Effects of Forces

Question Paper

Course	CIE IGCSE Physics
Section	1. Motion, Forces & Energy
Topic	Effects of Forces
Difficulty	Hard

Time Allowed   50

Score   /38

Percentage   /100

Question 1a

A student is using some 50 g masses.

Calculate the weight of one 50 g mass.

weight of 50 g mass = ... N

[3 marks]

Question 1b

The student uses the 50g masses as loads to stretch a spring.

Fig. 2.1 shows the apparatus the student uses to obtain readings for a load–extension graph.
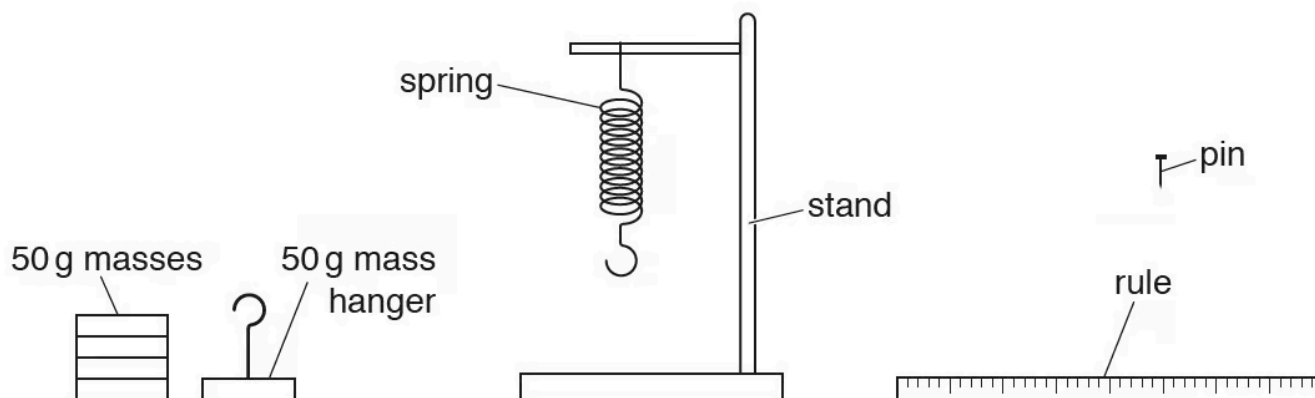

Fig. 2.1 (NOT to scale)

Describe how the student could use the apparatus and ensure that the readings are accurate.

[4 marks]

Question 2a

The mass of a small steel ball is 120 g. The volume of the ball is 16.0 cm^3.

(i)   Calculate the density of the steel ball.

density = ... g / cm^3 [3]

(ii)   The ball falls to the ground from rest. At a time of 0.2 s after it started to fall, its acceleration is 10 m / s^2.

State the acceleration of the ball at a time of 0.1 s after it started to fall.

[1]

[4 marks]

Question 2b

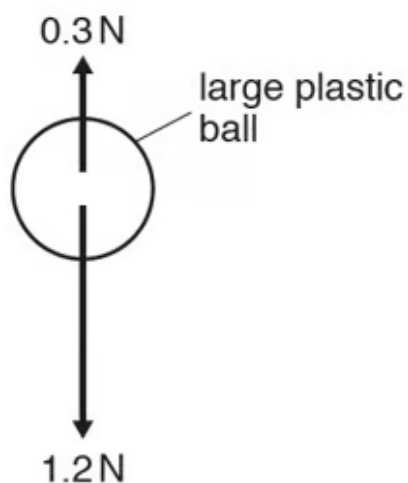Fig. 3.1 shows the vertical forces that act on a large plastic ball as it is falling.

Fig. 3.1 (not to scale)

(i)   State the name given to each of the forces shown in Fig. 3.1.

[1]

(ii)   Calculate the size of the resultant force on the ball.

resultant force = ... N [1]

[2 marks]

Question 3a

A load is attached to a spring, as shown in Fig. 3.1. Two arrows indicate the vertical forces acting on the load. The spring and the load are stationary.
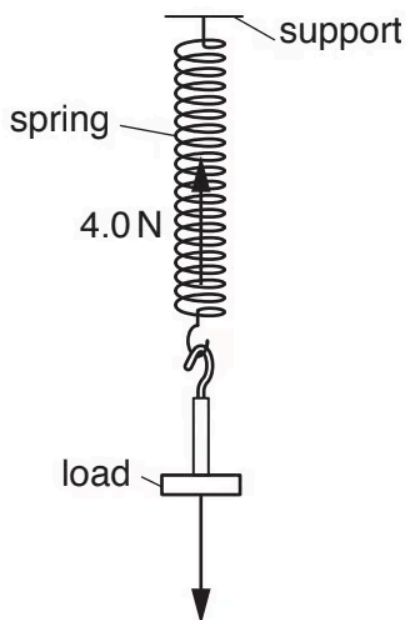

Fig. 3.1

(i)   State the name of the force acting vertically downwards.

[1]

(ii)   The vertical force that acts upwards is 4.0 N.

State the value of the force acting vertically downwards.

force = ... N [1]

[2 marks]

Question 3b

The load is pulled downwards and then released. The load moves up and down.

Fig. 3.2 represents the vertical forces acting on the load at some time after it is released.

Fig. 3.2

Calculate the resultant force on the load and state its direction.

resultant force = ... N

direction = ...

[2 marks]

Question 3c

(i)   State the principle of conservation of energy.

[1]

(ii)   Eventually the load stops moving up and down.

Describe and explain why the load stops moving. Use your ideas about conservation of energy.

[2]

[3 marks]

Question 4a

Extended tier only

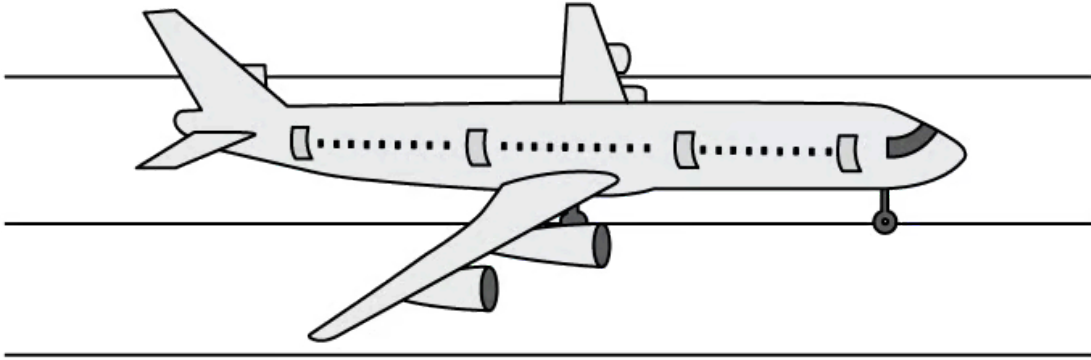Fig. 1.1 shows an aeroplane accelerating uniformly on a runway.

Fig. 1.1

The aeroplane has a mass of 3.1×10^6 kg.

From rest, the aeroplane reaches a speed of 70 m/s after 32 s.

Calculate the following quantities

    (i)   The acceleration of the aeroplane.

acceleration = ... [2]

    (ii)   The resultant force acting on the aeroplane.

resultant force = ... [2]

[4 marks]

Question 4b

Extended tier only

When the aeroplane reaches its destination, air traffic control directs it to circle the airfield until there is a safe time to land.

Fig. 1.2 shows a head on view of the aeroplane flying at a constant speed in a circular horizontal path.
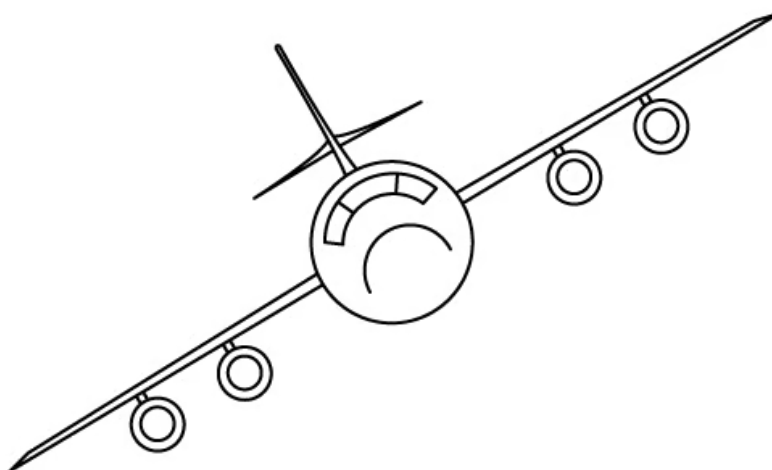

Fig 1.2

Draw an arrow showing the resultant force on the aeroplane.

Explain your answer.

[3 marks]

Question 4c

Extended tier only

The pilot wants to decrease the radius of the circular flight path whilst maintaining a constant speed.

Suggest how the pilot could achieve this.

[1 mark]

Question 4d

Extended tier only

As the aeroplane lands on the runway, it decelerates from its top speed. The resultant force on the aeroplane is less than it was at take off.

Explain why this is the case.

[4 marks]

Question 5a

A resultant force acts on an object at rest.

State the direction of the acceleration.

[1 mark]

Question 5b

Extended tier only

A resultant force acts perpendicularly on a object traveling at a constant speed.

State the effect of the force on the object.

[1 mark]

Question 5c

Extended tier only

A man with a mass of 70 kg steps into an elevator.

(i)   State the value of the force exerted on the man by the elevator.

force = ... [1]

(ii)   Calculate the force required to accelerate the man at 1.6 m/s^2.

force = ... [1]

(iii)   Explain why these values are different.

[2]

[4 marks]