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.

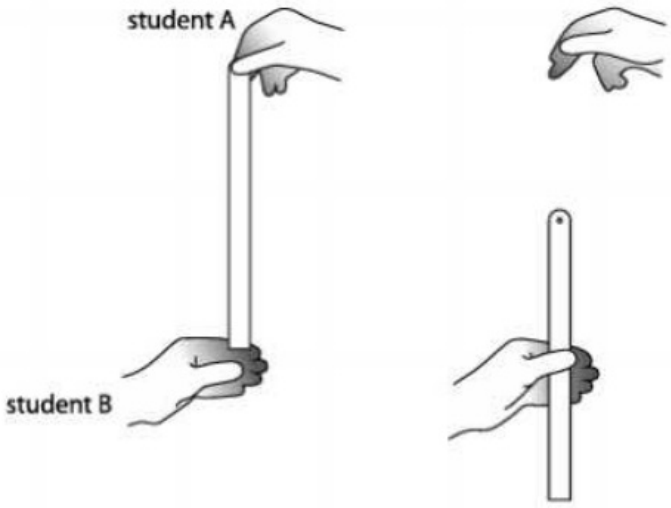


Figure 4

(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	18

Figure 5

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

Give your answer correct to 2 significant figures.

(2)

average = 18.36

18.4

distance = 18 cm

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

Use the equation

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

⇒ dist = 14

(2)

$t^2 = \frac{14}{500} = 0.028$

$t = 0.167$

average time = 0.17 s

0.167

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

(2)

25.5 because it is far 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)
- 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)

$F = m \times a$

$m = \frac{F}{a} = \frac{1870}{1.83} = 1020$

mass = 1020 kg

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

Calculate the speed of the car after 16 s.

(3)

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

$v = u + at$

speed = ... m/s

v^2 ↑ final speed

$v^2 = u^2 + 2as$ → dist

u ↓ initial

a ↑ acc.

(c) The car starts on another journey.

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

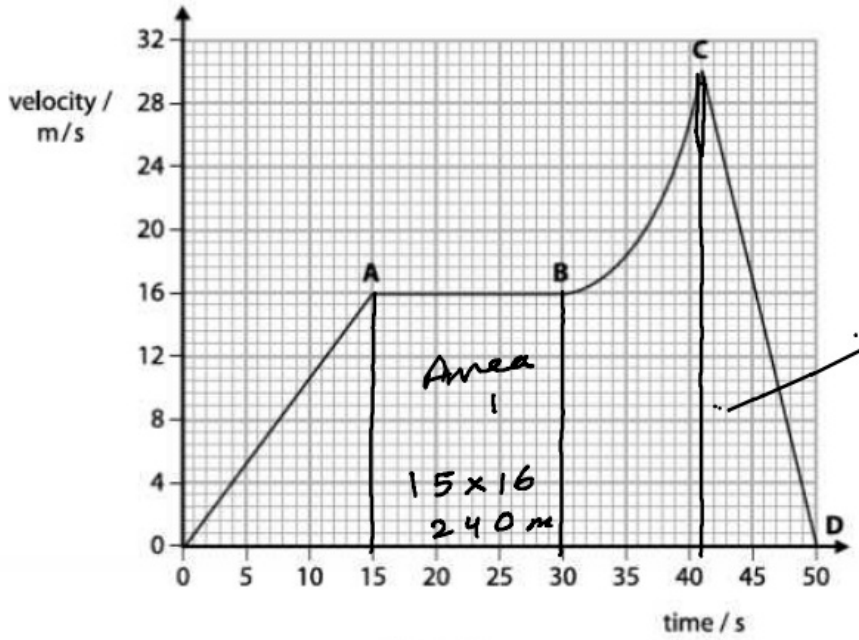


Figure 6

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)

$\frac{1}{2} \times 9 \times 30$

9×15

$= 135$

area when moving with const speed = 240 = dist 1

= = = deceleration = 135 = dist 2

So dist 1 > dist 2

(Total for Question 5 = 10 marks)

Question 3: Chapter 2 Forces and shape + Chapter 5 the turning effect of forces

4PH1 JUNE 2022 2PR

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

The spring mechanism shuts the gate automatically.

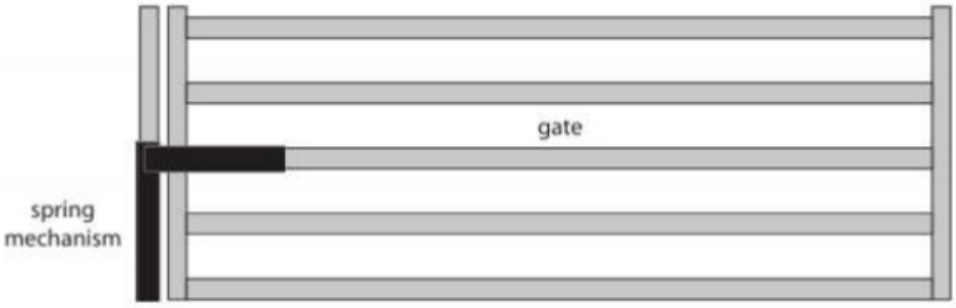
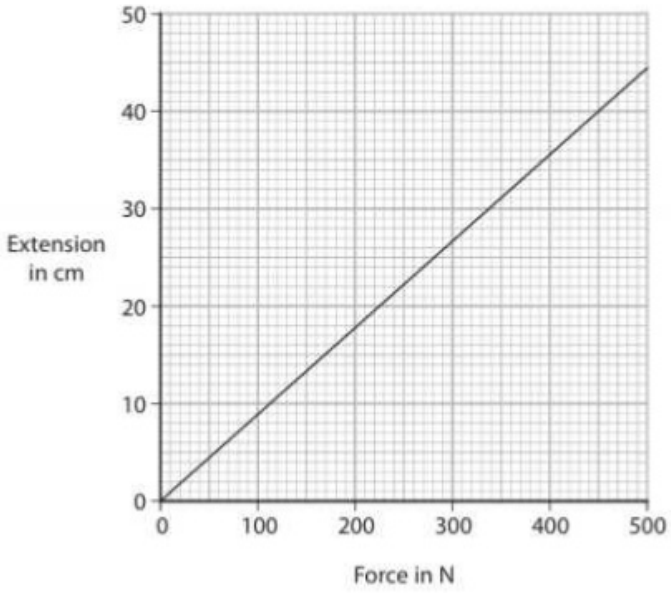


Diagram 1

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



Describe the relationship shown by the graph.

(2)

as the force inc. ⇒ the extension inc. (1)
and the relationship is linear (1)

or Force and extension are directly proportional (2/2)

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

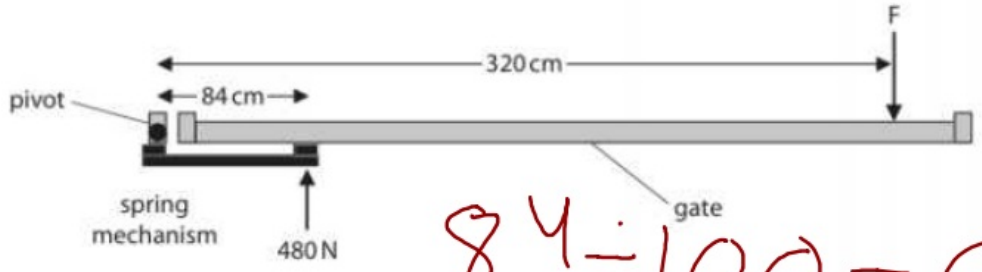


Diagram 2

84 ÷ 100 = 0.84

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)

480 × 0.84 = 403 N m

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

Calculate the magnitude of force F.

(3)

clockwise moments = anticlockwise moments.

Force = $\frac{\text{Moment}}{\text{distance}} = \frac{403.2}{3.2\text{m}}$

320cm = 3.2m

= 126

126 N

force F = _____ 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)

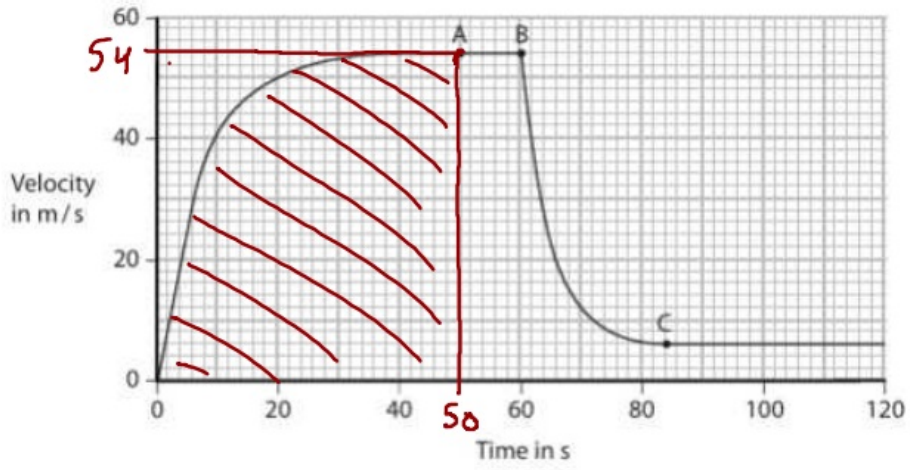
it may exceeds the elastic limit and it will not go back to its original shape when the force is removed

(Total for Question 7 = 10 marks)

↳ permanent deformation

Question 4: Chapter 3 Forces and movement / 4PH1 MAY 2019 1PR

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



(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
- ☐ **B** acceleration and velocity are equal
- ☐ **C** weight and acceleration are equal
- ☒ **D** weight and air resistance are equal

(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

⇒ we find the area under graph

area = 50 × 54

= 2700 m

of rectangle

(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 allow "upwards force"
MP1. air resistance increases (greatly) when parachute is opened;	
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 balanced again" allow air resistance = weight
MP6. constant speed achieved	allow idea that there is no acceleration

٠٥

(c) After point C, the parachute jumper continues to fall at a constant velocity.

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

Which store is the energy transferred into?

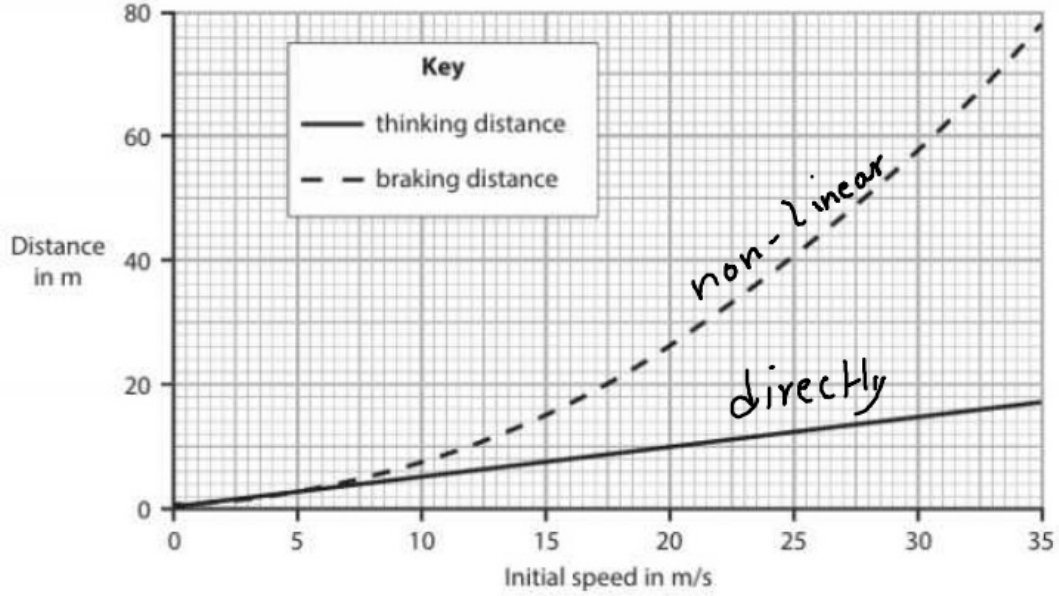
(1)

- ☐ **A** chemical store
- ☐ **B** gravitational store
- ☐ **C** kinetic store
- ☐ **D** thermal store

(Total for Question 8 = 7 marks)

Question 5: Chapter 3 Forces and movement / 4PH1 MAY 2020 1PR

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



(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)

$v = 0$

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

$0^2 = 35^2 + 2 \times a \times 78$

$a = -7.9$

braking acceleration = -7.9 m/s²

$y = 3x$ ⟶ Linear, directly straight line

$y = 3x^2$ ⟶ curving up

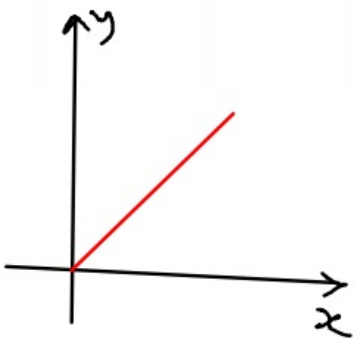
(b) Evaluate how the thinking distance and the braking distance vary for different values of initial speed.

Refer to information from the graph in your answer.

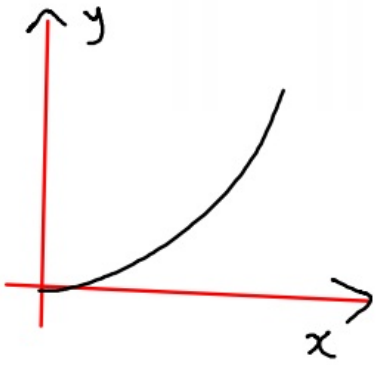
(5)

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)



$y \propto x$



$y \propto x^2$

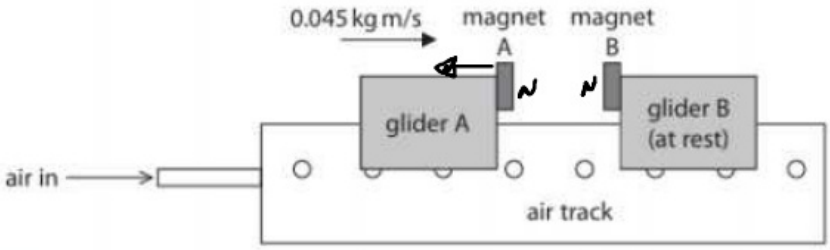
Question 6: Chapter 4 Momentum / 4PH1 JUNE 2021 2PR

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)

force on A is to the left from magnet B as both magnets are alike and so they repel in opposite direction.

(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.

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

(1)

total before = total after

0.045 + 0

total momentum = 0.045 kg m/s

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

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

(i) Which symbol represents a switch?

(1)

- [x] **A**
- [ ] **B**
- [ ] **C**
- [ ] **D**

(ii) Which symbol represents a diode?

(1)

- [ ] **A**
- [x] **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)

(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)

(Total for Question 1 = 6 marks)

Question 8: Chapter 7 Current and voltage in circuits / 4PH1 MAY 2020 1PR

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)

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

(1)

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

Calculate the total current in the toaster.

[mains voltage = 230V]

(3)

current = ... A

(iii) The toaster contains 48 thin metal wires.

Calculate the current in each of the thin metal wires.

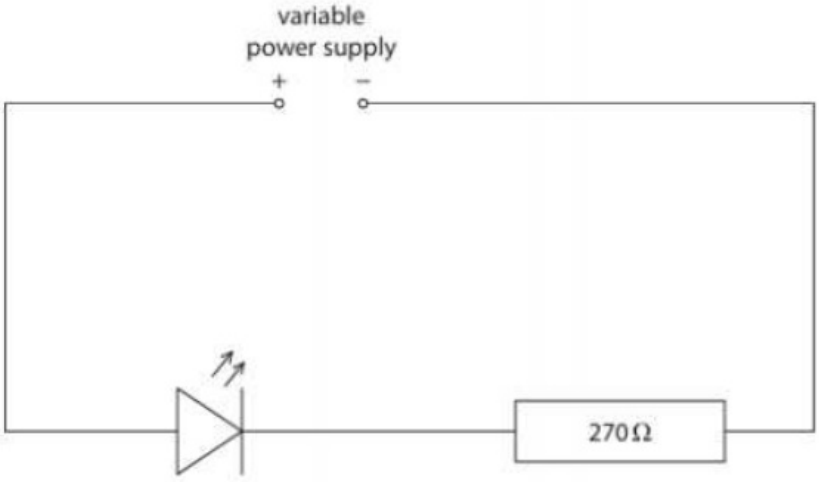
(1)

current = ... 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)

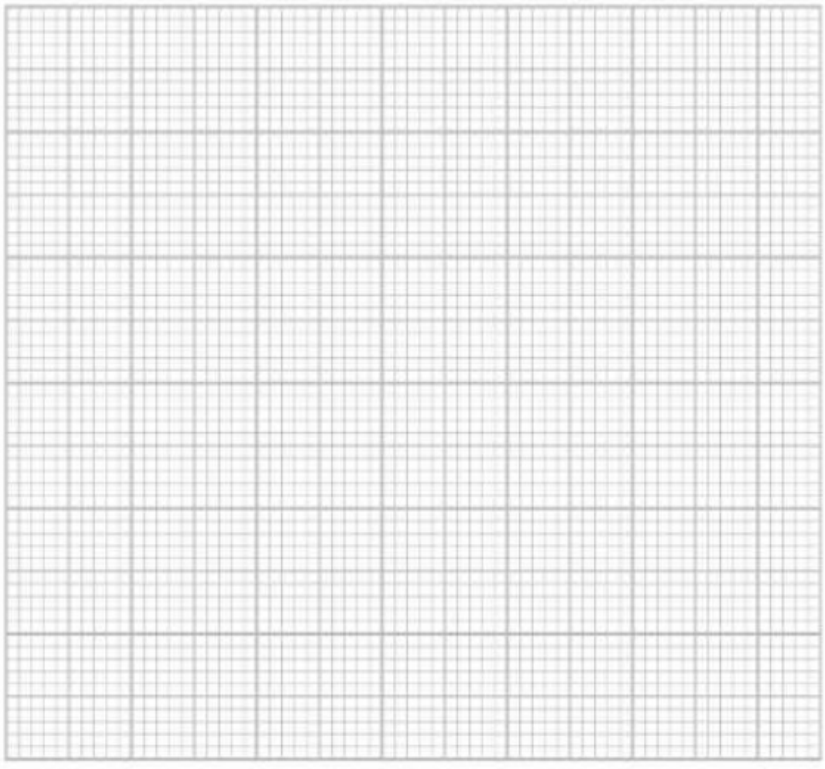
(ii) One of the results is anomalous.

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)

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

(1)

(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.

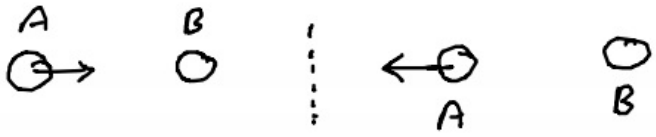
(2)

(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)



$0.045 + 0 = -0.021 + \text{mom. of B}$

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)

$F = \frac{\Delta p}{t}$

0.066 final

0 initial

$F = \frac{0.066}{0.19}$

average force = 0.35 N

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

(1)

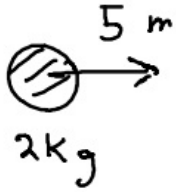
to the right and equal the force on A by B

(Total for Question 3 = 8 marks)

→ mom. = m x v while v is +ve

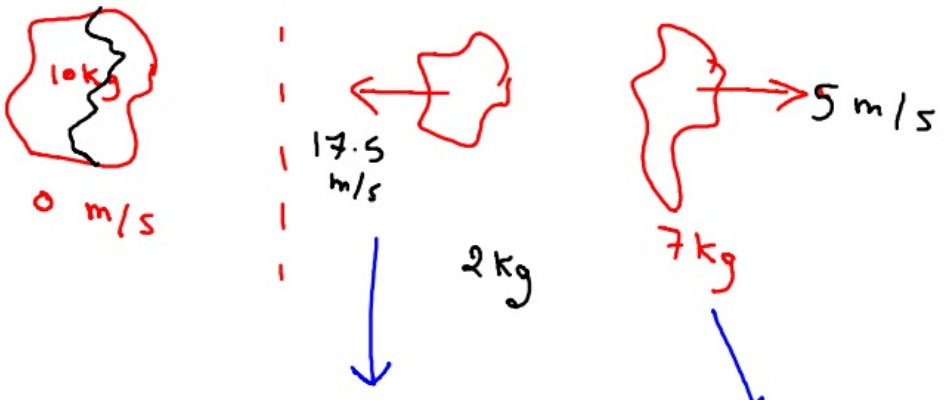
← mom = m x v while v is -ve

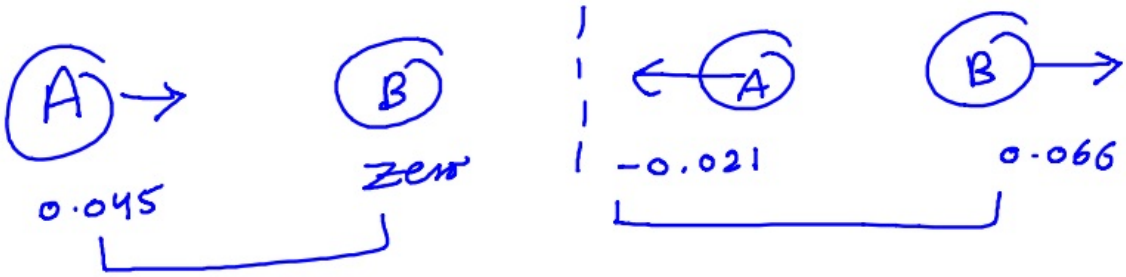
Revision Momentum



mom. = 2 x 5 = 10 kgm/s
to the right
or 10 kgm/s

mom = 2 x 5 = 10 kgm/s
to the left or -10 kgm/s





Question 11: Chapter 14 Energy transfers / 4PH0 JAN 2013 1P

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)