**MARKING SCHEME**

**ARISE AND SHINE EXAMINATION**

**PHYSICS PAPER 232/3**

**Form 4 trial I examination**

**MARCH/APRIL 2023**

**QUESTION 1**

You are provided with the following apparatus.

* An ammeter (range 0 – 1A)
* A resistance wire labeled R
* Two new dry cell (size D)
* Six connecting wires (at least three with crocodile clip)
* A switch
* A jockey
* A micrometer screw gauge (to be shared)
* A voltmeter (0-3V)

**Proceed as follows:**

1. Assemble your apparatus as shown in **Figure 1**

(b). With the switch S open, record the voltmeter reading.

 V = **3.10**. Volts (1 mark)

(c). Adjust the length x of the wire to 25cm. Close the switch, read and record the value of current I in Table 1

Table

$$- 4 s. a must or exact$$

$\pm $0.02

2. d.p a must

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Length x (cm) | 25 | 35 | 45 | 55 | 65 | 75 |
| Length (100 – x) cm | **75** | **65** | **55** | **45** | **35** | **25** |
| current I (A) | **0.13** | **0.15** | **0.17** | **0.21** | **0.26** | **0.34** |
| $\frac{1}{I} $ (A-1) | **7.692** | **6.667** | **5.882** | **4.762** | **3.846** | **2.941** |

 (b). Using the micrometer screw gauge provided measure the diameter t, of the resistance wire R

t = **0.37mm**

t = **0.37x10-3m**

(i). Given P = $\frac{SVt^{2}}{4}$

Determine the value of P (3 marks)

P = 1.588 x 10-1 x 3.0 x (0.37x10-3)2 =1.6305 x 10-8 (with or without units

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**QUESTION 2**

This question has two pars A and B. Answer all the parts

Part A

You are provided with the following:

A metre rule

Two identical 100g masses (labelled A and B)

Liquid L in 250ml beaker ¾ full (water)

Three pieces of thread, each 30cm long.

Stand with clamps

Tissue paper

Vernier calipers

***Proceed as follows:***

a).Take one 100g mass and measure the diameter d and height h using the Vernier calipers

d = 3**. dp m** - Accept any-measurements of masses not specified (1mark)

h = **3.dp m** (1 mark)

b. Determine the volume V given that V = $π\left(\frac{d}{2}\right)2\_{h}$

 V **Exact or 4.s.fm3** (1 mark)

c. Using a stand and one piece of thread, suspend the metre rule in air such that it balances horizontally.

 Record the position of the centre of gravity G.

 G = **50.0** $\pm $**1dpcm** (1mark)

NOTE: the metre rule should remain suspended at this point throughout the experiment.

d. Set up the apparatus as shown in Figure 1 below;

Suspend the mass A at a distance x = 30cm and completely immerse it in liquid L without touching the sides of the beaker.

* Hang mass B and adjust its position such that the rule is balanced and measure the distance dcm. Tabulate your results in table 1 below;
1. Table (3marks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x (cm) | 30 | 35 | 40 |  |
| d (cm) | **26.0** | **31.0** | **35.0** | **- ALL 2 correct @ ½ mrk**$\pm $**0.5** |
| $$\frac{d}{x}$$ | **Exact or 4 s.f** | * **ALL 2 correct @ ½ mrk**
 |

(e).(i). Determine the weight F of one of the masses A or in air. Given that

g = 10N/K g and A = B

 Weight F in air = **1N**√1 *Ignore Unit but penalize fully if the unit is wrong* (1 mark)

(ii). Using the principle of moments, determine the apparent weight P of A when completely immersed in Liquid L

***1 x d = WX correspond***  value of x√

***1 x 26 = w x 30***

(iii). Apparent weight P = **0.8667**√1 - *Ignore units but penalize fully if wrong units given* . Find the up thrust U on A when completely immersed. (1 mark)

 (iv).Upthrust; U = **Answer @ e- Answer (a) F√½**

= **Exact √1/2**- *Ignore unit but penalize fully if unit is wrong*

(h). Determine the density of liquid L, given that;

**P =** $\frac{Un}{V}$ **where n = 0.1 Kg/N**  (1 ½ marks)

**Answer @ g x 0.1**

**Answer @ b**

**= Exact or 4.s.f- ignore unit but penalize fully if unit is wrong**

**PART TWO**

You are provided with the following apparatus

* A glass beaker
* Aa metal solid
* Some water
* Source of fire
* A piece of cotton thread
* A plastic beaker wrapped with tissue
* Thermometer
* Liquid L

***Proceed with the experiment as follows:***

(f). Fill the glass beaker with the water provided and place it on the fire source. Use the piece of thread to carefully lower the metal solid to the bottom of the beaker.

Heat the water to its boiling point. Use the thermometer to measure its point.

Boiling point of water **= (91+273) Kelvin** (1 mark)

(g). (i). Find the following measurements using appropriate instruments

Mass of the solid Ms = **62.23 g** (1/2 mark)

 Mass of the wrapped empty plastic beaker M1 ……………..g (½ mark)

 **Mass of plastic beaker + water = 271.24g**

 **T1 (Cold H2O) - T1 = 22oC + 273**

 **T2 (Hot water) - 91+273**

 **Metal inside (final temp of mixture)**

 **T3 = 24oC+273**

(i). **heat cost by metal solid = heat gained by cold water + heat gained by plastic beaker**

**0.06323x480x67= (0.03561x359x2) +0.23563x9x2**

**2033.4768 = 25.56798+0.47126CL.**

**CL =**$\frac{2007.9088}{0.47126}$

**= 42.60Jkg-1k-1**$\pm $**300**

Use the plastic beaker to measure 240ml of liquid L, hence find the joint mass of the plastic beaker and its content liquid L, M2 = **(Hot water) - 91+273(g)**  ( ½ mark)

: Initial temperature of liquid L, T1 = **(Cold H2O) - T1 = 22oC + 273**Kelvin (1 mark)

(b)(ii). At boiling point of water; quickly transfer the metal solid into liquid L, stir well and measure the temperature of the mixture immediately.

Temperature of the mixture T2**(Hot water) - 91+273**Kelvin (1 mark)

(c). By using the measurements taken in pars (f) g(i) and g(ii) as well as the equation provided below, determine the specific heat capacity of liquid L. (Take 5.H.C of metal solid = 480J/kg/k and 5.H.C of plastic = 359 J/kg/k).

(Heat lost by metal) = (heat gained by liquid L) + (heat gained by plastic beaker). (3 marks)