Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity \( g = 10 \text{m/s}^2 \).

You may find some of these equations useful:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>( W = mg )</td>
</tr>
<tr>
<td>Density</td>
<td>( \rho = \frac{m}{V} )</td>
</tr>
<tr>
<td>Moments</td>
<td>Moment = force \times \text{perpendicular distance}</td>
</tr>
<tr>
<td>Pressure</td>
<td>( P = \frac{F}{A} )</td>
</tr>
</tbody>
</table>

For office use only:

<table>
<thead>
<tr>
<th>Question No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Total Mark</th>
<th>Practical Mark</th>
<th>Final Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Score</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>85</td>
<td>15</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Actual Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION A : This section carries a total of 40 marks.

1. Naomi and Jack were in the laboratory to find out the density of a stone.
   a. i. What measuring instrument did they use to measure the volume of water?
      _______________________________________________________________ (1)

   ii. What is the volume of water? _____________________________________ (1)

   iii. What is the volume of water and the stone? _________________________ (1)

   iv. What is the volume of the stone? __________________________________ (1)

b. What measuring instrument did they use to measure the mass of the stone?
   _______________________________________________________________ (1)

c. Help Naomi and Jack calculate the density of another stone of mass 300g
   and volume 50 cm³.

   ________________________________________________________________
   ________________________________________________________________ (2)

d. Explain using the word DENSITY why the stone sinks in water.

   ________________________________________________________________ (1)
2. This question is about Heat Energy and Temperature
a. Write down True or False next to each sentence.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Temperature is measured in Joules.</td>
</tr>
<tr>
<td>ii</td>
<td>The higher the temperature the hotter the object.</td>
</tr>
<tr>
<td>iii</td>
<td>Degree Celcius ( °C ) is a unit of temperature.</td>
</tr>
<tr>
<td>iv</td>
<td>Energy and Temperature are the same.</td>
</tr>
<tr>
<td>v</td>
<td>Heat is a type of energy</td>
</tr>
<tr>
<td>vi</td>
<td>Heat energy flows from a cold place to a hot place.</td>
</tr>
</tbody>
</table>

(3 marks)

b. Continue the following sentences
i. When an object is heated it e ________________________________. (1)
ii. When an object cools it c __________________________________. (1)
iii. When things are heated, they get bigger because the m __________________ start moving more and take up more space. (1)

c. Explain why a bottle of lemonade always has space between the top of the liquid and the cap.

_______________________________________________
_______________________________________________
_______________________________________________

(2)
3. Carrie and David were investigating which rod is the best conductor of heat. They set up the experiment as shown in the diagram. The table shows their results.

![Diagram of experiment](image)

<table>
<thead>
<tr>
<th>Metal</th>
<th>Time for all pins to fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Steel</td>
<td>12 minutes</td>
</tr>
<tr>
<td>Nickel</td>
<td>16 minutes</td>
</tr>
</tbody>
</table>

a. Which material did they use to stick the pins to the rod? Explain why this material is chosen.

__________________________________________________________________________ (2)

b. Which metal is the best conductor of heat? Explain your answer.

__________________________________________________________________________
__________________________________________________________________________ (2)

c. Which statement about conductors is correct. Underline the correct answer.

- Metals are good conductors because of free moving electrons.
- Atoms in metals are widely spaced so heat energy is easily transferred.
- In cold weather metal conductors are warm to touch. (1)

d. What must Carrie and David do to ensure a **FAIR** comparison?

__________________________________________________________________________
__________________________________________________________________________ (1)

e. What are handles of pots and pans made of? Explain why they are made of this material.

__________________________________________________________________________
__________________________________________________________________________ (2)
4. This question is about Forces.
a. This picture shows four forces on a plane. Name these forces.

__________________  
__________________  
__________________  
__________________  (4 marks)

b. A car has a thrust of 4000N and a frictional force of 2500N.

Calculate the resultant force on the car.

____________________________________________________________
____________________________________________________________  (2 mark)

c. A wooden block has a mass of 4kg. Calculate its weight.

____________________________________________________________
____________________________________________________________ (2 marks)
5. The diagram below shows two cups containing hot tea. Cup A is uncovered and Cup B is covered.

![Cup A and Cup B](image)

a. Which cup will cool more quickly? Explain your answer.

__________________________________________________________________________________________________________________________________________ (2)

b. Warm air rises because it is _________________ dense than cold air. (1)

c. Why do the sides of the cup become warm after a while?

__________________________________________________________________________________________________________________________________________ (1)

d. Heat travels through the sides of the cup by C______________________. (1)

e. A kitchen cloth was used to cover cup B. Cup B stayed warmer for a longer time.
   Explain how this cloth kept the cup warm for a longer time.

__________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________ (3)
SECTION B: This section carries a total of 45 marks

6. This question is about Pressure in solids.

A wooden block of dimensions 10cm x 10cm x 30cm, is placed on a flat surface as shown in position A. The mass of the block is 2.4kg.

a. Find:

   i. The weight of the block in N.

   ____________________________________________________________
   ____________________________________________________________ (1)

   ii. Using the formula \( P = \frac{F}{A} \) find the pressure the block is making on the flat surface in position A.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________ (3)

   iii. The block is moved to position B. Calculate the new Pressure the block is making on the flat surface.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________ (3)

   iv. Which position A or B makes the bigger Pressure on the flat surface? Explain your answer.

   ____________________________________________________________
   ____________________________________________________________ (3)
b. Gabriel lies on two different mattresses as shown below.

Diagram 1

Diagram 2

i. In which diagram is Gabriel making most pressure on the mattress?

__________________________________________________________________________       (2)

ii. Which mattress would be more comfortable to sleep on? Explain your answer.

__________________________________________________________________________       (3)

7. **This question is about Hooke’s Law.**

A wire was suspended vertically and 1N weights were loaded to it. Below is a table showing the results.

<table>
<thead>
<tr>
<th>Load (N)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension (mm)</td>
<td>0</td>
<td>10</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>55</td>
<td></td>
</tr>
</tbody>
</table>

a. Fill in the missing value in the table above.       (1)

b. Use the results shown in the table above and plot a graph of extension on the y-axis against load on the x-axis.       (6)

c. On your graph mark with and E the point of the elastic limit.       (2)

d. Use the graph to find:

   i. The extension when the load is 4.5N.

   ____________________________________________________________________________       (2)

   ii. The load that would give an extension of 25mm.

   ____________________________________________________________________________       (2)

   iii. Hooke’s Law states that the _________________ of a spring is directly proportional to the __________ .       (2)
8. a. Kevin investigates heat energy emitted from four different lamps A, B, C and D. He set up the experiment as shown below. He recorded the temperature at the start of the experiment and 5 minutes later he recorded the final temperature.

<table>
<thead>
<tr>
<th>Lamp</th>
<th>Initial temperature (°C)</th>
<th>Final temperature (°C)</th>
<th>Temperature change (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>17</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>18</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>20</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>22</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

i. In the table above record the temperature change for each lamp. (4)

ii. Which lamp caused the largest rise in temperature? ____________________________________________________________ (1)

iii. Mention ONE thing which was kept constant during the investigation. ______________________________________________________ (2)

iv. Heat energy is reaching the lamp by ____________________________________________________________ (2)

v. Name one other form of energy the lamp is producing? ____________________________________________________________ (2)

b. The diagram below shows different examples of how heat can be lost from inside a badly insulated house.

Suggest a solution for the following:

Roof ____________________________________________________________ (4)

Outside walls ____________________________________________________________

Doors and windows ____________________________________________________________

Ground floor ____________________________________________________________