

**JUNIOR LYCEUM ANNUAL EXAMINATIONS 2008**  
 DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION  
 Educational Assessment Unit

<b>FORM 3</b>	<b>PHYSICS</b>	<b>TIME: 1h 30min</b>
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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 formulae useful.

**Density**       $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$

**Force**       $W = mg$

Moment of a force = force X perpendicular distance

**Energy & Work**       $\text{Work done} = F s$

$\text{Power} = \frac{\text{Work done}}{\text{Time taken}}$

$\text{PE} = m g h$

$\text{KE} = \frac{mv^2}{2}$

**Pressure**       $\text{Pressure} = \frac{\text{Force}}{\text{Area}}$

$\text{Pressure} = \rho h g$

**Waves**       $v = f \lambda$        $v = \frac{s}{t}$

$\text{Frequency} = \frac{\text{number of waves}}{\text{time}}$

$\text{Refractive Index of glass} = \frac{\text{speed of light in air}}{\text{speed of light in glass}}$

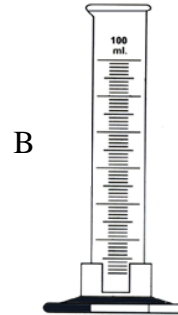
$\text{Magnification} = \frac{\text{height of image}}{\text{height of object}} = \frac{\text{image distance}}{\text{object distance}}$

*For office use only:*

Question No.	1	2	3	4	5	6	7	8	Total Mark	Practical Mark	Final Mark

**SECTION A: Answer all questions in the space provided. This section has a total of 40 marks.**

1. (a) Isaac and Nicole use the apparatus below to find the density of a small quantity of cooking oil.



(i) Name the above apparatus:

A = \_\_\_\_\_

B = \_\_\_\_\_

[2]

(ii) They find that 35g of oil has a volume of 38cm<sup>3</sup>. Calculate its density.

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[2]

(b) Isaac and Nicole calculate the density of three different solids A, B and C as shown in the table below.

Solid	Density
A	1.6 g/cm <sup>3</sup>
B	2.7 g/cm <sup>3</sup>
C	0.6 g/cm <sup>3</sup>

(i) Which solid A, B or C **floats** over water? (Density of water is 1.0g/cm<sup>3</sup>) Give a reason for your answer.

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[2]

(ii) If solid A is broken into two smaller pieces, would its density change? Explain your answer.

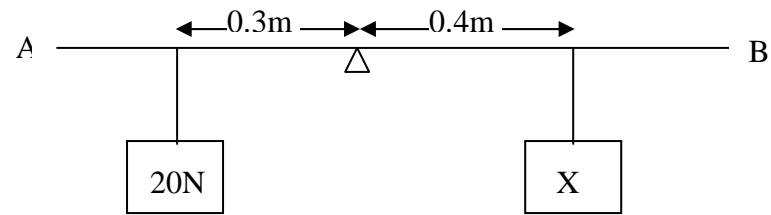
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[2]

2. The diagram shows a metre rule AB resting at its centre on a pivot. A weight of 20N is placed 0.3m away from the pivot. Another weight X is placed 0.4m away from the pivot on the opposite side to keep the rule in balance.



- (a) Underline the correct answer in each of the following:
- (i) The direction of the weight X is (upwards, downwards).
  - (ii) The direction of the moment of the weight X is (clockwise, anticlockwise).
  - (iii) The direction of the moment of the 20N weight is (clockwise, anticlockwise).
  - (iv) The sum of the clockwise moments is (greater than, equal to, smaller than) the sum of anticlockwise moments.

[4]

- (b) Calculate the size of weight X.

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[2]

- (c) Calculate the size of the reaction force at the pivot.

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[2]

- 3.(a) Elisa has a mass of 50kg. When she stands with both feet flat on the ground, the total surface area in contact with the ground is 0.2m<sup>2</sup>. Calculate:

- (i) Elisa's weight \_\_\_\_\_

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[2]

- (ii) her pressure on the ground.

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[2]

(b) She wears a pair of shoes with high heels as shown in the diagram.



(i) How will her pressure on the ground change?

\_\_\_\_\_ [1]

(ii) Give **one** reason for your answer.

\_\_\_\_\_ [2]

(iii) It is not allowed to walk with high heels on the marble floor of St. John's Cathedral at Valletta. Explain why.

\_\_\_\_\_ [1]

4. Ganni jumps on a mat, until he is jumping high and reaching a height of 1.8m. His mass is 60kg.



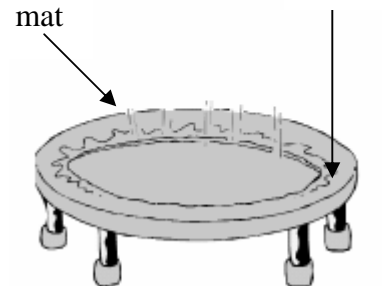
(a) Mark on the diagram, where Ganni has

(i) maximum K.E. with letter **X**

(ii) maximum P.E. with letter **Y** [2]

(b) Calculate his potential energy at a height of 1.8m.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]



(c) With what speed must he leave the mat to reach a height of 1.8m?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

(d) Eventually Ganni slows down his movements and stops. Describe the energy changes that occur.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

5. Fill in the missing words from the lists provided.

(a) **planets, stars, red shift**

\_\_\_\_\_ give out light but \_\_\_\_\_ only reflect light. [2]

(b) **orbit, monitoring, communication**

Thousands of artificial satellites orbit the Earth. \_\_\_\_\_ satellites orbit the earth once every 24 hours. \_\_\_\_\_ satellites rotate in low orbit and are used for weather forecast. [2]

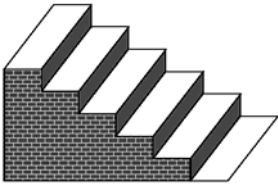
(c) **same size, larger, smaller**

The bigger the masses of the planets, the \_\_\_\_\_ is the gravitational force between the planets. The further away the masses are from each other, the \_\_\_\_\_ is the gravitational force between them. [2]

(d) **universe, galaxy, solar system**

The \_\_\_\_\_ consists of a large number of galaxies. Our galaxy is called the Milky Way. The \_\_\_\_\_ is a system of planets orbiting around a sun. [2]

**SECTION B: Answer ALL questions. This section has a total of 45 marks.**



6. Roberta and Kieran investigate their personal power when they walk up a flight of stairs.

(a)(i) The stairs consist of 5 steps, each 15cm high. Roberta has a mass of 50 kg. Calculate the work done by Roberta in walking up the stairs.

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(ii) Roberta's average time in walking up the stairs is 10s. Calculate her power output. Give the correct units for power. [3]

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(iii) Suggest **one** precaution they may take to obtain more accurate results. [3]

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(iv) Kieran weighs more than Roberta, but takes the same time to walk up the steps. How will his personal power vary with that of Roberta? Explain your answer. [1]

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(b) Roberta and Kieran observe the lift installed at their school. They tabulate the work done by the lift as it moves from one floor to another, as shown below. [2]

Height (m)	Work done (kJ)
2	16
4	32
6	48
8	64
10	80
12	96

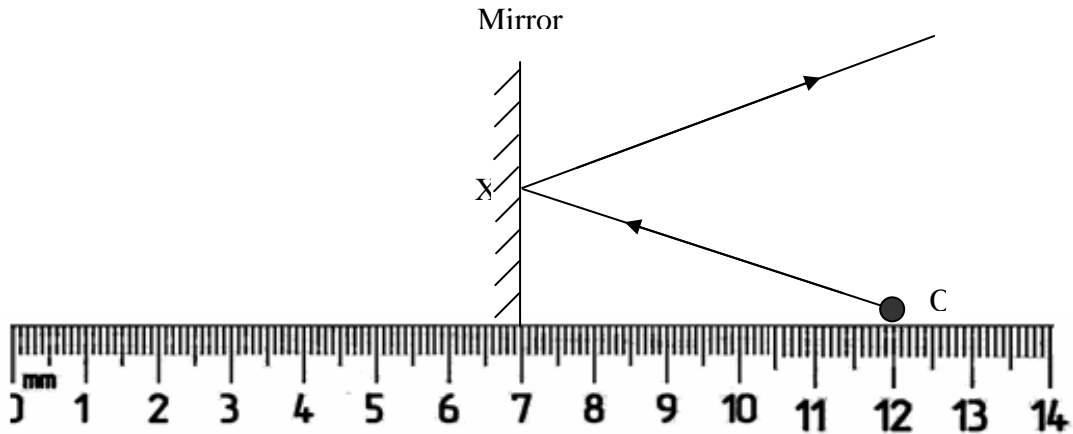
(i) On the graph paper provided, plot a graph of **work done** on the *y-axis* against **height** on the *x-axis*. [4]

(ii) Use your graph to find

- the work done when the lift moves 7m \_\_\_\_\_
- the height when 40kJ of work has been done \_\_\_\_\_

[2]

7.



(a) Jacob and Louise investigate the image produced in a plane mirror by an object O. They set the object 5 cm in front of the mirror as shown below.

(i) Complete the ray diagram to show how an image is formed. Mark the position of the image as I. [2]

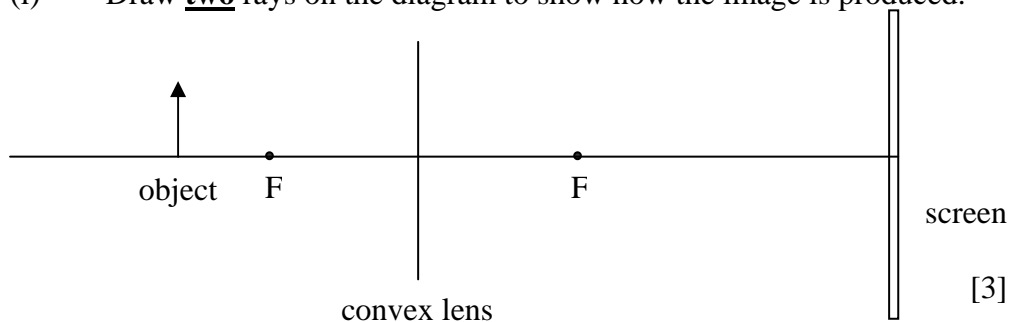
(ii) Draw the **normal** at position X on the mirror. [1]

(iii) Mark clearly the angle of incidence and the angle of reflection at position X on the mirror. [2]

(iv) What is the horizontal distance of image from the mirror?  
 \_\_\_\_\_ [1]

(b) The lens of a projector is used to put an image on a screen.

(i) Draw **two** rays on the diagram to show how the image is produced.



(ii) Give **three** characteristics to describe the image obtained on the screen. [3]

\_\_\_\_\_  
 [3]

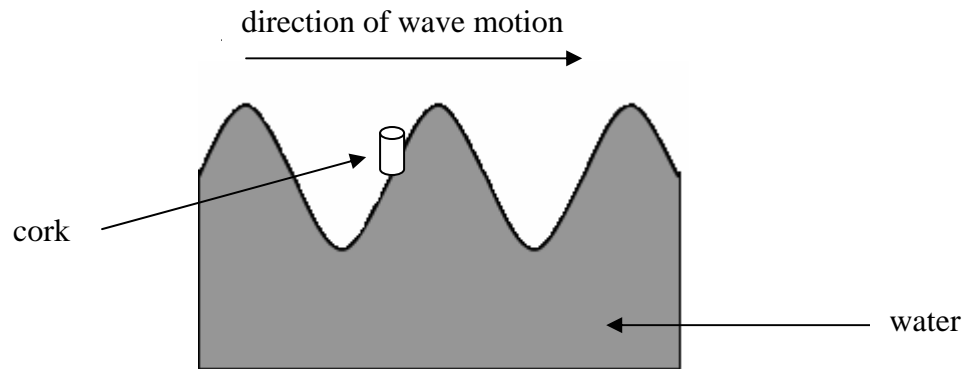
(iii) Calculate the magnification of the lens.

\_\_\_\_\_  
 [1]

(iv) Describe **two** changes which occur to the image when the object is moved very close to the lens.

\_\_\_\_\_  
 [2]

- 8.(a) Water waves are produced in a glass-sided water tank. Viewed from the side at a particular instant, the waves appear as shown below. A small cork floats on the water as shown.



- (i) Mark on the above diagram
- a crest with a letter C
  - a trough with a letter T
  - the length of one wavelength, using  $\lambda$
  - the amplitude of the wave, with the letter A.
- [4]
- (ii) On the above diagram, draw arrows to show how the cork moves.
- [1]
- (iii) Are the water waves as shown in the diagram transverse or longitudinal? Give **one** reason for your answer.

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[2]

- (iv) It was observed that 10 waves passed a particular point every 4s. Calculate the frequency of these waves. Give the correct units of frequency.

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[2]



(b) Ships use ultrasound to detect objects under water.

(i) What is ultrasound?



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[1]

(ii) A ship sends out a pulse of ultrasound with a speed of  $1500\text{m/s}$  and detects an echo  $1.5\text{s}$  later. Calculate the distance between the ship and the object that causes the echo.

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[2]

(iii) Both X-rays and ultrasound are used in medicine. Why is ultrasound preferred to X-rays to produce an image of an unborn baby?

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[1]

(iv) Name **two** properties of X-rays.

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[2]