Rosary School – Marj Elhamam

Physics (4XPH1)

Revision Worksheet

No. of Pages: (25)	No. of Questions: (11)	Mark: (_____/98)
Name: _____		Date: 30 / 6 / 2025
Grade: 9 ( )		Duration:2 hours

Instructions

• Write your name in the space provided.

• Write in a **black pen**. If **pencil** is used for any **diagrams / sketches / graphs** it must be dark.

• Answer **all** questions.

• Do not use correction fluid.

• Answer the questions in the spaces provided.

• Show all the steps in any calculations and state the units.

Information

• The total mark for this paper is **98.**

• The marks for **each** question are shown in brackets.
  – use this as a guide as to how much time to spend on each question.

• Calculators are allowed.

Advice

• Read each question carefully before you start to answer it.

• Write your answers neatly and in good English.

• Try to answer every question.

• Check your answers if you have time at the end.

Question 1: Chapter 1 Movement and position / Specimen

4   Figure 4 shows two students investigating their reaction times.

Student B supports his left hand on a desk.

Student A holds a ruler so that the bottom end of the ruler is between the finger and thumb of student B.

When student A releases the ruler, student B catches the ruler as quickly as he can.

The investigation is repeated with the right hand of student B.
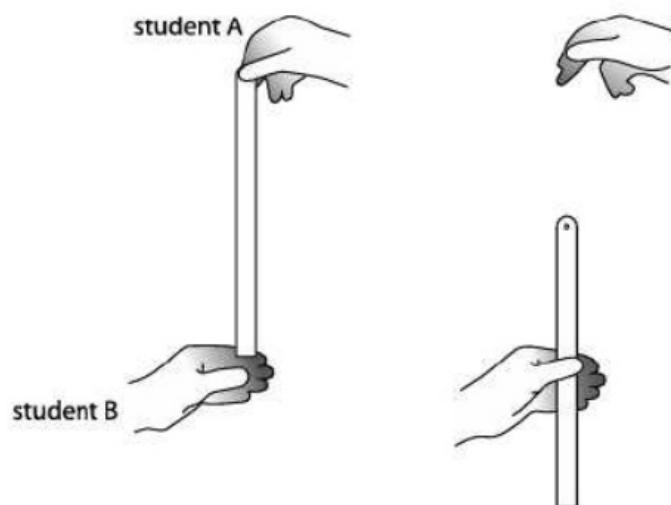
Figure 4

(a) The students took five results for the left hand and five results for the right hand.

Figure 5 shows their results.

which hand	distance dropped (cm)					
	trial 1	trial 2	trial 3	trial 4	trial 5	average
left	10.1	25.5	18.4	14.6	11.7	14
right	17.5	16.1	19.4	18.6	20.2	

Figure 5

(i) Calculate the average distance dropped for the right hand.

Give your answer correct to 2 significant figures.

(2)

$$\frac{17.5 + 16.1 + 19.4 + 18.6 + 20.2}{5}$$

$$18.36$$

distance = ___18___ cm

(ii) Calculate the average time for the left hand.

Use the equation

$$time^2 = \frac{distance}{500}$$

(2)

$$t^2 = \frac{14}{500} \Rightarrow t = \sqrt{\frac{14}{500}}$$

$$0.17$$
$$0.167$$

average time = ___0.1673___ s

3

(b) Explain whether any of the readings are anomalous.

(2)

An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • 25.5 is an anomalous result (1) • (because) it is much further away from the mean than the other results (1)	ignore 19

⇒ much further away from the average value

(c) Give **two** ways that the students can improve the quality of their data other than ignoring anomalous results.

(2)

4(c)

- Take more readings (1) *→ repeat more and more*
- Idea that a third student should also measure the reaction time (1)

(d) Describe how the students could develop their investigation to investigate how reaction time changes with another variable.

(2)

• using a larger group of students/large population of students (1) • and measure how their reaction time varies with age/height (1)	allow any suitable variable

(Total for Question 4 = 10 marks)

Question 2: Chapter 3 Forces and movement / Specimen

5   (a) A car accelerates at a constant rate of 1.83 m/s² along a flat straight road.

   The force acting on the car is 1.870 kN.

   Calculate the mass of the car.

   Give your answer to three significant figures.

   (3)

$$F = m \times a$$

to convert N to

$$m = \frac{F}{a} = \frac{1.870 \times 1000}{1.83} = \frac{1870}{1.83}$$

1021

mass = 1020 kg

   (b) The car accelerates from rest for 16 s.

   Calculate the speed of the car after 16 s.

   (3)

$$V = u + at$$

$$V = 0 + 1.83 \times 16$$

$$\boxed{V = 29.3}$$

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

speed = 29.3 m/s

(c) The car starts on another journey.

Figure 6 shows the graph of the car's movement.

gradient = acc.
area = dist.

2.5×0.8

5 squares
= 4

each square
equals 0.8

30

15×16=
240

$\frac{1}{2}$×9×30

135
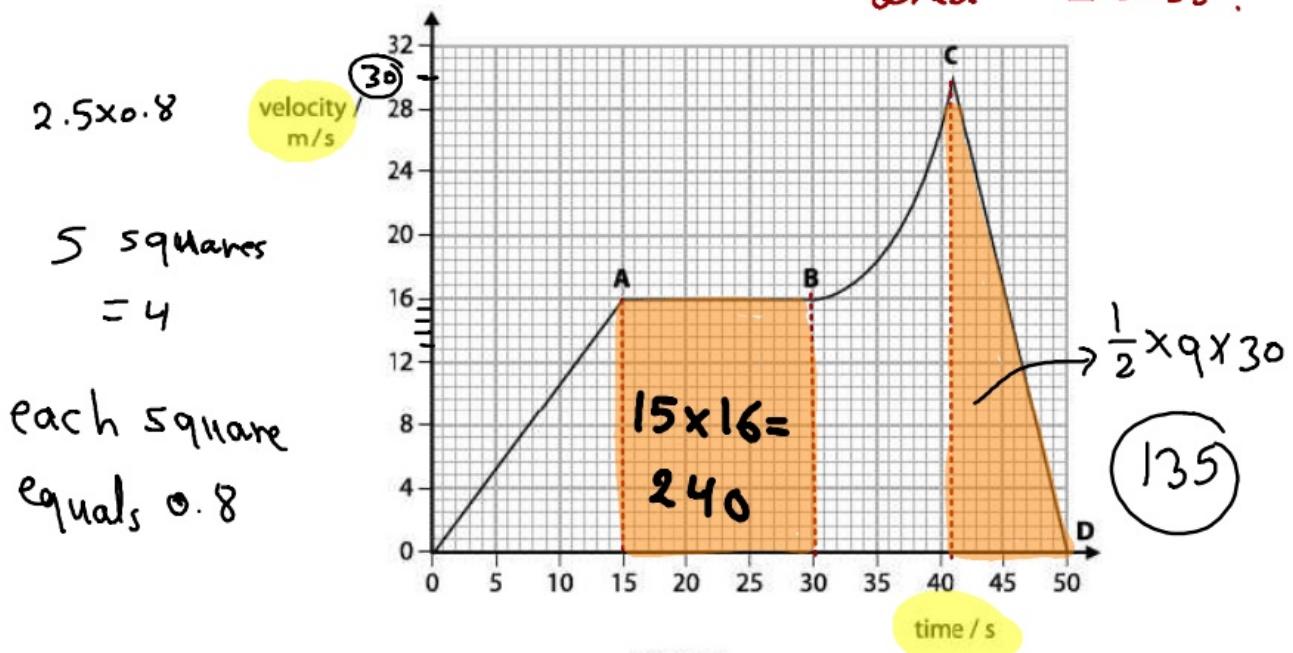
Figure 6

Show that the distance travelled when the car is moving at a constant speed is greater than the distance travelled when the car is slowing down.

(4)

compare area under graph

area 1 = 240 = dist. 1   while moving with constt   d =
                                                        speed 240
area 2 = 136 = dist 2

while slowing
down

dist = 136 m

(Total for Question 5 = 10 marks)

6

7 Diagram 1 shows a gate fitted with a spring mechanism.

The spring mechanism shuts the gate automatically.
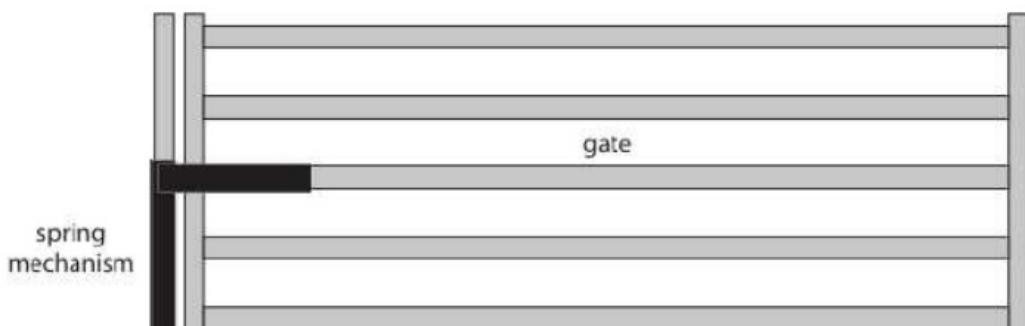
Diagram 1

(a) The graph shows some data from an investigation into how the extension of the spring changes with an increasing force.

Force in N
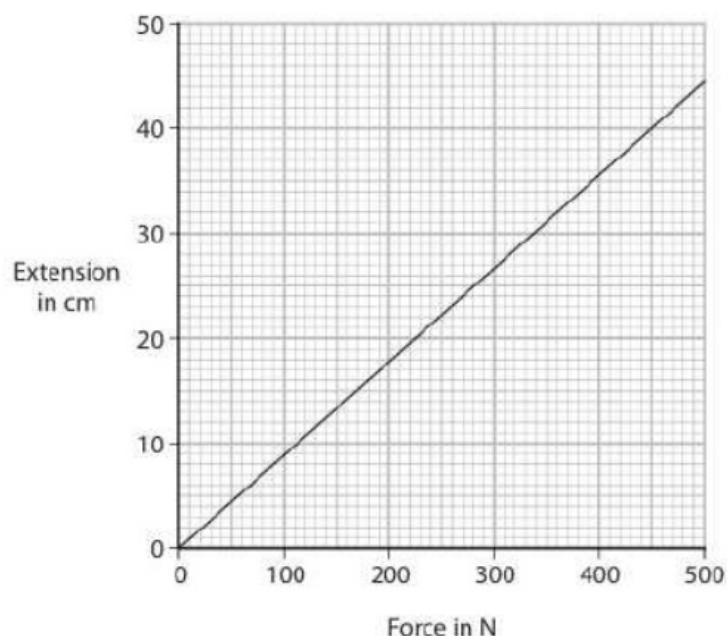
Describe the relationship shown by the graph.

(2)

as the (force) ①increases the (extension) increases and linear ① relationship [directly prop.]

2/2

7

(b) Diagram 2 shows the gate viewed from above.
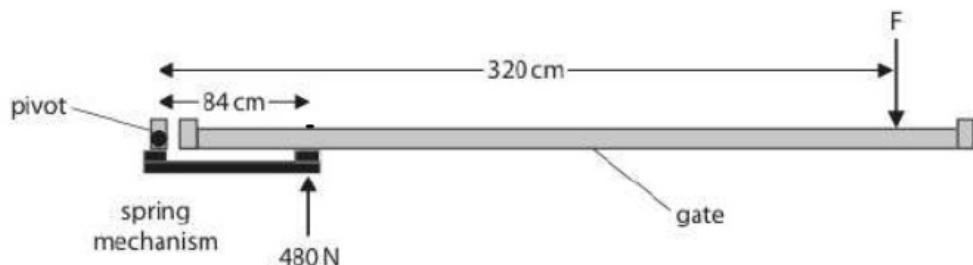
Diagram 2

The force the spring exerts on the gate is 480 N.

Show that the moment of the force the spring exerts on the gate is about 400 Nm.

(2)

$$Moment = 480 \times 0.84 = 403 \, Nm$$

(c) The force, F, is the minimum force needed to start opening the gate.

Calculate the magnitude of force F.

(4)

$$F \times \frac{326}{320} = \frac{480 \times 0.84}{320}$$

force F = 126 N

(d) The spring is removed for testing.

Explain what will happen to the spring if the force applied to extend the spring is too large.

(2)

it will exceeds elastic limit
and it doesn't return back
to its original shape or length.

(Total for Question 7 = 10 marks)

8

8 The graph shows how the velocity of a parachute jumper changes with time.

A) 50
B) 1300 ✗
C) 2300 ✓
D) 2700

46 × 50 = 2300

Velocity in m/s

Time in s
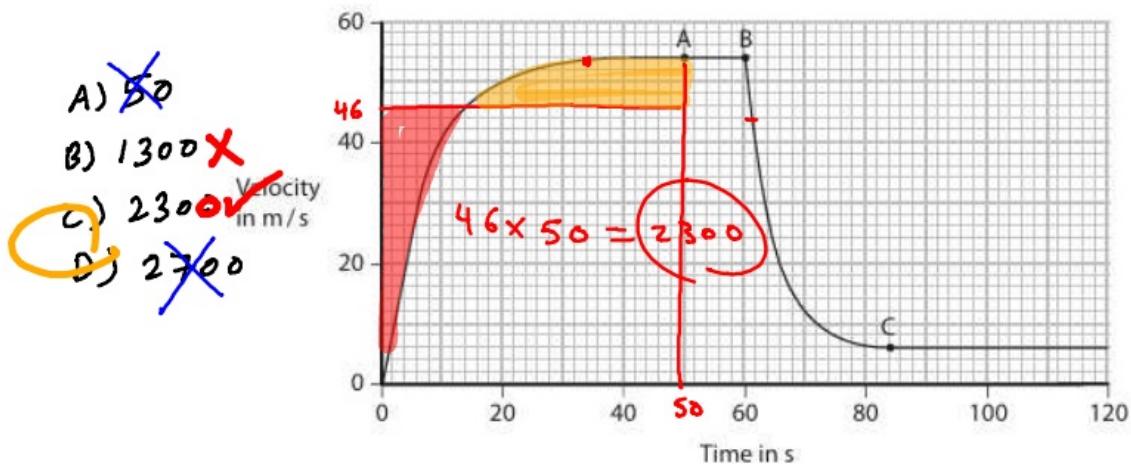
(a) At point A, the parachute jumper is falling at terminal velocity and has not yet opened her parachute.

(i) Which statement is correct about the parachute jumper at point A?

(1)

☐ A acceleration and air resistance are equal m/s^2 N

☐ B acceleration and velocity are equal m/s^2 m/s

☐ C weight and acceleration are equal   N m/s^2

☒ D weight and air resistance are equal   N   N

→ So Resultant force = 0

(ii) Which is the best estimate of the distance fallen by the parachute jumper from the start until point A?

(1)

☐ A 50 m

☐ B 1300 m

☒ C 2300 m

☐ D 2700 m

(b) The parachute jumper opens her parachute at point B.

Her velocity decreases until she reaches terminal velocity again at point C.

Explain this change in velocity.

(4)

any four from:	allow "drag" for air resistance throughout
MP1. air resistance increases (greatly) when parachute is opened;	allow "upwards force"
MP2. idea that air resistance is greater than the weight;	allow upwards force is bigger than downwards force
MP3. (therefore) deceleration / upwards acceleration;	allow idea of upwards resultant force ignore "velocity decreases"
MP4. idea that air resistance decreases with speed;	
MP5. resultant force (eventually) becomes zero;	allow "forces are ·5 balanced again" allow air resistance = weight
MP6. constant speed achieved	allow idea that there is no acceleration

(c) After point C, the parachute jumper continues to fall at a constant velocity. ⟵ No inc. or change in K.e

As she falls, energy is transferred from a gravitational store.

Which store is the energy transferred into?

(1)

☐ A chemical store ✗

☐ B gravitational store ✗

☐ C kinetic store ✗

☒ D thermal store ✗

falls down
gpe dec.
Constt speed → No inc. of K.e

(Total for Question 8 = 7 marks)

10

11 The graph shows how the thinking distance and braking distance of a car vary with its initial speed.

$S = 78$
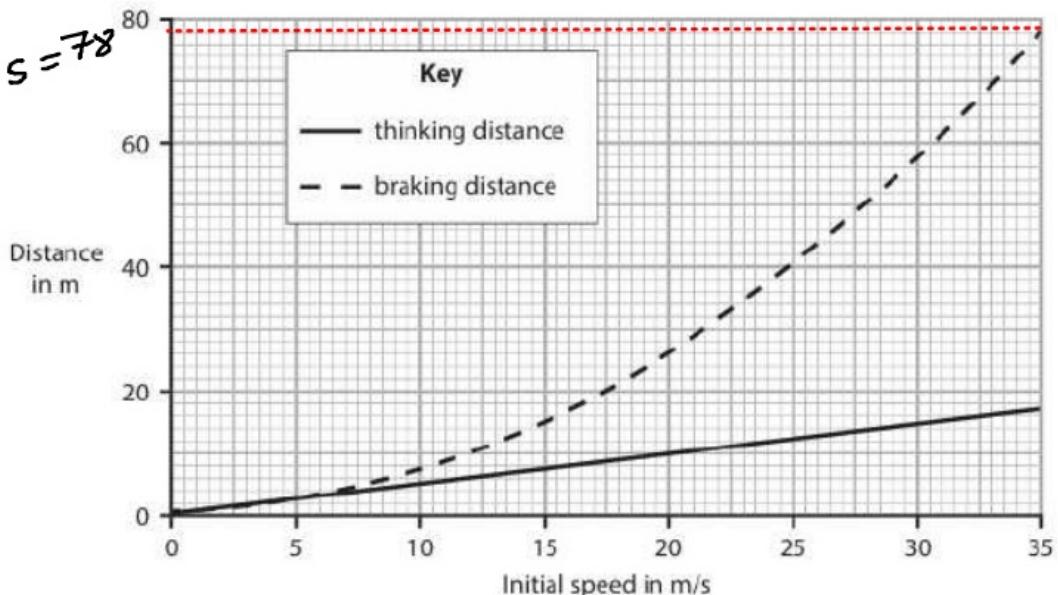
(a) A car has an initial speed of 35 m/s.

The brakes are applied and the car comes to a complete stop in the braking distance shown by the graph.

Calculate the mean braking acceleration of the car.

(4)

$u = 35$
$v = 0$
$a = ??$
$S = 78$

$v^2 = u^2 + 2as$

$a = \dfrac{v^2 - u^2}{2S} = \dfrac{0 - 35^2}{2 \times 78}$

braking acceleration = $\longrightarrow$ 7·9 m/s²

(b) Evaluate how the thinking distance and the braking distance vary for different values of initial speed.

Refer to information from the graph in your answer.

(5)

any five from:		
MP1.	thinking distance OR braking distance increases as (initial) speed increases;	
MP2.	braking distance increases by a greater amount than thinking distance for the same increase in (initial) speed;	e.g. gradient of braking distance graph larger than gradient for thinking distance
MP3.	thinking distance is (directly) proportional to (initial) speed;	
MP4.	braking distance has a non-linear relationship with (initial) speed;	
MP5.	idea that braking distance is proportional to (initial) speed squared;	e.g. when initial speed doubles, the braking distance is four times greater / eq.
MP6.	suitable use of data to justify thinking distance relationship;	e.g. reading off thinking distance for two values of initial speed and showing they increase by the same factor
MP7.	suitable use of data to justify braking distance relationship;	e.g. reading off braking distance for two values of initial speed and showing they do not increase by the same factor

(Total for Question 11 = 9 marks)

3 The diagram shows an air track that can be used to investigate motion without friction.

Air comes out through a series of small holes in the air track, which lifts the gliders slightly above the track.

There are two gliders on the track.

Each glider has a magnet.
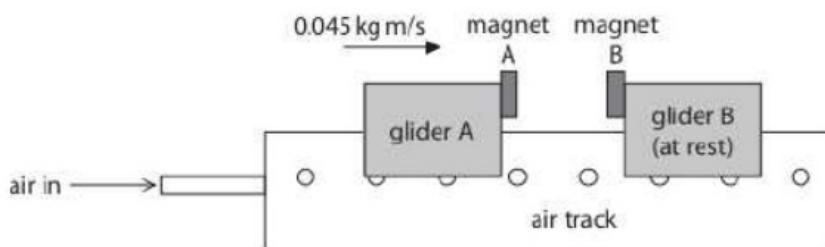
The poles of the magnets nearest each other are alike.

(a) Explain the direction of the force acting on magnet A from magnet B.

(2)

to the left   due to repulsion force from B

(b) The gliders collide and the magnets cause them to rebound.

Before the collision, the momentum of glider A is 0.045 kg m/s to the right and glider B is at rest. *mom = 0*

(i) State the total momentum of glider A and glider B after the collision.

(1)

because total momentum is conserved.

total momentum = *0.045* kg m/s

13

Question 7: Chapter 6 Mains electricity / 4PH0 JAN 2012 1P

b

1 (a) The diagram shows some electrical circuit symbols.

A

B

C

D

(i) Which symbol represents a switch?

(1)

☒ A

☐ B

☐ C

☐ D

(ii) Which symbol represents a diode?

(1)

☐ A

☒ B

☐ C

☐ D

(b) A hairdryer connected to the mains supply takes a current of 5.5 A.

(i) Which of these fuses should be used with the hairdryer?

(1)

☐ **A**   3 A

☒ **B**   5 A

☒ **C**   7 A

☐ **D**   13 A

(ii) Explain your answer.

(1)

7 A is little greater to the normal current.

(iii) The hairdryer has a plastic case so there is no need for an earth wire connection in the plug.

Explain why the hairdryer is still safe to use.

(2)

(iii)	Comment on device – (plastic) insulator / does not conduct; Comment on user - no risk of shock / electrocution;	(double) insulated / no current (through) / cannot become live No electricity reaches user / person cannot touch live parts

(Total for Question 1 = 6 marks)

5   A toaster is an electrical device used for toasting bread.

© Levent Konuk/Shutterstock

The toaster contains thin metal wires.

These wires get hot when there is a current in them.

The wires transfer energy to the bread by heating and by radiation.

(a) Give a reason why the wires in the toaster are connected in parallel.

(1)

wires have a higher current / voltage;	allow idea that if one breaks the rest will keep working / some can be on but not others / eq

(b) (i) State the formula linking power, current and voltage.

(1)

$$P = IV$$

→ convert from kw → w

(ii) The power rating of the toaster is 2.8 kW.

Calculate the total current in the toaster.

[mains voltage = 230V]

(3)

$$I = \frac{P}{V} = \frac{2800}{230} =$$

current = 12 A .... A

(iii) The toaster contains 48 thin metal wires.

Calculate the current in each of the thin metal wires.

(1)

I = 12A   48 branches $\frac{12}{48}$
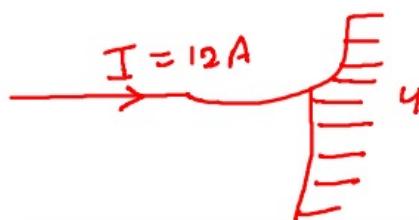
current = 0.25 .... A

(Total for Question 5 = 6 marks)

Question 9: Chapter 8 Electric charge / 4PH1 JUNE 20211P

5 The diagram shows a circuit used to investigate the relationship between current and voltage for a light-emitting diode (LED).
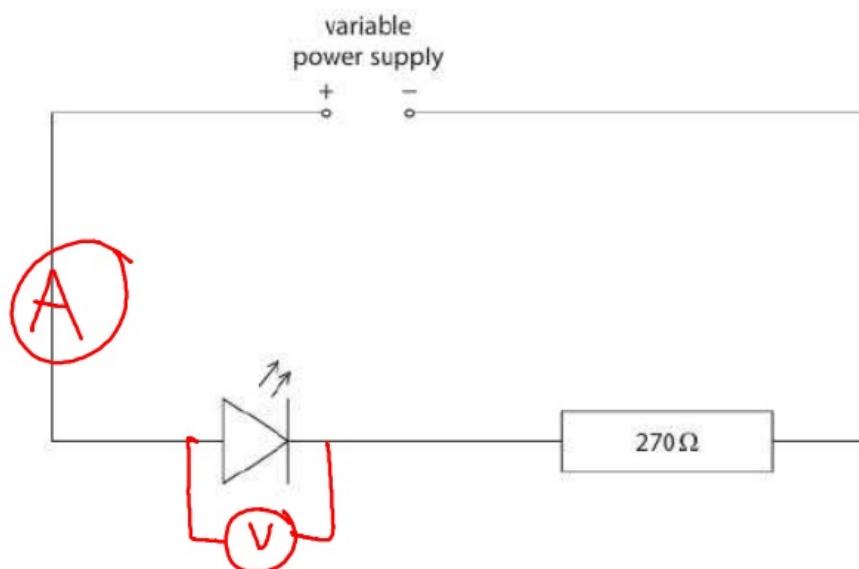
(a) Draw meters on the diagram to measure the voltage of the LED and the current in the LED.

(3)

(b) The table shows the results of the investigation.

Voltage in V	Current in mA
0.00	0.0
0.30	0.5
0.35	2.5
0.40	1.5
0.45	2.0
0.50	4.5
0.55	9.0
0.60	15.0

(i) Plot the results on the grid.

(3)

(ii) One of the results is anomalous.

On the graph, draw a circle around the anomalous result.

(1)

(iii) Draw a curve of best fit.

(1)
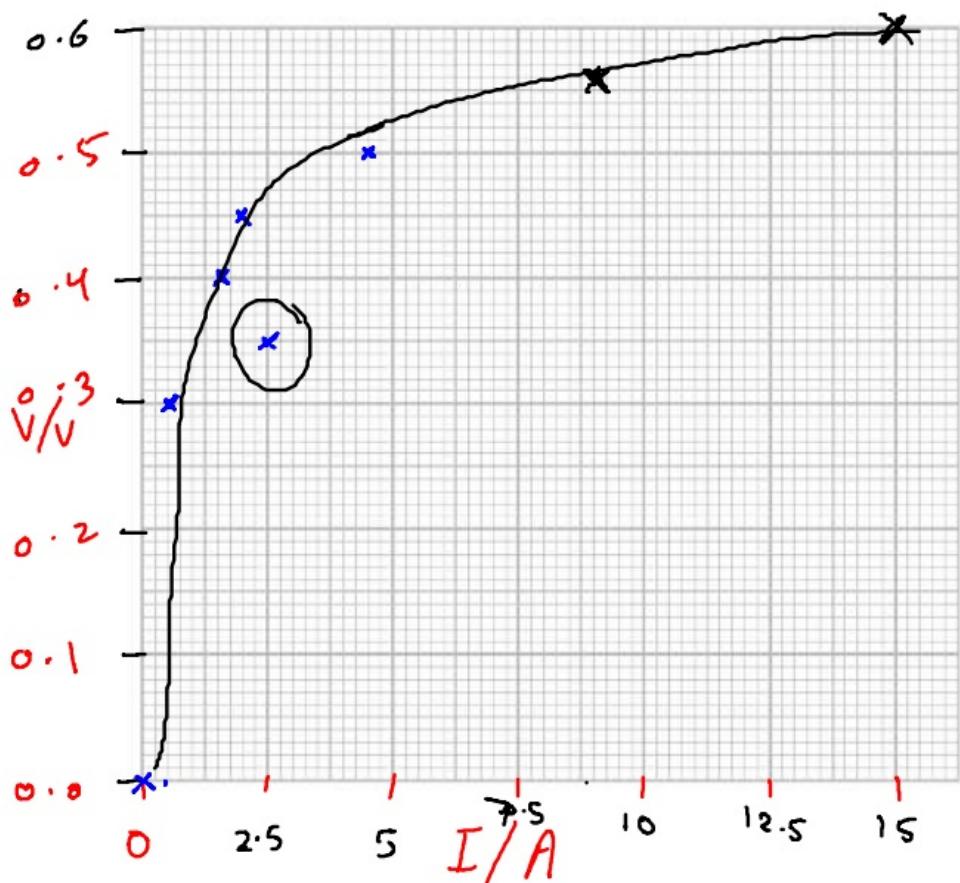
(iv) Give a reason why a line graph is the best way of showing these results.

(1)

because the data are
continous / not discrete

(v) State the formula linking voltage, current and resistance.

(1)

$$V = IR$$

(vi) Any current larger than 15 mA will permanently damage the LED.

The resistor in the circuit has a resistance of 270 Ω.

Use the results from the investigation to determine the maximum voltage of the power supply without damaging the LED.

(4)

maximum voltage = ... V

(Total for Question 5 = 14 marks)

Question 10: Chapter 9 Electric Charge / 4PH1 June 2023 2PR

3 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)

....

....

....

....

....

....

(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)

....

....

....

....

....

(Total for Question 3 = 8 marks)

(ii) After the collision, the momentum of glider A is 0.021 kg m/s to the left.

Calculate the momentum of glider B after the collision.

(2)

total before = total after

$0.045 + 0 = [\text{mom. of } A + \text{mom of } B]^{after}$

$0.045 = -0.021 + \times$

momentum of glider B = __0.066__ kg m/s

(iii) The time taken for glider B to change its momentum is 0.19 seconds.

Calculate the average force on glider B that causes this change in momentum.

(2)

$F = \dfrac{\Delta P}{t} = \dfrac{0.066 - 0}{0.19}$

average force = __0.35__ N

(iv) Give the direction of the force on glider B from glider A.

(1)

A   B → to the right
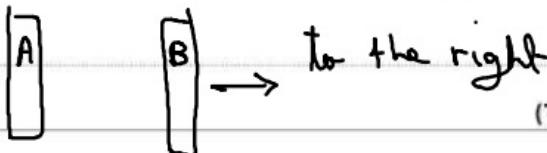
(Total for Question 3 = 8 marks)

Same poles

and the force by B on A

is 0.35 N to the Left

9 A student uses an electric heater to investigate efficiency.

   He places the heater in an aluminium block, switches the heater on and measures the temperature of the block each minute for 20 minutes.

(a) The student wants to calculate the electrical energy supplied to the heater.

   (i) Complete the table by recording the readings shown on the meters below.

   (2)

Current in amps, A	
Voltage in volts, V	

   (ii) Show that the energy supplied to the heater in 20 minutes is about 30 000 J.

   (3)

(b) The student is told that only 22 000 J are used to raise the temperature of the aluminium block by 25 °C.

    (i)   State the equation linking efficiency, useful energy output and total energy input.

                                                       (1)

    (ii) Calculate the efficiency of heating the aluminium block.

                                                       (2)

Efficiency = ...

    (iii) The efficiency of the **heater** will be **higher** than this value.

           Suggest why.

                                                         (1)

    (iv) State **one** way in which the student could increase the efficiency of heating the aluminium block.

                                                        (1)

(Total for question = 10 marks)