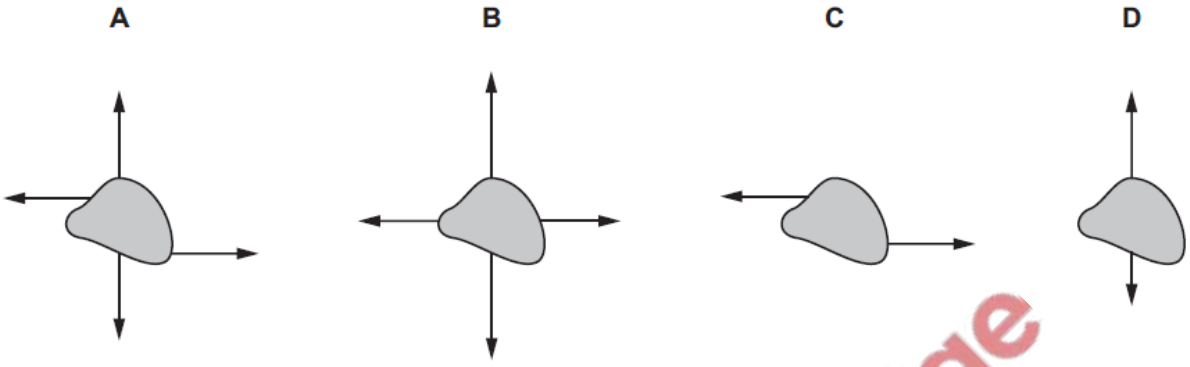
Forces – 2023 IGCSE Physics 0625

1. Nov/2023/Paper_ 0625/11,21/No.6

Forces are applied to four identical objects.

The length of each arrow indicates the magnitude of the force.

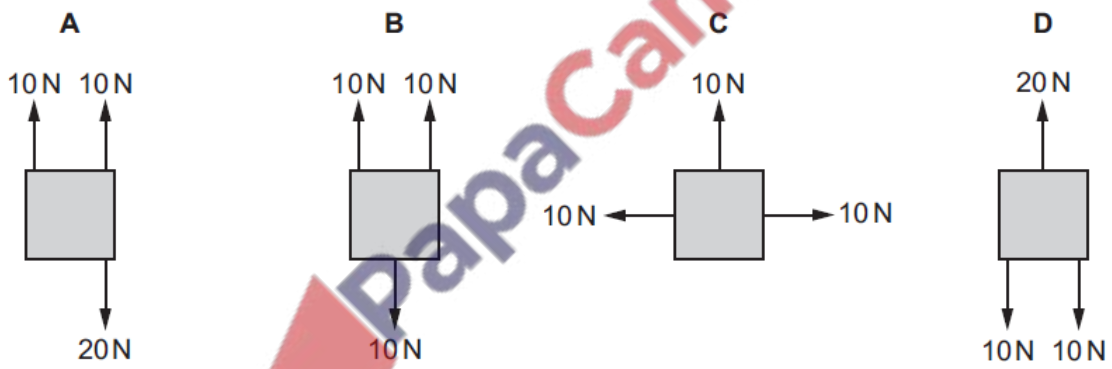
Which object is in equilibrium?



2. Nov/2023/Paper_ 0625/12,22/No.6

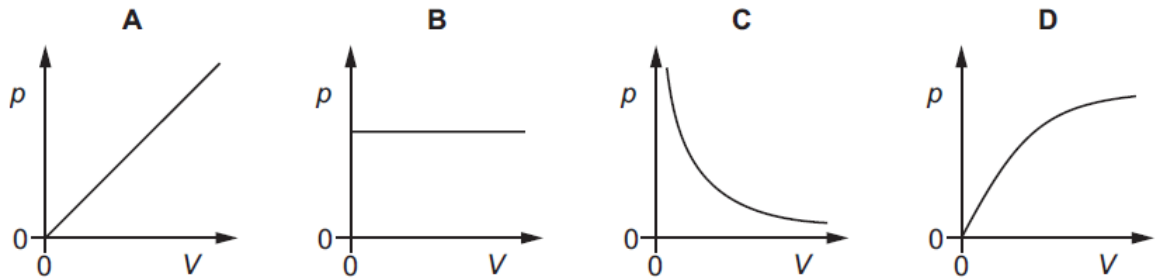
The diagrams show four identical objects. Each object is acted on by only the forces shown.

Which diagram shows an object in equilibrium?



3. Nov/2023/Paper_ 0625/13/No.8

Which graph shows the relationship between the pressure *p* of a fixed mass of gas and its volume *V* at a constant temperature?



4. Nov/2023/Paper_ 0625/22/No.5

A satellite orbits the Earth at constant speed in a circular orbit.

Which statement is correct?

A The resultant force on the satellite is zero.

B The resultant force on the satellite is towards the Earth.

C The resultant force on the satellite is away from the Earth.

D The resultant force on the satellite is in the direction of its motion.

5. Nov/2023/Paper_ 0625/23/No.5

An object moves in a circle at constant speed.

Which statement about the force needed on the object is correct?

A A force away from the centre of the circle keeps the object moving in the circle.

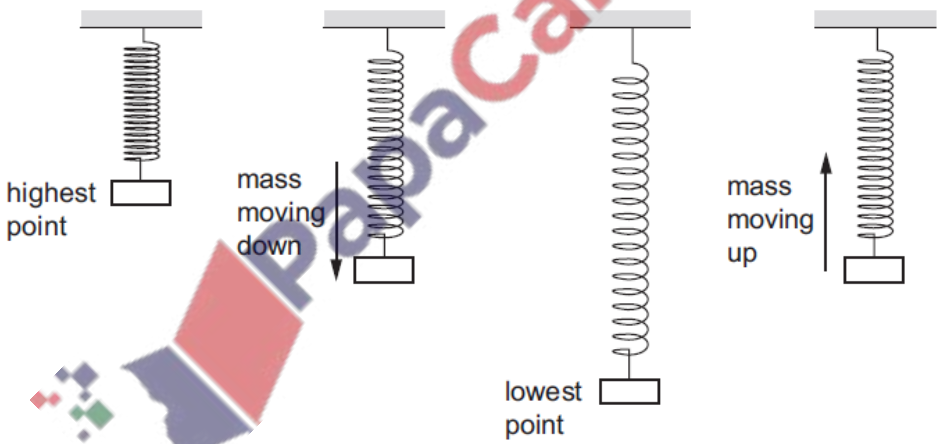
B A force in the direction of motion of the object keeps it moving in the circle.

C A force towards the centre of the circle keeps the object moving in the circle.

D No force is needed to keep the object moving at constant speed in the circle.

6. Nov/2023/Paper_ 0625/23/No.8

A mass bounces up and down on a steel spring. The diagram shows the mass and the spring at different points during the motion.



At which point is the least energy in the gravitational potential store of the mass and at which point is the most energy in the elastic store of the spring?

	least energy in gravitational potential store of the mass	most energy in the elastic store of the spring
A	mass moving down	mass moving up
B	mass moving down	lowest point
C	lowest point	mass moving up
D	lowest point	lowest point

7. Nov/2023/Paper_ 0625/31/No.2(b)

(b) The cylinder is falling at constant speed through the air. Fig. 2.1 shows the vertical forces acting on the cylinder.

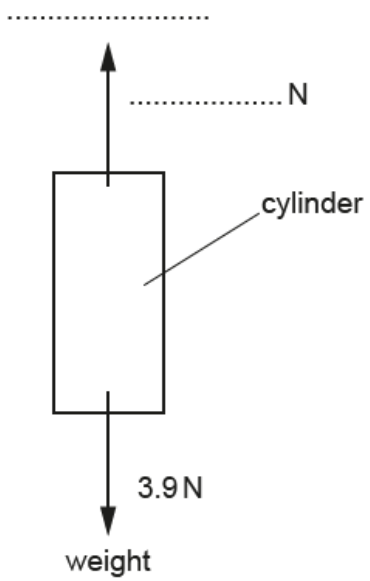


Fig. 2.1 (not to scale)

On Fig. 2.1, write the name and the size of the upward force on the cylinder. [2]

8. Nov/2023/Paper_ 0625/32/No.3b(ii)

(ii) The graph of load against extension for a spring is shown in Fig. 3.3.

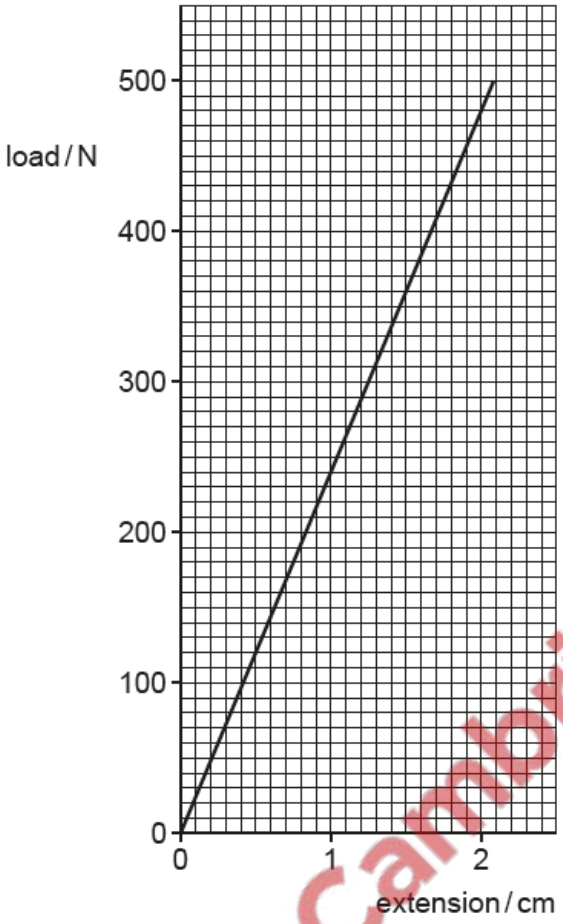


Fig. 3.3

The unstretched length of the spring is 16 cm.

Determine the length of the spring when the load on the spring is 240 N.

length of spring = ... cm [2]

9. Nov/2023/Paper_ 0625/42/No.3(b)

(b) Fig. 3.2 shows the directions of two forces acting on a different balloon as it moves.

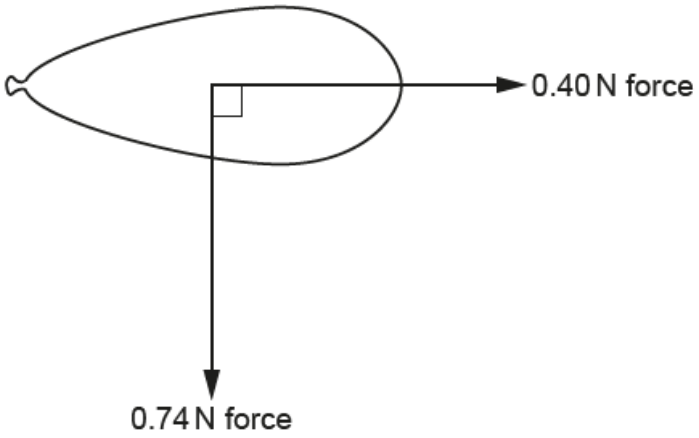


Fig. 3.2 (not to scale)

Determine the magnitude and direction of the resultant force on the balloon.

magnitude .....

direction relative to horizontal force .....

[4]

10. Nov/2023/Paper_ 0625/43/No.2

(a) Fig. 2.1 is a graph that shows how the extension of a spring varies with the load suspended from it.

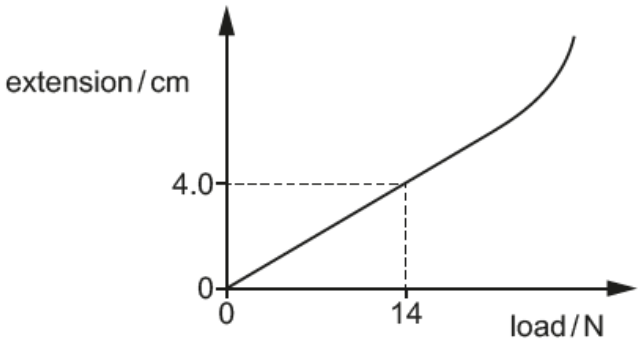


Fig. 2.1

(i) Determine the spring constant of this spring.

spring constant = ... [3]

(ii) On Fig. 2.1, mark the limit of proportionality and label this point L. [1]

(b) Fig. 2.2 shows a car travelling at constant speed around corner A on a road.

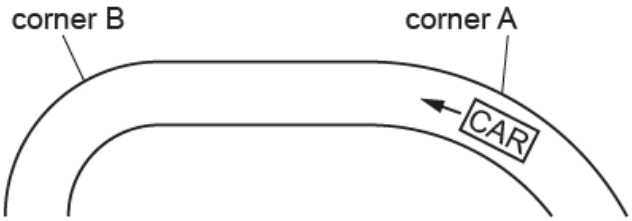


Fig. 2.2

(i) On Fig. 2.2, mark with an arrow the direction of the resultant force acting on the car as it travels around corner A. [2]

(ii) Corner B has a smaller radius than corner A. The car travels at the same speed around corner B as around corner A.

State how the resultant force changes due to the car travelling around a corner of smaller radius.

..... [1]

[Total: 7]

11. June/2023/Paper_0625/11/No.7

Four objects are moving.

Which object has a zero resultant force acting on it?

A the object moving at a decreasing speed

B the object moving at an increasing speed

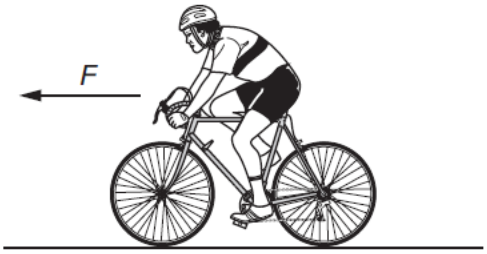
C the object moving at a constant speed in a circle

D the object moving at a constant speed in a straight line

12. June/2023/Paper_0625/13,23/No.6

A cyclist is travelling in a straight line along a horizontal road at a constant speed.

A constant driving force *F* acts on the cyclist in the forward direction shown.



Which statement about the magnitude of the frictional forces acting on the cyclist is correct?

A The magnitude is equal to *F*.

B The magnitude is smaller than *F*, but greater than zero.

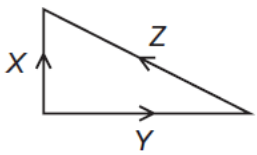
C The magnitude is greater than *F*.

D The magnitude is zero.

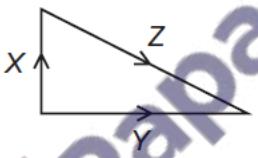
13. June/2023/Paper_0625/21/No.1

Which vector diagram correctly shows the force *Z* as the resultant of forces *X* and *Y*?

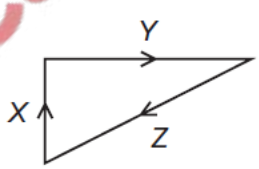
A



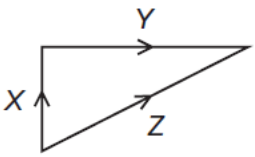
B



C



D



14. June/2023/Paper_0625/21/No.2

An object falls towards the surface of the Earth.

The object is falling at its terminal velocity.

Which statement is correct?

A There is air resistance and the acceleration of the object is negative.

B There is air resistance and the acceleration of the object is zero.

C There is no air resistance and the acceleration of the object is negative.

D There is no air resistance and the acceleration of the object is zero.

15. June/2023/Paper_0625/21/No.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.

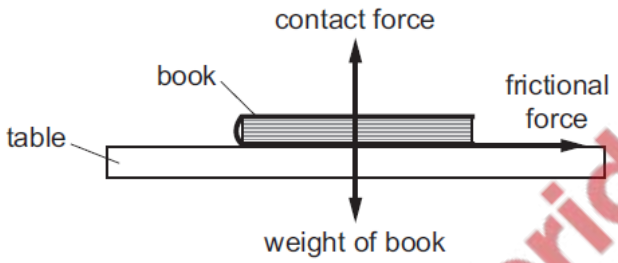
Which mass, on the Moon, would stretch the spring by the same extension?

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

16. June/2023/Paper_0625/21/No.7

A train is travelling horizontally in a straight line. A book is on a table in the train.

The diagram shows all the forces acting on the book.



How is the train moving?

A accelerating to the left of the diagram

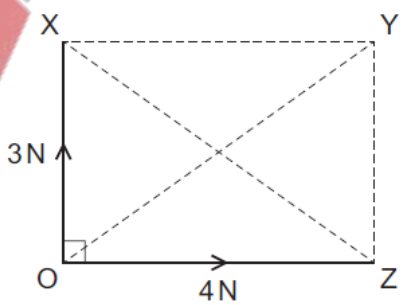
B accelerating to the right of the diagram

C moving at uniform speed to the left of the diagram

D moving at uniform speed to the right of the diagram

17. June/2023/Paper_0625/22/No.1

Forces of 3 N and 4 N act at right angles, as shown.



What is the resultant force?

A 1 N along XZ

B 5 N along XZ

C 5 N along OY

D 7 N along OY

18. June/2023/Paper_0625/22/No.2

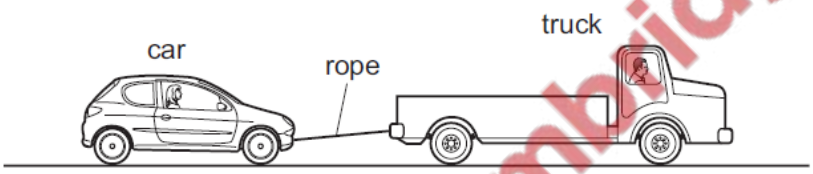
A light ball is held at rest at the top of a tall cliff. It is released and falls through the air, eventually reaching its terminal velocity.

Which row describes the behaviour of the ball as it descends?

	the initial acceleration of the ball	the final acceleration of the ball
A	0	0
B	0	*g*
C	*g*	0
D	*g*	*g*

19. June/2023/Paper_0625/22/No.7

A truck is towing a car along a straight horizontal road at a constant speed.



The rope breaks.

Which row gives the direction of the initial acceleration of the truck after the rope breaks and the reason for the acceleration?

	direction of acceleration of the truck	reason
A	left	the driving force is greater than the resistive forces on the truck
B	left	the driving force is smaller than the resistive forces on the truck
C	right	the driving force is greater than the resistive forces on the truck
D	right	the driving force is smaller than the resistive forces on the truck

20. June/2023/Paper_0625/23/No.7

A spring has an unstretched length of 3.0 cm. When a force of 60 N is applied to the spring, its length increases to 5.0 cm. The limit of proportionality is not exceeded.

What is the spring constant of the spring?

A 7.5 N / cm **B** 12 N / cm **C** 20 N / cm **D** 30 N / cm

21. June/2023/Paper_0625/32/No.2(c)

Fig. 2.1 shows the speed–time graph for a cyclist.

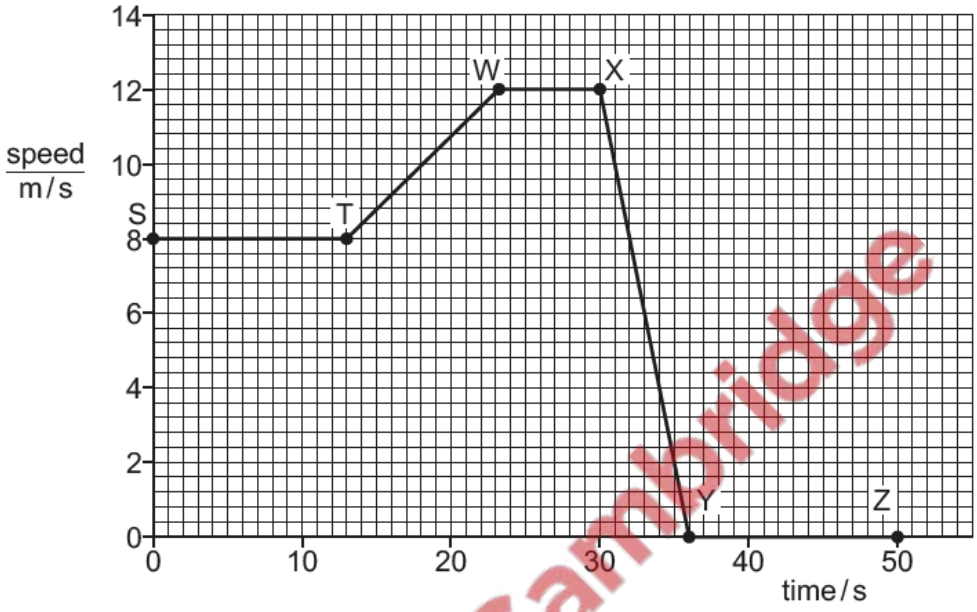


Fig. 2.1

(c) Fig. 2.2 shows the horizontal forces on a cyclist.

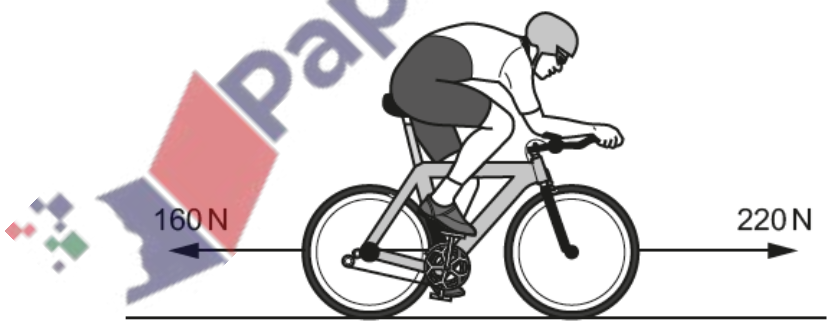


Fig. 2.2

(i) Calculate the size of the resultant force on the cyclist.

resultant force = ... N [1]

(ii) State the effect, if any, of the resultant force on the motion of the cyclist.

..... [1]

22. June/2023/Paper_0625/41/No.1

Fig. 1.1 shows a straight section of a river where the water is flowing from right to left at a speed of 0.54 m/s.

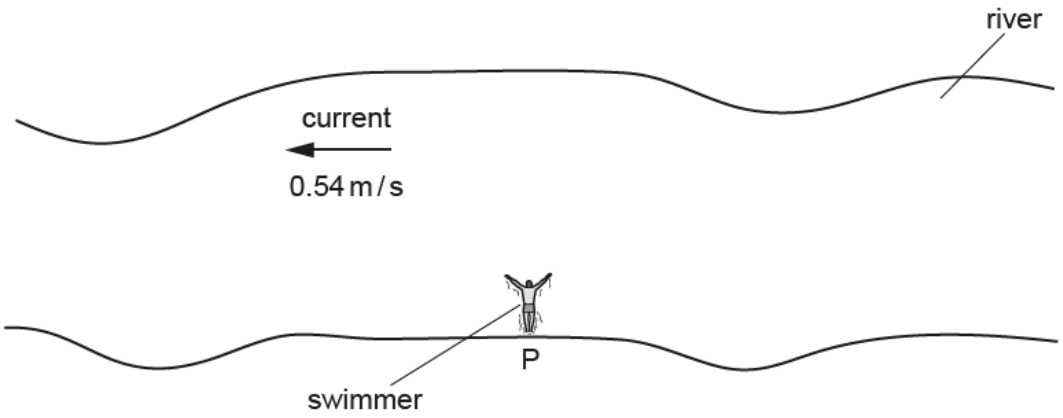


Fig. 1.1 (not to scale)

A swimmer starts at point P and swims at a constant speed of 0.72 m/s relative to the water and at right angles to the current.

(a) (i) Determine, relative to the river bank, both the magnitude and direction of the swimmer's velocity.

magnitude of velocity = ...

direction of velocity .....

[4]

(ii) After 1.5 minutes, the swimmer reaches point Q.

Calculate the distance between P and Q.

distance = ... [3]

(b) When the swimmer is crossing the river, his actions produce a constant forward force on his body.

Explain why he moves at a constant speed.

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.....

.....

..... [2]

[Total: 9]

23. June/2023/Paper_0625/42/No.1

(a) Fig. 1.1 shows a helicopter which is stationary at a height of 1500 m above the ground.

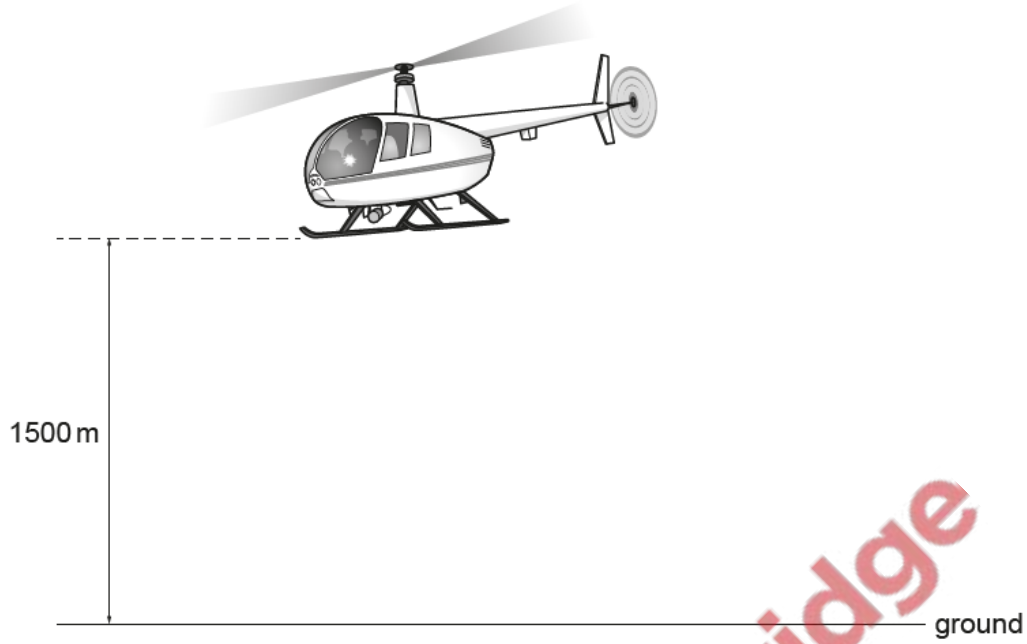

Fig. 1.1 (not to scale)

(i) State the **two** conditions necessary for the helicopter to remain in equilibrium.

condition 1 .....

.....

condition 2 .....

.....

[2]

(ii) The mass of the helicopter is 3200 kg.

Calculate the change in the gravitational potential energy of the helicopter as it rises from the ground to 1500 m.

change in gravitational potential energy = ... [2]

(b) Fig. 1.2 shows a vertical speed–time graph for a parachutist who jumps from a stationary hot-air balloon.

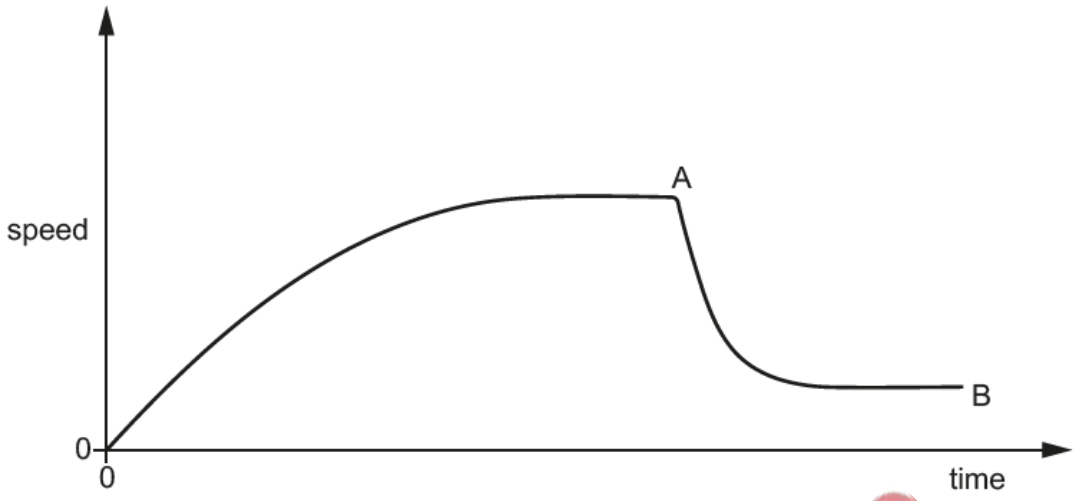

Fig. 1.2

The parachutist jumps from the balloon at time = 0 and reaches the ground at B. The point A indicates when the parachute opens.

(i) On Fig. 1.2, label a point on the graph where the acceleration is:
- zero with '1'
- negative with '2'
- decreasing with '3'. [3]

(ii) Explain, in terms of forces, the changes in motion which occur from when the parachutist leaves the hot-air balloon until point A.

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..... [4]

[Total: 11]

24. June/2023/Paper_0625/43/No.1(b)

Fig. 1.1 shows a balloon filled with helium gas.

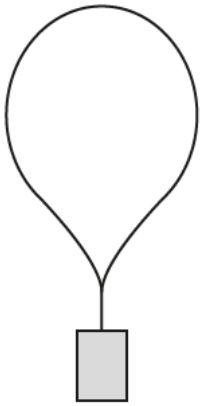

Fig. 1.1

The mass of the balloon is 120 kg.

(b) The resultant force on the balloon is 54 N.

Show that the acceleration of the balloon is 0.45 m/s^2.

[2]