JUNIOR LYCEUM ANNUAL EXAMINATIONS 2005

Educational Assessment Unit - Education Division

FORM 3 **PHYSICS** **TIME: 1h 30min**

Name: _____ **Class:** _____

Answer **ALL** questions in the spaces provided on the Examination Paper. All working must be shown. The use of a calculator is allowed.

Where necessary take acceleration due to gravity g = 10 m/s^2

You may find some of these formulae useful:

area of triangle = $\frac{\text{base x height}}{2}$ area of trapezium = $\frac{h}{2}$ (sum of the parallel sides)

volume = length x breadth x height

$v = s/t$ $v = u + at$ $s = at^2/2$ $W = mg$ density = mass/volume

work done = F s PE = m g h Power = $\frac{\text{work done}}{\text{time}}$ KE = $\frac{mv^2}{2}$

moment of a force = force x perpendicular distance

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

refractive index of glass = $\frac{\text{speed of light in air}}{\text{speed of light in glass}}$

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

$v = f\lambda$

Section A: Answer all questions in the spaces provided. 55 marks

1. Complete the following table as shown in part (a).

No.	Physical Quantity	S. I. Symbol	S. I. Unit
a	time	t	s
b	focal length	f	
c	force	F	
d	potential energy	PE	
e	initial velocity	u	
f	power	P	

1
1
1
1
1

2. a. The apparatus required to measure the length of your room is a _____. **1**

b. The _____ of some wine can be found using a measuring cylinder. **1**

c. The time taken for Martha to complete a 100 m race can be measured using a _____. **1**

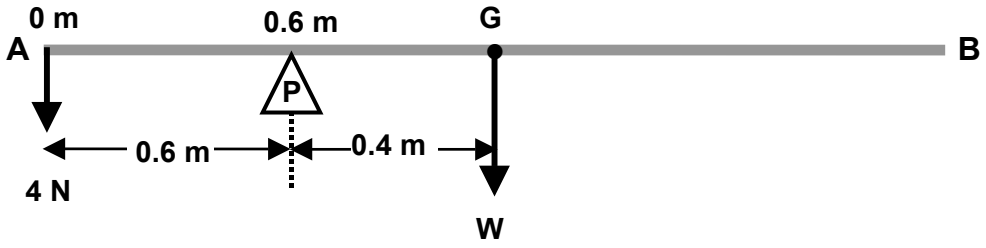
d. The weight of some flour can be found using a _____. **1**

e. The mass of a bag of apples is 2500 g.
Its mass in kilograms is _____ kg. **2**

f. Joseph takes 4 minutes to travel on foot from his home to school.
The time in seconds is _____ s. **2**

g. A plastic water pipe is 350 cm long.
Its length in metres is _____ m **2**

3. A uniform metal ruler AB is balanced at the 0.6 m mark when a load of 4 N is placed at the 0 m mark.



a. Point **G** on the ruler is the _____ of the ruler. **1**

b. Support **P** is called a _____. **1**

c. Calculate:

i. the **length** of the ruler AB, **1**

_____

ii. the weight **W** of the ruler AB, **3**

_____

_____

iii. the **total force** supported by the support P, **1**

_____

iv the **reaction** at the support P **1**

_____

_____

d. State the direction of the:

i. direction of the **total force** acting on the support P, _____ **1**

ii. direction of the **reaction** at the support P. _____ **1**

4. **a.** The figure represents a ray of light striking and being reflected by a plane mirror MM'.

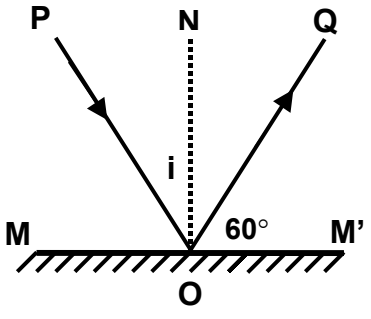
i. PO is the _____ray. **1**

ii. _____ is the reflected ray. **1**

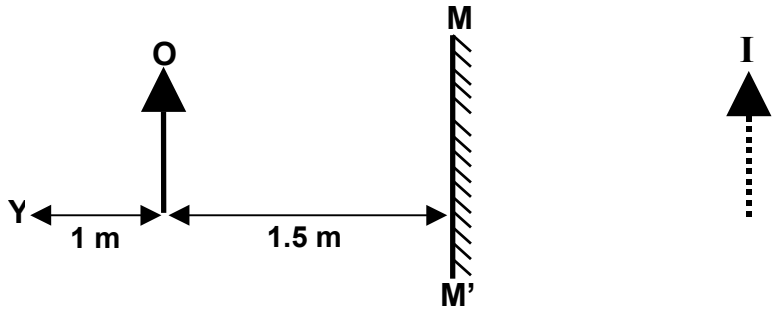
iii. NO is the _____. **1**

iv. Angle i is the angle of _____. **1**

v. The angle of reflection r = _____°. **1**



4. **b.** The figure shows an object **O** placed 1.5 m away from a plane mirror MM', and its image **I** appearing inside the mirror. An observer **Y** is 1 m away from the object **O** as shown.



i. The distance between the object **O** and the image **I** = _____ m. **1**

ii. The distance of the observer **Y** from the mirror **MM'** = _____ m. **1**

iii. The image **I** appears to be _____ m behind the mirror. **1**

iv. The distance between the observer **Y** and the image **I** = _____ m. **1**

v. The distance between the observer **Y** and **his** image = _____ m. **1**

5. **a.** Tommy lifts a bucket containing 3 kg of water from a well. The mass of the empty bucket is 1.0 kg. Calculate:

i. the **weight** of the empty bucket, **1**

_____

ii. the **weight** of the water in the bucket, **1**

_____

iii. the **total mass** of the bucket and the water, **1**

_____

iv. the **total weight** of the bucket and the water. **1**

_____

5. **b.** Tommy takes 50 s to raise the bucket and the water through a height of 5 m from the surface of the water to the top of the well. Calculate:

i. the **work done** by Tommy in lifting **the bucket and the water**, **2**

_____

ii. The **power** built up by Tommy while carrying out this work. **2**

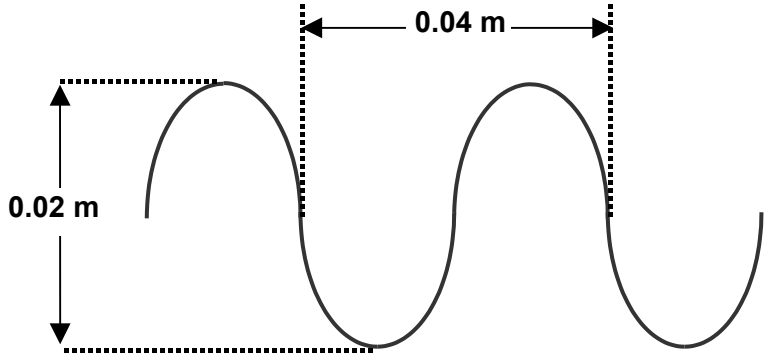
_____

iii. The **potential energy** gained by the bucket and the water at the top of the well. **2**

_____

_____

6. **a.** The figure below represents water waves obtained in a large ripple tank.



i. Mark a **crest** by the letter **'C'** on the wave diagram. **1**

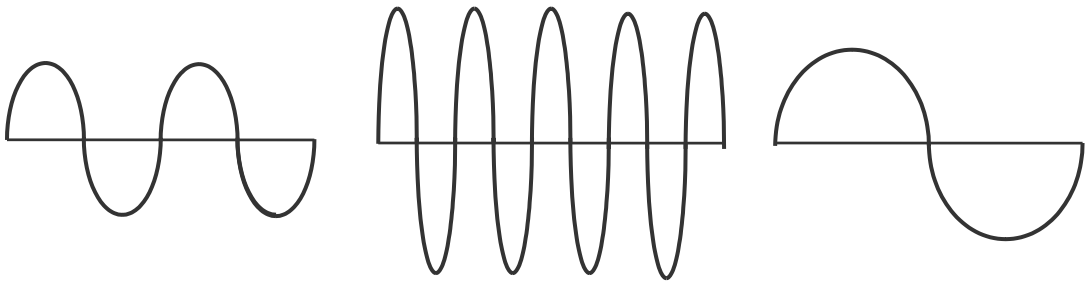
ii. Mark a **trough** by the letter **'T'** on the wave diagram. **1**

iii. A water wave is a _____ wave. **1**

iv. The amplitude of the water wave is _____ m. **1**

v. The wavelength of the wave is _____ m. **1**

6. **b.** The wave diagrams represent sound waves A, B and C travelling through **the air** during 0.04 s.



A **B** **C**

i. The note of lowest frequency is given by sound wave _____. **1**

ii. The loudest note is produced by sound wave _____. **1**

iii. Calculate the frequency of the note represented by sound wave A. **2**

_____

_____

_____

6. **c.** The velocity of both transverse waves and longitudinal waves depends **only** on the _____ through which the waves travel. **1**

Section B: Answer all questions in the spaces provided. 45 marks

1. The following table shows how the velocity **v** of a truck changes with time **t.**

v / m/s	**0**	**4**	**8**	**12**	**16**	**20**	**24**	**24**	**12**	**0**
t / s	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

a. Plot a graph of velocity **v** (y-axis) against the time **t** (x-axis) on the graph paper provided. **5**

b. **i.** The velocity of the truck after 2.5 s is _____ m/s. **1**

ii. The truck reaches a velocity of 18 m/s after _____ s. **1**

c. From the graph or otherwise, calculate:

i. the **acceleration** of the truck during the first **6 s** of its journey. **3**

_____

_____

_____

ii. the **total** distance covered by the truck. **3**

_____

_____

_____

_____

iii. the **average velocity** of the truck during the **whole journey**. **2**

_____

_____

_____

_____

_____

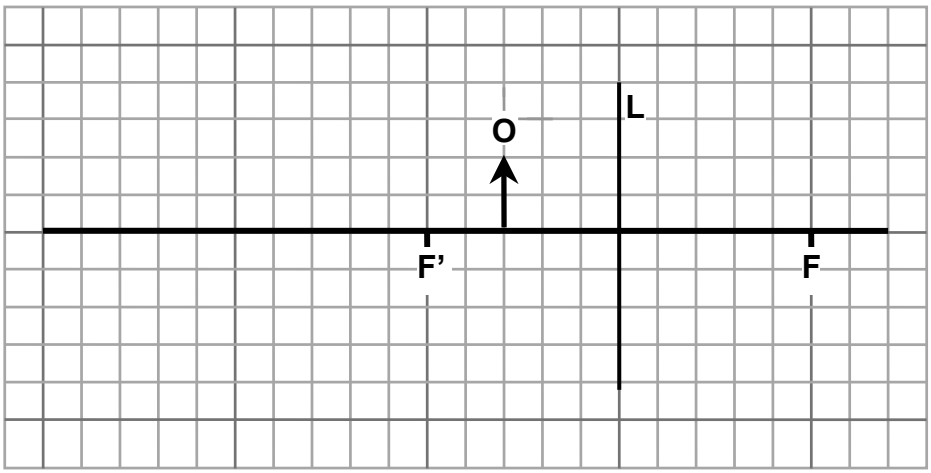
_____

_____

_____

2. **a.** The figure shows an object O placed in front of a converging lens L.

Note: 1 small square represents **1 cm.**



i. The height of the object is _____ cm. **1**

ii. Draw two rays from the top of the object **O** to locate its image **I.** **2**

iii. Draw the image **I.** **1**

i**v.** The height of the image **I** is _____ cm. **1**

v. Calculate the magnification produced by the converging lens L. **3**

vi. The image is upright, virtual and _____. **1**

vii. The focal length of the lens **L** is _____ cm **2**

b. **i.** The refractive index of diamond is 2.5. This means that the speed of light in _____ is 2.5 times the speed of light in _____. **2**

ii. Calculate the speed of light in diamond given that the speed of light in air is 3×10^8 m/s (300 000 000 m/s). **2**

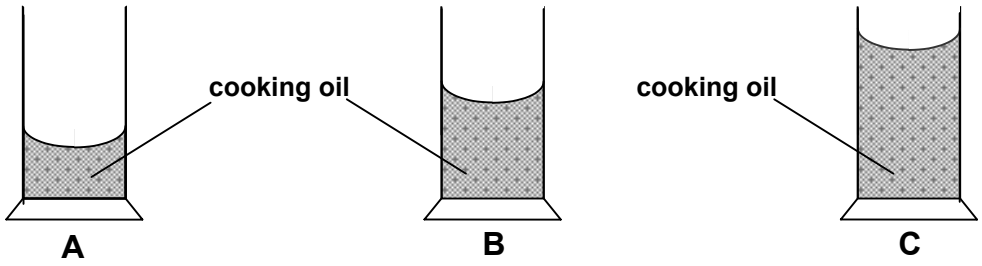
_____

_____

_____

_____

3. Figures A, B and C below show three measuring cylinders containing different amounts (masses) of the same kind of cooking oil. The mass of each measuring cylinder when empty is 70 grams.



a. You are asked to carry out an experiment to find out whether the density of cooking oil depends on its mass.

i. What is the additional apparatus you require to carry out your investigation? _____. **2**

ii. State the two measurements you require to find the density of cooking oil. _____ **2**

_____

iii. Draw a suitable table of results to record your observations. **3**

iv. Do you expect different values for the density of cooking oil in the three measuring cylinders? _____. **1**

v. Give a reason for your answer to question iv. **1**

_____

b. Martha buys a bottle of cooking oil from the supermarket. The density of the cooking oil is 920 kg/m^3. Calculate:

i. the **mass of cooking** oil in a fully-filled bottle of volume 0.001 m^3, **2**

_____

_____

ii. the **weight of the cooking oil** in the bottle, **1**

_____

iii. the **weight of the empty bottle** given that its mass is 800 g, **2**

_____

iv. the **total weight** of a fully-filled bottle of cooking oil. **1**

_____