Past-paper walk-through

Mass and weight ▪ 1.3

eXercise

Questions in this set

- 0625/22 N25 Q3 ▪ 1 mark
- 0625/23 N25 Q4 ▪ 1 mark
- 0625/41 N25 Q2 ▪ 8 marks
- 0625/21 J24 Q2 ▪ 1 mark
- 0625/21 J24 Q3 ▪ 1 mark
- 0625/21 J23 Q4 ▪ 1 mark
- 0625/21 J23 Q6 ▪ 1 mark

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 3

0625/22 N25 ▪ Q3 ▪ 1 mark

3 A space probe that has a mass of 600 kg is on the planet Mars.

The acceleration of free fall on Mars is 4.0 m/s^2.

What is the weight of the space probe on Mars?

A 60 N **B** 150 N **C** 2400 N **D** 6000 N

Solution 3

Answer: **C**

Why

- Weight is the force of gravity on a mass: $W = mg$.
- Use the value of g for Mars, not for Earth.
- $W = 600 \times 4.0 = 2400$ N.

Question 4

0625/23 N25 ▪ Q4 ▪ 1 mark

4 Which measuring instrument is used to compare masses?

A balance

B protractor

C stop-watch

D voltmeter

Solution 4

Answer: **A**

Why

- A balance works by comparing an unknown mass against known ones.
- So it compares masses directly, and its reading does not depend on g.
- A protractor measures angles, a stop-watch time and a voltmeter potential difference.

Question 2

0625/41 N25 ▪ Q2 ▪ 8 marks

2 Table 2.1 contains information about the planet Mars.

Table 2.1

mass	6.4×10^{23} kg
gravitational field strength at surface	3.7 N / kg
average density	3900 kg / m^3

(a) Define gravitational field strength.

Question 2

(b) **(i)** An object has a weight of 42 N at the surface of the Earth.

Calculate the weight of the object at the surface of Mars.

Question 2

(ii) Calculate the volume of Mars.

Question 2

(c) Fig. 2.1 shows a space buggy that is tested on Earth. The buggy is travelling at a constant speed in a straight line. The driving force on the buggy is 30 N.

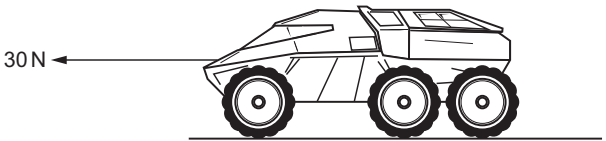


Fig. 2.1

(i) Draw and label **one** arrow on Fig. 2.1 to show the size and direction of the resistive forces on the buggy. [2]

(ii) Air resistance on Mars is less than air resistance on Earth.
The same driving force, 30 N, is exerted on the buggy on Mars.

1. State the effect this has on the resultant force on the buggy on Mars

Question 2

f. State the effect this has on the resultant force on the buggy on Mars.

Question 2

Question 2

2. State the relationship between resistive forces, driving force and resultant force.

Question 2

[1]

[Total: 8]

Solution 2

(a)

Mark scheme

- (gravitational field strength is) force per unit mass (on an object in a gravitational field)

Solution 2

(b)(i)

Mark scheme

- 16 N
- W = mg OR (m =) W÷g OR 42 / 9.8 OR (mass of object =) 4.3 (kg)

(b)(ii)

Mark scheme

- 1.6 × 1020 m3
- (V =) m / OR (V =) 6.4 × 1023 / 3900

Solution 2

(c)(i)

Mark scheme

- arrow parallel to driving force AND pointing to the right
- 0625/41
- October/November 2025
- (arrow pointing to the right) labelled 30 N

Solution 2

(c)(ii)

Mark scheme

- 1
- (resultant force) increases OR there is a resultant force (in the direction of the driving force)
- OR
- 2
- resultant force = driving force – resistive force(s)

Question 2

0625/21 J24 ▪ Q2 ▪ 1 mark

2 Which name is given to the quantity of matter in an object?

A density

B mass

C volume

D weight

Solution 2

Answer: **B**

Why

- Mass is the quantity of matter in an object.
- It is measured in kilograms and does not change with location.
- Weight is the *force* of gravity on that mass, and density is mass per unit volume.

Question 3

0625/21 J24 ▪ Q3 ▪ 1 mark

3 A body is moved from place X to place Y where the gravitational field strength is different.

What happens to its mass and to its weight due to the move?

	mass	weight
A	changes	changes
B	changes	stays the same
C	stays the same	changes
D	stays the same	stays the same

Solution 3

Answer: **C**

Why

- Mass is the quantity of matter, so it does not depend on where the object is.
- Weight is mg, so it changes when the gravitational field strength changes.
- So the mass stays the same and the weight changes.

Question 4

0625/21 J23 ▪ Q4 ▪ 1 mark

4 On the Earth, a spring stretches by 5.0 cm when a mass of 3.0 kg is suspended from one end.

The gravitational field strength on the Moon is $\frac{1}{6}$ of that on the Earth.

Which mass, on the Moon, would stretch the spring by the same extension?

A 0.50 kg **B** 3.0 kg **C** 5.0 kg **D** 18 kg

Solution 4

Answer: **D**

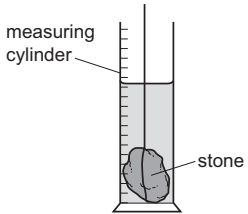
Why

- A spring stretches according to the *force* pulling on it, which is the weight.
- On the Moon g is one sixth, so each kilogram weighs only one sixth as much.
- To produce the same force you therefore need six times the mass: $6 \times 3.0 = 18$ kg.

Question 6

0625/21 J23 ▪ Q6 ▪ 1 mark

6 A student determines the density of an irregularly shaped stone. The stone is slowly lowered into a measuring cylinder partly filled with water.



Which other apparatus does the student need to calculate the density of the irregularly shaped stone?

A a balance

Question 6

B a thermometer

C a metre rule

D a stop-watch

Solution 6

Answer: **A**

Why

- The measuring cylinder gives the volume, from the rise in the water level.
- Density is mass divided by volume, so the mass is still needed.
- A balance is the instrument that measures mass.