JUNIOR LYCEUM ANNUAL EXAMINATIONS 2003
EDUCATIONAL ASSESSMENT UNIT-EDUCATION DIVISION

FORM 3	PHYSICS	Time: 1h 30 min

NAME: ______________________ **CLASS:** __________

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

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

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

You may find some of these formulae useful.

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

$v = s/t$ $v = u + at$ $s = at^2/2$ $W = mg$ 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 × 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 = $\frac{\text{number of waves}}{\text{time}}$ $v = f\lambda$

1. A filament lamp is a device which changes electrical energy into light and heat.

   (a) Name a device which changes:

   (i) Electrical energy into sound ______________________

   (ii) Solar energy into heat ______________________

   (iii) Wind energy into kinetic energy ______________________

   (iv) Chemical energy into electrical energy ______________________

   (v) Kinetic energy into electrical energy ______________________

   (vi) Chemical energy into heat ______________________ **6 marks**

   (b) Which of the devices you named in (a) are converters of <u>renewable</u> sources of energy? **2 marks**

   ____

   (c) A car changes 30% of the chemical energy of burning fuel into kinetic energy. Name 2 other forms of energy, besides kinetic energy, into which the chemical energy from fuel is changed.

   1. ____________________ **2 .** ____________________ **2 marks**

2. For a car moving with a speed of 10m/s, the thinking distance is 8m and the braking distance is 12m. When the speed of the car increases to 20m/s, the thinking distance increases to 16m and the braking distance increases to 48m.

   (a) Find the total stopping distance at:

   (i) 10m/s ______________________

   (ii) 20 m/s ______________________ **2 marks**

   (b) Calculate the reaction time (or thinking time) of the driver at:

   (i) 10 m/s ______________________

   (ii) 20 m/s ______________________ **4 marks**

   (c) Give a reason why answers (b i) and (b ii) are equal.

   ____ **2 marks**

   (d) For an initial speed of 10m/s, calculate the deceleration which brought the car to rest in 4 seconds.

   ____ **2 marks**

3. (a) Give the name of 2 types of radiation from the electromagnetic spectrum whose wavelength is larger than that of ultra-violet radiation.

1. ______________________ **2.** ______________________ **2 marks**

(b) State 2 similarities between ultra-violet radiation and visible radiation.

1. ______________________ **2.** ______________________ **2 marks**

(c) Give a reason why it is advisable to cover exposed skin with a suitable cream if you stay outdoors in summer.

____ **2 marks**

(d) State 1 application of ultra-violet radiation.

____ **2 marks**

(e) Ozone in the atmosphere absorbs much of the ultra-violet radiation from the sun.

(i) State what is happening to the ozone layer.

____ **1 mark**

(ii) Name 1 harmful effect this is producing.

____ **1 mark**

4. In an experiment to study the strength of materials, a student used 3 wires of the same length and thickness but of different materials. The wires held vertically were loaded with different weights and each time, the length of the wire was measured.
Here are the results:

Wire 1

Load/kg	0	0.5	1.0	1.5	2.0	2.5
Length/cm	40	41	42	43	44	45
Extension/cm	0					

Wire 2

Load/kg	0	0.5	1.0	1.5	2	2.5
Length/cm	40	40.6	41.2	41.8	42.4	43.0
Extension/cm	0					

Wire 3

Load/kg	0	0.5	1.0	1.5	2	2.5
Length/cm	40	41.4	42.8	44.2	47.0	49.6
Extension/cm	0					

(a) For each load, work out the extension, filling in the 3 tables above. **5 marks**

(b) Which of the wires, **Wire 1**, **Wire 2** or **Wire 3** stretches most when loaded with a weight of 1kg?

2 marks

____

(c) For which wire, **Wire 1**, **Wire 2** or **Wire 3** was its elastic limit exceeded?

2 marks

____

(d) Give a reason for your answer to (c).

____ **1 mark**

5.(a)Which instrument connected to a microphone may be used to display sound waves ?

______________________ **1 mark**

(b) A tuning fork when struck vibrates 320 times/second.

(i) What is the frequency of the note? ________________________ **2 marks**

(ii) If the velocity of sound in air is 320m/s, calculate the wavelength.

____ **3 marks**

(c) The tuning fork is struck more strongly.
Underline the correct answer:

(i) The sound emitted:

is quieter / is louder / has a higher pitch / has a lower pitch **1 mark**

(ii) Only the: wavelength / frequency / amplitude changes. **1 mark**

(d) The tuning fork is struck and its base held on a worktop. Explain why you hear a louder sound.

____ **2 marks**

6. (a) A copper wire may be used to transmit electrical energy. What type of energy does an optic fibre transmit?

____ **1 mark**

(b) Why does this energy keep inside the optic fibre, even if the fibre is bent?

____ **2 marks**

(c) When constructing a bundle of optic fibres, only very thin fibres are used. Why are thick fibres unsuitable?

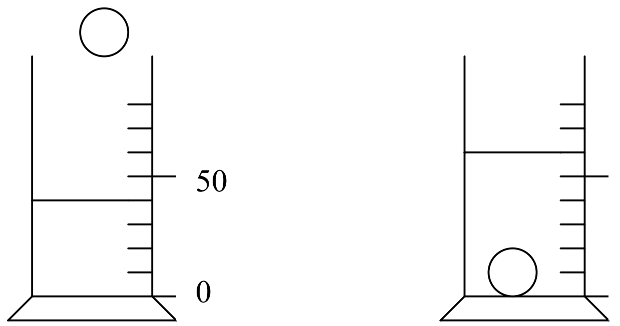
____ **2 marks**

SECTION B: Answer all questions on the sheets provided.
This section carries 45 marks.

This question is about density

7. In an experiment to measure the density of glass a student placed a glass marble in a container half filled with water (fig. a). He measures the water levels before and after.

fig. a fig. b



(a) (i) What is the above container called?

By looking at the above figures find:

(ii) The volume of the water alone.
(iii) The volume of the water and the marble.
(iv) The volume of the marble alone.
(v) What measuring instrument is used to find the mass of the glass objects?

5 marks

(b) He repeated the experiment for different glass objects and filled up the table below.

Object	Mass/g	Volume/cm^3	Density/(g/cm^3)
Glass lens	26	10	______
Glass marble	52	20	2.6
Glass stopper	78	30	______
Glass block	104	40	______

(i) Plot a graph of mass/g on the y-axis against volume/ cm^3 on the x-axis.
6 marks

(ii) Find the slope (gradient) of the graph and be careful to include the units in your answer. **2 marks**

(iii) Fill up the density column. **1 mark**

(iv) By considering the units, what quantity does the slope represent?
1 mark

This question is about forces work and energy.

8 (a) Peter has a mass of 50 kg.

(i) Find his weight in Newtons **1 mark**

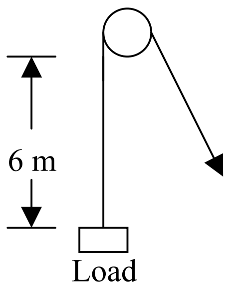
In order to go upstairs at a constant speed he needs to make a constant upward force.

(ii) What is the value of this upward force? **1 mark**

(iii) Find the work he does if he runs a vertical distance of 6m. **2 marks**

(iv) If he takes 10 seconds to run upstairs, calculate his power. **2 marks**

(b) He now tries to carry 10kg of books upstairs, but he finds it is too tiring. So he uses a pulley to raise the 10kg load to a height of 6m.



(i) What length of rope does he pull to raise the books to the top? **1 mark**

(ii) If he pulls the rope with a force of 120N, how much work does he do in raising the books? **2 marks**

(iii) What is the potential energy of the load (books) at a height of 6m? **2 marks**

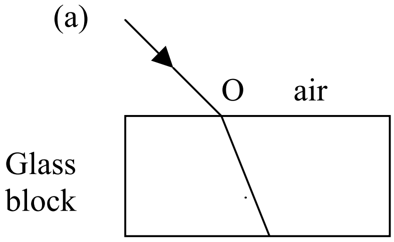
(iv) Comparing your answers to questions (ii) and (iii) above, calculate the extra work done by Peter. **2 marks**

(c) The rope is not strong enough and it breaks. The books fall to the ground 6m below. Compete this energy change diagram:

2 marks

This question is about refraction of light, lenses and magnification.

9 (a)



Copy the diagram and for point O:

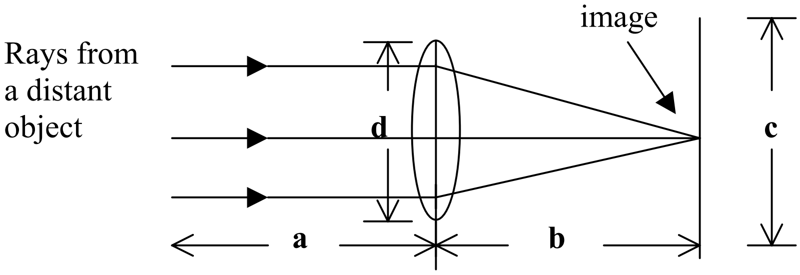
(i) Draw a normal. **1 mark**

(ii) Mark and label on the diagram:

the incident ray, the angle of incidence,
the refracted ray, the angle of refraction.

4 marks

(b) John took a converging lens and tried to investigate what can be done by a lens. He first aimed it to receive light rays from a distant object and used a white cardboard to get a sharp, clear image on the cardboard (screen).

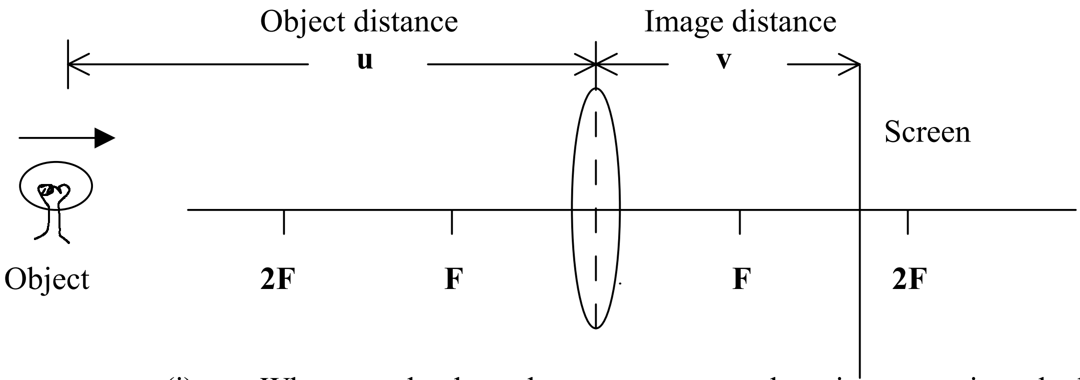


(i) Which distance a, b, c, or d is the focal length of the lens? **1 mark**

(ii) The image seen in the above diagram is:
(Write down the correct word for each pair on your answer sheet)

- real or inverted,
- magnified or diminished,
- upright or inverted. **3 marks**

(c) John now places a brightly lit object (a lamp) and wants to investigate the magnification of the image <u>as the object is moved closer</u> to the lens.



(i) What must he do to the screen to get a sharp image on it as the lamp is moved towards the lens? **1 mark**

(ii) Describe one precaution he could take for an accurate result. **1 mark**

He got these results:

Object distance **u**/cm	image distance **v**/cm	magnification **m**
24 **16** **12**	**12** **16** **24**	___ **1** ___

(iii) Fill up the missing magnification values. **2 marks**

(iv) What is the focal length of the lens? **2 marks**