THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATIONS

131/1 **PHYSICS 1**

(For Both School and Private Candidates)

Time: 3 Hours **Year: 2023**

Instructions

1. This paper consists of sections A and B with a total of **ten (10)** questions.
2. Answer **all** questions in section A and choose **two (2)** questions from section B.
3. Marks for each question or part thereof are indicated.
4. Mathematical tables and non-programmable calculators may be used.
5. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil.
6. Cellular phones and any other unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. The following information may be useful:
   (a) Acceleration due to gravity, $g = 9.8\ m/s^2$
   (b) The ratio of specific heat capacity, $\gamma = 1.4$
   (c) 1 g of water = $1\ cm^3$
   (d) Latent heat of vaporization of water = $2256\ Jg^{-1}$
   (e) Density of water = $10^3\ kg/m^3$
   (f) Pie, $\pi = 3.14$.

SECTION A (70 Marks)

Answer **all** questions from this section.

1. (a) (i) How is the term dimension differ from dimensional formula? **(02 marks)**

(ii) Apply the method of dimension to deduce the value of x in the expression $F = kA\rho V^x$, where F, V, A, ρ and k are the force acting on the body, speed, surface area, density and dimensionless constant respectively.

(04 marks)

(b) The pressure P can be calculated from the relation $P = \frac{F}{\pi R^2}$, where F is the force and R the radius. If the percentage errors of F and R are ± 2 and ± 1 respectively, determine the possible percentage error of P. **(04 marks)**

2. (a) How is the horizontal range of a projectile affected when its initial velocity is doubled for a given angle of projection, θ ? **(04 marks)**

(b) An aircraft travelling at 150 km/hr dropped a luggage of food to flood victims isolated on a patch of land 250 m below. Determine:

(i) The time on which the luggage should be dropped before the aircraft is directed overhead. **(03 marks)**

(ii) The speed of luggage as it reaches the ground. **(03 marks)**

3. (a) A car is moving with a speed of 40 m/s around unbanked curve of radius 500 m. Determine the least coefficient of friction which allows the car to negotiate the curve without sliding. **(03 marks)**

(b) A stone of mass 1 kg attached to a string of length 1 m is whirled in a horizontal circle of radius 0.6 m at a constant speed. Calculate;

(i) The tension in the string. **(04 marks)**

(ii) The maximum number of revolutions per second it can make. **(03 marks)**

4. (a) (i) Give two daily life examples on which Newton's first law of motion applies. **(02 marks)**

(ii) Sand drops vertically at the rate of 100 g/s on a horizontal conveyor belt moving at a steady velocity of 5 cm/s. Find the force required to keep the belt moving. **(03 marks)**

(b) Figure 1 shows the system of forces being at equilibrium.

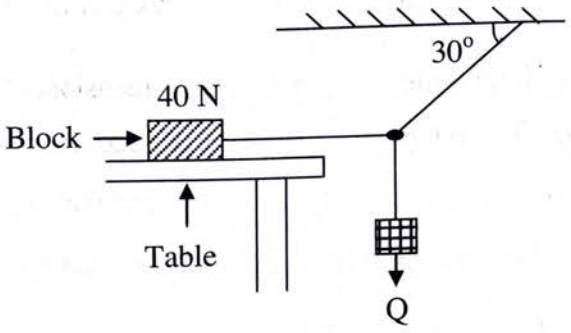

Figure 1

Determine the maximum value of the force Q if the friction force on the block cannot exceed 12 N. **(05 marks)**

5. (a) A motor car tyre has a pressure of 4 atmospheres at a room temperature of 27 °C. If the tyre suddenly burst, calculate the temperature of the escaping air. **(03 marks)**

(b) (i) Distinguish between triple point of water and thermometric property as used in heat. **(03 marks)**

(ii) The resistance R_θ of a particular resistance thermometer at a Celsius temperature θ as measured by a constant volume gas thermometer is given as $R_\theta = 2.50\times10^{-4}\theta^2 + 0.1850\theta + 40.0$. Calculate the temperature as measured on the scale of the resistance thermometer which corresponds to a temperature of 70 °C on the gas thermometer. **(04 marks)**

6. (a) (i) What is meant by reversible process as applied in thermodynamics? **(01 mark)**

(ii) Distinguish isobaric process from isochoric process. **(03 marks)**

(b) If 1 g of water is subjected at a pressure of 1.013×10^5 Pa it becomes 1671 cm^3 of steam. Calculate;

(i) The external work done. **(03 marks)**

(ii) The increase in internal energy of the system. **(03 marks)**

7. (a) Analyse three possible solutions to the side effects of global warming. **(03 marks)**

(b) (i) Briefly explain four major causes of water pollution. **(04 marks)**

(ii) What are the three disadvantages of using solar energy? **(03 marks)**

SECTION B (30 Marks)

Answer **two (2)** questions from this section.

8. (a) (i) Identify two conservation laws embodied in Kirchhoff's rules stating its physical significance. **(02 marks)**

(ii) Why is it safe for a bird to stand on a high voltage wire without being harmed? **(02 marks)**

(b) Study the circuit diagram in Figure 2 and apply Kirchhoff's rules to find the values of the currents I_1, I_2 and I_3. **(04 marks)**

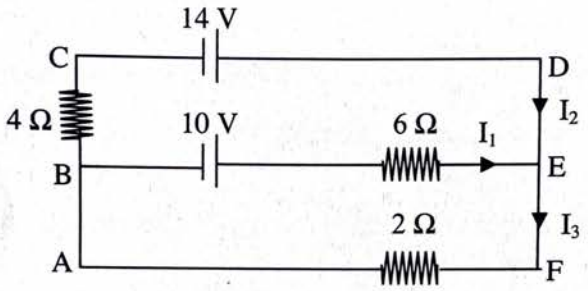

Figure 2

(c) (i) A capacitor of $1\,\mu F$ is used in a television circuit where the frequency and the current flowing are 1000 Hz and 2 mA (r.m.s) respectively. Compute the voltage across the capacitor. **(03 marks)**

(ii) Determine the current flowing when an a.c voltage of 20 V (r.m.s) and frequency of 50 Hz is connected to a capacitor in 8 (c) (i). **(04 marks)**

9. (a) (i) Comment on the argument that electrical conductivity of a semiconductor depends on temperature variation. **(02 marks)**

(ii) Draw a circuit diagram showing a reverse biased diode. **(02 marks)**

(iii) Why there is a very little current flow in the circuit drawn in (a) (ii)? **(01 mark)**

(b) (i) Study the circuit diagram in Figure 3 then find the gain of the amplifier. **(03 marks)**

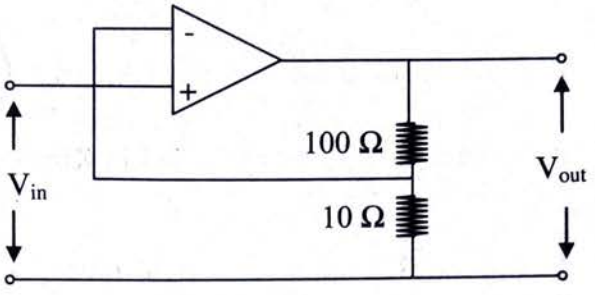

Figure 3

(ii) Generate the truth table for the logic gates in Figure 4. **(03 marks)**

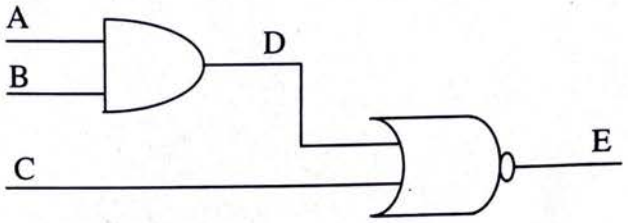

Figure 4

(c) (i) What is meant by a voltage follower? Give one importance. **(02 marks)**

(ii) Draw a diagram to show an Op-Amp as a voltage follower. **(02 marks)**

10. (a) (i) Sketch the circuit symbol for NPN transistor showing the direction of a convectional current. **(02 marks)**

(ii) Under what condition does a semiconductor diode behave as an open switch? **(02 marks)**

(b) (i) Why insulators do not conduct electricity under ordinary condition? Explain in terms of energy band theory. **(03 marks)**

(ii) A common emitter amplifier has an input resistance of 0.5 Ω and output resistance of 45 Ω. If the current gain, $\beta = 65$; find the voltage gain. **(03 marks)**

(c) (i) What is the purpose of the barrier potential difference in a P-N Junction? **(02 marks)**

(ii) Identify two advantages of a junction diode and sketch its characteristic curve which shows how it can act as a rectifier. **(03 marks)**

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131/2 **PHYSICS 2**

(For Both School and Private Candidates)

Time: 3 Hours **Year: 2023**

Instructions

1. This paper consists of a total 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. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil.
6. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. The following information may be useful:
   (a) Acceleration due to gravity g = 9.8 m/s^2
   (b) Pie $\pi = 3.14$
   (c) Density of air $\rho_a = 1.29$ kg/m^3
   (d) Density of steel $\rho_s = 7800$ kg/m^3
   (e) Density of mercury $\rho_m = 13.6 \times 10^3$ kg/m^3
   (f) Density of water $\rho_w = 10^3$ kg/m^3
   (g) Density of oil $\rho_o = 900$ kg/m^3
   (h) Speed of sound, c = 340 m/s.
   (i) Permitivity of free space, $\varepsilon_o = 8.854 \times 10^{12}$ $Nm^{-2}kg^{-2}$.
   (j) Coefficient of viscosity of air = 1.8×10^{-5} Nsm^{-2}.
   (k) Pressure of air = 1.013×10^5 Pa.
   (l) Surface tension of water = 0.072 N/m
   (m) Permiability of free space, $\mu_0 = 4\pi \times 10^{-7}$ H/m
   (n) Plank's constant, h = 6.63×10^{-34} Js
   (o) Reydberg's constant = 1.1×10^7 m^{-1}
   (p) 1 a.m.u = 931 MeV.
   (q) Young's modulus of rubber, E = 6×10^8 N/m^2

1. (a) (i) What is meant by laminar flow as used in Fluid Dynamics? **(01 mark)**

(ii) State continuity equation for the incompressible fluid flowing through the pipe. **(01 mark)**

(iii) Identify two assumptions made to develop an equation in 1 (a) (ii). **(02 marks)**

(b) If 0.56 seconds was taken by a steel ball bearing a diameter of 8.0 mm to fall through oil at steady speed over a vertical distance of 0.2 m, determine:

(i) The weight of the ball. **(03 marks)**

(ii) The up thrust on the ball. **(03 marks)**

(iii) The viscosity of the oil. **(04 marks)**

(c) A large tank contains water to a depth of 1 m. If water emerges from the small hole in the side of the tank 20 cm below the level of the surface, calculate;

(i) The speed at which water emerges from the hole. **(03 marks)**

(ii) The distance from the base of the tank at which water strike the flow on which the tank is standing. **(03 marks)**

2. (a) (i) How does stationary wave differ from progressive wave? Give two points. **(02 marks)**

(ii) State the principle of superposition as applied in wave motion. **(02 marks)**

(iii) A plane progressive wave is represented by the equation; $y = 0.4\sin\left(200\pi t - \frac{20}{17}\pi x\right)$, where y is in metre and t in seconds. Determine the phase difference in radians between a point 0.25 m from the fixed point and a point 1.1 m from the same fixed point. **(04 marks)**

(b) (i) Why changes in pressure do not affect the velocity of sound? **(02 marks)**

(ii) At what temperature will the velocity of sound in air be twice than the velocity in air at $0\ ^0C$? **(03 marks)**

(c) (i) Why does an empty vessel produces more sound than a filled one? **(02 marks)**

(ii) A closed organ pipe is of length 0.68 m. Compute the wavelengths and frequencies of the three lowest frequency modes of vibrations. **(05 marks)**

3. (a) (i) What is meant by the terms modulus of elasticity and modulus of rigidity as used in properties of matter? **(02 marks)**

(ii) An aluminium cube of dimensions $4\,cm \times 4\,cm \times 4\,cm$ is subjected to a tangential force. If its top face is sheared by a length of 0.012 cm with respect to the bottom; calculate the shearing strain and shearing stress given that the modulus of rigidity of aluminium is $2.08 \times 10^{10}\,N/m^2$. **(04 marks)**

(b) A rubber cord of a catapult having a cross-sectional area of 2 mm^2 and initial length of 0.2 m is stretched to 0.24 m in order to fire a small object of mass 10 g. Compute:

(i) The energy stored in the rubber. **(03 marks)**

(ii) The initial velocity of the object as it just leaves the catapult. **(03 marks)**

(c) (i) Briefly explain the classification of materials based on their elastic properties. **(06 marks)**

(ii) Why do spring balances show wrong readings after they have been used for a long time? **(02 marks)**

4. (a) (i) Distinguish between electric dipole and dipole field. **(02 marks)**

(ii) An electric dipole consists of two charges of $+20\ \mu C$ and $-20\ \mu C$ separated by a small distance of '$2a$' in free space. Calculate the electric field intensity at a point on the axial line of the dipole at a distance of 10 cm from the centre of the dipole. **(04 marks)**

(b) (i) Figure 1 shows two points A and B lying between electric lines of force emerging from a charged body.

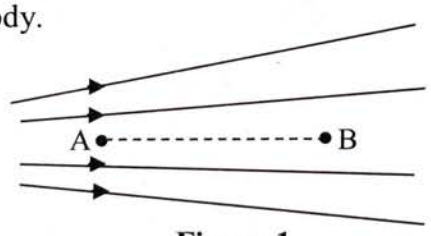

Figure 1

At which point should an electric field intensity expected to be high? Give reason for your answer. **(03 marks)**

(ii) A charged plastic ball of mass 8.4×10^{-16} kg is found to remain suspended in a uniform electric field of 2.6×10^{4} V/m. Find the charge on the ball. **(04 marks)**

(c) (i) What is meant by the term electric potential? **(02 marks)**

(ii) Calculate the electric potential at the surface of a silver nucleus of radius 3.4×10^{-14}m given that the atomic number of silver and charge 'e' on proton are 47 and 1.6×10^{-16}C respectively. **(05 marks)**

5. (a) (i) Briefly explain the production of magnetic field in a moving coil galvanometer. **(02 marks)**

(ii) How does a wire carrying current differ from another wire carrying no current? **(02 marks)**

(b) (i) What are the four factors which affect the magnitude of force exerted by magnetic field on the charge? **(04 marks)**

(ii) With the aid of a well labeled diagram, describe the principle, construction and mode of action of a moving coil galvanometer. **(06 marks)**

(c) (i) Why does a current carrying conductor experience a force in a magnetic field? **(02 marks)**

(ii) Calculate the strength of magnetic field produced if a force of 1.09×10^{-11} N is acting on a proton which enters a magnetic field with a speed of 3.4×10^{7} m/s in a direction perpendicular to the field. **(04 marks)**

6. (a) (i) Explain how stability of an atom is related to its binding energy. **(02 marks)**

(ii) A nuclear reaction is given by the equation, ${}^{7}_{3}\text{Li}+{}^{1}_{1}\text{H}\rightarrow 2{}^{4}_{2}\text{He}+17.3\,\text{MeV}$. Find the mass of ${}^{4}_{2}\text{He}$ in a.m.u given that the mass of ${}^{7}_{2}\text{Li}$ and ${}^{1}_{1}\text{H}$ are 7.0186 a.m.u and 1.00813 a.m.u respectively. **(05 marks)**

(b) (i) Why neutron is a most effective bombarding particle in nuclear reactions? **(02 marks)**

(ii) The half life of a radioactive substance is 30 days. Determine the time taken for $\frac{3}{4}$ of its original mass to disintegrate. **(04 marks)**

(c) In an experiment to account for the photoelectric effect phenomenon students noted some electrons in hydrogen – like atoms (Z = 3) making transition from fifth to fourth orbit and from fourth to third orbit such that the resulting radiations were incident normally on a metal plate ejecting photoelectrons. If the stopping potential for the photoelectrons ejected by shorter wavelength is 3.96 V; determine:

(i) The work function of the metal. **(04 marks)**

(ii) The stopping potential for the photoelectrons ejected by longer wavelength. **(03 marks)**

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ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

131/3A

PHYSICS 3A
(PRACTICAL A)

(For Both School and Private Candidates)

Time: 3:20 Hours **Year: 2023**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question **one (1)** carries **20** marks and the other **two (2)** carry **15** marks each.
4. Mathematical tables and non-programmable calculators may be used.
5. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil.
6. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).

The following information may be useful:

Specific heat capacity of water $C_w = 4.2$ J/gK.

Pie, $\pi = 3.14$.

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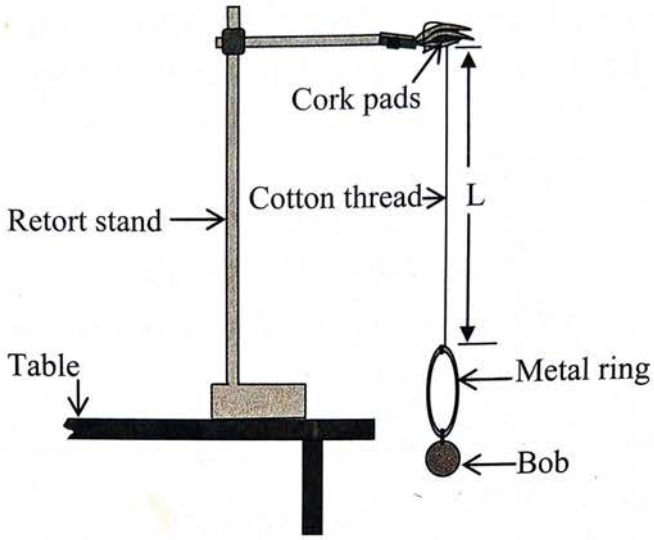
1. You are required to perform an experiment according to the following instructions:

(a) Tie up the given metal ring and suspend it from the retort stand, then tie a pendulum bob at the lower position of the ring as shown in the following Figure:



(b) Starting with length L = 30 cm, displace the bob slightly sideway and then release it in such a way that it oscillates in a horizontal plane. Determine the time, t for 20 complete oscillations and the periodic time, T.

(c) Repeat the procedures in 1 (a) and (b) for L = 40 cm, 50 cm, 60 cm and 70 cm in each experiment and record the value of t and T.

Questions

(i) Tabulate the results of L, t, T and T^2.

(ii) Plot a graph of L (cm) against T^2 (s^2).

(iii) From the graph, read and record the value of L at $T^2 = 0$.

(iv) What is the significance of the value obtained in 1 (iii)?

(v) What is the aim of doing this experiment?

2. You are provided with a beam balance, thermometer, calorimeter with its lid and stirrer and hot liquid labelled **B**.

Proceed as follows:

(a) Weigh an empty calorimeter with its lid and stirrer and record its mass as M_1.

(b) Fill the calorimeter to about two-thirds full with a liquid **B** that has been heated to a temperature of about 85°C.

(c) While stirring, insert the thermometer and start the stopwatch. Read and record the temperature after every 2 minutes interval as liquid cools under forced condition to a temperature of about 55°C.

(d) After cooling the liquid **B** to about 55°C, remove the thermometer and weigh the calorimeter with its content and record its mass as M.

(e) Find the mass of liquid **B** and record it as M_2.

Questions

(i) Tabulate the results of time (seconds) and the temperature (°C).

(ii) Plot a cooling curve for liquid **B**.

(iii) Draw the tangent at the temperature of 70 °C and obtain the rate of cooling of the liquid **B**.

(iv) Use the equation $(M_2C_B + 400M_1)\frac{d\theta}{dt} = 10.096\ Js^{-1}$ and the value obtained in 2 (iii) to calculate the specific heat capacity of liquid **B** (C_B).

3. You are provided with a battery **E**, a key **K**, ammeter **A**, voltmeter **V**, resistance box **S**, unknown resistor **R** and pieces of connecting wires.

Proceed as follows:

(a) Connect the given components in series except the voltmeter which should be connected in parallel with the unknown resistor.

(b) Set the resistance of 10 Ω in a resistance box. Close the key and record the readings of the ammeter and voltmeter.

(c) Repeat the procedures in 3 (b) each time by setting the resistance to 15 Ω, 20 Ω, 25 Ω and 30 Ω.

Questions

(i) Draw a circuit diagram for the connection.

(ii) Tabulate the results obtained in 3 (b) and (c).

(iii) Plot a graph of voltage (V) against current (I).

(iv) Compute the value of unknown resistance.

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EXAMINATION

131/3B **PHYSICS 3B**

(ACTUAL PRACTICAL B)

(For Both School and Private candidates)

Time: 3:20 Hours **Year: 2023**

Instructions

1. This paper consists of **three (3)** questions**.**
2. Answer **all** questions.
3. Question **one (1)** carries **20** marks, and the other **two(2)** carry **15** marks each.
4. Mathematical tables and non-programmable calculators may be used.
5. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil
6. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet (s).

The folowing information may be useful:

Specific heat capacity of Water $C_w = 4.2J/gK$

Pie, $\pi = 3.14$.

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1. You are required to examine the oscillations of a simple pendulum using the given apparatus by following the procedures:

   (a) Suspend a pendulum bob from the length L equals to 0.90 m and displace it through a small angle so that it swings parallel to the edge of the bench.

   (b) Determine the time, t for 20 oscillations and the corresponding periodic time, T.

   (c) Repeat the procedures in 1 (a) and (b) above for the values of $L = 0.70\ m, 0.50\ m, 0.30\ m,$ and $0.10\ m.$

   Questions

   (i) Record your readings in a table including the values of log L and log T.

   (ii) Plot a graph of $\log_{10} L$ against $\log_{10} L$

   (iii) Use the graph in 1 (ii) to resolve the values of constants n and k from the equation $L^n = KL^{-1}$

2. You are provided with hot water, metal foil, wooden block, thermometer, stopwatch, marker pen, rubber bands, copper calorimeter with its lids, stirrer and kerosene lamp/Bunsen burner. Follow the following procedures to perform an experiment:

   (a) Cover the outer surface of the calorimeter with the meter foil provided and use the rubber bands to hold the metal foil tightly on the calorimeter.

   (b) Use a marker pen; indicate a mark of about two-thirds inside the calorimeter.

   (c) Fill the calorimeter with hot water of about 90^{o}C to the mark indicated in 2 (b).

   (d) Cover the calorimeter with its lid when the stirrer and thermometer are

inserted.

(e) While stirring, start the stopwatch when the temperature of the liquid in the calorimeter is about 80^0C. Read and record the temperature of the liquid after every 2 minutes until it reaches 60^0C.

(f) Empty the calorimeter, remove the metal foil and carefully blacken the outer surface of the calorimeter using the soot from a kerosene lamp/ Bunsen burner provided. Repeat the procedures in 2 (c) up to (e).

Questions

(i) Tabulate your results.

(ii) Using the same axis, plot the cooling curves for the blackened calorimeter with its content and for the calorimeter with metal foil together with its content.

(iii) From each of the curves, read and record the time taken for hot water to cool from 80^0C to 60^oC.

(iv) What is the implication of the results in 2 (iii).

(v) What is the aim of doing this experiment?

3. Determine the e.m.f. of the given dry cell E using ammeter A, resistance box R, switch K, masking tape and pieces of connecting wires. In order to achieve the task, the follow the instructions below:

(a) Carefully set up the circuit as required using the given apparatuses.

(b) Start with R = 2Ω, close the switch and record the current I from the ammeter.

(c) Repeat the procedure in 3 (b) for the values of R = 4 Ω, 6 Ω, 8 Ω and 10 Ω.

Questions

(i) Draw a well labelled circuit diagram of your connections.

(ii) Tabulate the obtained data including the value of $\frac{1}{I}$

(iii) Plot a graph of R against $\frac{1}{I}$

(iv) Use the graph in 3 (iii), determine the e.m.f. of the dry cell E.

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NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

ADVANCED CERTIFICATE OF SECONDARY EDUCATION

EXAMINATION

131/3C **PHYSICS 3C**

(ACTUAL PRACTICAL C)

(For Both School and Private candidates)

Time: 3:20 Hours **Year: 2023**

Instructions

1. This paper consists of **three (3)** questions**.**
2. Answer **all** questions.
3. Question **one (1)** carries **20** marks, and the other **two (2),** carry **15** marks each.
4. Mathematical tables and non-programmable calculators may be used.
5. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil
6. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet (s).

The folowing information may be useful:

Specific heat capacity of Water $C_w = 4.2J/gK$

Pie, $\pi = 3.14$.

1. You are provided with a half metre rule, metre rule, two retort stands and two pieces of threads.

   Proceed as follows:

   (a) Set up the apparatus as shown in the following figure 1 with the length of threads L= 60cm. The flat side of the ruler with a scale must be horizontal.

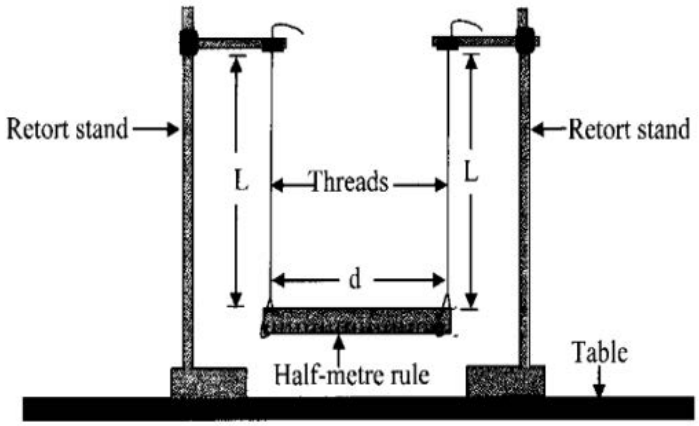

Figure 1

   (b) Set the threads very near to the ends; such that, distance d is 50 cm. Displace the ends of the ruler through a small angle along the horizontal plane so that it swings. Determine the time, t for 20 complete oscillations and the corresponding periodic time, T. Also to record the distance d between the threads.

   (c) Without removing the retort stands, adjust the threads 5cm from each end to make the distance d = 40cm, then repeat the procedure in 1 (b). Continue moving the threads from each end by 5cm to obtain a total of five readings.

Questions

(i) Tabulate the values of $d(s)$, $t(s)$, $T(s)$ and $\frac{1}{d}(m^{-1})$

(ii) Plot a graph of $T(s)$ against $\frac{1}{d}(m^{-1})$

(iii) Use the graph in 1 (ii) and the equation $d = \frac{0.31\pi}{T}\sqrt{\frac{L^3}{g}} + \text{constant}$, determine the value of acceleration due to gravity, g.

2. You are provided with the following apparatus: Copper calorimeter, kerosene lamp/ bunsen burner, a metal foil, thermometer, hot water, stopwatch, stirrer, lid, a container with 250 ml of hot water of about 85°C and a wooden base. Proceed as follows:

(a) Carefully blacken the outer surface of the calorimeter using soot from a kerosene lamp/Bunsen Burner and set up the given apparatus as required.

(b) Fill to about $\frac{2}{3}$ of the blackened calorimeter with hot water whose initial temperature is 85^0C.

(c) Stir constantly the hot water in the calorimeter then read and record the temperature t of water at one minute intervals until it has fallen to about 75^0C.

(d) Empty the water in the calorimeter and cover the outer surface of the calorimeter with the metal foil provided and repeat the procedures in 2 (b) to (c).

Questions

(i) Draw the set-up of your experiment.

(ii) Tabulate the results obtained in 2 (c) and (d).

(iii) Plot the cooling curves for both the blackened calorimeter with its contents and the calorimeter covered with the metal foil together with its contents in the same axis.

(iv) From each of the curves plotted in 2 (iii), read the time taken by the hot water to cool from 80^{o}C to 75^{o}C.

(v) Compare the results obtained in 2 (iv). Give a reason for your answer.

3. Determine the e.m.f. and internal resistance of a cell using an ammeter, voltmeter, switch, dry cell, rheostat, masking tape and connecting wires. Follow the following procedures:

   (a) Connect the circuit using the given apparatuses. Close the switch and adjust the rheostat so that the cell supplies a current of 0.4A. Read the Voltmeter and record the value of voltage, V.

   (b) Repeat the procedures in 3 (a) for the values of current, I equal to 0.6A, 0.8A, 1.2A, and 1.6A. Read and record the value of voltage, V in each case.

Questions

(i) Draw a well labelled diagram of the circuit you connected.

(ii) Record your results in a tabular form.

(iii) Plot a graph of V (volts) against I (amperes).

(iv) Formulate the equation governing this experiment.

(v) Determine the internal resistance, r and the e.m.f, E of the cell.