



TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION
PHYSICS 2

(For Both School and Private Candidates)

131/2

TIME: 3 Hours

Thursday, 5th March 2026 p.m.

Instructions

1. This paper consists of **six (6)** questions.
2. Answer **five (5)** questions.
3. Each question carries **twenty (20)** marks.
4. Mathematical tables and non-programmable calculators may be used.
5. Communication devices and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. The following information may be useful:
 - (a) Acceleration due to gravity $g = 9.8 \text{ m/s}^2$
 - (b) Density of water $= 10^3 \text{ kgm}^{-3}$
 - (c) Permeability of free space $\mu_0 = 4\pi \times 10^{-7} \text{ Hm}^{-1}$
 - (d) Permittivity of free space $\epsilon_0 = 8.854 \times 10^{-12} \text{ Fm}^{-1}$
 - (e) $K = \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$
 - (f) Mass of an electron $m_e = 9.1 \times 10^{-31} \text{ kg}$
 - (g) Mass of proton $m_p = 1.7 \times 10^{-27} \text{ kg}$
 - (h) Mass of neutron $m_n = 1.675 \times 10^{-27} \text{ kg}$
 - (i) $1 \text{ a.m.u} = 931 \text{ MeV}$
 - (j) Speed of light in air $c = 3 \times 10^8 \text{ m/s}$
 - (k) Planck's constant, $h = 6.63 \times 10^{-34} \text{ Js}$
 - (l) Molar gas constant, $R = 8.31 \text{ J/mol K}$
 - (m) Boltzmann constant, $K = 1.38 \times 10^{-23} \text{ J/K}$
 - (n) Avogadro's constant, $N_A = 6.022 \times 10^{23}$
 - (o) Coefficient of surface tension of soap $= 0.08 \text{ Nm}^{-1}$
 - (p) $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$
 - (q) Electron charge $(e) = 1.6 \times 10^{-19} \text{ C}$
 - (r) Rydberg constant, $R_H = 1.1 \times 10^7 \text{ m}^{-1}$.

1.
 - (a)
 - (i) State Bernoulli's theorem for horizontal flow. **(01 mark)**
 - (ii) According to Bernoulli's theorem, the pressure of water should remain uniform in a pipe of uniform cross-section. But actually it goes on decreasing, why? **(02 marks)**
 - (iii) A pipe is running full of water. At a certain point A, it tapers from 30cm diameter to 10cm diameter at B. The pressure difference between point A and B is 100cm of water column. Find the rate of flow of water through the pipe. **(05 marks)**
 - (b)
 - (i) Derive an expression for terminal velocity of a spherical body falling from rest through a viscous fluid. **(04 marks)**
 - (ii) Sketch the graph of velocity against time for the motion of ball falling through a viscous fluid. **(02 marks)**
 - (c)
 - (i) Use Poiseuille's formula to find the dimensions of coefficient of viscosity. **(02 marks)**
 - (ii) Two capillaries of the same length and radii in the ratio 1:2 are connected in series and the liquid flow through the system under streamline conditions. If the pressure across the two extreme ends of the combination is 1m of water, what is the pressure difference across the second capillary? **(04 marks)**
2.
 - (a) What do you understand by the terms
 - (i) Progressive waves **(01 mark)**
 - (ii) Refraction of waves **(01 mark)**
 - (iii) Diffraction of waves **(01 mark)**
 - (iv) Standing waves **(01 mark)**
 - (b) Two progressive waves travelling in the opposite direction in a medium are represented by;

$$y_1 = 5 \sin\left(\omega t + \frac{\pi}{3}\right) \text{ and } y_2 = 5 \sin\left(\omega t - \frac{\pi}{3}\right)$$

If the two progressive waves form a standing wave, determine the resultant amplitude and phase angle formed. **(04 marks)**
 - (c) The shortest length of the resonance tube closed at one end which resound to fork of frequency 256Hz is 31.6cm. The corresponding length for a fork of frequency 384Hz is 20.5cm. Determine the end correction of the tube and the velocity of sound in air. **(05 marks)**

- (d) (i) Explain two cases in which there is no Doppler effect of sound. **(02 marks)**
- (ii) A viewing screen is separated from a double-slit source by 1.2m. The distance between two slits is 0.03mm. The second order bright fringe ($m=2$) is 4.2cm from the center line. Determine the wavelength of light and distance between two successive bright fringes. **(05 marks)**
3. (a) (i) What do you understand by the term ultimate strength of a material? **(01 mark)**
- (ii) Young's modulus of elasticity and modulus of rigidity do not exist for liquid and gases, why? **(02 marks)**
- (iii) A stone of 0.5kg mass is attached to one end of a 0.8m long aluminium wire of 0.7mm diameter and suspended vertically. The stone is now rotated in horizontal plane at a rate such that the wire makes an angle 85° with the vertical. Find the increase in length of a wire. **(04 marks)**
- (b) (i) What shape does a liquid take when it weighs nothing? **(01mark)**
- (ii) Suppose a soap bubble of radius $2.4 \times 10^{-4}\text{m}$ in an air cylinder is originally at a pressure of 10^5Pa . The air in the cylinder is now compressed isothermally until the radius of the bubble is halved. Calculate now the new pressure of air in the cylinder. **(05 marks)**
- (c) (i) All molecular motions ceases at 0K. Explain. **(02 marks)**
- (ii) A small dust particle suspended in a gas is struck successively by five gas molecules whose speeds are 300m/s, 500m/s, 400m/s, 600m/s and 200m/s. Calculate the root mean square speed of these five molecules. **(03 marks)**
- (iii) Two moles of argon have a mass of 0.036kg. Calculate the average internal energy of gas atoms at 240K. **(02 marks)**
4. (a) (i) Most vehicles carrying inflammable materials here in Tanzania have long chains hanging down and which drag on the ground. Explain. **(02 marks)**
- (ii) What are the properties of equal potential surface? **(02 marks)**
- (iii) Point charges having values $+5\mu\text{C}$, $+10\mu\text{C}$ and $-10\mu\text{C}$ are placed in air at the corners A, B and C of an equilateral triangle ABC having each side 5cm. Find the resultant force on the charge at A. **(05 marks)**
- (b) (i) It is dangerous to touch the terminals of a high voltage capacitor even after the charging circuit is turned off. Justify this statement. **(02 marks)**

- (ii) The plates of a parallel plate capacitor has an area of 90cm^2 each and are separated by 2.5mm . The capacitor is charged by connecting it to a 400V supply. How much electrostatic energy is stored by the capacitor and its energy density? **(05 marks)**
- (c) A high voltage d.c power supply line falls on a car. So the entire metal body of the car is at a potential of 10V with respect to the ground. Explain what happens to the passengers;
- (i) When they are sitting in the car **(02 marks)**
- (ii) When they step out of the car **(02 marks)**
5. (a) (i) Imagine that the room in which you are seated is filled with a uniform magnetic field pointing vertically downward. At the center of the room, an electron is released with a certain speed in horizontal direction. Describe the motion and path of the electron in the field. **(02 marks)**
- (ii) A current carrying solenoid tends to contract. Why? **(02 marks)**
- (iii) A galvanometer is a common used device in physics laboratory in current electricity experiments. As a form six student list three ways through which the current sensitivity of the device can be increased. **(03 marks)**
- (b) (i) State the Biot – savart law and use it to derive an expression for magnetic field at the center of a current carrying coil. **(04 marks)**
- (ii) Consider a coil of 400 turns of cross sectional area 30cm^2 connected in a circuit of resistance 200Ω . What will be the maximum charge induced in the coil when it is inserted in a magnetic field of flux density $2.5 \times 10^{-3}\text{T}$ to produce a maximum change of flux? **(03 marks)**
- (c) (i) Diamagnetism is a property of all materials. Discuss. **(02 marks)**
- (ii) By using a labeled diagram of Hysteresis loop. Summarize the two main difference of loop generated by steel and the one generated by soft iron. **(04 marks)**
6. (a) (i) What are the two main differences between Rutherford's and Bohr's model of an atom? **(02 marks)**
- (ii) Calculate the de Broglie wavelength of an electron and proton moving at 10^5m/s . **(04 marks)**
- (b) Hydrogen atom in its ground state is excited by means of monochromatic radiation of wavelength $975\text{\AA}$. How many different lines are possible in the resulting spectrum? Calculate the longest wavelength amongst them. The ionization energy of hydrogen atom is 13.6eV . **(05 marks)**

- (c) (i) Why is neutron most effective as a bullet in nuclear fission? **(01 mark)**
- (ii) State the significance of binding energy per nucleon as applied in atomic physics. **(02 mark)**
- (iii) Calculate the binding energy per nucleon if atomic mass of O_8^{16} is 16.0000 a.m.u. Given that mass of proton = 1.007593 a.m.u and mass of neutron = 1.008982 a.m.u. **(03 marks)**
- (d) There is a stream of neutrons with a kinetic energy of 0.0327 eV. If the half-life of neutrons is 700 seconds, what fraction neutrons will decay before they travel a distance of 10m? **(03 marks)**

Wabillah Tawfiq