GOZO COLLEGE

HALF YEARLY EXAMINATION 2009 – 2010

FORM:	3 J/L	**SUBJECT:**	PHYSICS	**DURATION:**	1.5 HRS
NAME:	_____		**CLASS:**	_____	

Useful Equations:

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

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 $g = 10\ m/s^2$

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 $53\,\mathrm{g}$ of petroleum have a volume of $66\,\mathrm{cm}^3$. Calculate its density.

_____

_____

_____

d. If water has a density of $1.0\,\mathrm{g/cm}^3$, 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 $80000\ \text{cm}^3$. Its volume in m^3 is _____.
    e. The area occupied by a car in a parking space is 4 m^2. This area in cm^2 is _____.

[5 marks]

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

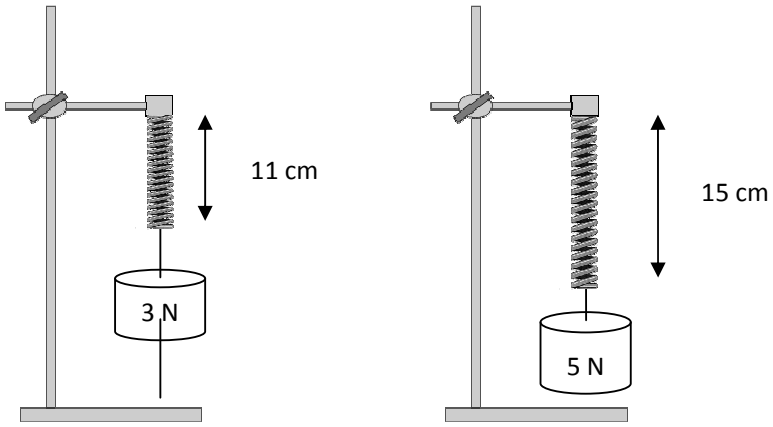


Figure 3

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

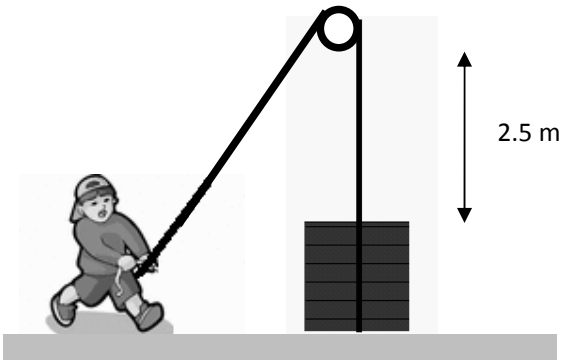
_____
_____
_____

[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 $1.2\,\mathrm{kg}$ is thrown vertically upwards with a speed of $5.0\,\mathrm{m/s}$. It reaches a maximum height of $1.0\,\mathrm{m}$.

   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 $30.0\ \mathrm{N}$ is placed $0.20\ \mathrm{m}$ away from the pivot.

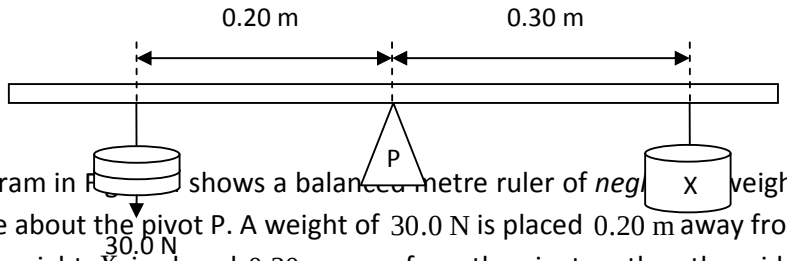


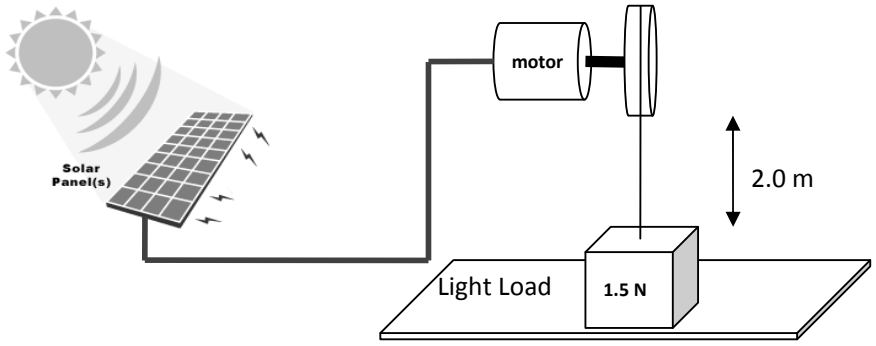
Figure 4

the correct answer.

a. Weight X produces a (clockwise, anti-clockwise) moment.
b. If the ruler is balanced the clockwise moment is (greater than, equal to, less than) the anti-clockwise moment.
c. Anti-clockwise moment is equal to (6 Nm, 8 Nm, 4 Nm).
d. Weight X is therefore equal to (15 N, 20 N, 25 N).
e. 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.



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

_____

b. Calculate the power of the motor.

_____

_____

c. 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 the **same type** of rock. The diagram in Figure 5 shows the results obtained by the two students.

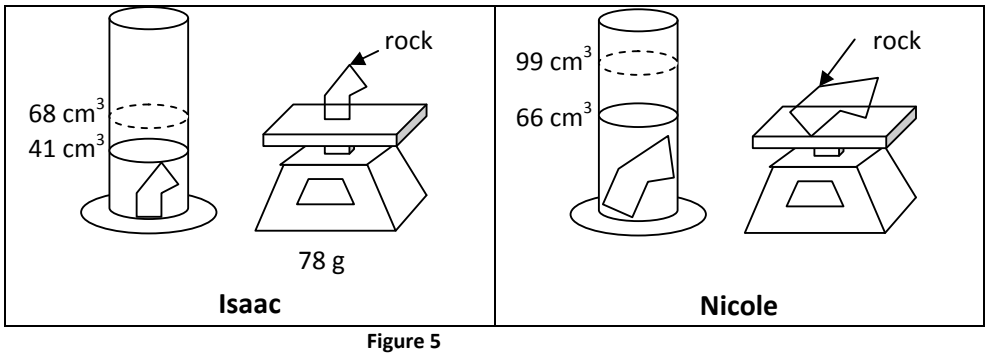


Figure 5

a. State the two quantities needed to find the density of a substance.

_____

[2 marks]

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

_____

_____

[4 marks]

c. State the density of the rock that Nicole is holding.

_____

[1 mark]

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

_____

_____

[4 marks]

e. 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	

[1 mark]

f. Isaac accidentally drops the rock in a container with mercury of density $13.6\,\mathrm{g/cm^3}$. State whether the rock floats or sinks **in mercury** and give a reason for your answer.

_____

[3 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 $90\,\mathrm{kg}$ and his two sons have a mass of $40\,\mathrm{kg}$ and $45\,\mathrm{kg}$ respectively. They sit on the see-saw as shown in Figure 6.

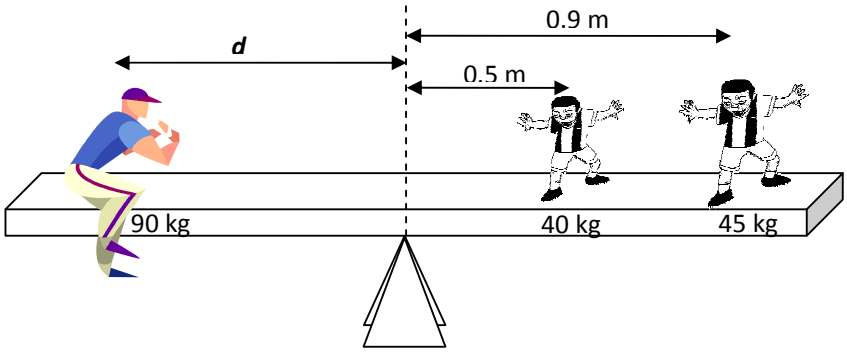


Figure 6

a. Calculate the weight of the (i) father and (ii) of **each** of his two sons.

_____

_____

_____

[3 marks]

b. If the father ***were*** to stand up, state the direction in which the see-saw will turn.

_____

[1 mark]

c. Calculate the ***total moment*** produced by the two boys.

_____

_____

_____

_____

[4 marks]

d. If the see-saw is balanced, what is the moment produced by their father.

_____

_____

[2 marks]

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

_____

_____

_____

[3 marks]

f. In which direction must their father move in order to overturn the see-saw clockwise. Give a reason for your answer.

_____

_____

[2 marks]

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

a. State the principle of conservation of energy.

_____

_____

[2 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 $0.2\ \mathrm{kg}$.

Kinetic Energy /J	**Maximum Height / m**
1.60	
2.50	
3.60	
4.90	
6.40	

Table 2

b. Describe how she can obtain information about the potential energy (P.E.) of the ball if in the above table she **only** has information about the kinetic energy (K.E.).

_____

_____

[1 mark]

c. Determine the maximum height reached by the ball for each of the different speeds and write them down in Table 2. Use the space below for your workings.

_____

_____

_____

_____

_____

_____

_____

[5 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?

_____

_____

[2 marks]