**NAME: ……………………………………….… INDEX NUMBER: ……………………/…….**

**SIGNATURE: ………………………….……. DATE…………………………………….…….**

**232/1**

**PHYSICS**

**Paper 1**

2 hours

**FORM 4**

**Instruction to Candidates**

1. *Write your name, index number in the spaces provided above.*
2. *Sign and write the date of examination in the spaces provided above.*
3. *This paper consists of* **two** *sections:* **A** *and* **B**.
4. *Answer* **all** *the questions in sections* **A** *and* **B** *in the spaces provided.*
5. ***All*** *working***must** *be clearly shown.*
6. *Silent non programmable electronic calculators may be used.*
7. *Candidates should answer the questions in English.*

 **For Examiners Use Only**

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| --- | --- | --- | --- |
| **Section** | **Question** | **Maximum****Score** | **Candidate’s****Score** |
| **A** | 1 – 10 | 25 |  |
| **B** | 11 | 15 |  |
| 12 | 8 |  |
| 13 | 11 |  |
| 14 | 9 |  |
| 15 | 11 |  |
|  **Total Score** | **80** |  |

This paper consists of 11 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing

**SECTION A (25 Marks)**

*Answer all the questions in this section in the spaces provided*

1. Name two main factors that should be put into consideration when choosing a measuring instrument for a given task. **(2 marks)**

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1. The figure below shows a section of a burette containing water to the level indicated.

48

49

50

The tap of the burette is opened to release 20 drops each of volume 15 mm3. On the same diagram, show the new water level. **(3 marks)**

1. A form one student was doing an experiment to investigate surface tension. She poured some water on a trough and allowed it to settle. She then took a razor blade and tried to make it float/rest on water surface but never succeeded. Give two possible reasons why her experiment failed. **(2 marks)**

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1. Why do solids particles have a knit structure? **(1 mark)**

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1. (a) Give a reason why metals are good heat conductors compared to other solids. **(1 mark)**

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(b) Apart from nature of the material, give twoother factors that determine thermal conductivity of a material. **(2 marks)**

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1. A U-tube contains some mercury. Water is poured into one arm of the U-tube and oil is poured into the other arm, as shown below.

Water

60cm

48cm

Oil

The amounts of oil and water are adjusted until the surface of the mercury in the two arms is at the same horizontal level. The column of water, density 1000kg/m3 is 48cm high. The column of oil is 60cm high. Calculate the value of density of oil. **(3 marks)**

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1. A uniform metre rule of mass 200g is placed on two knife edges P and Q as shown in the figure below. P is at 10 cm mark while Q is at 100 cm mark

Q

P

300

A mass of 300g is paced at 65 cm mark as indicated. Calculate the reactions given by supports P and Q. **(4 marks)**

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1. In terms of the change in the position of the centre of gravity, show the difference inthe three states of equilibrium. **(3 marks)**

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1. The figure below shows a system of three identical springs of springs constant 200 N/m.

10 N

Neglecting the weight of the springs and their connectors, calculate the work done by the force of 10N to stretch the system. **(3 marks)**

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1. The figure below shows two pipes with different cross-sections areas each having a pipe dipped into walls. The pipes A and B are equal cross sectional areas.

A

B

Show the new level of water in column A and B as the piston is pushed on. **(1mark)**

**SECTION B (55 Marks)**

*Answer all the questions in this section in the spaces provided*

1. (a) Differentiate the following terms, **(3 marks)**
2. Distance and displacement

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1. Speed and velocity

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1. Acceleration and deceleration.

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(b) A ball on a snooker table is hit by another ball and travels a distance of 50 cm due south. It is then hit again and travels a distance of 25 cm due west. What is its displacement from its initial position? **(2 marks)**

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(c) The world record for men’s 100 m sprint stood at 9.58 s as set by Usain Bolt in 2009.

1. What average speed does this represent? **(2 marks)**

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1. If the athlete accelerates to a steady speed in the first 1.5 seconds and the runs at this speed to the finish line, at what steady speed does he run?**(3 marks)**

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(d) An object is released from a helicopter which is hovering (stationary) 180 m above the ground. Ignoring the effect of air resistance

1. Calculate how long it takes the object to reach to the ground? **(2 marks)**

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1. The helicopter then sets off horizontally at a speed of 40 m/s as it drops a second object from the same position and height. Calculate the horizontal distance on the ground between the two objects. **(3 marks)**

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1. (a) State the Newton’s first law of motion **(1 mark)**

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(b) Define momentum and give its SI unit **(2 mark)**

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(c) A force of 100N acts on a ball of mass 500 g for 0.5 s before the ball rolls down on the horizontal ground.

1. Calculate the velocity at which the ball set off with. **(2marks)**

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1. If the frictional force between the ball and the ground is 2 N, calculate the distance the ball travels before it comes to a stop. **(3 marks)**

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1. (a) Define the following
2. Velocity ratio **(1 mark)**

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1. Mechanical advantage **(1 mark)**

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1. Efficiency **(1 mark)**

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(b) A small pump develops an average power of 80W. It raises water from a borehole to a point 15m above the water level. Calculate the mass of water delivered in one hour. **(3 marks)**

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(c) The figure shows a wheel and axle being used to raise a load W by applying an effort ‘E’. The radius of a large wheel is ‘R’ and that of a small wheel is ‘r’.

E

r

R

W

1. Show that the velocity ratio (V.R) of this machine is given by $R/r$. **(2marks)**

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1. If $r = 5cm$ and $R = 8cm$, determine the effort $‘E’$ required to raise a load of $40N$, given the efficiency of the machine is $85\%.$ **(3marks)**

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1. **(a)** Define specific latent heat of fusion  **(1 mark)**

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**(b)** In an experiment to determine the power of an electric heater, melting ice was placed in a container with an outlet and the heater placed in the ice as shown below. The melted ice was collected.

To power supply

Heater

1. Other than the current and voltage, state the measurement that would be taken to determine the quantity of heat absorbed by the melted ice in unit time. **(1 mark)**

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1. If the latent heat of fusion of ice is Lf, show how measurement in $(i)$ above would be used in determining the power P of the heater. **(2 marks)**

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1. It is found that the power determined in this experiment is lower than the manufacturer’s value indicated on the heater. Explain. **(1 mark)**

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**(c)** 200 g of ice at 0°C is added to 400g water in a well lagged calorimeter of mass 40g.The initial temperature of the water was 40°C. If the final temperature of the mixture is X°C,

 *(Specific latent of fusion of ice L = 3.36 x 105 Jkg-1, specific heat capacity of water, c = 4200Jkg-1K-1, specific heat capacity of copper = 400 Jkg-1K-1.)*

1. Derive an expression for the amount of heat gained by ice to melt it and raise its temperature to X°C **(2 marks)**

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1. Derive an expression for the amount of heat lost by the calorimeter and its content when their temperature falls to X°C. **(2 marks)**

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1. (a) The figure below shows a set-up that may be used to verify pressure law.

 

1. State the measurements that should be taken in the experiment. **(2 marks)**

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1. Explain how the measurements in (i) above may be used to verify pressure law. **(3 marks)**

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1. A column of air 26cm long is trapped by mercury thread 5.0cm long as shown in the figure (a) below. When the tube is inverted as in figure (b) the air column becomes 30cm long. What is the value of atmospheric pressure? **(3 marks)**

5 cm

5 cm

30 cm

26 cm

$$(a)$$

$$(b)$$

Air

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1. A steel cylinder of capacity 0.5m³ contains nitrogen at a pressure of 30,000Pa when the temperature is 27°C. What will be the pressure of nitrogen if it is allowed to flow into another cylinder of capacity 9.5m³ with the temperature reduced to -23°C? **(3 marks)**

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1. State the difference between the temperature measured in Kelvin scale and Celsius scale. **(1 mark)**

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