AQA GCSE Physics | 8463

SPECIFICATION POINT 4.5.5.1.1

Pressure in a fluid 1

Past-paper questions

Tier	**Foundation**
Question groups	**10**
Available paper years	**2013–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.5.5.1.1 Pressure in a fluid 1

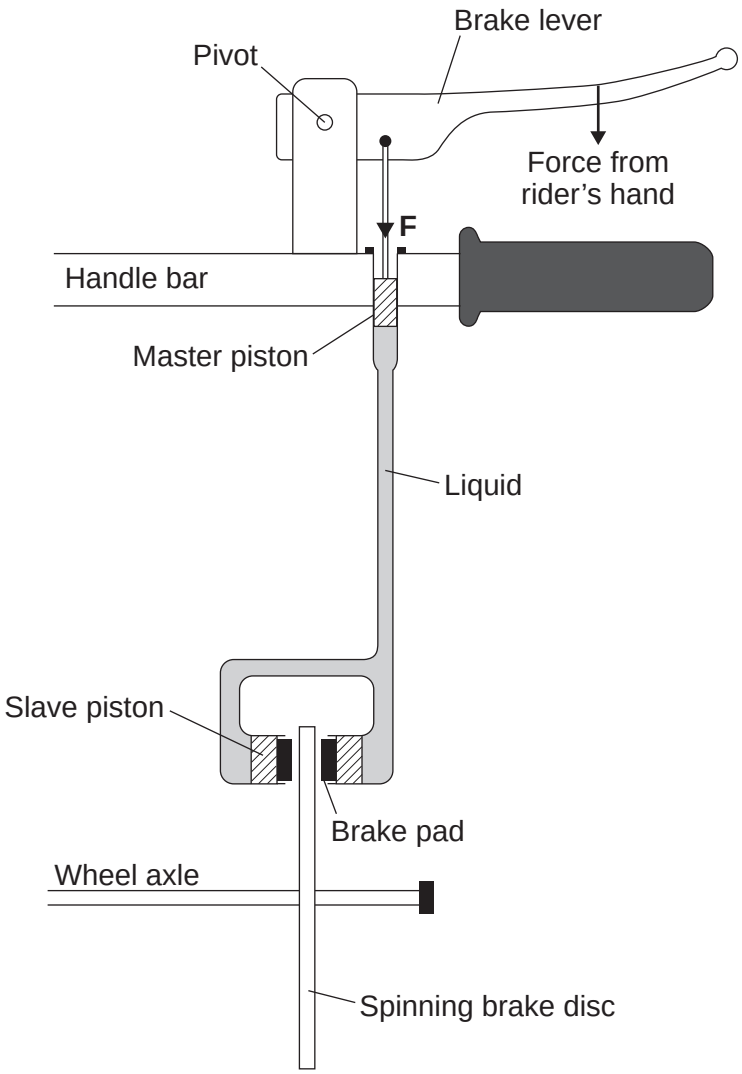
Question 01

June 2013 | PH3FP | Original Q6 | Legacy

6 Mountain bike riders use brakes to slow down.



Some mountain bikes use liquid-filled pipes to transmit the force from the rider's hand on the brake lever to the brake pads. These brakes are called hydraulic brakes.



4.5.5.1.1 Pressure in a fluid 1

Question 01 · continued June 2013 | PH3FP | Original Q6 | Legacy

6 (a) Draw a ring around the correct answer to complete each sentence.

6 (a) (i) Liquids can be used to transmit the forces in a brake system,

because liquids

- are incompressible.
- can flow.
- take the shape of the container.

(1 mark)

6 (a) (ii) The pressure in the liquid is transmitted

- against force **F** only.
- downwards only.
- in all directions.

(1 mark)

6 (b) When the rider's hand pulls on the brake lever, the force **F** applied to the liquid by the master piston is 80 N. The cross-sectional area of this piston is 50 mm^2.

Calculate the pressure, in N/mm^2, exerted on the liquid by the master piston.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Pressure = ... N/mm^2

(2 marks)

6 (c) The unit N/mm^2 is **not** the usual unit of pressure.

Which unit is usually used when calculating pressure?

Draw a ring around the correct answer.

N Nm^2 Pa

(1 mark)

6 (d) The rider applies a larger force to the brake lever. How would this increase in force affect the pressure in the liquid?

.....

(1 mark)

6

4.5.5.1.1 Pressure in a fluid 1

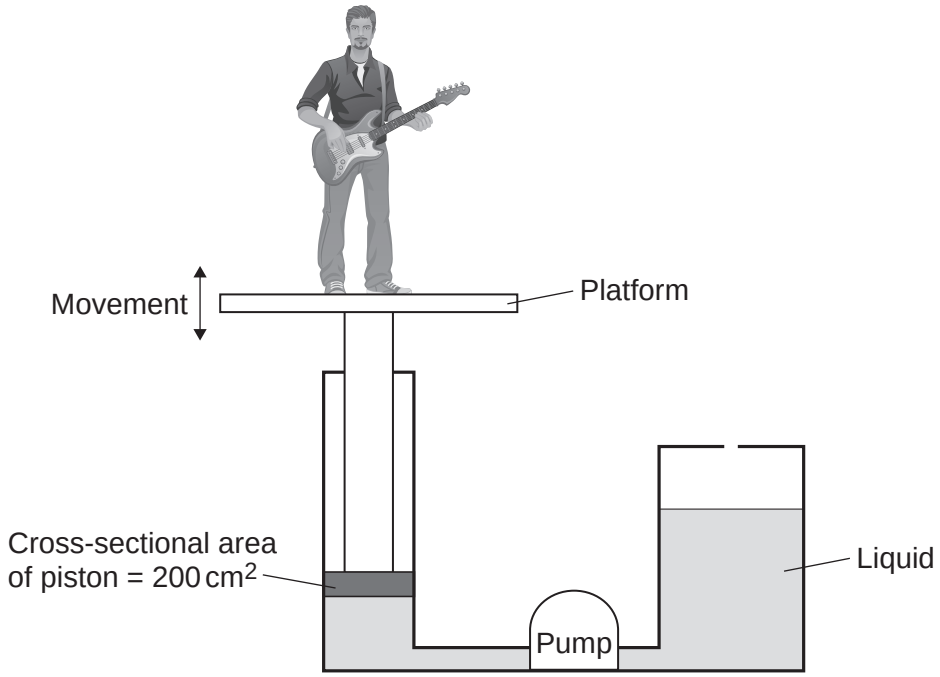
Question 02

June 2014 | PH3FP | Original Q5 | Legacy

5 Musicians sometimes perform on a moving platform.

Figure 9 shows the parts of the lifting machine used to move the platform up and down.

Figure 9



5 (a) What name is given to a system that uses liquids to transmit forces?

Draw a ring around the correct answer.

[1 mark]

electromagnetic **hydraulic** **ionising**

4.5.5.1.1 Pressure in a fluid 1

Question 02 · continued June 2014 | PH3FP | Original Q5 | Legacy

5 (b) To move the platform upwards, the liquid must cause a force of 1800 N to act on the piston.

The cross-sectional area of the piston is 200 cm^2.

Calculate the pressure in the liquid, in N/cm^2, when the platform moves.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Pressure = ... N/cm^2

5 (c) A new development is to use oil from plants as the liquid in the machine.

Growing plants and extracting the oil requires **less energy** than producing the liquid usually used in the machine.

Draw a ring around the correct answer to complete the sentence.

[1 mark]

Using the oil from the plants gives | an environmental / an ethical / a social | advantage over the liquid usually used.

4

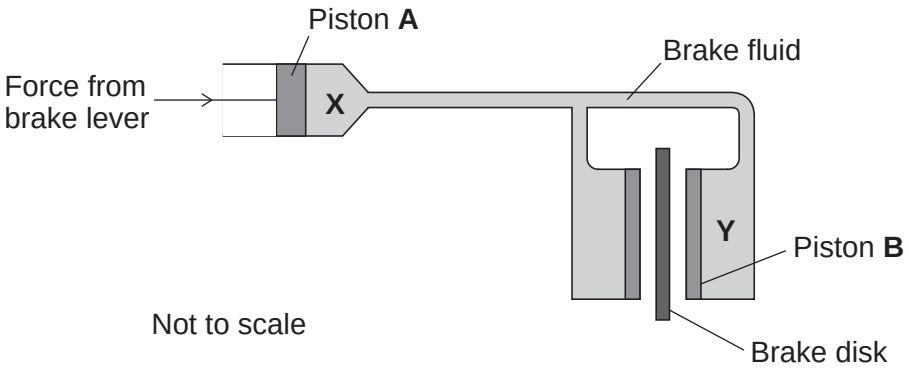
4.5.5.1.1 Pressure in a fluid 1

Question 03

June 2016 | PH3FP | Original Q3 | Legacy

3 **Figure 4** is a simplified diagram of a hydraulic brake system.

Figure 4



3 (a) Which is the correct statement about the pressure at **X** and the pressure at **Y**?

[1 mark]

Tick (✓) **one** box.

The pressure at **X** is greater than at **Y** ☐

The pressure at **X** is the same as at **Y** ☐

The pressure at **X** is less than at **Y** ☐

3 (b) Piston **B** is larger than piston **A**.

How will this affect the size of the force on piston **B**?

Use the correct answer from the box to complete the sentence.

[1 mark]

smaller than	**the same as**	**larger than**

The force on piston **B** will be _____ the force on piston **A**.

4.5.5.1.1 Pressure in a fluid 1

Question 03 · continued

3 (c) (i) A force of 24 N acts on piston **A**. The cross-sectional area of piston **A** is 8 mm^2.

Calculate the pressure in N/mm^2 at position **X**.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

Pressure = _____ N/mm^2

3 (c) (ii) The unit N/mm^2 is not often used to measure pressure.

Which unit is usually used to measure pressure?

[1 mark]

Tick (✓) **one** box.

- newton ☐
- pascal ☐
- watt ☐

3 (d) The liquid used in the hydraulic brake system freezes at –30 °C.

Suggest **one** effect a temperature below –30 °C would have on the brake system.

[1 mark]

6

4.5.5.1.1 Pressure in a fluid 1

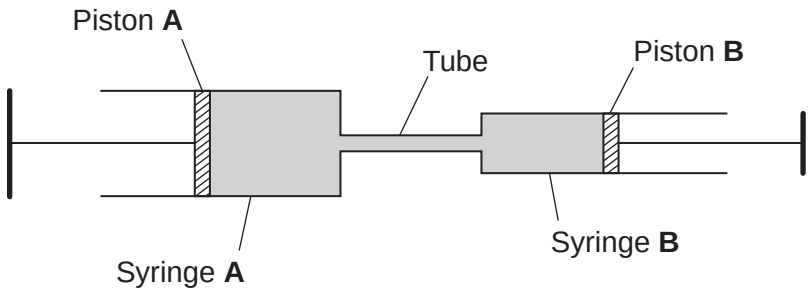
Question 04

June 2017 | PH3FP | Original Q3 | Legacy

3 A student made a hydraulic system using two syringes filled with water.

The syringes were joined with a tube, as shown in **Figure 4**.

Figure 4



3 (a) What property of water makes it suitable to use in a hydraulic system?

[1 mark]

Tick (✓) **one** box.

It is almost incompressible. ☐

It is a poor electrical conductor. ☐

It is transparent. ☐

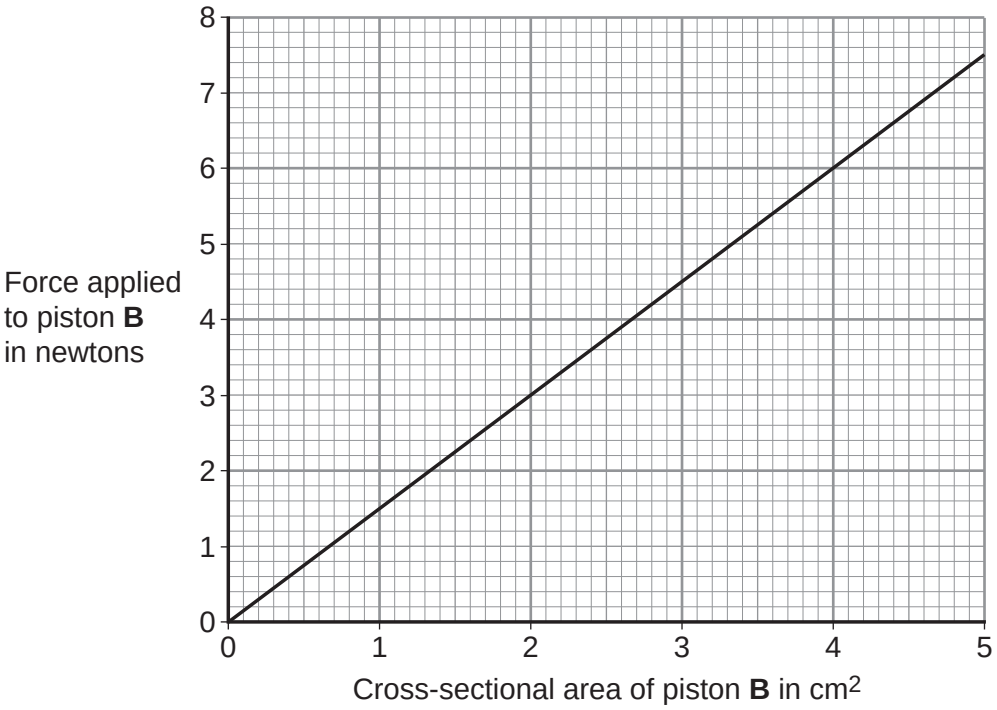
4.5.5.1.1 Pressure in a fluid 1

Question 04 · continued

3 (b) The student investigated how changing the cross-sectional area of piston **B** affected the force needed to keep piston **B** moving at a constant rate.

The results are shown in **Figure 5**.

Figure 5



3 (b) (i) Describe the relationship between the cross-sectional area of piston **B** and the force applied to piston **B** shown in **Figure 5**.

[2 marks]

Question 3 continues on the next page

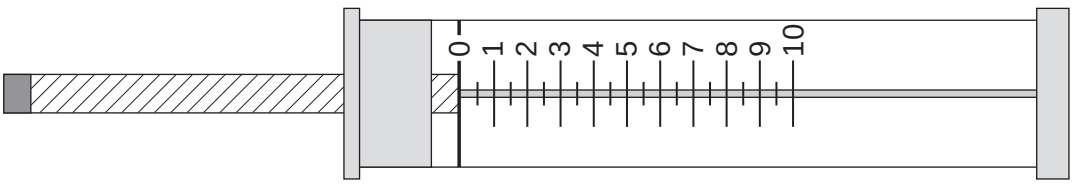
4.5.5.1.1 Pressure in a fluid 1

Question 04 · continued

3 (b) (ii) The student used a newton-meter to measure the force applied to piston **B**.

The newton-meter is shown in **Figure 6**.

Figure 6



What is the smallest change in force that can be measured with this newton-meter?

[1 mark]

Tick (✓) **one** box.

0.1 N ☐

0.5 N ☐

1 N ☐

4

4.5.5.1.1 Pressure in a fluid 1

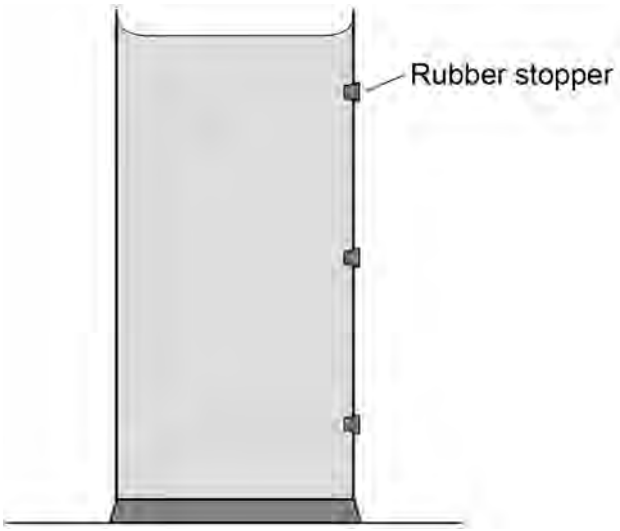
Question 05

June 2018 | 8463/2F | Original Q9

0 9 **Figure 11** shows a container filled with water.

The three holes in the side of the container are sealed with rubber stoppers.

Figure 11



0 9 . 1 The water exerts a force of 27 N on the bottom of the container.
The cross-sectional area of the bottom of the container is 0.009 m^2.

Calculate the pressure exerted by the water on the bottom of the container.

Use the equation:

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Choose the unit.

[3 marks]

kg/m^3	**N/m**	**Pa**

Pressure = _____ Unit _____

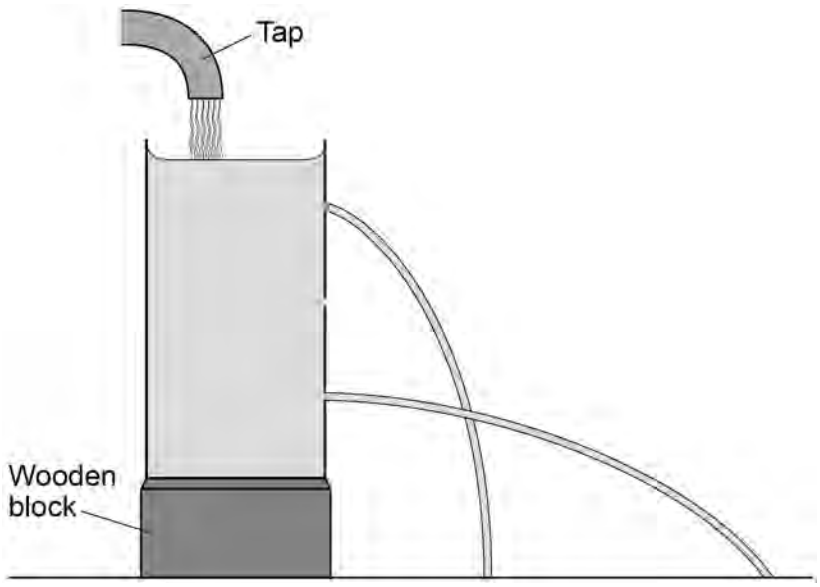
4.5.5.1.1 Pressure in a fluid 1

Question 05 · continued

The container is put under running water from a tap and the three rubber stoppers removed.

Figure 12 shows the path taken by the water escaping from the top and bottom holes.

Figure 12



0 9 . 2 Complete **Figure 12** to show the path taken by the water escaping from the centre hole.

[1 mark]

0 9 . 3 What can be concluded from **Figure 12** about the pressure in a liquid?

[1 mark]

Question 9 continues on the next page

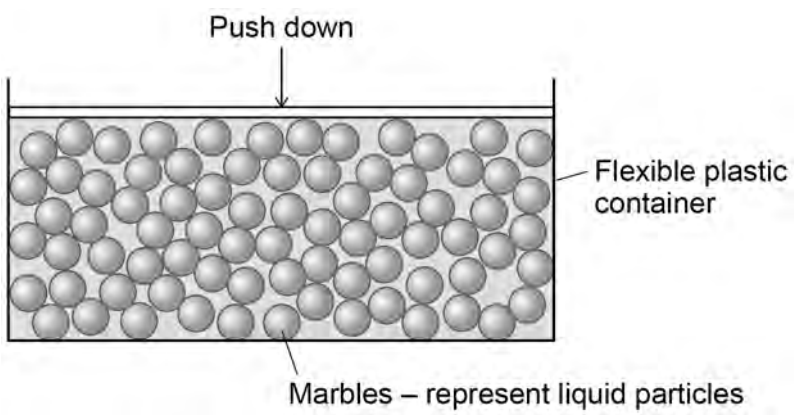
4.5.5.1.1 Pressure in a fluid 1

Question 05 · continued

0 9 . 4 **Figure 13** shows a simple model of a liquid.

When a force pushes down on the marbles, the marbles push the sides and bottom of the container outwards.

Figure 13



What can be concluded from this model about the pressure in a liquid?

[1 mark]

6

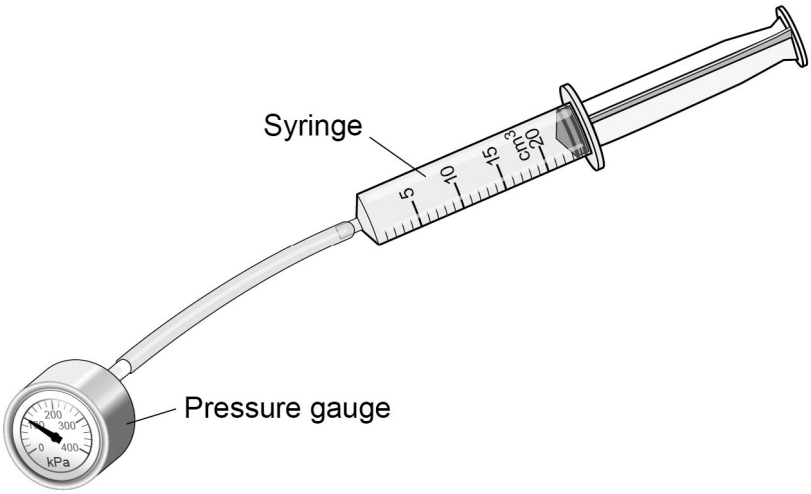
4.5.5.1.1 Pressure in a fluid 1

Question 06

November 2020 | 8463/1F | Original Q6

0 6 A student used the equipment in **Figure 9** to investigate how the pressure of a gas varies with the volume of the gas.

Figure 9



The syringe is filled with air.

Table 2 shows the results.

Table 2

Volume in cm^3	Pressure in kPa
24	100
20	120
12	200
10	240

4.5.5.1.1 Pressure in a fluid 1

Question 06 · continued

0 6 . 1 Describe how the student could use the equipment in **Figure 9** to obtain the data shown in **Table 2**.

[4 marks]

0 6 . 2 Describe what happens to the pressure of the air when the volume of the air is halved.

[2 marks]

Question 6 continues on the next page

4.5.5.1.1 Pressure in a fluid 1

Question 06 · continued

0 6 . 3 The temperature of the air in the syringe remained constant during the student's investigation.

Which **two** properties of the air particles would change if the temperature increased?

[2 marks]

Tick (✓) **two** boxes.

- kinetic energy ☐
- mass ☐
- shape ☐
- speed ☐
- volume ☐

8

4.5.5.1.1 Pressure in a fluid 1

Question 07

November 2021 | 8463/2F | Original Q8

0 8 The thinking distance and braking distance for a car vary with the speed of the car.

0 8 . 1 Explain the effect of **two** other factors on the **braking** distance of a car.

Do **not** refer to speed in your answer.

[4 marks]

Question 8 continues on the next page

4.5.5.1.1 Pressure in a fluid 1

Question 07 · continued

0 8 . 2 Which equation links acceleration (a), mass (m) and resultant force (F).

[1 mark]

Tick (✓) **one** box.

resultant force = mass × acceleration ☐

resultant force = mass × acceleration^2 ☐

resultant force = $\frac{\text{mass}}{\text{acceleration}^2}$ ☐

resultant force = $\frac{\text{mass}}{\text{acceleration}}$ ☐

0 8 . 3 The mean braking force on a car is 7200 N.

The car has a mass of 1600 kg.

Calculate the deceleration of the car.

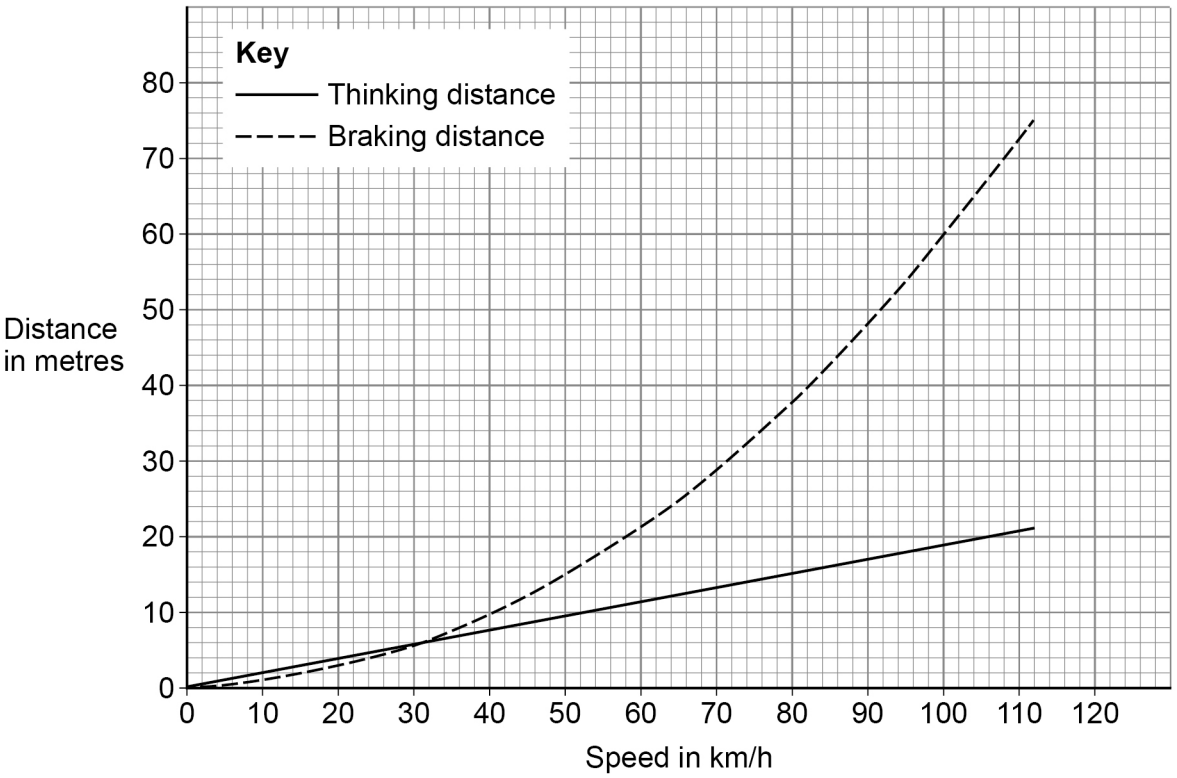
[3 marks]

Deceleration = _____ m/s^2

4.5.5.1.1 Pressure in a fluid 1

0 8 . 4 **Figure 18** shows how the thinking distance and braking distance for a car vary with the speed of the car.

Figure 18



Determine the stopping distance when the car is travelling at 80 km/h.

[2 marks]

Stopping distance = _____ m

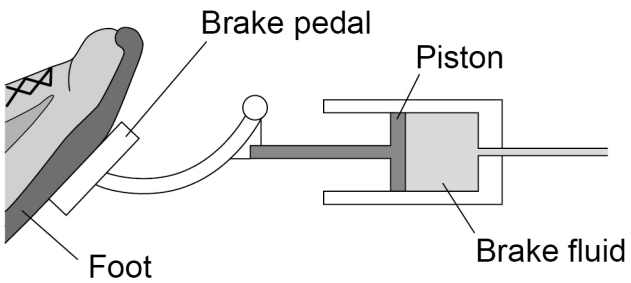
Question 8 continues on the next page

4.5.5.1.1 Pressure in a fluid 1

Question 07 · continued

Figure 19 shows part of the braking system for a car.

Figure 19



0 8 . 5 Which equation links area of a surface (A), the force normal to that surface (F) and pressure (p)?

[1 mark]

Tick (✓) **one** box.

$p = F \times A$ ☐

$p = F \times A^2$ ☐

$p = \frac{F}{A}$ ☐

$p = \frac{A}{F}$ ☐

4.5.5.1.1 Pressure in a fluid 1

Question 07 · continued

0 8 . 6 When the brake pedal is pressed, a force of 60 N is applied to the piston.

The pressure in the brake fluid is 120 000 Pa.

Calculate the surface area of the piston.

Give your answer in standard form.

Give the unit.

[5 marks]

Surface area (in standard form) = _____ Unit _____

16

4.5.5.1.1 Pressure in a fluid 1

Question 08

June 2022 | 8463/2F | Original Q6

0 6 The Earth is surrounded by an atmosphere.

0 6 . 1 The radius of the Earth is 6400 km.

Which of the following could be an approximate depth of the Earth's atmosphere?

[1 mark]

Tick (✓) **one** box.

100 km ☐

6400 km ☐

100 000 km ☐

640 000 km ☐

0 6 . 2 What state of matter is most of the Earth's atmosphere?

[1 mark]

Tick (✓) **one** box.

Gas ☐

Liquid ☐

Solid ☐

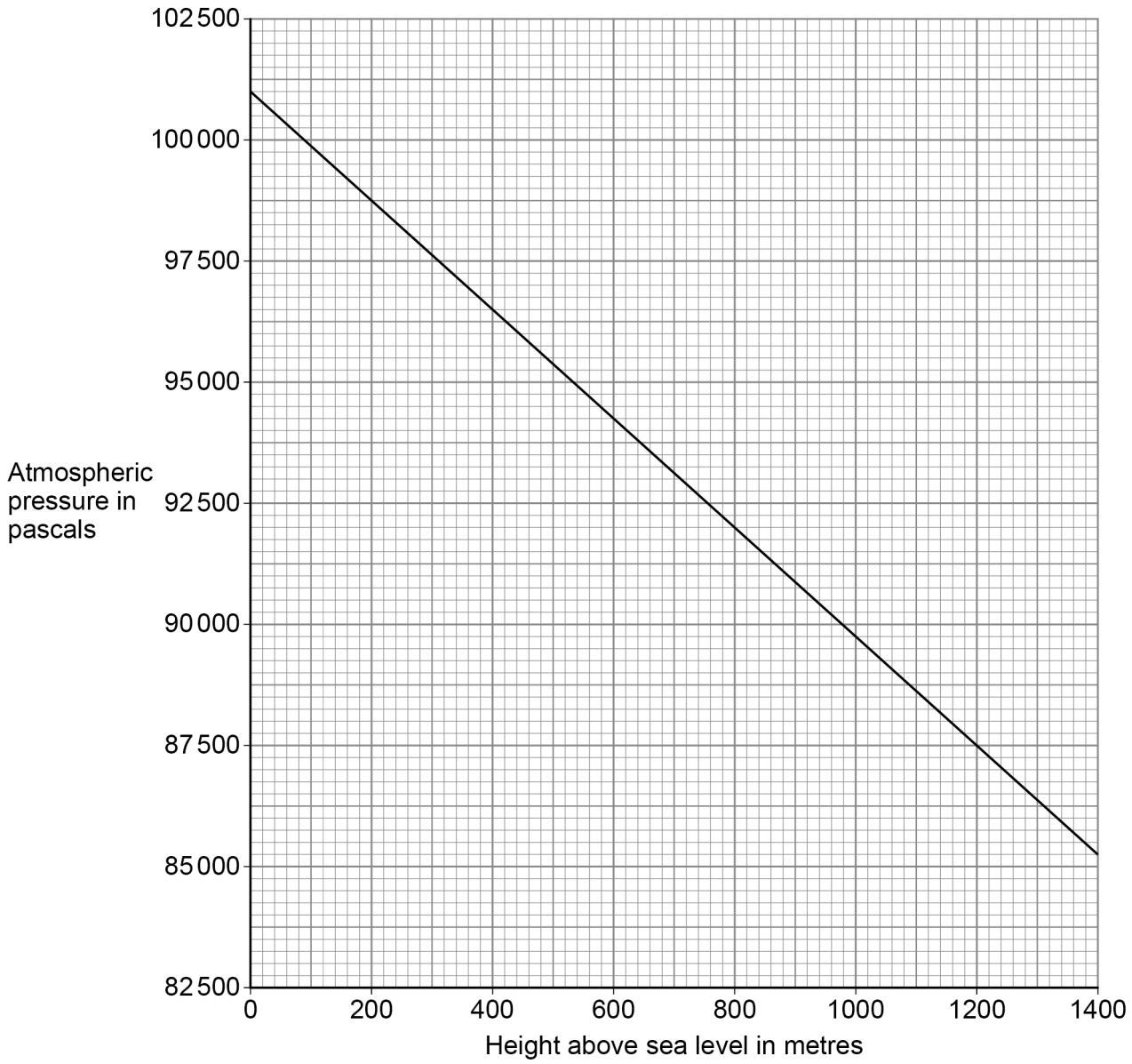
Question 6 continues on the next page

4.5.5.1.1 Pressure in a fluid 1

Question 08 · continued

Figure 12 shows how atmospheric pressure varies with height above sea level.

Figure 12



4.5.5.1.1 Pressure in a fluid 1

Question 08 · continued

0 6 . 3 The highest point above sea level in England is the top of a mountain called Scafell Pike.

The height above sea level of Scafell Pike is 978 m.

Determine the atmospheric pressure at the top of Scafell Pike.

Use **Figure 12**.

[1 mark]

Atmospheric pressure = _____ Pa

0 6 . 4 Determine the difference between the atmospheric pressure at sea level and at the top of Scafell Pike.

Use **Figure 12** and your answer from Question **06.3**

[1 mark]

Difference in atmospheric pressure = _____ Pa

0 6 . 5 A student climbs Scafell Pike.

Why does the atmospheric pressure decrease as the student climbs higher?

[2 marks]

Tick (✓) **two** boxes.

- The air exerts a greater force on the student. ☐
- The density of the air decreases. ☐
- The mass of air above the student decreases. ☐
- The temperature of the air increases. ☐
- The volume of air above the student increases. ☐

Question 6 continues on the next page

4.5.5.1.1 Pressure in a fluid 1

Question 08 · continued

0 6 . 6 **Figure 13** shows a mountain lake.

Figure 13



The lake has a surface area of 2000 m^2.

Atmospheric pressure exerts a force of 188 000 000 N on the surface of the lake.

Calculate the atmospheric pressure at the surface of the lake.

Use the equation:

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

[2 marks]

Atmospheric pressure = _____ Pa

8

4.5.5.1.1 Pressure in a fluid 1

Question 09

0 9 Infrared waves are transverse waves.

0 9 . 1 Complete the sentence.

[1 mark]

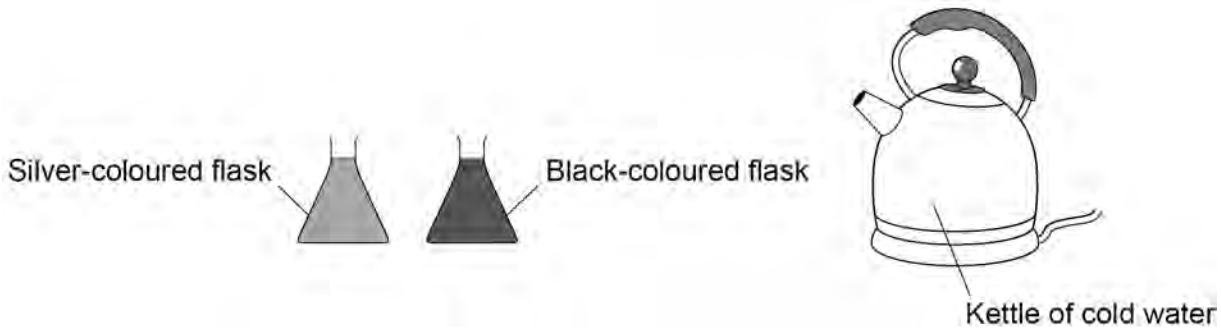
In a transverse wave, the direction of oscillation is _____

to the direction of energy transfer by the wave.

A student investigated how the colour of a surface affects the rate at which the surface emits infrared radiation.

Figure 23 shows some of the equipment used.

Figure 23



4.5.5.1.1 Pressure in a fluid 1

Question 09 · continued

0 9 . 2 The student wrote the following hypothesis:

‘The black-coloured flask will emit more infrared radiation than the silver-coloured flask during 10 minutes of cooling.’

Describe a method to test this hypothesis.

[6 marks]

Question 9 continues on the next page

4.5.5.1.1 Pressure in a fluid 1

Question 09 · continued

0 9 . 3 When will the flasks emit infrared radiation at the greatest rate?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

During the 1st minute ☐

During the 5th minute ☐

During the 9th minute ☐

Reason _____

_____

4.5.5.1.1 Pressure in a fluid 1

Question 09 · continued

Another student investigated the absorption of infrared radiation by different surface colours.

The student filled four hollow metal cubes with cold water.

Each cube was the same size but had a different surface colour.

The cubes were then placed the same distance from an infrared heater.

After 10 minutes, the student measured the temperature increase of the water inside each cube.

0 9 . 4 What was the dependent variable in this investigation?

[1 mark]

0 9 . 5 **Table 2** shows the results.

Table 2

Surface colour of the cube	Temperature increase after 10 minutes in °C
Matt white	3.0
Shiny white	2.0
Matt black	6.5
Shiny black	4.0

Give **two** conclusions that can be made from the results in **Table 2**.

[2 marks]

1

2

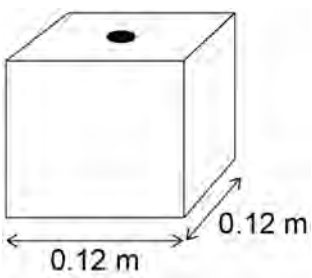
4.5.5.1.1 Pressure in a fluid 1

Question 09 · continued

Figure 24 shows one of the cubes. The cube is filled with water.

The weight of the water exerts a pressure on the bottom of the cube.

Figure 24



Use the Physics Equations Sheet to answer questions **09.6** and **09.7**.

0 9 . 6 Which equation correctly links area, force and pressure?

[1 mark]

Tick (✓) **one** box.

pressure = force × area^2 ☐

pressure = force × area ☐

pressure = $\frac{\text{force}}{\text{area}}$ ☐

pressure = $\frac{\text{area}}{\text{force}}$ ☐

4.5.5.1.1 Pressure in a fluid 1

Question 09 · continued

0 9 . 7 The water pressure at the bottom of the cube is 1500 Pa.

Calculate the force of the water on the bottom of the cube.

[4 marks]

Force = _____ N

17

Turn over for the next question

4.5.5.1.1 Pressure in a fluid 1

Question 10

June 2024 | 8463/2F | Original Q7

0 7 A swimming pool is being filled with water.

0 7 . 1 Calculate the weight of the water in the swimming pool when the mass of the water is 25 000 kg.

gravitational field strength = 9.8 N/kg

Use the equation:

weight = mass × gravitational field strength

[2 marks]

Weight = _____ N

4.5.5.1.1 Pressure in a fluid 1

Question 10 · continued

0 7 . 2 When the swimming pool is full, the weight of the water is 1 960 000 N.

The bottom of the swimming pool has an area of 49 m^2.

Calculate the pressure at the bottom of the swimming pool when it is full.

Use the equation:

$$\text{pressure} = \frac{\text{weight}}{\text{area}}$$

Choose the unit from the box.

[3 marks]

m^2	**m^3**	**N**	**Pa**

Pressure = _____ Unit _____

Question 7 continues on the next page

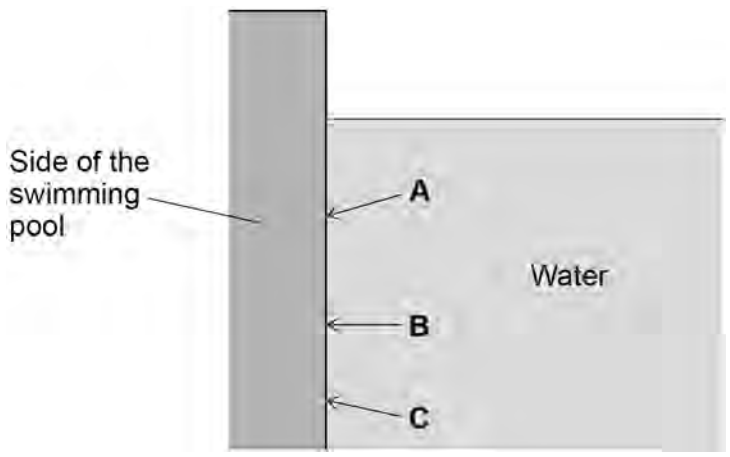
4.5.5.1.1 Pressure in a fluid 1

Question 10 · continued

0 7 . 3 There is a force acting on the side of the swimming pool because of the water pressure.

Figure 11 shows the side of the swimming pool.

Figure 11



Which arrow shows the direction of the force acting on the side of the swimming pool?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

0 7 . 4 A child is swimming in the pool. The velocity of the child is 0.70 m/s.

The child then accelerates for 5.0 s, reaching a final velocity of 1.3 m/s.

Calculate the acceleration of the child.

Use the equation:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

[2 marks]

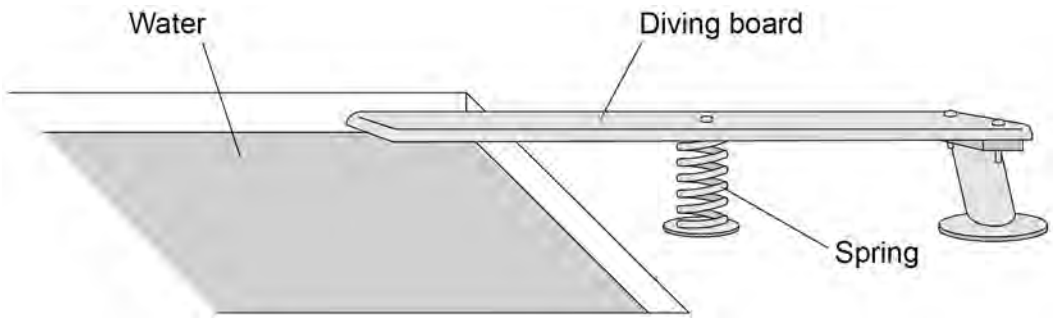
Acceleration = _____ m/s^2

4.5.5.1.1 Pressure in a fluid 1

Question 10 · continued

Figure 12 shows a diving board at the side of the swimming pool.

Figure 12



0 7 . 5 The original length of the spring is 0.84 m.

When the child stands on the diving board, the length of the spring decreases by 0.21 m.

Calculate the percentage change in the length of the spring.

[2 marks]

Percentage change in length = _____ %

Question 7 continues on the next page

4.5.5.1.1 Pressure in a fluid 1

Question 10 · continued

Use the Physics Equations Sheet to answer questions **07.6** and **07.7**.

0 7 . 6 Write down the equation which links extension (*e*), force applied to a spring (*F*) and spring constant (*k*).

[1 mark]

0 7 . 7 The force applied to the spring by the weight of the child is 336 N.

The change in length of the spring is 0.21 m.

Calculate the spring constant of the spring.

[3 marks]

Spring constant = _____ N/m

4.5.5.1.1 Pressure in a fluid 1

Question 10 · continued

0 7 . 8 The child steps off the diving board and falls into the swimming pool.

The initial velocity of the child is 0 m/s.

acceleration due to gravity = 9.8 m/s^2

Calculate the final velocity when the child has fallen a distance of 0.95 m through the air.

Give your answer to 2 significant figures.

Use the Physics Equations Sheet.

[4 marks]

Final velocity of child (2 significant figures) = _____ m/s

18