AQA Physics Paper 2
Revision Test: Forces and their Interactions (FT)

Q1

Complete the following sentences using words chosen from the box below. Words may be used more than once. Not all the words in the box are required to complete the sentences.

complexity	direction	force	units
simplicity	time	magnitude	title

Scalars and vectors are similar because both types of quantities have _____ but they are also different because only vector quantities have _____.

In scientific diagrams, a vector quantity may be represented by an arrow. The length of the arrow represents the _____ of the vector. The direction of the arrow represents the _____ of the vector.

(4 marks)

Q2

Complete the table below by stating three examples of scalar quantities and three examples of vector quantities.

	Scalar quantity	Vector quantity
Example 1		
Example 2		
Example 3		

(6 marks)

Q3

Some cycling races take place on velodrome tracks that have a semi-circle at each end separated by straight sections in between, as shown in Figure 1.

The velocity of the cyclist at one point on the track is indicated by Q.

A short time later, the cyclist reaches another point on the track, indicated by R.

The cyclist has the same speed at point Q and at point R.

Complete the diagram to indicate the velocity of the cyclist at point R.

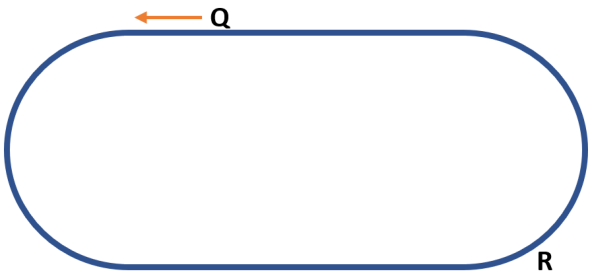


Figure 1

(3 marks)

Q4

All forces can be categorised as either contact forces or non-contact forces.

Tick one column in each row of the table below to identify the following forces as either a contact force or a non-contact force.

Force	Contact	Non-Contact
water resistance		
air resistance		
gravitational force		
friction		

(4 marks)

Q5

One of the following statements is not true for magnetic forces.

Tick the box that corresponds with the false statement

☐ **A** Magnetic forces can be either attractive or repulsive

☐ **B** Magnetic forces always act horizontally

☐ **C** The SI unit for magnetic force is the newton (N)

☐ **D** Magnetic forces are vector quantities

(1 mark)

Q6

Two forces act on a book that rests on a table. The diagram below, Figure 2, shows one of the forces.

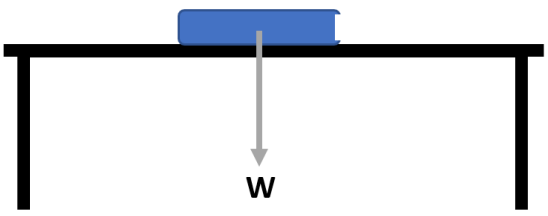


Figure 2

a) What is represented by **W** in Figure 2?

_____

(1 mark)

b) Draw an arrow on Figure 2 to represent the normal contact force for the book. Label the arrow N.

(3 marks)

Q7

The weight of a mass in a gravitational field is given by the equation;

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$W = m\,g$$

a) Complete the table below by stating the SI unit for each of the three quantities in the equation above.

Quantity	**SI unit**
weight (W)	
mass (m)	
gravitational field strength (g)	

(3 marks)

b) State the name that is given to the single point where the weight of an object can be considered to act.

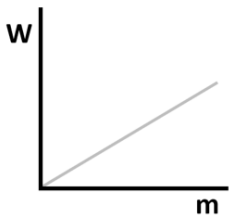
_____

(1 mark)

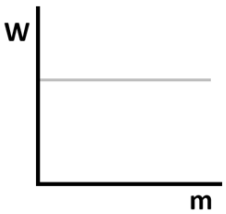
Q8

Which of the graphs below shows the general relationship between W and m for a constant value of g?

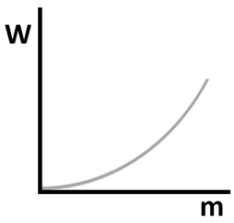
Circle the letter under the graph that is your answer.



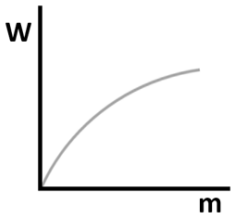
A



B



C



D

(1 mark)

Q9

The diagram below, Figure 3, shows an object that has been dropped and is falling through the air.

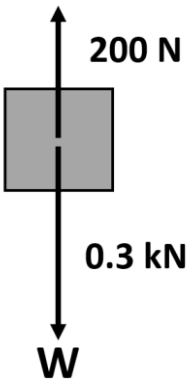


Figure 3

a) State the name of the force that is represented by the upwards arrow.

_____

(1 mark)

b) Calculate the overall force that is acting on the object.
You must include the appropriate unit with your answer.

.....

.....

overall force = _____ unit _____

(3 marks) *(1 mark)*

c) State the direction of the overall force that is acting on the object.

_____

(1 mark)

d) State the name that is given to the overall force acting on the object.

_____

(1 mark)

Exam-style questions

Q1

The International Space Station (ISS) is in orbit above Earth. The ISS travels at a constant average speed and takes 90 minutes to complete one orbit, which is a total distance of 42 600 km.

a) Calculate the average speed of the ISS.

average speed _____ km/h

(3 marks)

b) Describe the velocity of the International Space Station as it makes one complete orbit of the Earth.

(3 marks)

Q2

A magnet, labelled Y, is placed on a table and is free to move.

A second magnet, labelled Z, is held in a clamp close to the first magnet so that the North poles of both magnets are facing each other, as shown in Figure 1.

Initially, the two magnets are both stationary.

Figure 1

When the second magnet (Z) is moved closer, an increasing force acts on the first magnet (Y).

a) State what will happen to the first magnet (Y) when the second magnet (Z) gets closer to it.

(2 marks)

b) Describe the force acting on magnet Z compared to the force acting on magnet Y.

_____

_____

(2 marks)

Q3

An astronaut travels from Earth to the moon. The overall journey is shown in Figure 2.

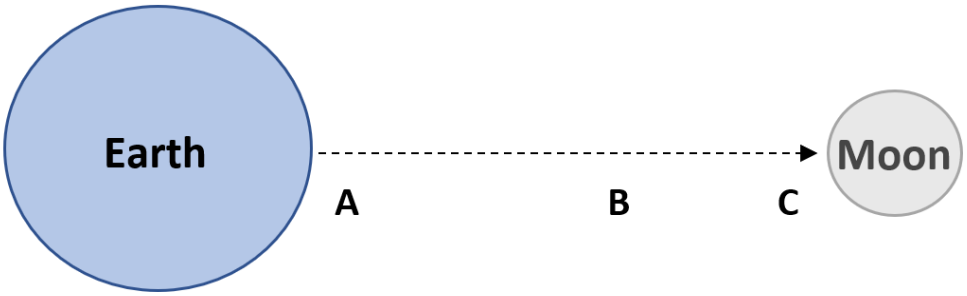


Figure 2

Describe and explain the pattern of weight change that the astronaut will experience during the journey.

Your answer must include specific details about the astronaut's weight at points A, B and C.

(6 marks)

ANSWERS: CORE QUESTIONS

Q1

One mark for each correct answer…

Scalars and vectors are similar because both types of quantities have **magnitude** but they are also different because only vector quantities have **direction**.

In scientific diagrams, a vector quantity may be represented by an arrow. The length of the arrow represents the **magnitude** of the vector. The direction of the arrow represents the **direction** of the vector.

(4 marks)

Q2

One mark for each correct answer…

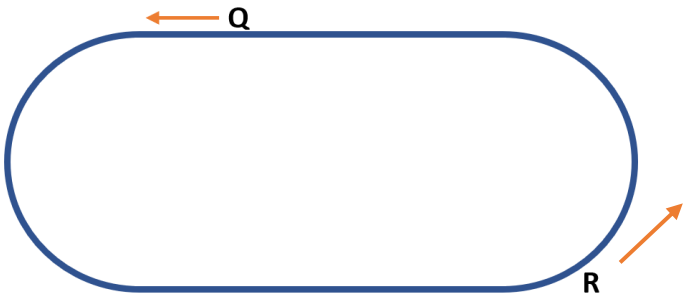
Any valid scalar, such as; mass, temperature, speed, time, distance, (electrical) resistance.

Any valid vector, such as; force, friction, weight, displacement, velocity, acceleration, potential difference, current. Allow only **one** of the following terms for a vector quantity; drag / air resistance / water resistance.

(6 marks)

Q3

Arrow expected as shown below…



Marking points; (visually) straight, (visually) same length as arrow for Q, (visually) direction tangential to curve.

(3 marks)

Q4

One mark for each correct answer…

Force	Contact	Non-Contact
water resistance	✓	
air resistance	✓	
gravitational force		✓
friction	✓	

(4 marks)

Q5

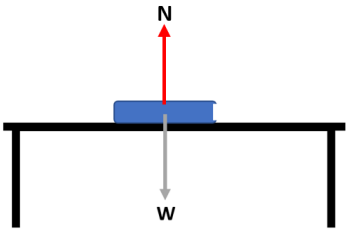
B is the false statement as magnetic forces can act in any direction.

(1 mark)

Q6

(a) The arrow represents the **weight of the book** (acting on the table) *(1 mark)*

(b) Arrow expected as shown below…



Marking points; (visually) straight line **with** upwards arrow *(1 mark)*
length of line is (visually) the same as the vector W *(1 mark)*
line originating from the same point as W (centre of mass of book) *(1 mark)*

Q7

a) One mark for each correct answer…

Quantity	**SI unit**
weight (W)	**N**
mass (m)	**kg**
gravitational field strength (g)	**N/kg**

(3 marks)

b) Accept any of the following; centre of mass / centre of gravity / centre of weight *(1 mark)*

Q8

A is the correct answer as weight is always directly proportional to mass *(1 mark)*

Q9

a) Accept any of the following; air resistance / drag / friction *(1 mark)*

b) Convert to consistent units (either 0.2 kN or 300 N) *(1 mark)*
Correct final value (either 0.1 or 100) *(1 mark)*
Separate mark for unit but the unit stated **must** be consistent with the value given. *(1 mark)*

c) Accept; downwards / in the direction of W *(1 mark)*

d) resultant (accept no other answers) *(1 mark)*

ANSWERS: EXAM-STYLE QUESTIONS

Q1

a) Convert minutes to hours (90 minutes = 1.5 hours) *(1 mark)*
Correct method (may be implied from final answer) – independent of correct conversion *(1 mark)*
Correct final answer (28 400) – unit not required *(1 mark)*

b) Marking points as follows;
the velocity changes (even though the average speed stays the same)… *(1 mark)*
because the **direction** of travel is (constantly) changing *(1 mark)*
but the **magnitude** of the velocity stays the same (as the average speed is constant) *(1 mark)*

Q2

a) Magnet Y will **move away** from magnet Z (one mark for move, one for direction) *(2 marks)*
b) The force acting on magnet Z is **equal** (in magnitude) to the force acting on magnet Y *(1 mark)*
The force acting on magnet Z is in the **opposite direction** to the force acting on magnet Y *(1 mark)*

Q3

Maximum available award is 6 marks: for full marks, all three specific details (second group) are required.

General description answer (makes no mention of specific points but describes a viable pattern of change);
the astronaut's weight will **decrease** (going away from the Earth) *maximum*
then increase (to a lower value) (when on to the moon) *2 marks*
No mark is to be awarded for reference to "change" alone as this is include in the question.

Specific description answer (responses must refer relative values and specific locations to achieve these marks);
at point A, the weight has its **maximum value** (accept, very close to / on Earth)
at point B, the weight will decrease to a **minimum value** at point B (far away from the Earth) *maximum*
at point C, the weight will have increased to a value lower than at point A (accept, on Earth) *4 marks*
some valid reference to gravity / gravitational field is required for 4 marks

Explanation answer (responses link the values of weight to the cause of weight);
relative values at all three specific descriptions must be given (as detailed above)
weight is dependent on the gravitational field *maximum*
close to the Earth, the astronaut is in a strong gravitational field, maximising weight *6 marks*
the Moon's gravitational field is weaker than Earth's, so the astronaut's is less at C than at A
the location of the minimum gravitational field is closer to the Moon than to Earth