

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.

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

$V = IR$ $P = VI$ Charge = Current x time 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)



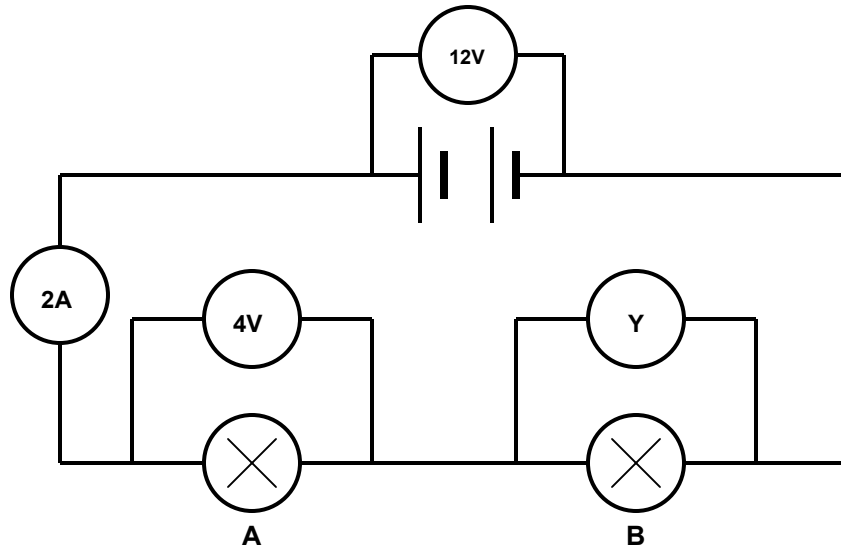
(i) When you do a handstand, the pressure on your hands is greater than the pressure on your feet when you stand upright. Why?

[2]

(ii) The wind pressure on the wall is 100 Pa . If the wall has an area of 6 m^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]

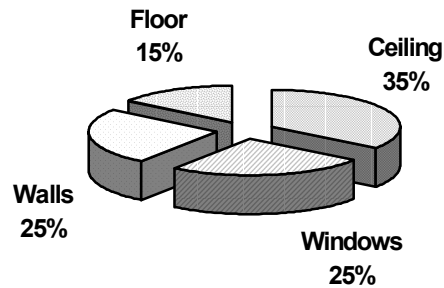
5. This question is about **Heat Transfer**.

(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
- (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. [1]



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]

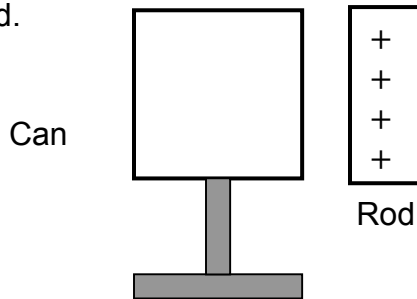
(ii) Why does Paul's hair become positively charged?

_____ [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.

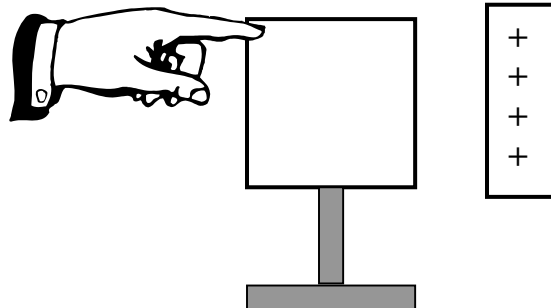


(i) Draw on the diagram above any induced charges on the can. [4]

(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.



(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.		

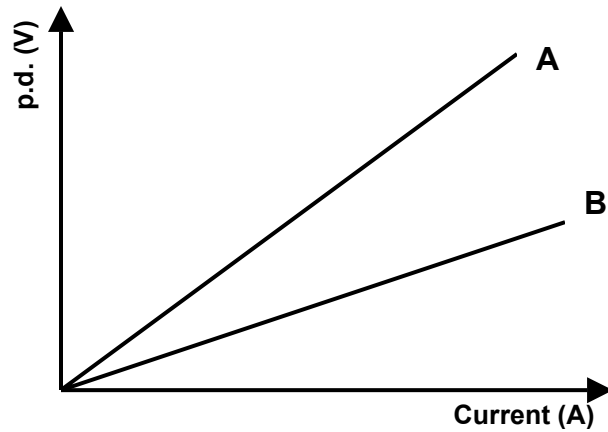
[2]

[2]

[2]

[2]

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



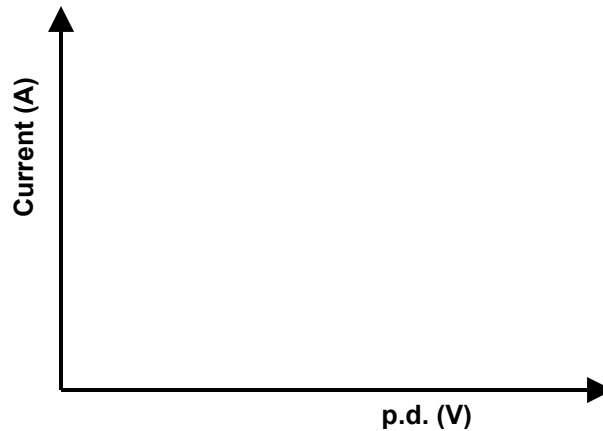
- (i) Do you think that these conductors obey Ohm's Law? Explain why.

[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.

