MEASUREMENT /DENSITY/MASS/VOLUME-SET-1-QP-MS

1 The density of the metal used to make the load carried by truck **Y** is 2700 kg / m^3. The mass of the load is 1000 kg.

Calculate the volume of the load.

State the formula that you use and show your working. State the unit of your answer.

formula

working

volume = ... unit ..... [3]

MARKING SCHEME

(volume =) $\frac{\text{mass}}{\text{density}}$;

$= \frac{1000}{2700}$;

$= 0.37\,\text{m}^3$; [3]

2 The mass of ball **X** is 3.97 g (3.97×10^{-3} kg). The volume of ball **X** is 4.17 cm^3 (4.17×10^{-6} m^3).

Calculate the density of the plastic used to make ball **X**.

State the formula that you use and show your working. State the units of your answer.

formula

working

density = ... unit = ... [3]

MARKING SCHEME

$$(\text{density}) = \frac{\text{mass}}{\text{volume}} \ ;$$

$$\frac{3.97}{4.17} \text{ OR } \frac{3.97 \times 10^{-3}}{4.17 \times 10^{-6}} \ ;$$

$$= 0.952 \text{ g/cm}^3 \text{ OR } 952 \text{ kg/m}^3 \ ; \qquad [3]$$

3 Fig. 1.1 shows an astronaut in a rocket about to take off for the Moon.

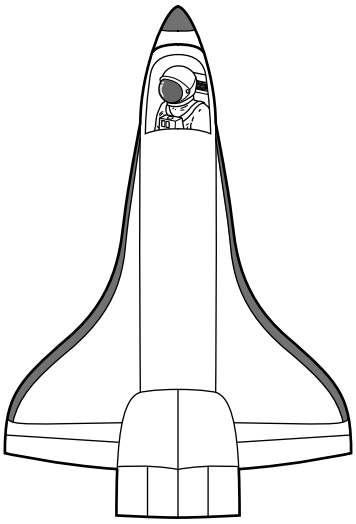

Fig. 1.1

(a) The mass of the astronaut and his spacesuit on the Earth is 100 kg.

The weight of the astronaut and his spacesuit on Earth is 1000 N.

The Moon has a smaller gravitational field than the Earth.

(i) Suggest the mass and weight of the astronaut and his spacesuit on the Moon.

- mass on the Moon .....kg
- weight on the Moon .....N [1]

(ii) Explain your answers to **(i)**.

explanation for mass .....

.....

.....

explanation for weight.....

.....

.....

[2]

(b) The weight of the rocket on take-off is 20 000 000 N.

When the rocket blasts off from the Earth's surface, it experiences a thrust force of 25 000 000 N.

Explain why the thrust force must be greater than the weight of the rocket.

.....

.....[1]

MARKING SCHEME

(a) **(i)** mass 100 (kg) weight less than 1000 (N) ; [1]

(ii) mass does not change / does not depend on gravitational field ;
weight different because weight is effect of gravitational field on mass / owtte ; [2]

(b) need resultant upwards force to accelerate the rocket ; [1]

4 Fig. 11.2 shows a small model elephant made of gold.

Fig. 11.2

Describe a method for measuring the volume of this small model elephant.

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.....

..... [2]

MARKING SCHEME

eureka can / displacement method ;
volume of water displaced is the volume of the object ; [2]

5 **(a)** Fig. 3.1 shows a speed/time graph for a train.

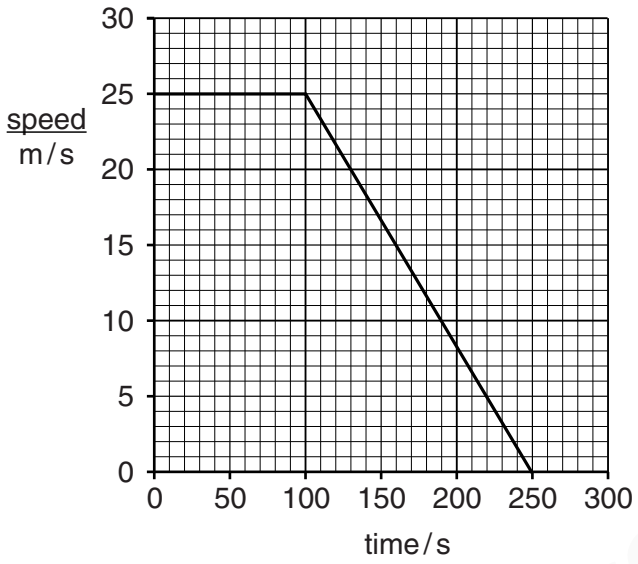

Fig. 3.1

(i) Calculate the distance travelled by the train between 0 s and 250 s. State the unit.

Show your working.

distance = ... unit ..... [3]

(ii) The mass of the train is 500 000 kg.

Calculate the kinetic energy of the train in kilojoules, when it is travelling at 20 m/s.

State the formula that you use and show your working.

formula

working

kinetic energy = ... kJ [2]

(b) The track for the train is composed of steel rails.

Steel has a density of 7.80 g / cm^3 at 20 °C.

(i) State how the density of steel changes when the temperature rises to 35 °C. Explain why this happens in terms of particles.

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.....

.....

.....[3]

(ii) The steel rails are made from steel blocks. Each block is a cube with sides of 50 cm.

Calculate the mass of one of these steel blocks in kilograms when the temperature is 20 °C.

Show your working.

mass = ... kg [3]

MARKING SCHEME

(a) **(i)** distance = area under graph (**or** working on graph) ;
= 25 × 100 + ½ × 150 × 25 = 4375 ;
m ; [3]

(ii) (KE =) ½ mv^2 ;
= ½ x 500 000 × 20 × 20 = 100 000 000 (J) = 100 000 (kJ) ; [2]

(b) **(i)** density decreases ;
mass does not change ;
kinetic energy of particles increases / speed of particles increases ;
particles move further apart ; [max 3]

(ii) volume = 125 000 cm^3 ;
mass = 7.8 × 125 000 = 975 000 g ;
= 975 (kg) ; [3]

[Total: 11]