



GOZO COLLEGE

HALF YEARLY EXAMINATION 2009 – 2010

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| | | | | | |
|--------------|-------|-----------------|---------|------------------|---------|
| FORM: | 3 S/S | SUBJECT: | PHYSICS | DURATION: | 1.5 HRS |
| NAME: | _____ | CLASS: | _____ | | |

| Useful Equations: | | | |
|--------------------------|--|---|--------------------------------|
| Density | $\rho = \frac{M}{V}$ | | |
| Force | $W = m \times g$ | | |
| Moment | Moment = Force \times Perpendicular Distance | | |
| Work & Energy | P.E = $m \times g \times h$ | $K.E = \frac{1}{2}mv^2$ | Work = Force \times Distance |
| Power | Power = $\frac{\text{Work Done}}{\text{Time Taken}}$ | Efficiency = $\frac{\text{Useful Output Power}}{\text{Input Power}} \times 100\%$ | |

Directions to candidates:

Answer all questions in the spaces provided on the **Exam Paper**.

Answer all questions in Section A. Questions in this section carry 5 marks each.

Answer all questions in Section B. Questions in this section carry 15 marks each.

All working must be shown.

The use of calculator is allowed.

Where necessary take the acceleration due to gravity $g = 10 \text{ m/s}^2$

For Examiner's Use Only. Do not write anything in this table.

| | | | | | | | | | | | | | | |
|----------|---|---|---|---|---|---|---|---|----|----|----|--------|-----------|-------|
| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Theory | Practical | Total |
| Max Mark | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 15 | 15 | 15 | 85 | 15 | 100 |
| Score | | | | | | | | | | | | | | |

SECTION A

Answer all questions.

1. Complete Table 1 by filling in the missing physical quantity or SI unit.

| Physical Quantity | SI Unit |
|-------------------|-----------------|
| Density | kg/m^3 |
| | m |
| Force | |
| | J |
| Power | |
| | kg |

Table 1

[5 marks]

2. Jonathan and Mary are using the apparatus below to find the density of some petroleum which does not mix with water.



Figure 1



Figure 2

- a. The apparatus in Figure 1 is called _____
- b. The apparatus in Figure 2 is called _____
- c. They find that 53 g of petroleum have a volume of 66 cm^3 . Calculate its density.

- d. If water has a density of 1.0 g/cm^3 , state whether the petroleum will sink or float when poured in water and give a reason for your answer.

[1, 1, 2, 1 mark]

3. Complete the following conversions.

- a. The length of a room is 350 cm. Its length in m is _____.
- b. It takes 8 minutes for light from the sun to arrive on earth. This time in seconds is _____.
- c. A tire of a monster truck has a mass of 100 kg. Its mass in grams is _____.
- d. The volume of a tank of water is 80000 cm³. Its volume in m³ is _____.
- e. The area occupied by a car in a parking space is 4 m². This area in cm² is _____.

[5 marks]

4. In 1678, a physicist named Robert Hooke was studying the elastic properties of a spring as shown in Figure 3.

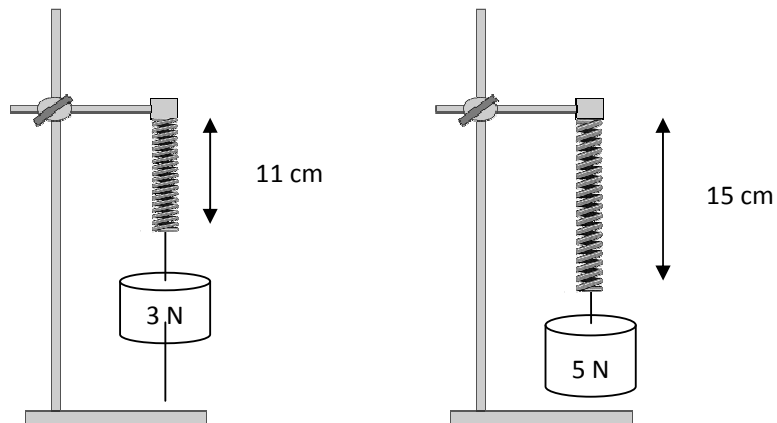


Figure 3

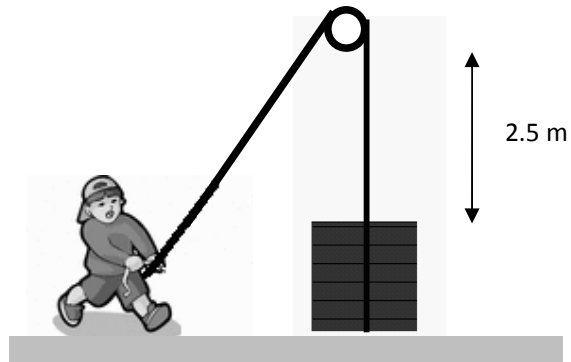
a. Calculate the extension produced by the spring for every 1 N placed on the spring.

[2 marks]

b. Find the original length of the spring. _____

[3 marks]

5. A boy is trying to lift a heavy load by a rope.



- a. Draw on the diagram the **two forces** acting on the load when it is being pulled. Name **each** force.
- b. If the load has a mass of 65 kg, calculate the force in N needed to pull the load.

- c. Calculate the work done by the boy to lift the load 2.5 m.

[2, 1, 2 marks]

6. A ball of mass 1.2 kg is thrown vertically upwards with a speed of 5.0 m/s. It reaches a maximum height of 1.0 m.

- a. Calculate the kinetic energy of the ball at the bottom.

[2 marks]

b. Calculate the potential energy of the ball at maximum height. _____

[2 marks]

c. Explain the difference in the values of the answers found in (a) and (b).

[1 mark]

7. The diagram in Figure 4 shows a balanced metre ruler of negligible weight resting on its centre about the pivot P. A weight of 30.0 N is placed 0.20 m away from the pivot. Another weight X is placed 0.30 m away from the pivot on the other side. Underline the correct answer.

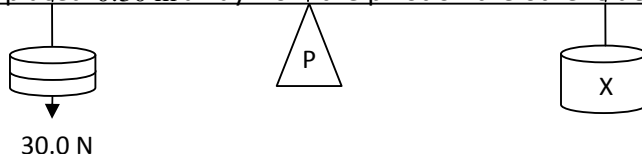
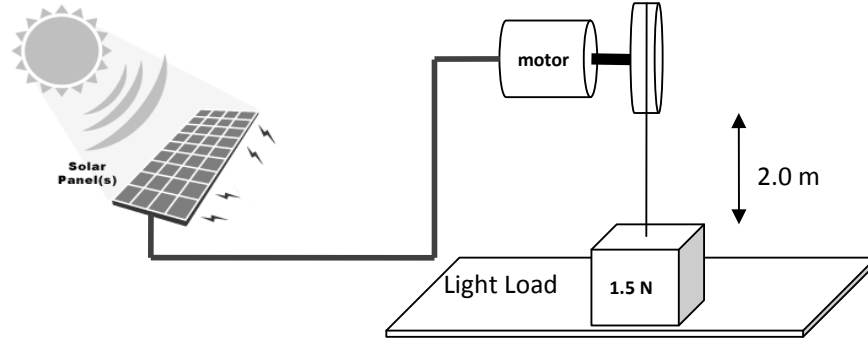


Figure 4

- Weight X produces a (clockwise, anti-clockwise) moment.
- If the ruler is balanced the clockwise moment is (greater than, equal to, less than) the anti-clockwise moment.
- Anti-clockwise moment is equal to (6 Nm, 8 Nm, 4 Nm).
- Weight X is therefore equal to (15 N, 20 N, 25 N).
- The total upward force supported by the pivot is (60 N, 30 N, 50 N).

[1, 1, 1, 1, 1 mark]

8. A small solar cell is used to power a small motor. The motor is used to lift a small load of 1.5 N a height of 2.0 m in 30 seconds.



- Name two **other** renewable sources of energy.

- Calculate the power of the motor.

- If the solar cell is 45% efficient, calculate the solar energy falling on the cell each second.

[2, 2, 1 mark]

SECTION B

Answer all questions.

9. *This question is about density.*

In a physics lab, two students are asked to find the density of **two** small pieces of rock. The diagram in Figure 5 shows the results obtained by the two students.

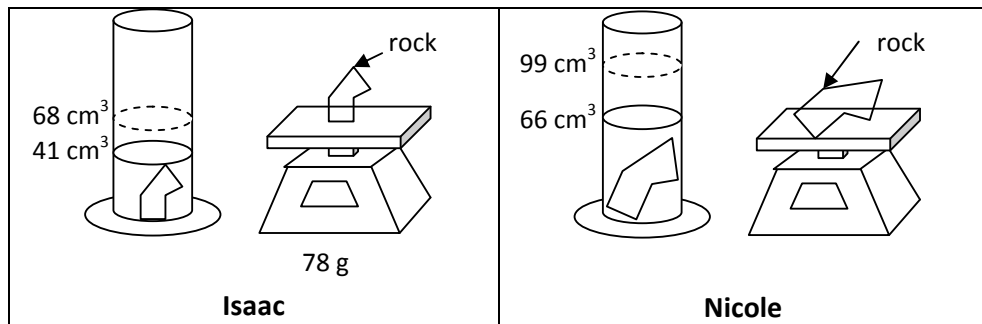


Figure 5

- To find density they need to know the _____ and the _____.

- Calculate the density of the rock that student Isaac is holding.

[2 marks]

[4 marks]

c. If Nicole has the **same type** of rock, what is the density of the rock that Nicole is holding.

[1 mark]

d. Calculate the volume of the rock that Nicole has.

[2 marks]

e. Calculate mass of the rock that Nicole has.

[4 marks]

f. Indicate by a the likely composition of the rock.

| Type | Density | |
|-----------|-----------------------|--|
| Basalt | 2.9 g/cm ³ | |
| Granite | 2.7 g/cm ³ | |
| Sandstone | 2.3 g/cm ³ | |

[2 marks]

10. This question is about moments.

A father and his two sons are in a playground having fun on a see-saw. The father has a mass of 90 kg and his son has a weight of 400 N . They sit on the see-saw as shown in Figure 6.

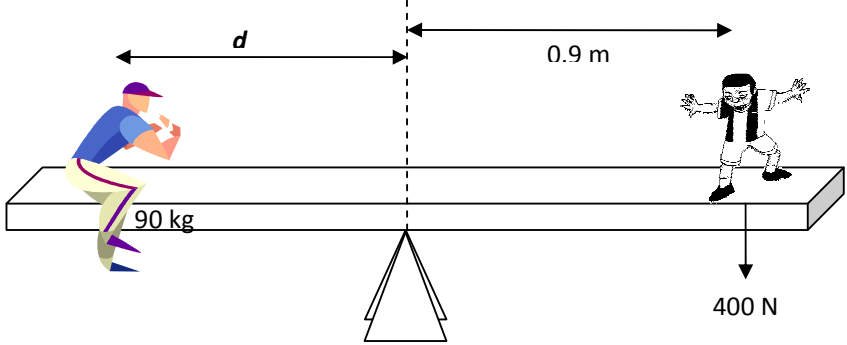


Figure 6

a. Calculate the weight of the father.

[3 marks]

b. The boy turns the see-saw (clockwise, anti-clockwise) direction.

[1 mark]

c. The father turns the see-saw (clockwise, anti-clockwise) direction. [1 mark]

d. Calculate the **moment** produced by the boy.

_____ [4 marks]

e. If the see-saw is balanced, what is the moment produced by his father.

_____ [2 marks]

f. Calculate the distance **d** his father must stand from the pivot in order to balance the see-saw.

_____ [3 marks]

g. In which direction (right or left) must their father move in order to overturn the see-saw clockwise.

_____ [1 mark]

11. *This question is about energy. You need a graph paper.*

a. The principle of conservation of energy states that energy can neither _____

_____ [3 marks]

In an experiment, a student throws a tennis ball vertically upwards at different speeds. The student is investigating how the kinetic energy with which she throws the ball effects the maximum height reached by the ball assuming that air has a negligible effect on the ball. The tennis ball has a mass of 0.2 kg .

| Kinetic Energy /J | Maximum Height / m |
|-------------------|--------------------|
| 1.60 | 0.80 |
| 2.50 | 1.25 |
| 3.60 | 1.80 |
| 4.90 | 2.45 |
| 6.40 | 3.20 |

Table 2

b. If the girl throws the ball with a higher speed will the Kinetic Energy increase or decrease?

[2 marks]

- c. Does the maximum height (increase or decrease) with increasing Kinetic Energy.

[2 marks]

- d. Plot a graph of *Maximum Height* on the **y-axis** against *Kinetic Energy* on the **x-axis**.

[5 marks]

- e. What can you conclude from the graph about the maximum height and kinetic energy of the ball?

[3 marks]