

SECONDARY SCHOOL 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 and Section B in the spaces provided on the Examination Paper. 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.

$$\text{Pressure} = \text{force} / \text{area} \quad \text{Force} = \text{mass} \times \text{acceleration}$$

$$a = \frac{v - u}{t}$$

$$\text{Momentum} = \text{mass} \times \text{velocity} \quad \text{Energy} = \text{Power} \times \text{Time}$$

$$\text{Heat energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

$$V = I R \quad P = V I \quad \text{Charge} = \text{Current} \times \text{time} \quad \text{Energy} = I V t$$

Section A: 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)



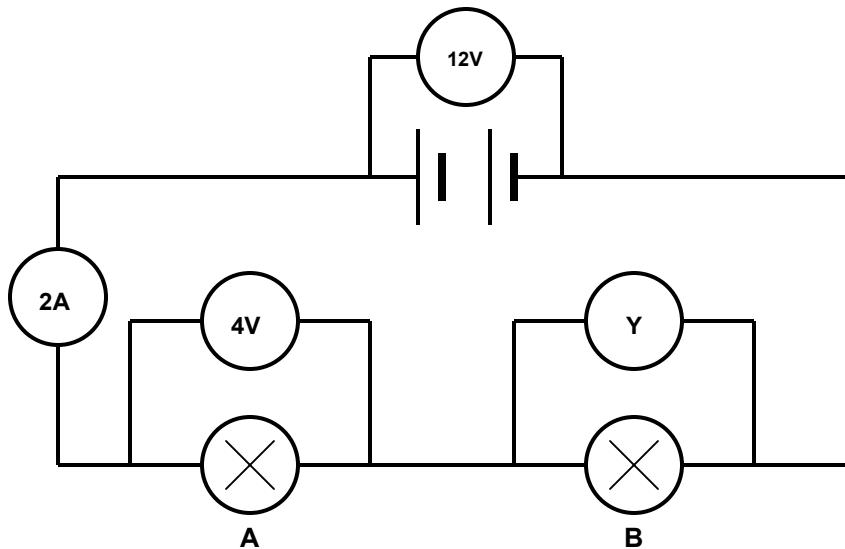
- (i) When you do a handstand, the pressure on your hands is greater than the pressure on your feet when you stand upright. Why?

[2]

- (ii) The wind pressure on the wall is 100Pa. If the wall has an area of 6m^2 , what is the force on it?

[3]

2.



- (a) What type of meter is Y? _____ [1]
- (b) What is the reading on meter Y? _____ [1]
- (c) How much charge passes through lamp A in 1 second? _____ [2]
- (d) How much energy is radiated from A every second? _____ [2]

3.



A sports car of mass 1500kg can accelerate from rest to 20m/s in 4s.

- (a) Calculate its acceleration.

-
- [2]
- (b) Calculate the force needed to produce this acceleration.
-
- [2]
- (c) A driver finds difficulty to drive a car when the ground is covered with ice. Why?
-
- [1]
- (d) Why is it important to wear a seat belt when driving a car?
-
- [2]
- (e) Streamlining a car reduces fuel consumption. Why?
-
- [2]

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.

[2]

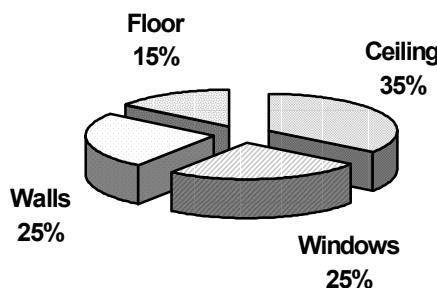
(b) If trolley Y was stationary, what is the **final** velocity of the two trolleys **after** collision?

[3]

5. This question is about **Heat Transfer**.

- (a) (i) Heat travels through solids by _____ [1]
(ii) Heat travels through liquids by _____ [1]
(iii) Heat travels through gases by _____ [1]

(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]

6. An electric oven is connected to the mains supply.

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

[2]

- (b) How many kilowatt-hours would it use in three hours?

[2]

- (c) Each unit of electricity costs 4c. Find the total cost after three hours.

[1]

- (d) Which **one** of the following fuses would you choose for the 3-pin plug fitted with this oven?

3A 5A 13A

[2]

7. In an experiment to find the specific heat capacity, a student heated 500g of water from 22°C to 32°C.

- (a) The mass of water in **kg** is _____

[1]

- (b) The temperature **rise** is _____

[1]

- (c) If the specific heat capacity of water is 4200 J/kg°C, the **heat energy** used is

[3]

- (d) The student used a stopwatch to record the time during which an immersion heater of 500 W was switched on. For how long was the heater switched on?

[3]

8. (a) When a toy gun is fired, it exerts a forward force on the rubber bullet. Why does the toy gun recoil backwards?

[3]

- (b) Mark on the diagram



[1]

(i) the direction of the force **A** on the rubber bullet

[1]

(ii) the direction of the force **B** on the toy gun as it recoils.

Section B: Answer ALL Questions in this section in the spaces provided.
This section carries 45 marks.

9. This question is about **electric charge**.

- (a) When Paul pulls a plastic comb through his hair, the comb becomes negatively charged.

- (i) Which ends up with more electrons than normal: the **comb** or **Paul's hair?**

[2]

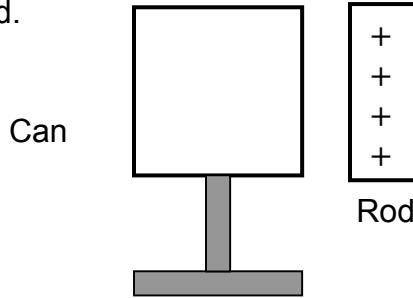
-
- (ii) Why does Paul's hair become positively charged?

[2]

- (b) Give ONE example of where electrostatic charge might be useful.

[2]

- (c) Paul holds a positively charged rod close to a metal can. The can is on an insulated stand.

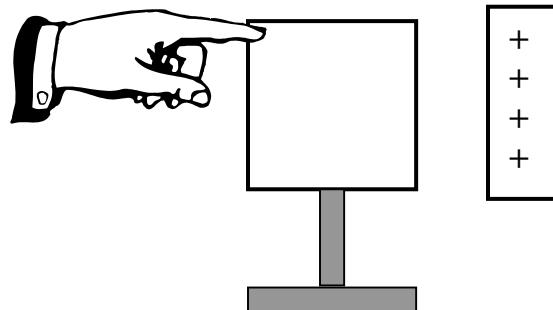


- (i) Draw on the diagram above any induced charges on the can. [4]

- (ii) Why is the can attracted to the rod even though the overall charge on the can is zero?

[2]

- (iii) If Paul touches the can with his finger, electrons flow through his hand. Show the charge flow while Paul is touching the can.



[2]

- (iv) What charge (**positive** or **negative**) is left on the can after Paul touches the can?

[1]

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) **Diode, Light Dependent Resistor (LDR), Thermistor and Variable Resistor** are **four** types of resistance components. Which of these four 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.

Function	Type of resistance component	Symbol
(i) A component that controls the brightness of a bulb.		
(ii) A component that may be used in an electrical thermometer to detect temperature change.		
(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.		

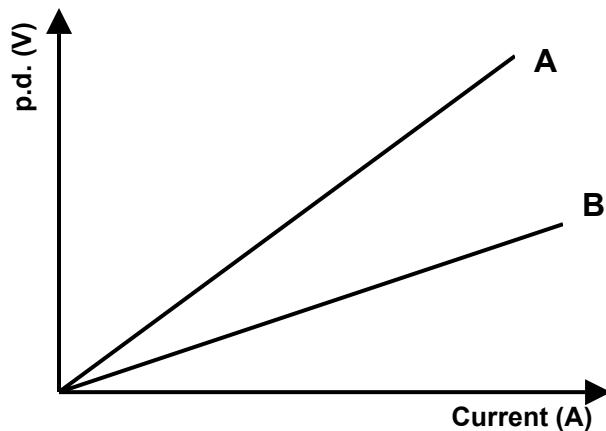
[2]

[2]

[2]

[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 why.

[2]

- (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 p.d.) that may be obtained.



[2]

11.



A skydiver jumps out from 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

- (a) Plot a graph of velocity (on the **y-axis**) against time (on the **x-axis**). [6]
- (b) Find the terminal velocity of the skydiver. _____ [1]
- (c) From the graph, find the velocity of the skydiver after (i) 5s and (ii) 11s.
 (i) _____ (ii) _____ [2]

- (d) The skydiver opens the parachute 20s after jumping out of the aeroplane. Describe the extra force now acting on the skydiver and its effect upon the skydiver's speed.



- (e) Will the skydiver reach a new terminal velocity? Explain your answer.
