JUNIOR LYCEUM ANNUAL EXAMINATIONS 2007
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 = base X height   area of trapezium = $\underline{h}$ (sum of parallel sides)
                    2   2

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

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

moment of a force = Force X perpendicular distance

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

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

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

For office use only:

Question	1	2	3	4	5	6	7	8	Total Exam	Practical	Final Mark
Marks											

SECTION A: Answer ALL questions. This section has a total of 40 marks.

1. Diagram A shows a measuring cylinder containing 10 cm^3 of water.

    Diagram B shows the same measuring cylinder containing the same volume of water after a stone was placed inside.

a. (i) Use your ruler to measure the height of the water levels.

Diagram A   Diagram B

25cm^3

h_1 ....cm

[1]   10cm^3

h_2 h_2........................cm

h_1
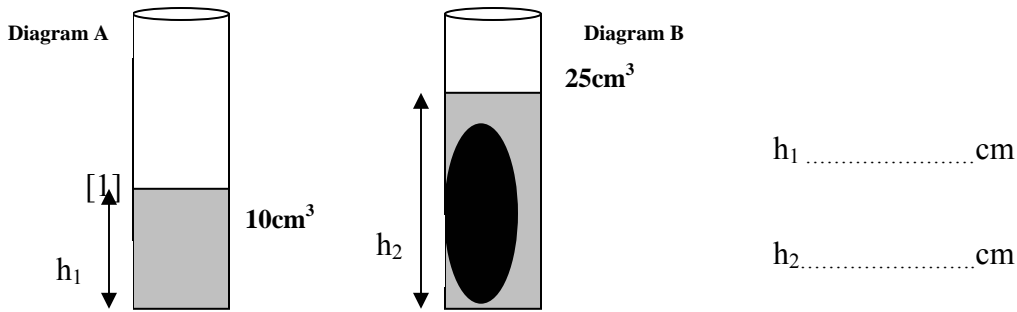
(ii) Calculate the difference in the water levels.   ……………………. [2]

b. (i) Calculate the volume of the stone in cm^3 ………………………….. …..…… [2]

    (ii) If the mass of the stone is 60g, work out the density of the stone in g/cm^3
    …………………………………………………… [2]

2. Fill in using the words below. Each word may be used only once.

   **inverted, refracts, equal, reflected, transverse, refraction, focus, wavelength.**

    a. A ray of light that hits a plane mirror is mostly …………………….

    b. After passing through a converging lens, parallel rays meet at the …………….

    c. A real image formed by a converging lens is always ……………….………….

    d. When a ray light passes from air into water, it ……..………towards the normal.

    e. Refraction always involves a change in wave velocity and ………….……….

    f. When total internal reflection occurs in an optical fibre, the angle of incidence is
        ………………….……to the angle of reflection.

    g. In a ripple tank, ……………………….takes place when waves pass from deep
        into shallow water.

    h. Sound waves are longitudinal but water waves are ……………..…… [8]

3. On a particular day, a solar panel absorbed an average of 1 MJ (1 000 000 J) of solar energy every hour. When joined to a hot water tank, this solar panel was found to be 40% efficient.
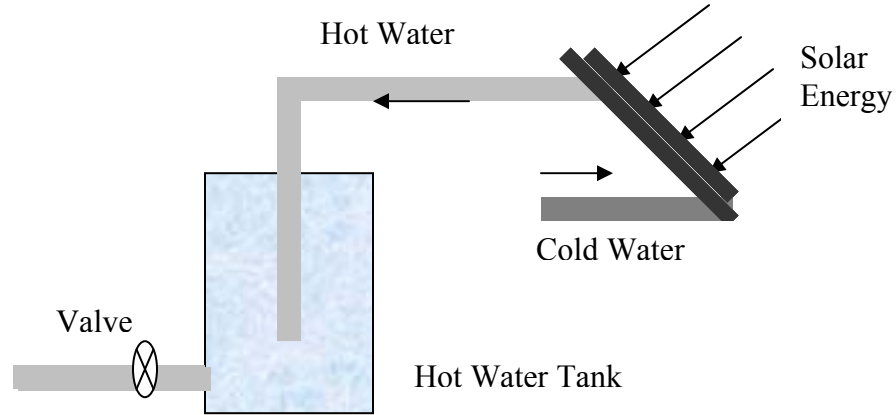
a. Is solar energy renewable or non-renewable ? ……………………………. [1]

b. Complete the energy flow diagram below

[1]
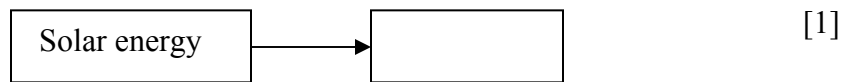
| Solar energy | → | |

c Calculate in J how much energy every hour is actually used to heat the water, if this solar panel is **40% efficient**.

………………………………………………………………………………. [2]
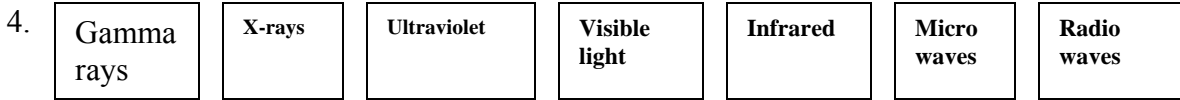
d. The principle of energy conservation states…………………………………….

…………………………………………………………………………. [1]

e. Keeping in mind your answer to question d, say what may have happened to the unused solar energy.

………………………………………………………………………….. [1]

f. Name one advantage and one disadvantage of heating water using solar energy over using electricity.

Advantage ………………………………………………………………. [1]

Disadvantage …………………………………………………. [1]

4.

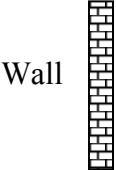| Gamma rays	X-rays	Ultraviolet	Visible light	Infrared	Micro waves	Radio waves

a. (i) All electromagnetic waves travel in a vacuum with the same ………………… [1]

   (ii) The electromagnetic waves above are arranged in order of increasing ……… [1]

   (iii) Ultra violet rays can cause ……………………………………………... ……… [1]

   (iv) X-rays pass through human tissues but are absorbed by the   …………………[1]

b. A radio transmitter encodes ('changes') sound waves into radio waves which are then transmitted to radio receivers.

   (i) Give one advantage of transmitting radio waves rather than sound waves.

      …………………………………………………………………… [1]

   (ii) In a radio receiver, a radio wave is   ………………   into a sound wave.   [1]

c. A radio station transmits at a frequency of 100 MHz (1.0×10^8 Hz).

   Find the wavelength of the waves if the velocity of electromagnetic waves in air is

   3.0×10^8 m/s.

   ……………………………………………………………………….…… [2]

5.   The speed of sound in air is 330 m/s.

   Wall   Sound produced at **A** reaches a wall at **B** in 2.5

seconds.

   A [_____] **B**

   a. Calculate the distance from **A** to **B**.

   ……………………………………………..………… [2]

   b. After hitting the wall, the sound returns to **A**.

   (i) At **B** the sound is ………………………..   [1]

   (ii) The same sound heard again at **A** is called an ……………………………   [1]

   (iii) The total time taken by the sound to reach **A** again is …………………seconds.

                                                                                             [1]

   c. As the sound at **A** is produced, a light is flashed.

   (i) From **B**, is the light seen before or after the sound is heard? ………………   [1]

   (ii) Give a reason for your answer …………………………………………………… [2]

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

6. The diagram shows a uniform ruler balanced on a pivot at its mid-point. Weights
hang at A and B.

A ▭ B

15N

X
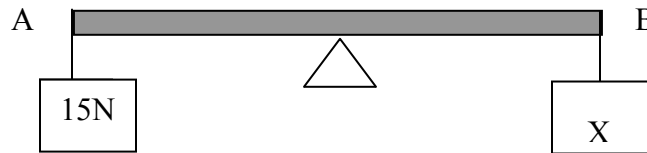
a. The centre of gravity of this uniform ruler acts through it …………………. [1]
b. When the ruler is balanced: (i)   X = ………N.   [2]
c. X is removed so that the ruler loses equilibrium. In which direction does it turn,
clockwise or anticlockwise ? …………………   [1]
d. When X is removed, equilibrium is restored by moving the pivot towards one
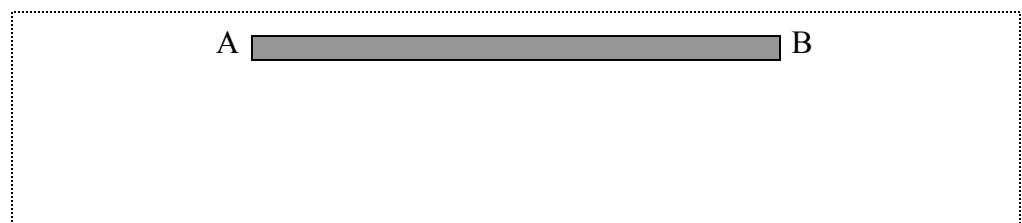end of the ruler.

(i) **Tick the correct option**.
Pivot moved towards end A ☐   Pivot moved towards end B ☐
[1]
(ii) Add to the diagram below, the pivot and the 15 N weight.   [2]
(iii)On the same diagram, mark

- the weight W of the ruler and its direction using an arrow.   [2]
- the distance d_1 between the 15N weight and the pivot.   [1]
- the distance d_2 between the centre of gravity and the pivot.   [1]

A ▭ B

(iv)   If $d_1 = 0.2$m and $d_2 = 0.3$m, calculate the value of W.

…………………………………………………………………………………… [4]

7. The last minute of a race can be divided into 3 parts.

> Part 1: Joseph ran with constant speed for 20 seconds.
>
> Part 2: Joseph sprinted forward for 30 seconds.
>
> Part 3: Joseph slowed down for 10 seconds until he came to rest.

Tick the correct option in questions a, b and c.

a. While sprinting forward, Joseph ran with

constant speed. ☐

acceleration. ☐

deceleration. ☐ [1]

b While slowing down, Joseph ran with

constant speed. ☐

acceleration. ☐

deceleration. ☐ [1]

c. In the diagram below, AB is the velocity – time graph for one part of this section of the race.

AB represents: Part 1 ☐ Part 2 ☐ Part 3 ☐ [1]
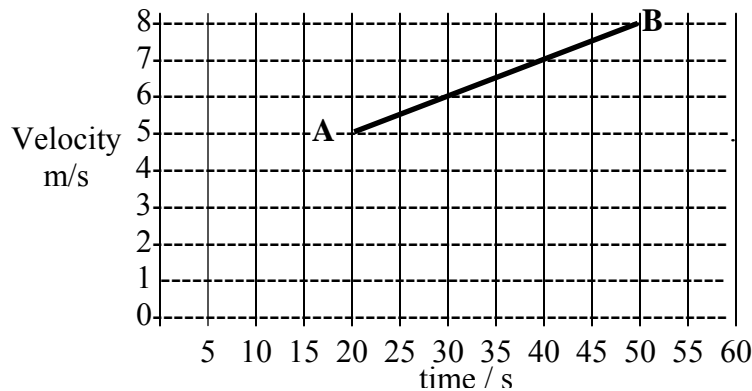

d. Write down the velocity of Joseph at :

(i) A ……………. (ii) B ……………… [2]

e. Keeping in mind your answer to d, use the equation $v = u + at$ to calculate the acceleration.

………………………………………………………………………………… [2]

f. Complete the graph by drawing lines to represent the other 2 parts of this section of the race. [4]

g. Work out the distance covered by Joseph between A and B.

8. A spring is mounted vertically as shown in the diagram below. The height **h** is the distance between the bottom of the load and the bench.

Maria measures values of **h** for different loads and tabulated her results.
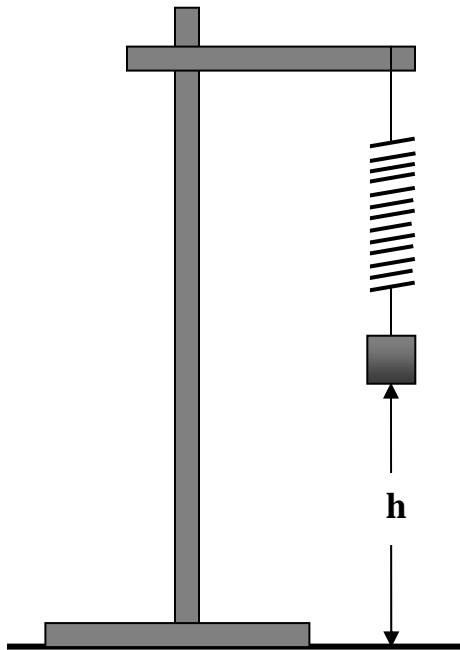
Load in N	Height **h** in mm
0	94
1	84
2	72
3	62
4	50
5	41

a. When a spring is loaded, the increase in length is called the .... [1]

b. A spring obeys Hooke's Law if the .... and the .... are directly proportional. [2]

c. On the graph paper on Page 8 of this answer paper, plot a graph of **h** in mm on the y-axis against Load in N on the x-axis. Draw the best straight line. [6]

d. Use your graph to find:
   (i) the load which gives a value of **h** of 80mm. .... [2]
   (ii) the value of **h** for a load of 1.5 N. .... [2]

e. For a load of 10 N, the spring does not regain its original length when the load is removed. This means that the .... has been exceeded. [2]