Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

Hailstones are small balls of ice. Hailstones form in clouds and fall to the ground.

Figure 1 shows different-sized hailstones.

Figure 1



A hailstone falls from a cloud and accelerates.

(a) Why does the hailstone accelerate?

_____

_____

(1)

(b) The hailstone stops accelerating and reaches terminal velocity.

Explain why the hailstone reaches terminal velocity.

_____

_____

_____

_____

_____

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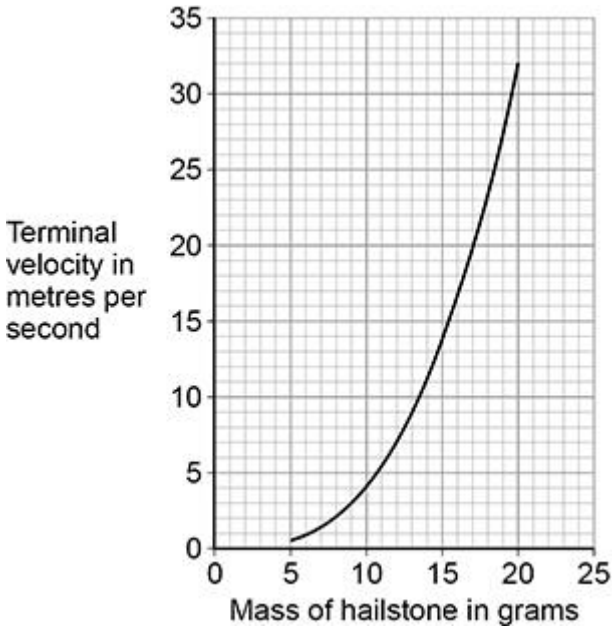
_____

(3)

A scientist investigated how the mass of hailstones affects their terminal velocity.

Figure 2 shows the results.

Figure 2



(c) Why does terminal velocity increase with mass?

Tick (✓) **one** box.

As mass increases the cross-sectional surface area of a hailstone increases. ☐

As mass increases the volume of a hailstone increases. ☐

As mass increases the weight of a hailstone increases. ☐

(1)

(d) Explain the difference in the maximum kinetic energy of a hailstone with a mass of 10 g and a hailstone with a mass of 20 g.

_____

_____

_____

_____

_____

_____

(3)

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(e) The kinetic energy of a hailstone is measured in joules.

Which of the following is the same as 1 joule?

Tick (✓) **one** box.

1 N m ☐

1 N/m ☐

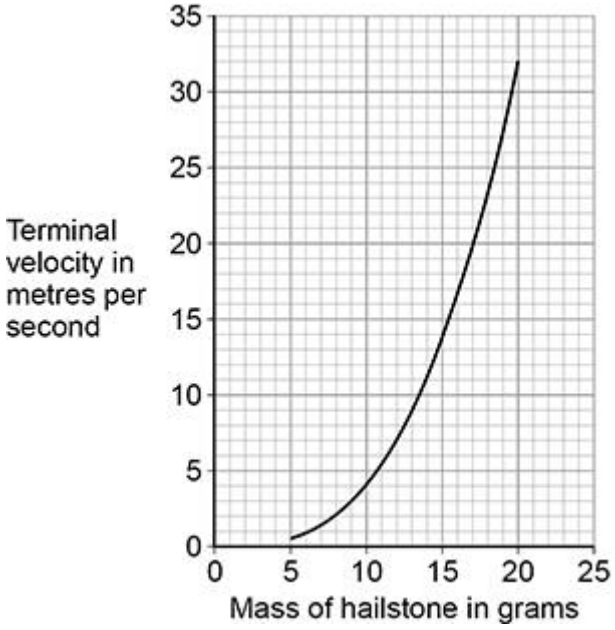
1 N/m^2 ☐

1 N m^2 ☐

(1)

Figure 2 is repeated below.

Figure 2



(f) A hailstone hit the ground at its terminal velocity of 25 m/s.

The hailstone took 0.060 s to stop moving.

Determine the average force on the hailstone as it hit the ground.

Use information from **Figure 2**.

Use the Physics Equations Sheet.

_____

_____

_____

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Average force = _____ N

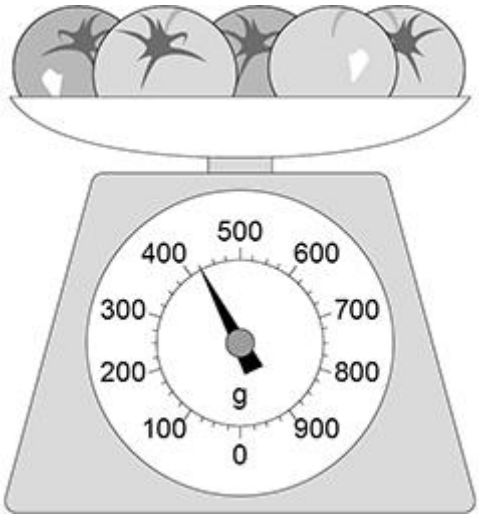
(3)

(Total 12 marks)

Q2.

Figure 1 shows a balance used to measure the mass of five tomatoes.

Figure 1



(a) What is meant by 'centre of mass'?

(1)

(b) Calculate the mean weight of a tomato in **Figure 1**.

Use the Physics Equations Sheet.

gravitational field strength = 9.8 N/kg

Weight = _____ N

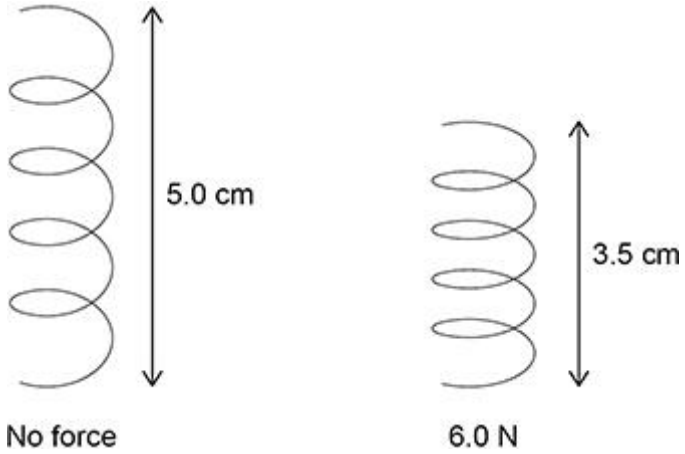
(3)

(c) The balance in **Figure 1** contains a spring that compresses when the tomatoes are placed on the balance.

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Figure 2 shows the spring with no force acting and with a 6.0 N force acting.

Figure 2



Determine the spring constant of the spring.

Use the Physics Equations Sheet.

Spring constant = _____ N/m

(3)

(d) Explain **one** property of the spring that makes it suitable for use in the balance.

(2)

(Total 9 marks)

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