## JUNIOR LYCEUM ANNUAL EXAMINATIONS 2003

Educational Assessment Unit – Education Division

FORM 4	PHYSICS	TIME:	1 hr 30 min

NAME: \_\_\_\_\_ CLASS: \_\_\_\_\_

Answer all the questions of Section A in the spaces provided on the Examination Paper. Answer all the questions in Section B on the sheets provided. All working must be shown. The use of a calculator is allowed.

Where necessary take the acceleration due to gravity,  $g = 10 \text{ m/s}^2$ .

You may find some of these formulae useful.

Pressure = force / area Force = mass x acceleration  $a = \frac{v-u}{t}$ Momentum = mass x velocity Energy = Power x Time Heat energy = mass x specific heat capacity x temperature change V = I R P = V I Charge = Current x time Energy = I V t

## <u>Section A:</u> Answer ALL Questions in this section in the spaces provided. This section carries 55 marks.

1. (a) In solids, pressure depends on \_\_\_\_\_\_ and \_\_\_\_\_. [2]
(b) (i) When you do a handstand, the pressure on your hands is greater than the pressure on your feet when you stand upright. Why?
(ii) The wind pressure on the wall is 100Pa. If the wall has an area of 6m<sup>2</sup>, what is the force on it?

[3]



- 4. Trolley X of mass 2 kg moving at a steady speed of 2.5 m/s collides and couples with trolley Y of mass 3 kg.
  - (a) Find the **momentum** of trolley X **before** collision.

5.

(b) If trolley Y was stationary, what is the <b>final</b> velocity of the two trolleys <b>after</b> collision?		
This question is about Heat Transfer.		
(a) (i) Heat travels through solids by		
(ii) Heat travels through liquids by		
(iii) Heat travels through gases by		

(b) Some houses in Malta and Gozo are not insulated and lose heat in several ways. It is found that heat is **lost** according to the chart below:



- (i) Which part of the house needs most insulation? [1]
- (ii) Suggest how each part of the house can be insulated.

Ceiling	[1]
Walls	[1]
Windows	[1]
Floor	[1]

- - -

(a) How much power does the oven use when it takes a current of 10A at 240V?

(k	How many kilowatt-hours would it use in three hours?			
(0	c) Each unit of electricity costs 4c. Find the total cost after three hou			
(0	I) Which <b>one</b> of the following fuses would you choose for the 3-pin plug fitted with this oven?			
	3A 5A 13A			
². In o	an experiment to find the specific heat capacity, a student heated 500g f water from 22°C to 32°C.			
(8	a) The mass of water in <b>kg</b> is			
(t	b) The temperature <b>rise</b> is			
(0	c) If the specific heat capacity of water is 4200 J/kg°C, the heat energy used is			
(0	The student used a stonwatch to record the time during which an			
((	immersion heater of 500 W was switched on. For how long was the heater switched on?			
3. (a	a) When a toy gun is fired, it exerts a forward force on the rubber bullet. Why does the toy gun recoil backwards?			
(t	b) Mark on the diagram			
	(i) the direction of the force <b>A</b> on the rubber bullet			
	(ii) the direction of the force $\mathbf{B}$ on the toy gun as it recails			
	(i) the direction of the force <b>D</b> on the toy gun as it recoils.			

## <u>Section B:</u> Answer ALL Questions in this section on the sheets provided. This section carries 45 marks.

- 9. This question is about **electric charge**.
  - (a) When Mary pulls a plastic comb through her hair, the comb becomes negatively charged.
    - (i) Which ends up with more electrons than normal: the **comb** or **Mary's hair**?

[2]

[2]

[4]

[2]

- (ii) Why does Mary's hair become positively charged?
- (b) Give ONE example of where electrostatic charge might be useful. [2]
- (c) Mary holds a positively charged rod close to a metal can. The can is on an insulated stand.



- (i) Copy the diagram. Draw in any induced charges on the can.
- (ii) Why is the can attracted to the rod even though the overall charge [2] on the can is zero?
- (iii) When Mary touches the can with her finger, electrons flow [2] through her hand. In which direction do the electrons flow?
- (iv) What charge (**positive** or **negative**) is left on the can after Mary [1] touches the can?
- 10. This question is about **resistance**.
  - (a) When a kettle is plugged into the 240V mains supply, the current through its element is 10 A. What is the resistance of its element? [2]
  - (b) What type of resistance components do you require to obtain the following results? In each case write down the name of the component AND draw the symbol used.
    - (i) A component that controls the brightness of a bulb. [2]
    - (ii) A component that may be used in an electrical thermometer to detect temperature change. [2]
    - (iii) A component used in electronic circuits that switches lights on and off automatically.
    - (iv) A component used in an electronic circuit that allows current to flow in one direction only. [2]

(c) The lines A and B on the following graph are for two different conductors.



- (i) Do you think that these conductors obey Ohm's Law? Explain [2] why.
- (ii) Which of the two conductors (A OR B) has the lower resistance? [1]
- (iii) If a tungsten filament is used, sketch a graph (current against [2] p.d.) which may be obtained.



11.

A skydiver jumps out of an aeroplane. The following readings of the skydiver's velocity (in **m/s**) against time (in **s**) are recorded.

Velocity (m/s)	Time (s)
0	0
9.0	2
19.0	4
27.5	6
35.0	8
43.0	10
50.0	12
54.5	14
58.5	16
60.0	18
60.0	20

