

GCSE Physics

Worksheet: Atmospheric pressure

TIME 30 min	TOTAL 29 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Atmospheric pressure

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

A window has an area of 1.2 m². Atmospheric pressure is 1.0 × 10⁵ Pa.

0 1 . 1

Calculate the force exerted by the atmosphere on one side of the window.

Use the equation:

pressure = force normal to a surface ÷ area of that surface

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Force = N

[2 marks]

0 1 . 2

Explain why this large force does not break the window.

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[1 mark]

0 2

0 2 . 1

What causes atmospheric pressure?

Tick (✓) **one** box.

Air molecules colliding with surfaces

Clouds pressing down on the ground

The Earth's magnetic field

The Sun heating the air

☐☐☐☐

[1 mark]

0 2 . 2

How does the density of the atmosphere change as altitude (height above sea level) increases?

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[1 mark]

0 2 . 3

Atmospheric pressure at the top of a mountain is lower than at the bottom of the mountain.

Explain why.

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.....

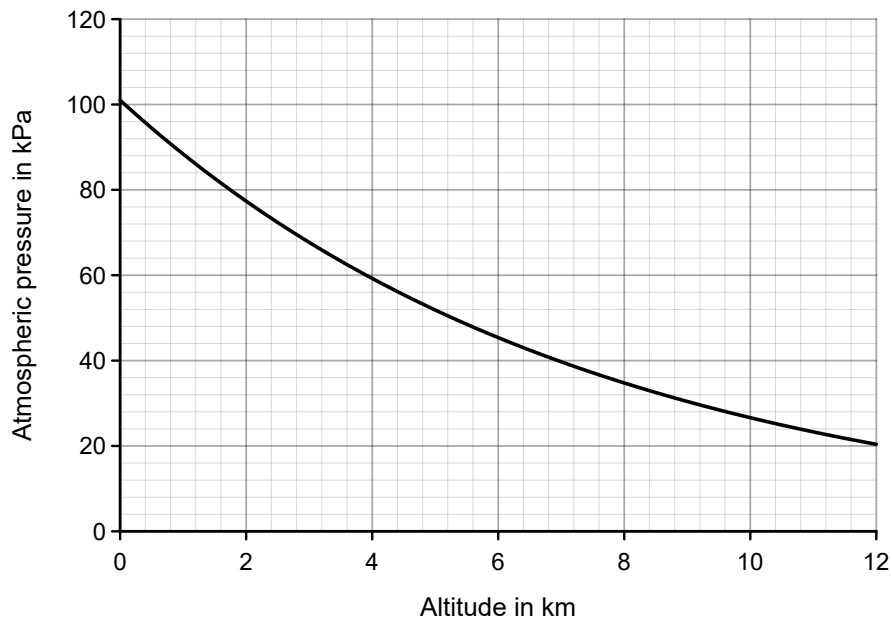
.....

[2 marks]

0 3

Figure 1 shows how atmospheric pressure changes with altitude, according to a simple model.

Figure 1



0 3 . 1

Use Figure 1 to estimate the atmospheric pressure at an altitude of 6 km.

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Pressure = kPa

[1 mark]

0 3 . 2

Describe how the rate at which atmospheric pressure decreases with altitude changes as altitude increases.

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[2 marks]

0 4

The cabin of a passenger aircraft flying at high altitude is pressurised: kept at a much higher pressure than the air outside.

0 4 . 1

Explain why the cabin needs to be pressurised.

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[3 marks]

0 4 . 2

At cruising height, the pressure inside the cabin is 75 000 Pa and the pressure outside is 25 000 Pa. A cabin window has an area of 0.080 m^2 . Calculate the resultant force on the window, and give its direction.

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[3 marks]

0 4 . 3

Suggest what a passenger might notice if the cabin pressure changed suddenly.

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[1 mark]

0 5

Table 1 shows how atmospheric pressure changes with altitude.

Table 1

Altitude in km	Atmospheric pressure in kPa
0	101
2	79
4	62
6	47
8	36
10	26

0 5 . 1

Describe how atmospheric pressure changes with altitude.

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[2 marks]

0 5 . 2

Explain why atmospheric pressure decreases as altitude increases.

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[2 marks]

0 5 . 3

An aircraft flies at an altitude of 10 km. The air pressure inside the cabin is kept at 75 kPa. A cabin window has an area of 0.080 m^2 . Calculate the resultant force on the window caused by the difference in pressure.

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Resultant force = N

[3 marks]

0 5 . 4

In which direction does this resultant force act on the window?

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[1 mark]

0 6

A person can drink through a straw by sucking air out of the straw.

0 6 . 1

Explain, in terms of pressure, why a person can drink through a straw.

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[3 marks]

0 6 . 2

Explain why a straw would not work in this way on the surface of the Moon, which has no atmosphere.

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Atmospheric pressure · 29 marks

Question 1 (3 marks)

01.1 [2 marks]

Answer: $1.2 \times 10^5 \text{ N}$

- $F = 1.0 \times 10^5 \times 1.2$ (1)
 - $1.2 \times 10^5 \text{ (N)}$ (1)
-

01.2 [1 mark]

Answer: Equal pressure pushes on the window from both sides, so the resultant force is almost zero.

- (approximately) equal atmospheric pressure acts on the window from both the outside and the inside, so the resultant force on the window is (close to) zero (1)
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Question 2 (4 marks)

02.1 [1 mark]

Correct: Air molecules colliding with surfaces

02.2 [1 mark]

Answer: It decreases.

- it decreases (1)
-

02.3 [2 marks]

Answer: There is less air (a smaller weight of air) above the summit, and the thinner air gives fewer collisions per second with a surface.

- there is less air above the top of the mountain / the weight of air above is smaller (1)
 - (the air is less dense so) fewer air molecules collide with a surface each second (1)
-

Question 3 (3 marks)

03.1 [1 mark]

Answer: 45 kPa (allow 43–47 kPa)

- 45 (kPa) (allow 43–47) (1)

03.2 [2 marks]

Answer: Pressure falls most rapidly at low altitude, and progressively more slowly at greater altitudes.

- the rate of decrease is greatest (the curve is steepest) at low altitudes (1)
- the rate of decrease becomes smaller (the curve becomes less steep) as altitude increases (1)

Question 4 (7 marks)

04.1 [3 marks]

Answer: Outside pressure (and oxygen per breath) is far too low at altitude; pressurising the cabin keeps conditions similar to a much lower, breathable altitude.

- at high altitude the atmospheric pressure outside is very low because the air is much less dense (1)
- so without pressurisation, each breath would contain far fewer oxygen molecules than passengers need (1)
- pressurising the cabin keeps the air inside at a pressure (and density) similar to that at a much lower altitude, so passengers can breathe normally (1)

04.2 [3 marks]

Answer: 4000 N, outwards.

- pressure difference = $75\,000 - 25\,000 = 50\,000$ (Pa) (1)
- $F = 50\,000 \times 0.080 = 4000$ (N) (1)
- outwards (from the cabin towards the outside) (1)

04.3 [1 mark]

Answer: Discomfort or pain in the ears ('popping') until the pressure equalises.

- a pressure difference across the eardrum, causing discomfort or pain ('ears popping') until it equalises (1)
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Question 5 (8 marks)

05.1 [2 marks]

Answer: Pressure decreases with altitude, but by smaller amounts for each 2 km step (not linear).

- pressure decreases as altitude increases (1)
- the decrease is not linear / the pressure falls by a smaller amount for each 2 km increase in altitude (1)

05.2 [2 marks]

Answer: There is a smaller weight of air above, and the air is less dense so there are fewer molecular collisions per second.

- there is less air / a smaller weight of air above a surface at a greater altitude (1)
- the air is less dense, so fewer air molecules collide with a surface per second (1)

05.3 [3 marks]

Answer: 3920 N

- pressure difference = $75 - 26 = 49 \text{ kPa} = 49\,000 \text{ Pa}$ (1)
- $F = 49\,000 \times 0.080$ (1)
- 3920 (N) (1)

05.4 [1 mark]

Answer: Outwards.

- outwards (from inside the cabin) (1)

Question 6 (4 marks)

06.1 [3 marks]

Answer: Sucking lowers the pressure inside the straw; atmospheric pressure on the drink's surface is then greater, and pushes the drink up the straw.

- sucking removes air from the straw (and mouth), reducing the pressure inside the straw below atmospheric pressure (1)
- atmospheric pressure, acting on the surface of the drink, is now greater than the reduced pressure inside the straw (1)
- this pressure difference pushes the drink up the straw and into the mouth (1)

06.2 [1 mark]

Answer: There is no atmospheric pressure on the Moon to push the drink up.

- there is no atmospheric pressure on the Moon to push the drink up the straw (1)