

Revision for Year 10 December Physics Assessment

Topic 1: Key Concepts in Physics

- 1.2 Recall and use multiples and sub-multiples of units, including giga (G), mega (M), kilo (k), centi (c), milli (m), micro (μ) and nano (n)

Which of these is the shortest length?

- ☐ A: 1 mm
☐ B: 0.1 Mm
☒ C: 1 μ m
☐ D: 0.1 cm

- 1.3 Be able to convert between different units, including hours to seconds

Draw one line from each time in hours or minutes to its matching time in seconds

2.6 hours	9600 s
160 minutes	9360 s
2 hours and 34 minutes	9240 s

- 1.4 Use significant figures and standard form where appropriate

If $A = 2.6 \times 10^5$
 And $B = 5.2 \times 10^6$
 Then what is $A \div B$?
☒ A: 5.0×10^{10}
☐ B: 0.05
☐ C: 2.60
☐ D: 0.5×10^1

Topic 2 part 1: Motion and Forces

- 2.3 Explain the difference between vector and scalar quantities

Which of these statements is true for vector quantities?

- ☐ A: vectors include magnitude only
☒ B: vectors include magnitude and direction
☐ C: vectors include direction only
☐ D: vectors do not include magnitude or direction

- 2.4 Recall vector and scalar quantities, including:

Circle all of the scalar quantities.

acceleration speed displacement
 mass velocity temperature
 momentum distance force

- 2.6 Recall and use the equations:

a (average) speed (metre per second, m/s) = distance (metre, m) $\div$ time (s)

If it takes 4 seconds for an aeroplane to travel 980 m. What is the speed of the aeroplane?

$$\text{SPEED} = \text{DISTANCE} \div \text{TIME}$$

$$? = 980 \div 4$$

$$= 245 \text{ m/s}$$

How far can a cyclist travel in 12 minutes if they are moving at a constant speed of 6 m/s?

$$12 \text{ min} \times 60 = 720 \text{ s}$$

$$\text{SPEED} = \text{DISTANCE} \div \text{TIME}$$

$$6 = ? \div 720$$

$$[\times 720]$$

$$6 \times 720 = 4320 \text{ m}$$

- 2.8 Recall and use the equation:

acceleration (metre per second squared, m/s^2) = change in velocity (metre per second, m/s) $\div$ time taken (second, s)

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

If it took 5 seconds for an aeroplane to increase its velocity by 30 m/s then what was the acceleration of the aeroplane?

$$\text{ACCELERATION} = \frac{\text{CHANGE IN VELOCITY}}{\text{TIME}}$$

$$? = 30 \div 5$$

$$= 6 \text{ m/s}^2$$

A cyclist was travelling at 7 m/s when they applied their brakes. Four seconds later they were at rest. What was the acceleration of the cyclist?

-0 m/s

$$\frac{\text{CHANGE IN VELOCITY}}{\text{TIME}} = \frac{\text{FINAL VELOCITY} - \text{INITIAL VELOCITY}}{\text{TIME}}$$

$$= \frac{0 - 7}{4} = -1.75$$

$$\text{ACCELERATION} = \frac{\text{CHANGE IN VELOCITY}}{\text{TIME}}$$

$$= -1.75 \text{ m/s}^2$$

A sky diver is falling at 55 m/s when they deploy their parachute. The parachute causes them to decelerate at 10 m/s^2 . What is the velocity of the sky diver five seconds after the parachute was deployed?

$$\text{ACCELERATION} = \frac{\text{CHANGE IN VELOCITY}}{\text{TIME}}$$

$$-10 = ? \div 5$$

$$-10 \times 5 = -50 \text{ m/s} [\times 5]$$

$$\frac{\text{CHANGE IN VELOCITY}}{\text{TIME}} = \frac{\text{FINAL VELOCITY} - \text{INITIAL VELOCITY}}{\text{TIME}}$$

$$-50 = ? \div 5$$

$$-50 + 55 = 5 \text{ m/s} [+ 55]$$

- 2.11 Describe a range of laboratory methods for determining the speeds of objects such as the use of light gates

Draw one line from each scenario to the appropriate equipment for measuring the speeds involved in that scenario.

Two snails race along a desk.	Light gate. Ruler.
A toy car quickly rolls down a 10 cm ramp	Stopwatch. Trundle wheel.
A student walks from one end of the school to the other	Stopwatch. Tape measure.

When is it more appropriate to use a light gate than a stopwatch?

- ☐ A: When time is very large
☐ B: When time varies a lot each repeat
☒ C: When time is close to or less than human reaction time
☐ D: When time cannot be measured in minutes

A card that is 6 cm long is attached to a trolley.

When the trolley is pulled down a ramp

the card passes through a light gate.

A data logger connected to the light gate records a time of 82 ms.

Show that the speed of the trolley through the light gate was roughly 0.7 m/s.

$$6 \text{ m} \div 100 = 0.06 \text{ m}$$

$$82 \text{ ms} \div 1000 = 0.082 \text{ s}$$

$$\text{SPEED} = \text{DISTANCE} \div \text{TIME}$$

$$? = 0.06 \div 0.082$$

$$= 0.73 \text{ m/s}$$

(which rounds down to 0.7 m/s)

- 2.12 Recall some typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems

Draw one line from each scenario to the most likely speed.

Driving a car in a built-up area	31 m/s
Walking	1 m/s
Driving a car along a motorway	10.5 m/s
Cycling	6 m/s

- 2.14 Recall Newton's first law and use it in the following situations:

- a where the resultant force on a body is zero, i.e. the body is moving at a constant velocity or is at rest
 b where the resultant force is not zero, i.e. the speed and/or direction of the body change(s)

Calculate the resultant force acting on each object and describe their motion.

10 N	Resultant force	0 N	Motion	CONSTANT SPEED
20 N	Resultant force	10 N UP	Motion	ACCELERATING UP
10 N	Resultant force	5 N RIGHT	Motion	ACCELERATING RIGHT
15 N	Resultant force	5 N UP AND 8 N RIGHT	Motion	ACCELERATING UP AND RIGHT

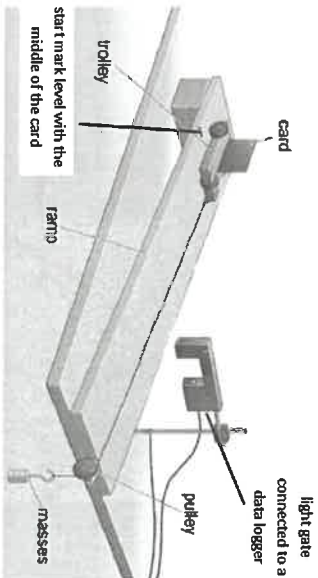
2.15 Recall and use Newton's second law as:
force (newton, N) = mass (kilogram, kg) $\times$ acceleration (metre per second squared, m/s²)
 $F = m \times a$

A remote control car with a mass of 0.5 kg experiences an acceleration of 2.5 m/s². State the magnitude of the force acting on the car to produce this acceleration.

$FORCE = MASS \times ACCELERATION$
 $? = 0.5 \times 2.5$
 $= 1.25 \text{ N}$

When a meteoroid crashes into a planet it experiences a resultant force of 0.13 kN. Assuming the mass of the meteoroid is 60 kg, what was its acceleration during the crash?

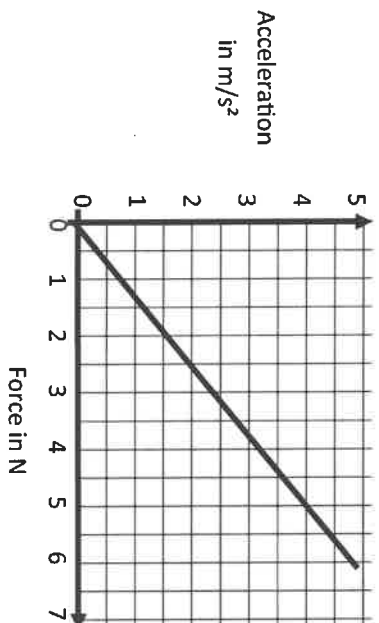
$0.13 \text{ kN} \times 1000 = 130 \text{ N}$
 $FORCE = MASS \times ACCELERATION$
 $130 = 60 \times ?$
 $[\div 60]$
 $130 \div 60 = 2.2 \text{ m/s}^2$



Equipment set up to investigate the effect of force on acceleration

- Why was the ramp tilted slightly?
- ☒ A: To compensate for the effects of frictional forces acting on the trolley
 - ☐ B: To cause acceleration of the trolley
 - ☐ C: So that the mass remains constant
 - ☐ D: To ensure the trolley passes through the light gate

- How could the mass of the moving system be kept constant?
- ☐ A: Add an equal mass to the trolley when one is added to the hook
 - ☒ B: Move masses between the trolley and the hook
 - ☐ C: Change the ramp angle each time
 - ☐ D: Only add mass to the trolley instead of the hook



Results of an investigation into the effect of force on acceleration of a trolley

Use the graph above to calculate the mass of the trolley

$(GRADIENT) / FORCE \div ACCELERATION$
 $INVERSE$
 $e.g. 5 \div 4 = 1.25 \text{ kg}$



The device shown in the image to the left is measuring the force acting on the apple hanging from it. What is the name of the force being measured?

- ☐ A: thrust
- ☐ B: friction
- ☐ C: mass
- ☒ D: weight

2.16 Define weight, recall and use the equation:
weight (newton, N) = mass (kilogram, kg) $\times$ gravitational field strength (newton per kilogram, N/kg)
 $W = m \times g$

What is the magnitude of the gravitational field strength at the surface of the Earth?

- ☒ A: 1000 N/kg
- ☐ B: 10 N/kg
- ☐ C: 1 N/kg
- ☐ D: 0.1 N/kg

A book resting on the surface of a table has a mass of 0.35 kg. What is the weight of the book?

$WEIGHT = MASS \times GRAVITY$
 $? = 0.35 \times 10$
 $= 3.5 \text{ N}$

At the start of a race the total weight of a formula 1 car, fuel and driver is 9080 N. What is the total mass of the car, fuel and driver?

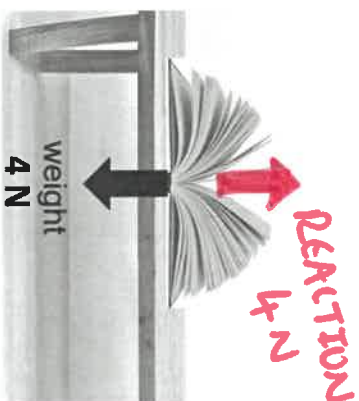
$WEIGHT = MASS \times GRAVITY$
 $9080 = ? \times 10$
 $[\div 10]$
 $9080 \div 10 = 908 \text{ kg}$

2.23 Recall and apply Newton's third law both to equilibrium situations and to collision interactions and relate it to the conservation of momentum in collisions

A book resting on a table is in equilibrium.

What does equilibrium mean?

- ☐ A: There are no forces acting
- ☐ B: Some forces are balanced
- ☒ C: All forces are balanced
- ☐ D: Only downwards forces exist



Add an arrow to this diagram to represent the reaction force that is the pair of the book's weight.

Which phrase finishes this statement:

There is a force from the book pushing down on the surface of the table, so there is also a force from the table...

- ☐ A: pulling down on the book
- ☐ B: pushing down on the book
- ☒ C: pulling up on the book
- ☐ D: pushing up on the book

2.24 Define momentum, recall and use the equation:
momentum (kilogram metre per second, kg m/s) = mass (kilogram, kg) $\times$ velocity (metre per second, m/s)
 $p = m \times v$

A toy car has a mass of 0.4 kg and is travelling to the right at 2.6 m/s.



Which of these describes the momentum of the toy car?

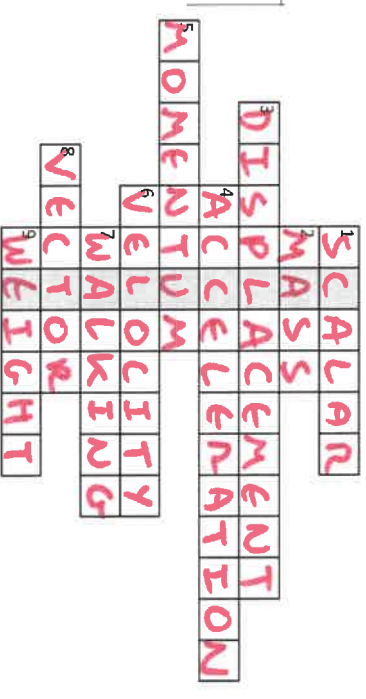
- ☒ A: 1.04 kgm/s right
- ☐ B: 1.04 kgm/s left
- ☐ C: 6.5 kgm/s right
- ☐ D: 6.5 kgm/s left

2.26 Use Newton's second law as:
force (newton, N) = change in momentum (kilogram metre per second, kg m/s) $\div$ time (second, s)
 $F = \frac{mv - mu}{t}$

A toy car is dropped on the floor. The momentum of the car just before it hits the floor is 1.5 kgm/s. It takes 0.22 s for the car to come to a stop when it hits the floor. Calculate the magnitude of the force the car experienced when it hits the floor.

$FORCE = CHANGE IN \div TIME$
 $MOENTUM$
 $? = (0 - 1.5) \div 0.22$
 $= -6.8 \text{ N}$

Bonus Question



- 1 a value that only has magnitude and not direction
- 2 calculated by dividing the force acting on an object by the object's acceleration
- 3 the vector equivalent of distance; how many meters in a straight line from one place to another
- 4 measured in m/s²
- 5 calculated by multiplying mass and velocity together
- 6 measured in m/s
- 7 an activity with a typical speed of roughly 1 m/s
- 8 a value that includes both magnitude and direction
- 9 a downwards force that all objects close to a planet experience

The bonus phrase from the highlighted column is

CALCULATE