JUNIOR LYCEUM ANNUAL EXAMINATIONS 2006

EDUCATIONAL ASSESSMENT UNIT- EDUCATION DIVISION

FORM 3	PHYSICS	Time: 1h 30min

NAME:_____ **CLASS:**_____

Answer all questions.
All working must be shown. The use of a calculator is allowed.

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

You may find some of these formulae useful.

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

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

work done = F s **PE = mgh** **Power = $\frac{\text{work done}}{\text{time}}$** **KE = $\frac{mv^2}{2}$**

moment of a force = Force $\times$ 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 = $\frac{\text{number of waves}}{\text{time}}$ **$v = f\lambda$**

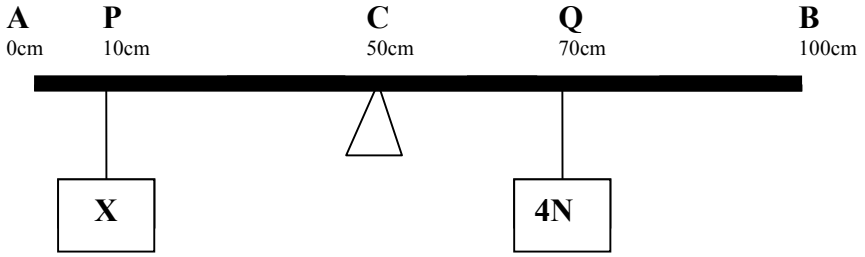
SECTION A: Answer all questions in the spaces provided.
This section carries 55 marks.

1. Fill in the table below:

	Quantity	Symbol	Unit	Instrument
i	Mass			Balance
ii	Time	t		
iii	Distance	s		
iv	Force			Spring balance
v	Volume			Measuring cylinder

[10]

2. The diagram shows a metre rule AB pivoted at its centre C. An object X is suspended from the 10 cms mark. When a 4N weight is suspended from the 70 cms mark, the rule is in equilibrium.



a. When the rule is in equilibrium: clockwise moments = _____ **[1]**

b. PC = ____cm = ____m and QC = ____cm = ____m **[2]**

c. The moment of the 4N weight about C is: _____ Nm **[2]**

d. The moment of X about C is: _____ Nm **[1]**

e. The size of X in Newtons is: _____ **[2]**

f. Total downward forces = _____N **[1]**

g. The reaction at the pivot = _____ N **[1]**

3. During an experiment on Hooke's Law, a student attached different loads to a spring.

a. Fill in the missing spaces in the table below:

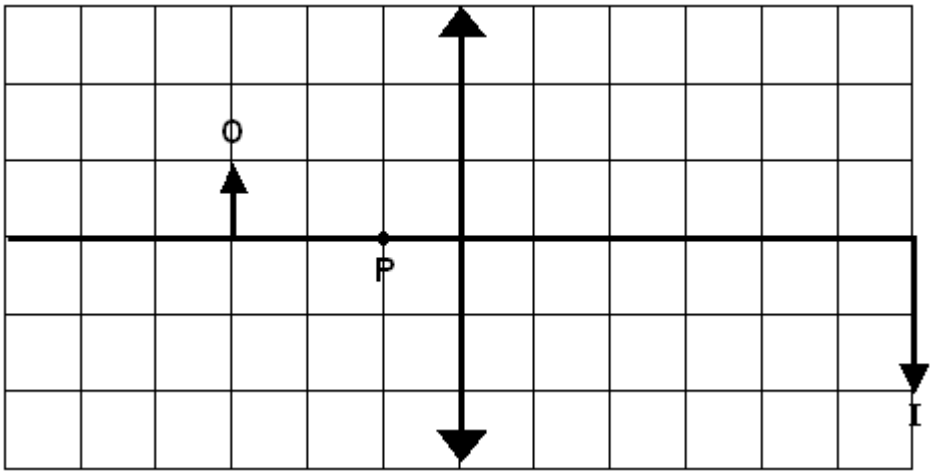
Mass attached in kg.	0	0.5	1.0	1.5
Weight attached in N	0		10	
Length in cm.	20	22		26
Extension in cm.				

[7]

b. When the attached weights are removed, the spring regains its original length. This means that it obeys _____ [1]

c. This experiment was repeated using heavier weights. When the attached weights are removed, the spring does **not** regain its original length. This means that the _____ was exceeded. [2]

4.



Lens

The diagram shows how the image I of an object O is formed by a thin converging lens.

a. (i) Measure the height of the object. _____ [1]

(ii) Measure the height of the image. _____ [1]

(iii) The image magnification is _____ [1]

b. From the tip of the object, draw:

(i) a ray of light that passes through the **centre** of the lens and ends at the image. [1]

(ii) another ray of light that is **parallel** to the axis and ends at the image. [1]

c. Measure the focal length of the lens. _____ [1]

d. Besides being magnified, the image is _____ [1]

e. The object is moved to point P. The new image formed is _____ than the object, _____ and _____. [3]

5.

Gamma rays		UV	Visible spectrum	IR	microwaves	

a. In the table above, the radiations are arranged in order of increasing wavelength. Fill in the missing radiations. [2]

b. UV stands for _____ [1]

IR stands for _____ [1]

c. The visible part of the spectrum is commonly known as _____. [1]

d. Name two properties common to all the radiations that form the electromagnetic spectrum.

_____

_____ [2]

e. Which of the radiations in the diagram:

(i) is used to kill cancerous cells _____ [1]

(ii) is used to detect broken bones _____ [1]

(iii) causes skin cancer _____ [1]

6.

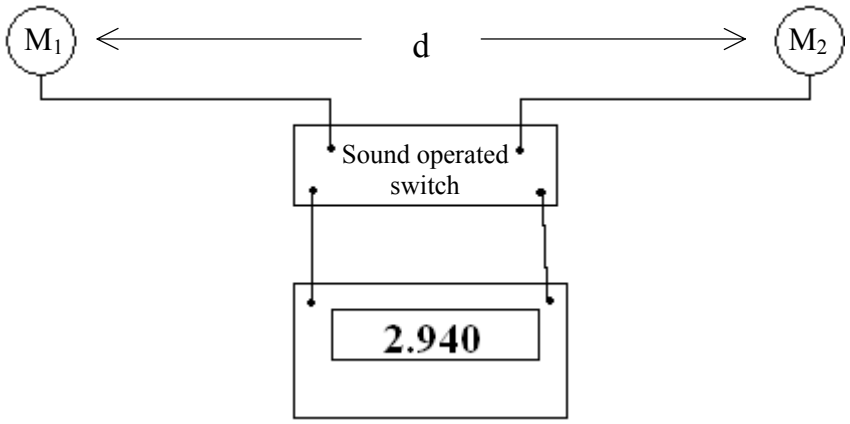
a. A battery-operated toy car running on flat ground changes chemical energy into _____ and _____ [2]

b. A bulb changes electrical energy into _____ and _____ [2]

c. A _____ changes energy from the sun into electricity [1]

Section B: Answer ALL questions on the foolscap provided.
This section carries 45 marks

7.



electronic millisecond stop clock

M_1 and M_2 are microphones placed a distance d apart. Any sound that reaches M_1 switches **on** the switch and the same sound arriving at M_2 switches it **off**. The stopclock records the time for the sound to travel the distance d. The table below shows the corresponding time intervals recorded on the stopclock when the distance d between the microphones is changed.

distance d in metres	1.0	1.2	1.4	1.6	1.8	2.0
time t in milliseconds	2.9	3.5	4.1	4.7	5.3	5.8

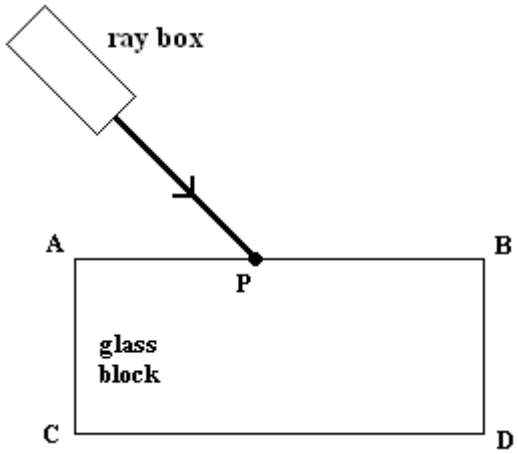
a. On the graph paper provided, plot a graph of distance/m on the Y-axis against time/ms on the X-axis. Draw the best straight line. **[8]**

b. From your graph, find the time when the distance is 1.5m **[2]**

c. Any corresponding pair of readings of d and t can be used to calculate the speed of sound in air. Explain how this can be done with reference to the table of readings above. **[2]**

d. Calculate the speed of sound in air in m/s using d = 1.4m, t = 4.1ms (0.0041s) **[3]**

8.



The diagram shows a ray of light incident at P on the face AB of a glass block.

a. On the foolscap provided, copy the diagram and add:

(i) a **normal** at P [1]

(ii) the **refracted** ray that continues from P [1]

b. The refracted ray hits face CD at Q and is again refracted as it emerges into the air.
On your diagram, draw:

(i) a **normal** at Q [1]

(ii) the **emergent** ray that leaves the block at Q [1]

c. What can you say about the direction of the incident ray and the emergent ray? [2]

d. Rays of light that pass through an optic fibre are not refracted but are transmitted through the fibre until they emerge into the air.

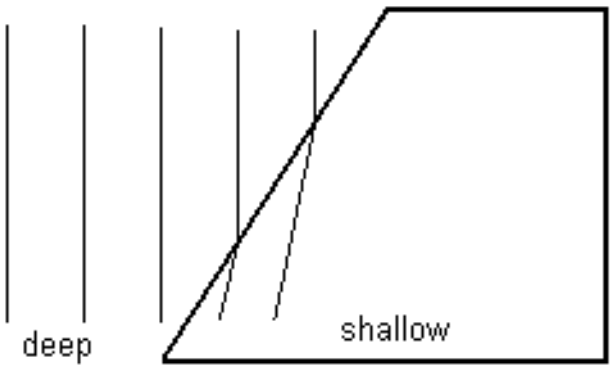
(i) What is this effect called? [2]

(ii) State one condition necessary for this effect to happen. [2]

(iii) Draw a diagram to show how light is transmitted through an optic fibre. [2]

e. If the speed of light in air is 3×10^8m/s and the speed of light in glass is 2×10^8m/s, calculate the refractive index of glass. [3]

9. The diagram represents wave crests produced at a frequency of **20Hz** in a ripple tank. The wave crests are in deep water travelling towards a straight boundary where the water becomes shallow.



a. Which piece of apparatus would you use to produce straight waves? [1]

b. (i) Water waves produced in a ripple tank are transverse. What are transverse waves? [2]

(ii) Give **two** other examples of transverse waves, other than water waves. [2]

c. (i) Use the diagram to measure the wavelength in deep water [1]

(ii) Calculate the speed of the waves in deep water [2]

d. On your foolscap, copy the diagram and add to it **2** more wave crests that have passed into the shallow section. [2]

e. (i) Use the diagram to measure the wavelength in shallow water. [1]

(ii) Calculate the speed of the waves in shallow water. [2]

f. Explain why the frequency remains unchanged throughout [2]