. Express the ellipse in the standard form.

Q6 (a) Find the center, foci, and the eccentricity of the hyperbola $11x^2 - 25y^2 - 44x + 50y - 256 = 0$

(b) Find the equation of the hyperbola whose latus rectum is 8 and eccentricity is $\frac{3}{\sqrt{5}}$

COURSE CODE: GST 141
COURSE TITLE: USE OF ENGLISH 1

TIME ALLOWED: 2 HOURS

ANSWER ALL QUESTIONS.

SECTION A

Instruction: Of the statements below, indicate which is TRUE and which is FALSE.
(Each question carries 1 mark).

1. Language is a vehicle of communication and it is culturally transmitted.
2. All clauses contain a subject and a predicate.
3. Speaking and listening are receptive communication skills.
4. Brackets and parentheses can be used interchangeably.
5. The semi colon (;) can sometimes perform same function as "and".
6. Bound morphemes are capable of independent existence.
7. The free morpheme is equivalent to a complex word.
8. Interrogatives are same as imperatives.
9. Compound sentences are formed by joining two or more free morphemes.
10. It is possible for a word to contain more than one morpheme.

SECTION B

Instruction: Fill in the blank spaces.
(Each question carries 2 marks).

11. type of affix occurs before the word to which it is attached and type occurs after it.
12. The type of noun that is used to name persons, geographical locations, calendar items, etc., is called, while the type that is not tangible is called
13. The type of word that is formed by combining one free morpheme and one or more bound morphemes is called and the word formed by combining two or more free morphemes is called
14. type of clause is same as a simple sentence and type is incapable of occurring alone.
15. "Each other" and "One another" are pronouns, while "everybody" and "nobody" are pronouns
16. "I", "We", "He/She" and "They" are pronouns with case.
17. pronouns are used to ask questions and pronouns refer back to themselves.
18. According to structure, verbs are categorised into and
19. Verbs that take objects are called verbs, while those that do not take objects are called verbs.
20. Auxiliary verbs are divided into and

SECTION C

Instruction: Underline the affixes or bound morphemes in the words below.
(Each question carries 1 marks).

21. Bewitch
22. Defrost
23. Frequently
24. Goes
25. Government
26. Oxen
27. Gluten
28. John's
29. Faithful
30. Afloat

SECTION D

Instruction: In line with the functions the words in **bold face** perform in the constructions below, identify the PART OF SPEECH to which they belong.
(Each question carries 1 marks).

31. Teachers **shoulder** a lot of responsibilities.
32. The **broken** bottle on the floor
33. The **boy** scouts are on parade.
34. Michael is **incredibly** generous.
35. The **fleeing** thieves are being **chased** by the police.
36. I love **cooking**.
37. **The** man is my father's friend.
38. **What** is your name?
39. The little girl is **afraid**.
40. **Both** the chairman **and** the board have been sacked.

SECTION E

Instruction: Identify the TYPES OF PHRASES AND CLAUSES the words in **bold face** are.
(Each question carries 2 marks).

41. **The tall dark beautiful girl with long hair in the kitchen** is Jennifer's friend.
42. The book **on the desk** is Michael's.
43. The footwear is **mine**.
44. John spends his money **however he likes**.
45. The teacher is counselling the student **whose bag was stolen**.
46. John **ate**.
47. He responded to the children **quite harshly**.
48. **John** is not being sincere.
49. The men **are outside**.
50. **The man that bought the car** is my dad's colleague.

Noun
Pronoun
Verb
Adverb
Adjective
Conjunction
Interjection
Preposition