

PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
ARUSHA REGIONAL
FORM FOUR MOCK EXAMINATION

PHYSICS 1

CODE: 031/1
TIME: 3 HOURS

MAY, 2025

INSTRUCTIONS:

- i) This paper consists of sections A, B and C with the total of Eleven (11) questions
- ii) Answer all questions in section A and B and only TWO (02) questions in section C
- iii) Non-programmable calculator may be used
- iv) Cellular phones and any un-authorised materials are not allowed in the examination room
- v) Write your examination number on every page of your answer sheet(s) provided
- vi) All writing must be in blue or black ink EXCEPT drawings which must be in pencil
- vii) Where necessary the following constant may be used: -
 - Acceleration due to gravity $g = 10 \text{ m/s}^2$*
 - Density of water $\rho = 1000 \text{ kg/m}^3$ or 1.0 g/cm^3*
 - Pie (π) = 3.14*
 - Density of air = 1.29 kg/m^3*
 - Electronic charge ' e ' = $1.6 \times 10^{-19} \text{ C}$*

SECTION A: (16 Marks)
Answer ALL questions

1. For each of the item (i) to (x) choose the correct answer from the given alternatives and write its letter beside the item number in the answer sheet provided.

- i) The following are the laboratory safety precautions Except: -
 - A. Laboratory should have doors and windows which open outwards
 - B. Laboratory floor should not be polished to avoid slippery
 - C. Fire extinguisher should be fitted in accessible position with instructions
 - D. Laboratory should be well ventilated
 - E. Do not enter in laboratory without permission
- ii) Which of the following equilibrium conditions apply to walking
 - A. Stable equilibrium
 - B. Unstable equilibrium
 - C. Neutral equilibrium
 - D. Stable and unstable equilibrium
 - E. Unstable and neutral equilibrium

- iii) When a force of 400N is applied to 200kg mass while there is nothing resting the motion on a horizontal surface the acceleration produced is: -
 A. $0.2 \times 10 \text{ m/s}^3$ B. $2 \times 10 \text{ m/s}^2$ C. $8 \times 10 \text{ m/s}^2$
 D. $2 \times 10^3 \text{ m/s}^2$ E. $0.2 \times 10^2 \text{ m/s}^2$
- iv) When stretched beyond its elastic, a metal wire such as steel becomes,
 A. Colder B. Plastic C. Elastic D. Obeys Hook's E. No energy
- v) A large lorry was moving at 72km/h when brakes were applied and it come to rest in 5 seconds. Its acceleration was: -
 A. -20 m/s^2 B. -13.6 m/s^2 C. 4 m/s^2
 D. -360 m/s^2 E. 20 km/h^2
- vi) In loading a lorry, a man lifts boxes each weighs 100N through a height of 1.5m. If he lifts 4 boxes per minute, the average power the man is working is:-
 A. 2250N B. 100N C. 10N D. 10W E. 600W
- vii) When cathode rays are stopped by a hard target, some energy are given, some energy are absorbed and changed to: -
 A. Sound B. Electrical C. Potential D. Eddy current E. Heat
- viii) During a hot day, there is a pool of water appearing on the road some distance ahead, when you come closer it disappears, this is called
 A. Shadow B. Penumbra C. Eclipse
 D. Dispersion of light E. Mirage
- ix) A falling object is pulled down by the Earth, and the Earth is pulled up towards the object. The Earth does not move because: -
 A. Earth has only gravity B. The Earth is very big
 C. Air resistance gets in the way
 D. The earth is fixed in the solar system
 E. The Earth has very large mass and small acceleration.
- x) If three spherical balls of the same size but first one made of wood, second one made of plastic and third one made of metal are released in air at the same height from the floor, which one will hit the floor first when they are dropped at once?
 A. Metal first, then wood and then plastic last
 B. Wood first, then plastic and then metal last
 C. It is very hard to tell
 D. They will hit the floor at the same time
 E. Plastic first, then wood and then metal last.

2. Match the descriptions of the terms in list A with its corresponding concept in list B by writing the letter of the correct response besides the corresponding item number in the answer booklet provided.

LIST A	LIST B
(i) The region around a magnet in which magnetic materials are attracted	A. Neural point
(ii) Materials that can redirect field line of force	B. Paramagnetic
(iii) Materials that can strongly be magnetized	C. Magnetization
(iv) The process of aligning the domains of atoms in one direction	D. Induced magnetism
(v) Group of magnetic dipoles arranged themselves in a magnetized object	E. Magnetic field
(vi) The process of destroying the alignment in a magnetized material	F. Demagnetization
	G. Permeable
	H. Magnetic domains
	I. Nickel and copper
	J. Ferromagnetic

SECTION B: (54 Marks)

Answer ALL questions in this section

3. a) With the aid of diagram (well labelled) Explain what is meant by the following terms
 - i) Angle of deviation (2 marks)
 - ii) Critical angle (2 marks)
- b) A thin convex lens has focal length 60cm. If an object 30cm high is placed 90cm from the lens on the left, draw a ray diagram to show the image formation of the object and use it to calculate: -
 - i) The distance of the image from the lens (3½ Marks)
 - ii) The size of the image (1½ marks)
4. a) An object which is moving over a horizontal surface does not continue with constant velocity when the accelerating force is removed. Instead, it slows down and eventually stops. Explain what causes the decelerations? (3 marks)
- b) A trolley of mass 5.0kg rests on a horizontal surface.
 - i) Draw a labelled sketch diagram to show the forces associated with the trolley and state the Newton's law related to the forces. (3 marks)
 - ii) When a boy pulls the trolley with a horizontal force of 24N, the trolley accelerates at 3m/s². Find the frictional force acting on the trolley. (3marks)
5. a) i) Why does a cricket batsman, a tennis player or a golf player follow through? (01 marks)
- ii) A rocket expels gas at a rate of 0.5kg/s. If the force produced by the rocket is 100N, what is the velocity with which the gas is expelled? (03 marks)

b) An athlete in a race exerts a force of 80N for a distance of 100m while he uses up 40000J of food energy.

i) Find his efficiency (04 marks)

ii) Defend your result in 5 b (i) above (01 marks)

6. a) i) Briefly explain why aeroplanes are often pressurised inside their cabin? (02 marks)

ii) Why is it difficult to steep a bicycle by gripping the centre of the handle bars? (02 marks)

b) Two forces of magnitude 15N one acting upwards and one acting downwards are needed to turn a car's steering wheel. If the radius of the steering wheel is 0.2m, find the torque which must be applied to turn the car's direction. (5 marks)

7. a) A student suggests that the radioactive source should be stored in freezer at -25°C . The student thinks that this would reduce the radiation emitted from the source.

i) Is the student right or wrong? (01 marks)

ii) Explain your answer above. (03 marks)

b) The count rate recorded by Geiger-Muller tube and counter close to an alpha particle source is 400 per minutes after allowing for the back ground count. If the half-life of the source is 4 days, what will be the count rate 12 days later? (05 marks).

8. a) i) Explain why one can jump higher on the surface of the moon than on the Earth. (02 marks)

ii) A piece of geological mineral whose dimensions are $2\text{m} \times 8\text{m} \times 4\text{m}$ found on the moon weighs 36N. Determine its weight and density when brought to the Earth. Given that acceleration due to gravity of the moon is $\frac{1}{6}$ of the Earth (04 marks)

b) Explain the significance of ozone layer on the Earth's atmosphere and its role in protecting life on Earth (03 marks)

SECTION C (30 Marks)

Answer only two (02) questions in this section

9. a) i) State three ways by which the capacitance of a capacitor may be increased. (03 marks)
- ii) What is the capacitance of a conductor if it has a potential of 250V and carries a charge of $2.5 \times 10^{-5} \text{C}$? (03 marks)
- b) You are provided with a bundle of a resistance wire labelled 0.30mm diameter and resistivity of $4.9 \times 10^{-7} \Omega \text{m}$. How will you design a resistance of 2Ω using this wire? (05 marks)
- c) An electrical appliance is labelled 240V, 60w
- i) What do the prints means? (01 marks)
- ii) What is the value of its resistance (03 marks)
10. a) In a cathode ray tube, why is the:
- i) Filament made of tungsten? (02 marks)
- ii) Cathode plate coated with oxide of barium and strontium? (02 marks)
- iii) Thick glass screen coated with Barium platinocyanide? (02 marks)
- iv) The anode is kept at positive potential with respect to cathode? (02 marks)
- v) A grid is kept at negative potential between the cathode and anode (02 marks)
- b) If the current gain (β) of the amplifier is 100, calculate the collector current given that the base current I_B is $20\mu\text{A}$ (05 marks)
11. a) Explain why it is not advisable for soldiers to march across a bridge in rhythm (03 marks)
- b) A student standing between two vertical walls and 450m from the nearest wall. Shouts. She hears the first echo after 3 seconds later. Use this information to calculate: -
- i) Velocity of sound in air (03 marks)
- ii) Distance between the two walls (04 marks)
- c) A 240V step down main transformer is used for lighting 12V, 24W ray box lamps. Which draws a current of 1.0A in primary coil. Calculate the efficiency of the transformer. (05 marks)