SECONDARY SCHOOL ANNUAL EXAMINATIONS 2003
EDUCATIONAL ASSESSMENT UNIT-EDUCATION DIVISION

FORM 3	PHYSICS	Time: 1 h 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.

You may find some of these formulae useful.

Area of triangle = $\dfrac{\text{base} \times \text{height}}{2}$ area of trapezium = $\dfrac{h}{2}$ (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 = $\dfrac{\text{work done}}{\text{time}}$ KE = $\dfrac{mv^2}{2}$

moment of a force = Force × perpendicular distance

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

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

frequency = $\dfrac{\text{number of waves}}{\text{time}}$ $v = f \lambda$

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

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**
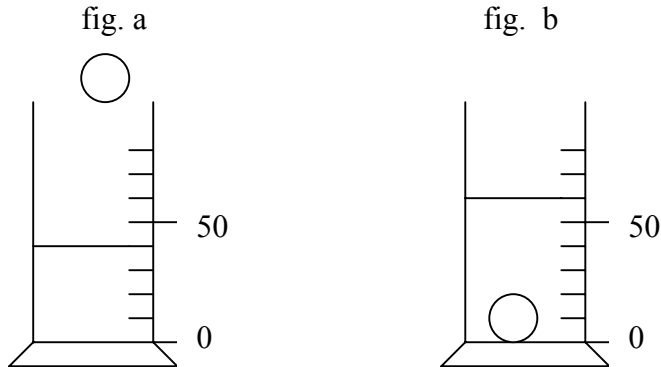
SECTION B: **Answer all questions in the space provided.**
This section carries 45 marks.

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?   _____ **1 mark**
        By looking at the above figures find:
        (ii)   The volume of the water alone.   _____ **1 mark**
        (iii)   The volume of the water and the marble.   _____ **1 mark**
        (iv)   The volume of the marble alone.   _____ **2 marks**

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

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

(c) (i)   Plot a graph of mass/g on the y-axis against volume/ cm^3 on the x-axis.
            (use the scale: y-axis 1cm to represent 5g
                    x-axis   4cm to represent 10 cm^3)   **7 marks**

    (ii)   What measuring instrument is used to find the mass of the glass objects?
            _____ **1 mark**

    The density of each of the four objects in the above table is 2.6g/cm^3.

    (iii)   Why do you think that the density is the same for all the four objects?
            _____
            _____ **2 marks**

6

This question is about forces work and energy.

8   Peter has a mass of 50 kg.

(a) (i)   Find his weight in Newtons. _____ **2 marks**

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? _____ **2 marks**

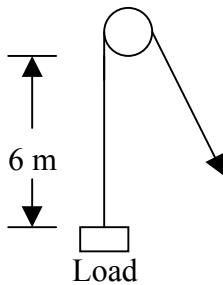(iii)   Find the work he does if he runs a vertical distance of 6m.

_____

_____ **2 marks**

He takes 10 seconds to go upstairs.

(iv)   If Power is the work done in 1 second, 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.


6 m

Load

(i)   What length of rope does he pull to raise the books to the top?
_____ **2 marks**

(ii)   He observes that some extra work is needed to overcome an opposing force acting at the pulley. What is this force called?
_____ **2 marks**

(iii)   When he oils the pulley it becomes easier to lift up the books. Will oiling increase or decrease this opposing force acting at the pulley?_____ **1 mark**
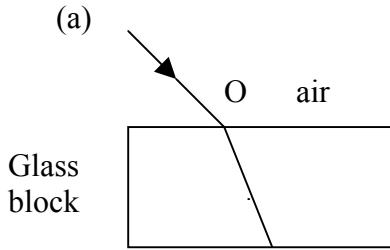
(c) The rope is not strong enough and it breaks. The books fall to the ground 6m below. Compete this energy change diagram:

Potential energy	Changed to →		Changed to →	
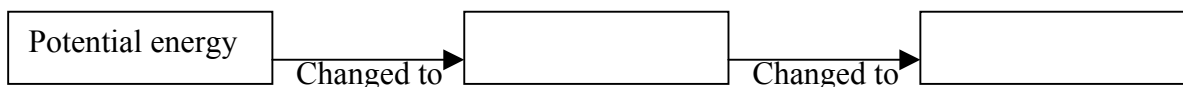
2 marks

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

9   (a)

Glass
block

O   air

For point O on the diagram:
(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

(iii)   In which medium does light travel faster, in air or in glass?

_____   **2 marks**

(b) John took a converging lens and tried to investigate what a lens can do. He aimed
the lens to receive light rays from a bright, distant object. He moved the lens till he
got a sharp, clear image on the cardboard (screen).

Rays from
a distant
object

image

c

a   b
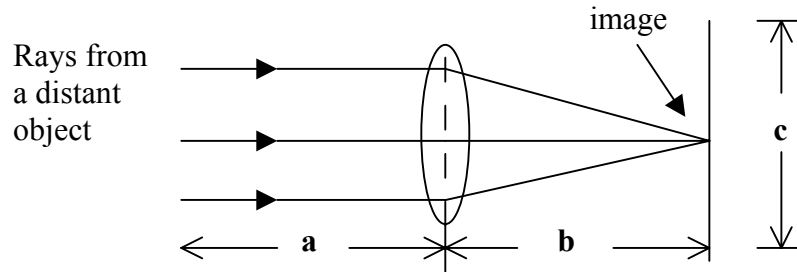
(i)   Which distance a, b, or c is the focal length of the lens? _____   **1 mark**
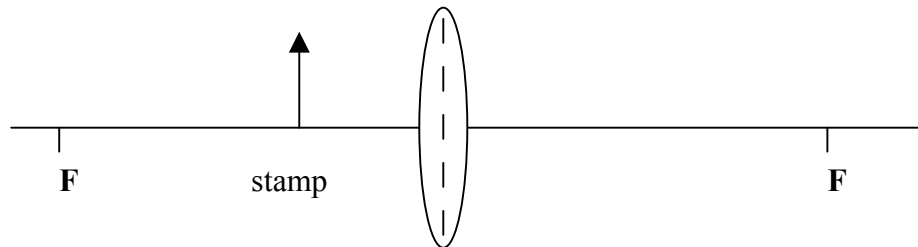(ii)   The image seen in the above diagram is:
         (Underline the correct word in each line)
         real or inverted,
         magnified or diminished,
         upright or inverted.   **3 marks**

(c) John now uses the same lens to look closely at a stamp

F   stamp   F

(i)   Complete the ray diagram above.   **3 marks**

(i)   Why do we say that the image is virtual?

_____

_____

                                                         1 mark
8