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Gampaha Education Zone

දෙවන වාර ඇගයීම -2025
Second Term Evaluation - 2025
இரண்டாம் தவணைப் பரீட்சை - 2025

ශ්‍රේණිය Grade **13**	විෂයය Subject හෞතික විද්‍යාව **physics**	කාලය Time **Three Hours**

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Name

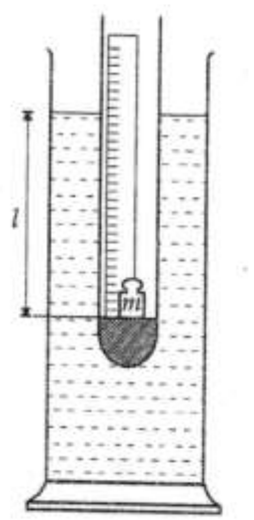
Part A – Structured Essay

Answer **all four** questions on this paper itself.

(g = 10 N kg^{-1})

1) An experimental setup designed to determine the density of a liquid using a weighted boiling tube is given below.

a)



i. What is the principle of physics used here.(write down the principle)

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ii. The physical quantities used in this system can be named as follows.

M – mass of the tube with initial weight
V – volume of the spherical portion of the tube
A – the external area of the cross section of the cylindrical portion of the tube
m – mass of additional weights inserted into the tube
ρ – density of the liquid
L – length of the cylindrical portion immersed in the liquid when the tube floats in a liquid

What is the most suitable instrument to measure A here.
A – ....

iii. Here wax or sand is used as initial load (M) inside the tube. What is the purpose of that?

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iv. Write down an expression for the upthrust force acting on this boiling tube.

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v. Construct a suitable equation to find the density of liquid using a graphical method.

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vi. Name the independent and dependant variables of the graph you wish to create.

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b) To find the density of the liquid, the value of the gradient calculated from the graph is not enough. For that, you need to calculate A.

Below are some readings obtained from the instrument you used in (a)(ii) above to calculate the value of A.

i. 3.01 cm, 3.00 cm, 3.00 cm, 2.99 cm. What is the least count of the instrument that obtained these readings ?

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ii. If the gradient of the graph created above is 1.48, what is the density of the liquid?

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c) A hydrometer can be defined as an instrument that can be used to find the density of a liquid. It can measure the density of a liquid at once.

i. A hydrometer is floated vertically in a liquid in such a way that it remains in equilibrium under two forces. Name those two forces.

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ii. Name the points where these forces act.

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iii. Explain the positions of the 2 forces you presented in (c)(ii) above when the hydrometer is raised vertically in the liquid.

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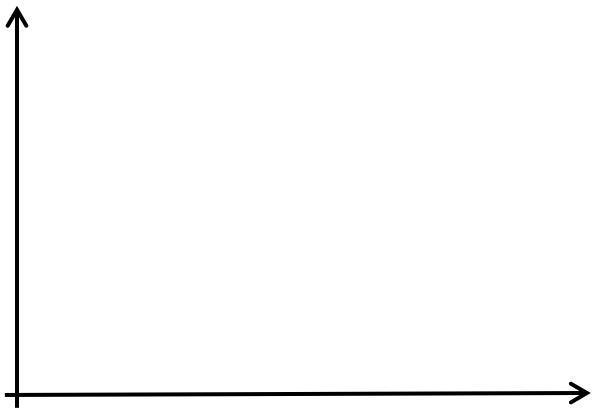
iv. When a hydrometer is immersed vertically in a liquid, there is an inverse relationship between the height of the hydrometer immersed in the liquid and the density of the liquid. Draw a rough graph of the height of immersion against the density of the liquid.



2) You are provided with the following materials for an experiment to find the specific heat capacity of iron balls using the method of mixtures.

A calorimeter, a boiling tube, a quantity of iron balls, a tripod with a wire gauze, a beaker with water, a stirrer , A piece of asbestos

a)

i. Name the measuring instruments that are not provided for the experiment but are essential for it, and name the physical quantity they measure.

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ii. Draw the experimental setup you arranged and name it.

The piece of asbestos

iii. What is expect by using a wire gauze here?

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iv. The calorimeter should also be prepared for the experiment by applying heat to the iron balls. Write down the list of measurements that you would take before adding the iron balls to the calorimeter.

m.....

m_o.....

θ_1.....

v. When heat is applied to the iron balls, the iron balls will reach a maximum temperature. How would you verify this?

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b) After adding iron balls to the calorimeter , you should take the measurements of mass and temperature.

i. State in few steps how to do it.(your measurements are θ_2 and m_2)

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ii. Before adding the iron balls, you should pay more attention to the amount of water filled to the calorimeter. What does this mean?

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iii. The iron balls should be added to water very quickly and very carefully. What does that mean?

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iv. Write down an expression for the specific heat capacity of iron balls (C_{Fe}) by taking the specific heat capacity of water is C_w and the specific heat capacity of copper is C_{cu} .

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c)

i. During the experiment period, the calorimeter will lose heat to the environment. Suggest a method to minimize this heat loss.

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ii. What is the main assumption you made in the calculation in (b) (iv) above?

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3) The speed of sound in air and the end error can be calculated by using a closed tube and a set of tunning forks. Some of the instruments used for this purpose are given below.

A tube of diameter about 2.5 cm and length about 50 cm, a tall jar, water, a stand ,cotton wool, a set of tunning forks

a)

i. If there are any measuring instruments and devices required for this experiment but not mentioned here, name them.

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ii. Draw a diagram of the setup prepared for this experiment in the space provided below. Name it.

iii. You must select atleast 5 tunning forks from the set of tunning forks given for the experiment. How do you select tunning forks by frequency? What is the reason for that?

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iv. According to the tunning forks you have choosen, what is the most important test you have to do before starting the experiment?

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v. What do you expect by using a tube open at both ends?

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b)

i. In setting up the experimental setup the tube open at both ends is completely immersed in water and then gradually raised up. What do you expect by completely submerging the tube?

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ii. A vibrating tunning fork is placed along the top of the tunning fork and the sound emitted through the tube is heard. Draw how you would place the tunning fork in the arrangement (a)(ii).

iii. You should use the small amount of cotton wool provided. How do you use it and what is the expected result from that?

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iv. Name the wave pattern that produced in the resonance tube in this experiment. Draw the wave pattern and the end correction (e) in that.

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c)

i. Write down an expression for the wavelength of the wave produced in the tube. (the vibration length is l and end error is e)

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ii. Take speed of sound in air as v and frequency of a tunning fork as f. Write down an expression to find the speed of sound in air (v) and end error (e) by using a graphical method.

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iii. Draw a rough sketch of the graph that you would expect in this experiment.

iv. If the gradient of the graph is m and the intercept is c, obtain values for the speed of sound and end error.

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v. In this experiment, the sound of intensity of the initial vibration length seemed to decrease for later tunning forks. What is the reason for this?

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vi. Can a liquid such as kerosene or alcohol be used instead of water. Explain your answer.

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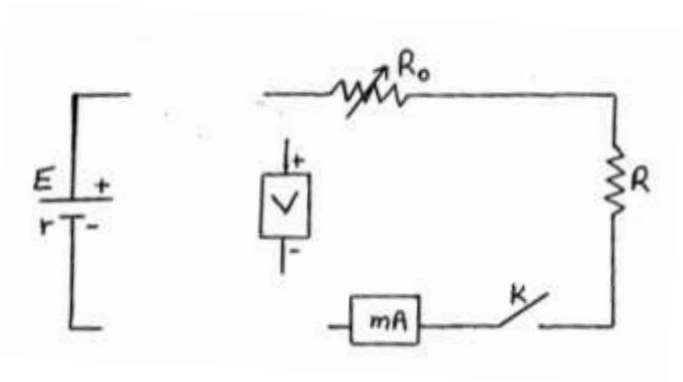
4)

a) An incomplete circuit diagram designed to determine the electromotive force (E) and the internal resistance (r) of a given cell is shown below.

i. Complete the circuit diagram correctly.



ii. Define the electromotive force of a cell.

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iii. Name the type of the key K used in the circuit.

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iv. Give the reason for selecting the key.

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v. Name R_0 and R here.

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vi. What is expected from using this resistor R.

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b)

i. Mark the polarity in the ammeter used.

ii. By varying the value of R_0, the miliammeter reading (T) and the voltmeter reading (V) are obtained at that time. Obtain a suitable equation to find the E and r using a graphical method.

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iii. Draw a rough sketch of the graph expected.

iv. Present the electromotive force and internal resistance using the gradient and the intercept of the graph you created.

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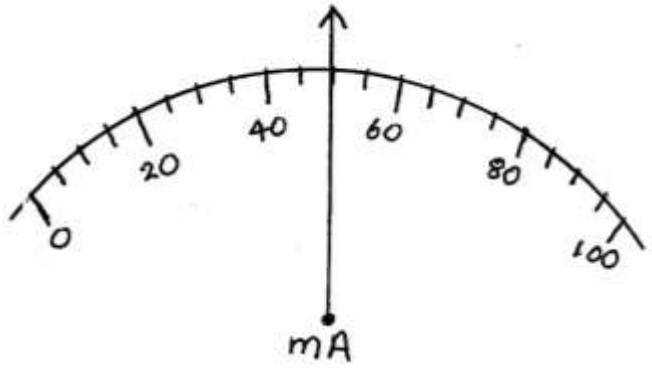
c) Readings for the current in the above experiment were as shown in the figure below.



i. Write down the mA reading shown here.

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ii. Write down the fractional error of this reading.

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