This is a Class 1 exam

Lebanon Evangelical School for Boys and Girls

Lebanon Evangelical School
for Boys and Girls Loueizeh - Baabda

Stage Exam 03

16MAY2025

Do NOT write in this box. Your MARK will be placed here.

Subject :	Physics
Class :	9A
Teacher :	Dr Ruth Brett
Duration :	1 hour

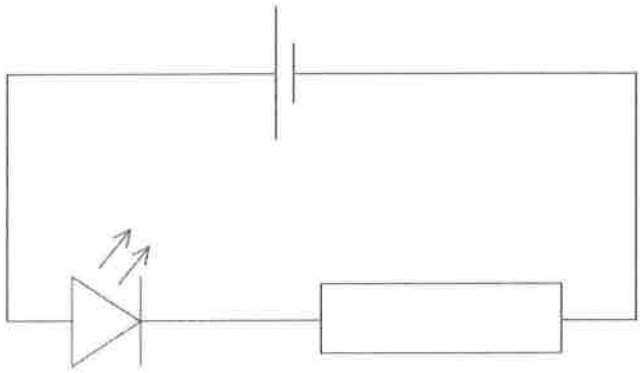
The last page has some equations you may find useful. You may remove it and do NOT need to hand it in with the rest of the exam.

You are to answer the questions to this exam on : This exam paper

Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Q1. The diagram shows a circuit containing a light emitting diode (LED) and a resistor.



(a) Add meters to the diagram to measure the voltage of the resistor and the current in the resistor.

(3)

(b) The current in the resistor is 7.3 mA.

The voltage of the resistor is 0.92 V.
Calculate the resistance of the resistor.

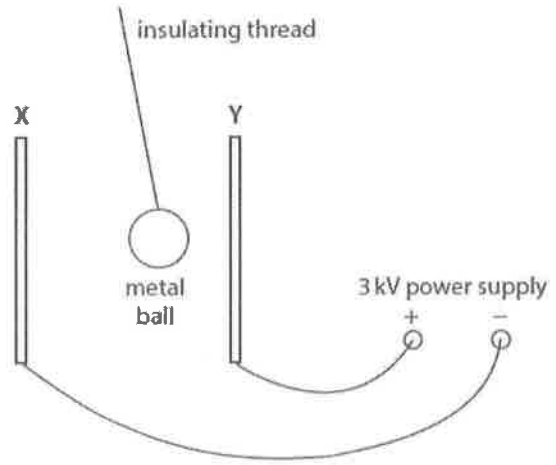
(3)

resistance = ... Ω

(Total for question = 6 marks)

Q2. This question is about a demonstration to show the link between current and charge.

The diagram shows two metal plates, X and Y, with a metal ball moving between them.



(a) The two metal plates have no charge before the power supply is connected.

When plate Y is connected to the positive terminal of the power supply, the plate becomes positively charged.
Explain how plate Y gains a positive charge.

(2)

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(b) (i) The metal ball becomes positively charged when it touches plate Y.

The metal ball then moves away from plate Y towards plate X.
Explain why the metal ball moves away from plate Y.

(2)

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(c) When the metal ball moves away from plate Y to plate X, a charge of 5.1×10^{-6} C is transferred.

Calculate the current if the metal ball takes 0.45 seconds to travel from plate Y to plate X.

(2)

current = ... A

(iii) Suggest why the current increases if the voltage of the power supply is increased.

(1)

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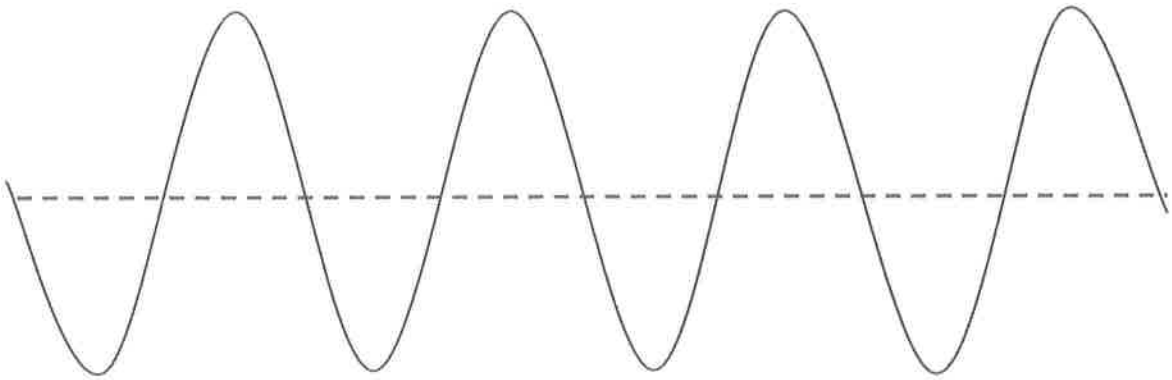
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(Total for question = 7 marks)

Q3. The diagram represents a wave.



(i) Determine the amplitude of the wave by measuring it with a ruler.

(1)

amplitude = ... cm

(ii) Determine the wavelength of the wave by measuring it with a ruler.

(1)

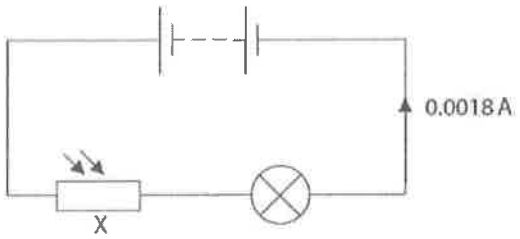
wavelength = ... cm

(iii) Add to the diagram a wave which has a **smaller** amplitude and **longer** wavelength.

(2)

(Total for question = 4 marks)

Q4. The diagram shows an electric circuit containing component X and a lamp connected in series.

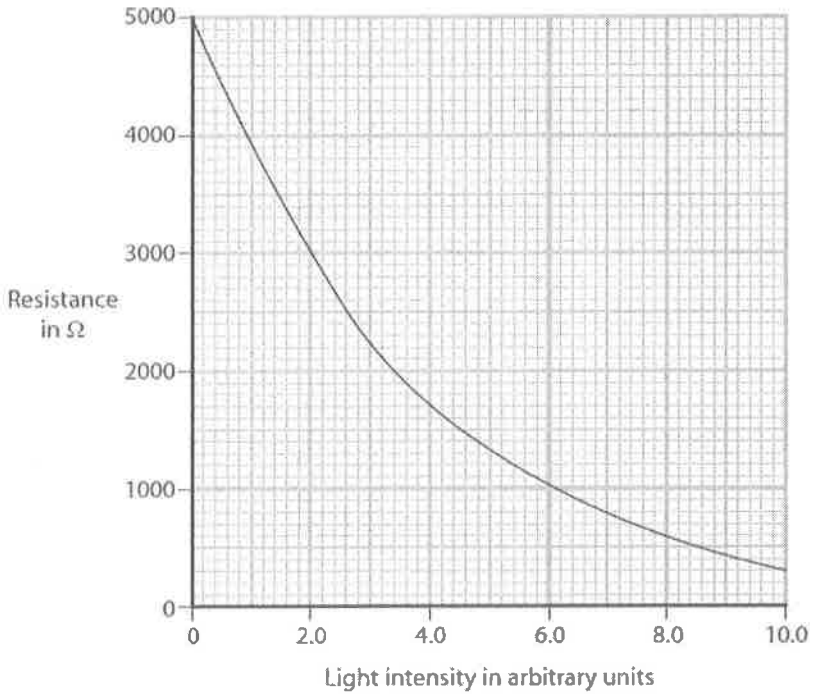


(a) Give the name of component X.

(1)

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(b) The graph shows how the resistance of component X changes with light intensity.



(i) Use the graph to determine the resistance of component X when the light intensity is 4.0 arbitrary units.

(2)

resistance = ... Ω

(ii) The current in the circuit is 0.0018 A.

Calculate the voltage across component X when the light intensity is 4.0 arbitrary units.

(3)

voltage = ... V

(iii) Explain what happens to the brightness of the lamp when component X is covered with a dark sheet of paper.

(2)

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(Total for question = 8 marks)

Q5. An x-ray machine produces x-ray waves with a frequency of 1.25×10^{18} Hz.

(a) Calculate the time period of these x-rays.

(2)

time period = ... s

(b) X-rays have a speed of 3.00×10^{8} m/s in air.

Calculate the wavelength of these x-rays.

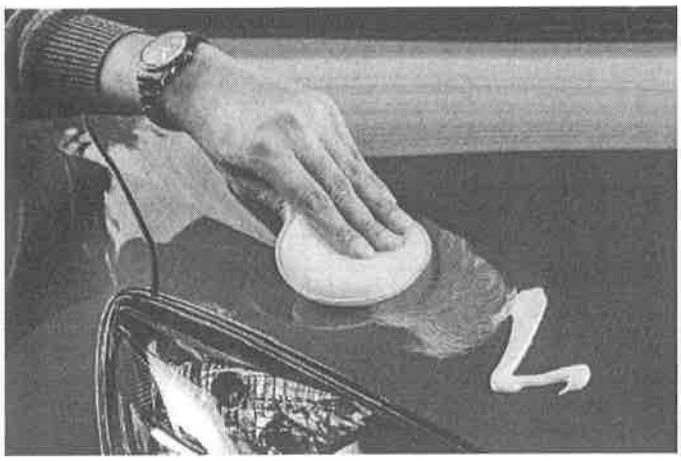
(3)

wavelength = ... m

(Total for question = 5 marks)

Q6. A cleaning product is applied to a car using a sponge pad.

The sponge pad is rubbed against the car to apply the cleaning product.



(Source: © Nor Gal/Shutterstock)

(a) Some parts of the car are made of metal and other parts are made of plastic. The metal parts of the car are earthed. Explain why the pad becomes charged when rubbing the plastic parts, but not when rubbing the metal parts.

(3)

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(b) The sponge pad is held near a metal post that is connected to the ground.

The sponge pad discharges with a small spark through the air to the metal post.

(i) The sponge pad stores 5.0 mJ of energy in its electrostatic store.
The voltage between the sponge pad and the metal post is 6000 V.
Calculate the charge transferred by the spark.

(3)

charge transferred = ... C

(ii) The small spark between the sponge pad and the metal post demonstrates that the sponge pad is charged.

Describe a different experiment that could demonstrate that the sponge pad is charged.

You may draw a diagram to support your answer.

(2)

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(Total for question = 8 marks)

Q7. A boat is floating on water, creating waves on the surface of the water.

(a) (i) Surface water waves are transverse.

Describe the difference between transverse waves and longitudinal waves.

(2)

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(ii) Diagram 2 shows the boat moving towards an observer.

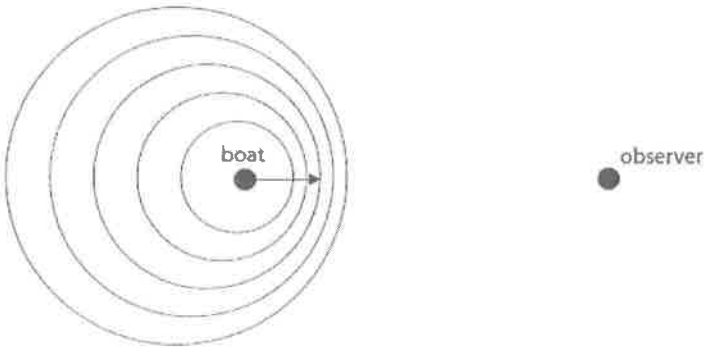


Diagram 2

Explain why the frequency of the water waves measured by the observer is larger than the frequency of the water waves created by the boat.

(3)

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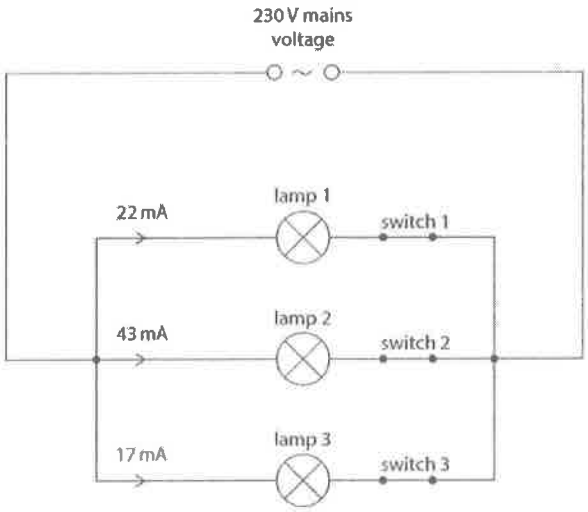
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(Total for question = 5 marks)

Q8. The diagram shows a domestic lighting circuit.



(a) Explain an advantage of using this circuit for domestic lighting.

(2)

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(b) When switch 1 is closed, the current in lamp 1 is 22 mA.

(i) Give the name of the charged particle that moves in an electric current.

(1)

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(ii) Show that lamp 1 has a power of about 5 W.

(3)

(iii) Calculate the energy transferred by lamp 1 when it is on for 30 seconds.

(3)

energy transferred = ... J

(c) The circuit is connected to the mains supply. Mains voltage is 230 V.

(i) State what is meant by the term **voltage**.

(1)

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(ii) Switches 1 and 3 are closed, which turn on lamps 1 and 3.
Switch 2 is open.
Calculate the current in the mains supply.

(2)

current = ... mA

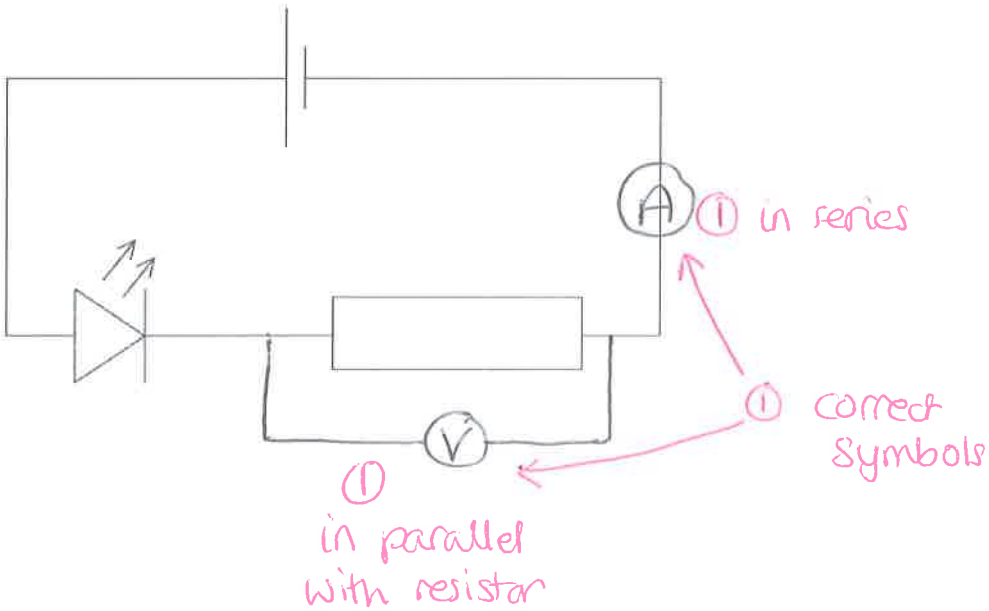
(Total for question = 12 marks)

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You do not need to hand it in with your paper.

2. Electricity	
power = current × voltage	$P = I \times V$
energy transferred = current × voltage × time	$E = I \times V \times t$
voltage = current × resistance	$V = I \times R$
charge = current × time	$Q = I \times t$
energy transferred = charge × voltage	$E = Q \times V$
3. Waves	
wave speed = frequency × wavelength	$v = f \times \lambda$
frequency = $\frac{1}{\text{time period}}$	$f = \frac{1}{T}$

Q1. The diagram shows a circuit containing a light emitting diode (LED) and a resistor.



(a) Add meters to the diagram to measure the voltage of the resistor and the current in the resistor.

(3)

(b) The current in the resistor is 7.3 mA. → $\frac{7.3}{1000}$ A = 0.0073A

The voltage of the resistor is 0.92 V.
Calculate the resistance of the resistor.

(3)

$V = I \times R$

$0.92 = 0.0073 \times R$ (1)

$R = \frac{0.92}{0.0073} = 126$

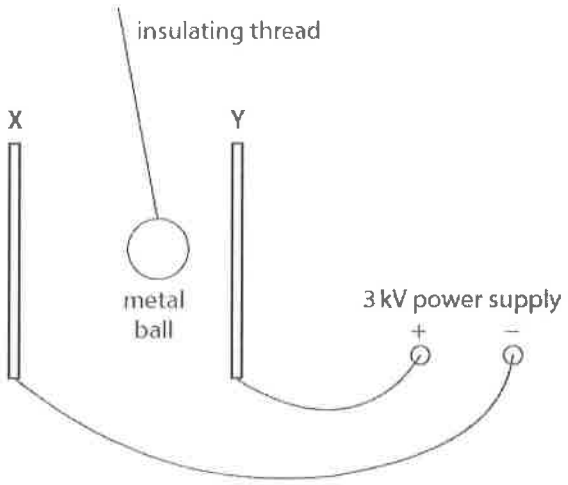
(1)

resistance = 126 (1) Ω

(Total for question = 6 marks)

Q2. This question is about a demonstration to show the link between current and charge.

The diagram shows two metal plates, X and Y, with a metal ball moving between them.



(a) The two metal plates have no charge before the power supply is connected.

When plate Y is connected to the positive terminal of the power supply, the plate becomes positively charged.
Explain how plate Y gains a positive charge.

(2)

The plate loses electrons (1) which are negatively (1) charged.

(b) (i) The metal ball becomes positively charged when it touches plate Y.

The metal ball then moves away from plate Y towards plate X.
Explain why the metal ball moves away from plate Y.

(2)

The ball and the plate have the same charge (1) so the ball is repelled from the plate. (1)

(c) When the metal ball moves away from plate Y to plate X, a charge of 5.1×10^{-6} C is transferred.

Calculate the current if the metal ball takes 0.45 seconds to travel from plate Y to plate X.

(2)

$Q = I \times t$

$5.1 \times 10^{-6} = I \times 0.45$ (1)

$I = \frac{5.1 \times 10^{-6}}{0.45} = 0.0000113$

(1)

current = 1.13×10^{-5} A

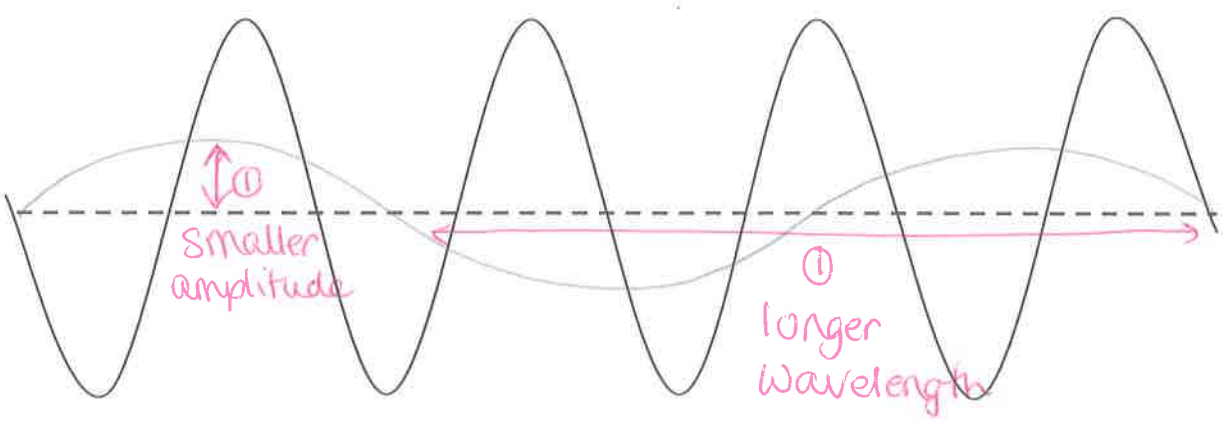
(iii) Suggest why the current increases if the voltage of the power supply is increased.

(1)

More charge is transferred to the ball each time the ball touches a plate. (1) or from

(Total for question = 7 marks)

Q3. The diagram represents a wave.



(i) Determine the amplitude of the wave by measuring it with a ruler.

(1)

amplitude = 2.6 cm

(ii) Determine the wavelength of the wave by measuring it with a ruler.

(1)

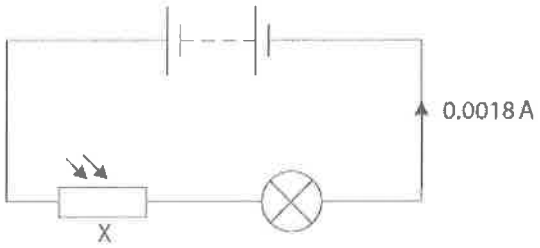
wavelength = 3.8 cm

(iii) Add to the diagram a wave which has a **smaller** amplitude and **longer** wavelength.

(2)

(Total for question = 4 marks)

Q4. The diagram shows an electric circuit containing component X and a lamp connected in series.

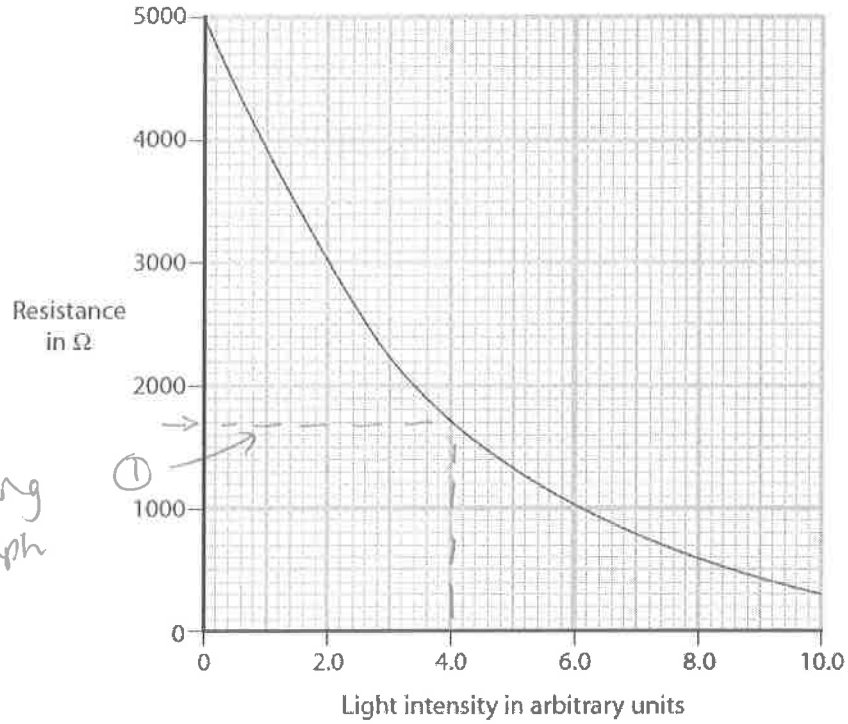


(a) Give the name of component X.

(1)

Light dependent resistor ①

(b) The graph shows how the resistance of component X changes with light intensity.



Using graph ①

(i) Use the graph to determine the resistance of component X when the light intensity is 4.0 arbitrary units.

(2)

resistance = 1700 ① Ω

(ii) The current in the circuit is 0.0018 A.

Calculate the voltage across component X when the light intensity is 4.0 arbitrary units.

(3)

$V = I \times R$ ① choosing correct equation

$V = 0.0018 \times 1700$ ①

$V = 3.06$

voltage = 3.06 ① V

(iii) Explain what happens to the brightness of the lamp when component X is covered with a dark sheet of paper.

(2)

When the LDR is covered, the light intensity decreases so the resistance increases. (1)
Therefore the current in the circuit decreases and the brightness of the lamp decreases. (1)

(Total for question = 8 marks)

Q5. An x-ray machine produces x-ray waves with a frequency of 1.25×10^{18} Hz.

(a) Calculate the time period of these x-rays.

(2)

$f = \frac{1}{T}$ $\quad 1.25 \times 10^{18} = \frac{1}{T}$ (1)

$T = \frac{1}{1.25 \times 10^{18}} = 8 \times 10^{-19}$ s

(1)

time period = 8×10^{-19} s

(b) X-rays have a speed of 3.00×10^{8} m/s in air.

Calculate the wavelength of these x-rays.

(3)

$v = f \times \lambda$

$3 \times 10^{8} = 1.25 \times 10^{18} \times \lambda$ (1)

$\lambda = \frac{3 \times 10^{8}}{1.25 \times 10^{18}} = 2.4 \times 10^{-10}$ or 2.40×10^{-10}

(1)

(1)

wavelength = 2.40×10^{-10} m

(Total for question = 5 marks)

or 2.4×10^{-10} m

Q6. A cleaning product is applied to a car using a sponge pad.

The sponge pad is rubbed against the car to apply the cleaning product.



(Source: © Nor Gal/Shutterstock)

(a) Some parts of the car are made of metal and other parts are made of plastic. The metal parts of the car are earthed. Explain why the pad becomes charged when rubbing the plastic parts, but not when rubbing the metal parts.

(3)

When the pad rubs the plastic parts, charge is transferred by friction (1). The charge builds up (1) on the plastic because plastic is an insulator (1) so the charge cannot get conducted to earth.

(b) The sponge pad is held near a metal post that is connected to the ground.

The sponge pad discharges with a small spark through the air to the metal post.

(i) The sponge pad stores 5.0 mJ of energy in its electrostatic store.
The voltage between the sponge pad and the metal post is 6000 V.
Calculate the charge transferred by the spark.

(3)

$E = Q \times V$

$\frac{5}{1000} = Q \times 6000$ (1)

$Q = \frac{0.005}{6000} = 0.000000833$

(1)

(1)

charge transferred = 8.3×10^{-7} C

(ii) The small spark between the sponge pad and the metal post demonstrates that the sponge pad is charged.

Describe a different experiment that could demonstrate that the sponge pad is charged.

You may draw a diagram to support your answer.

(2)

Bring the sponge pad near another uncharged insulator. (1) If there is attraction (1), the sponge pad is charged.

Examples - pick up small pieces of paper

- make hair stand on end

- deflect water from a tap

(Total for question = 8 marks)

Q7. A boat is floating on water, creating waves on the surface of the water.

(a) (i) Surface water waves are transverse.

Describe the difference between transverse waves and longitudinal waves.

(2)

The oscillations in a transverse wave are perpendicular to the direction of travel of the wave. ①

The oscillations in a longitudinal wave are parallel to the direction of travel of the wave. ①

(ii) Diagram 2 shows the boat moving towards an observer.

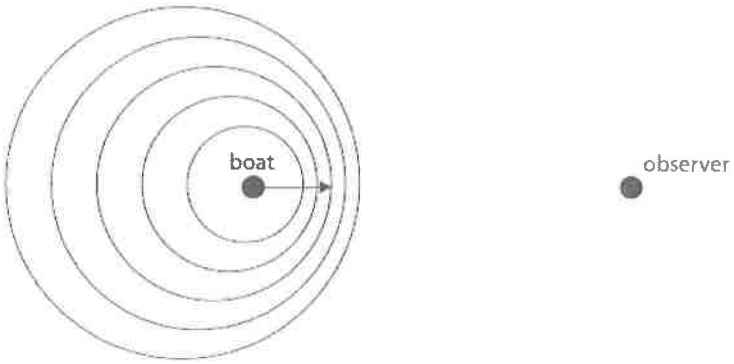


Diagram 2

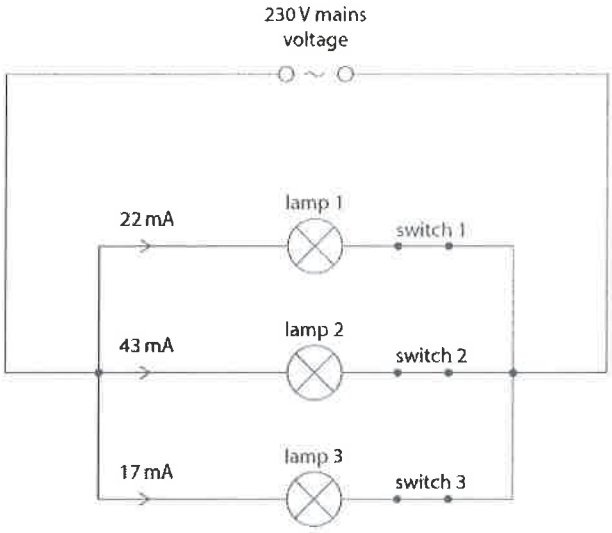
Explain why the frequency of the water waves measured by the observer is larger than the frequency of the water waves created by the boat.

(3)

The wavelength of the water waves is smaller, ①
but the speed of the waves is constant. ①
Since $v = f \times \lambda$ ①
if the wavelength decreases and the speed is constant,
the frequency must increase.

(Total for question = 5 marks)

Q8. The diagram shows a domestic lighting circuit.



(a) Explain an advantage of using this circuit for domestic lighting.

(2)

The lamps can be switched on and off independently (1) because this is a parallel (1) circuit.

(b) When switch 1 is closed, the current in lamp 1 is 22 mA.

(i) Give the name of the charged particle that moves in an electric current.

(1)

Electron (1)

(ii) Show that lamp 1 has a power of about 5 W.

(3)

$V = 230V \quad I = 22mA = 0.022A$ (1)

$P = V \times I = 230 \times 0.022 = 5.06W$ (1) (1)

(iii) Calculate the energy transferred by lamp 1 when it is on for 30 seconds.

(3)

$E = I \times V \times t$ (1)

$E = 0.022 \times 230 \times 30 = 151.8\,J$ (1) (1)

or $P = \frac{E}{t}$ $\quad E = P \times t = 5.06 \times 30 = 151.8\,J$

energy transferred = 152 J

(c) The circuit is connected to the mains supply. Mains voltage is 230 V.

(i) State what is meant by the term **voltage**.

(1)

Energy transferred per unit charge (1)

(ii) Switches 1 and 3 are closed, which turn on lamps 1 and 3.
Switch 2 is open.
Calculate the current in the mains supply.

(2)

$I = 22\text{mA} + 17\text{mA}$ (1)

$I = 39\text{mA}$

(1)

current = 39 mA

(Total for question = 12 marks)

You may remove this page.

You do not need to hand it in with your paper.

2. Electricity	
power = current × voltage	$P = I \times V$
energy transferred = current × voltage × time	$E = I \times V \times t$
voltage = current × resistance	$V = I \times R$
charge = current × time	$Q = I \times t$
energy transferred = charge × voltage	$E = Q \times V$
3. Waves	
wave speed = frequency × wavelength	$v = f \times \lambda$
frequency = $\frac{1}{\text{time period}}$	$f = \frac{1}{T}$