AQA GCSE Physics | 8463

SPECIFICATION POINT 4.5.5.1.2

Pressure in a fluid 2 (HT only)

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**9**
Available paper years	**2009–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 01 · Mark scheme

June 2009 | PHY1AP | Original Q4 | Legacy

Four	**3**	**3**	**1**	**2**

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 02 · Mark scheme

June 2014 | PH3HP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO spec ref
8(a)	(a) hydraulic (system)		1	AO1 3.2.3b
8(b)	15.40×10^2 **or** 1540	allow **1** mark for correct substitution, ie $8.75 \times 10^4 = \frac{F}{1.76 \times 10^{-2}}$ **or** $87\,500 = \frac{F}{0.0176}$ **or** $F = 8.75 \times 10^4 \times 1.76 \times 10^{-2}$ **or** $F = 87\,500 \times 0.0176$	2	AO2 3.2.3
8(c)	any **one** environmental **advantage**: plant oil is renewable using plant oil will conserve (limited) supplies **or** extend lifetime of the usual/crude oil. plant oil releases less carbon dioxide (when it is being produced / processed) plant oil will add less carbon dioxide to the atmosphere (when it is being produced / processed, than the usual oil) plant oil removes carbon dioxide from **or** adds oxygen to the air when it is growing	stating a converse statement is insufficient, or a disadvantage of the usual oil, ie the usual oil is non-renewable stating that plant oil is carbon neutral is insufficient	1	AO2 3.2.3c

Question 8 continues on the next page . . .

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 02 · Mark scheme

June 2014 | PH3HP | Original Q8 | Legacy

Question 8 continued . . .

Question	Answers	Extra information	Mark	AO spec ref
8(d)	(the current flowing through the coil) creates a magnetic field (around the coil)		1	AO2 AO3 3.3.1a, b
	(this magnetic field) interacts with the permanent magnetic field **or** current carrying conductor is in a (permanent) magnetic field	it must be clear which magnetic field is which	1	
	this produces a (resultant) force (and coil / cone moves)		1	
	when the direction of the current changes, the direction of the force changes to the opposite direction		1	
		accept for **2** marks the magnetic field of the coil interacts with the permanent magnetic field		
Total			**8**	

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 03 · Mark scheme June 2015 | PH3HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. ref.
7(a)(i)	the line of action of the weight (of the bus) lies / acts outside of the base (of the bus) there is a resultant <u>moment</u> (acting on the bus)	allow line of action through the centre of mass lies / acts outside the base	1 1	AO1 P3.2.2f
7(a)(ii)	in normal use the centre of mass may be in a different position **or** passengers on the bus may affect the position of the centre of mass for safety, buses should always be tested beyond the normal operating conditions / parameters	 for safety is insufficient accept in case something unexpected happens	1 1	AO3 P3.2.2
7(b)(i)	a liquid is (virtually) incompressible	accept a liquid cannot be squashed a liquid is difficult to compress is insufficient	1	AO1 P3.2.3a

Question 7 continues on the next page . . .

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. ref.
7(b)(ii)	84000	award **2** marks for $\frac{F}{0.28}=\frac{360}{0.0012}$ **or** $\frac{F}{0.28}=300\,000$ **or** award **1** mark for $P=\frac{360}{0.0012}$ **or** 300 000 (Pa) seen anywhere	3	AO2 P3.2.3b, c
Total			8	

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 03 · Mark scheme

June 2015 | PH3HP | Original Q7 | Legacy



4.5.5.1.2 Pressure in a fluid 2 (HT only)

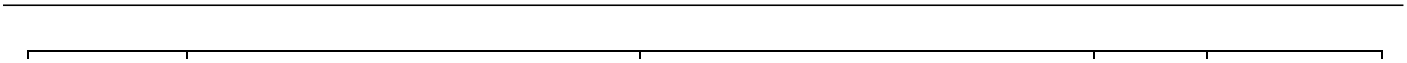
Answer 04 · Mark scheme June 2018 | 8463/2H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	all heights drawn the same as tube 1	judge by eye	1	AO2 4.5.5.1.2
04.2	increasing depth increases the height / mass / volume (of the water column) above the swimmer	allow more water above (the swimmer) more water is insufficient	1	AO1 4.5.5.1.2
	increasing the weight / force (of water) acting on the swimmer		1	
04.3		an answer of 12 112.8 scores **3** marks		
	increase in depth = 1.2 (m)		1	AO2 4.5.5.1.2
	(Δ) p = 1.2 × 1030 × 9.8	allow either 0.50 **or** 1.70 for 1.2	1	AO2 4.5.5.1.2
	(Δ) p = 12112.8	allow a correctly rounded answer allow a correct calculation using either 0.50 **or** 1.70	1	AO2 4.5.5.1.2
	pascals **or** Pa	do **not** accept pa allow N/m^2	1	AO1 4.5.5.1.2
Total			**7**	

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 04 · Mark scheme

June 2018 | 8463/2H | Original Q4



4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 05 · Mark scheme June 2018 | 8463/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	arrow of equal size pointing vertically upwards	judged by eye ignore horizontal arrows if equal and opposite horizontal arrows of unequal length negates this mark	1	AO2 4.5.1.4
	labelled 'upthrust'	ignore buoyancy ignore 25 kN	1	AO1 4.5.5.1.2
06.2		an answer of 2600 scores **4** marks		
	weight = 25 kN	allow 24 to 25 kN inclusive	1	AO3
	25 000 = mass x 9.8 **or** $m = \frac{25\,000}{9.8}$	allow their W correctly converted and substituted	1	AO2
	m = 2551 kg	allow correctly calculated value using their converted W allow a value correctly calculated with W in kN	1	AO2
	m = 2600 kg	allow a calculated answer correctly rounded to 2 significant figures	1	AO2 4.5.1.1 4.5.1.3
06.3	Newton's 3rd law (of motion)		1	AO1 4.5.6.2.3

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 05 · Mark scheme

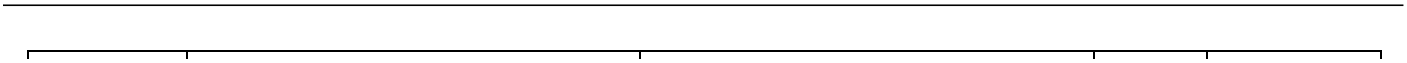
June 2018 | 8463/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	vertical force (50 N) drawn **and** horizontal force (150 N) drawn to the same scale		1	AO2 4.5.1.4
	resultant tension force in the correct direction	shown by an arrowhead	1	
	value of the tension force in the range 156 N–160 N	allow a calculated value of 158	1	
	value of direction in the range 18°–20° (from the horizontal)	allow 70° to 72° (from the vertical) allow a bearing in the range 288 to 290	1	
Total			**11**	

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 05 · Mark scheme

June 2018 | 8463/2H | Original Q6



4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 06 · Mark scheme

June 2022 | 8463/2HR | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	upthrust acts (upwards on the brick)		1	AO1 4.5.1.2 4.5.5.1.2
	normal contact force acts upwards (on the brick)		1	
	weight is equal to upthrust plus normal contact force	allow resultant force is equal to zero only if all three forces are given	1	

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 06 · Mark scheme

June 2022 | 8463/2HR | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	$A = 0.25 \times 0.10 = 0.025$ (m^2)		1	AO2 4.5.5.1.1 4.5.5.1.2
	$P = \frac{637}{0.025}$	allow correct substitution of incorrectly calculated value of A	1	
	$P = 25\,480$ (Pa)	allow correct calculation using an incorrectly calculated value of A to gain further marks, $P = F/A$ or an incorrect rearrangement of $P = F/A$ must have been used with the given data	1	
	$25\,480 = \underline{2.5} \times \rho \times 9.8$	allow correct substitution of incorrectly calculated value of P	1	
	$\rho = \frac{25\,480}{9.8 \times 2.5}$	allow correct rearrangement using an incorrectly calculated value of P allow use of $h = 2.6$ (m)	1	
	$\rho = 1040$ (kg/m^3)	allow correct calculation using an incorrectly calculated value of P allow use of $h = 2.6$ (m)	1	
	Alternative method			
	$A = 0.25 \times 0.10 = 0.025$ (m^2)		1	
	volume of water column (V) $= 0.025 \times 2.5$	allow use of an incorrectly calculated value of A	1	
	$V = 0.0625$ (m^3)	allow use of an incorrectly calculated value of A	1	
	m $(= \frac{637}{9.8})$ $= 65$ (kg)		1	
	$\rho = \frac{65}{0.0625}$	allow use of an incorrectly calculated value of V	1	
	$\rho = 1040$ (kg/m^3)	allow use of an incorrectly calculated value of V	1	

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 06 · Mark scheme

June 2022 | 8463/2HR | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	$F = 618 \times \frac{49.9}{2.5}$	allow calculation of density = 1008.979 (kg/m^3)	1	AO3 4.5.5.1.1 4.5.5.1.2
	F = 12 335.28		1	
	F = 12 300 (N)		1	
		allow correct rounding of an incorrectly calculated value of F allow max of **2** marks if 50 m is used		

Total Question 8		**12**

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 07 · Mark scheme

June 2023 | 8463/2H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	perpendicular		1	AO1 4.6.1.1

Question	Answers	Mark	AO / Spec. Ref.
01.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5-6	AO3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3-4	AO1
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1-2	AO1
	No relevant content	0	
	Indicative content **Method:** • heat the water / kettle • add an equal volume of (hot) water to each flask • insert a thermometer into each flask • record the initial temperature from both flasks OR • place an IR detector near each flask • the distance between the IR detector and the flask should be the same each time • record initial reading from IR detectors • (and) start a stop clock • record the temperatures / readings after 10 minutes from both flasks • calculate the change in temperatures / readings during the 10 minutes • compare the results to test the hypothesis to access level 3 the method must allow the correct consideration of a temperature decrease for both flasks or the correct comparison of IR detected from both flasks		4.6.2.2

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 07 · Mark scheme

June 2023 | 8463/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	during the 1st minute there is the greatest temperature difference (between the hot water and the surroundings)	 allow highest temperature or hottest MP 2 dependent on scoring MP 1	1 1	AO2 AO1 4.6.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	the temperature (increase / change after 10 minutes)	allow the final temperature do not allow temperature decrease	1	AO1 4.6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	black surfaces absorb more (infrared than white surfaces) matt surfaces absorb more (infrared) than shiny surfaces of the same colour	allow black surfaces have a greater temperature increase (than white surfaces) allow matt surfaces have a greater temperature increase than shiny surfaces of the same colour if no other marks scored, allow 1 mark for matt black surface is the best absorber and shiny white surface is the worst absorber if no other marks scored, allow 1 mark for matt black has the greatest temperature increase and shiny white has the smallest temperature increase	1 1	AO3 4.6.2.2 4.6.3.1

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	pressure = $\frac{\text{force}}{\text{area}}$		1	AO1 4.5.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	area of base = 0.0144 (m^2)	do not allow this or subsequent marks unless base area is used	1	AO2 4.5.5.1.1
	$1500 = \frac{F}{0.0144}$	this mark may be awarded if base area is incorrectly calculated	1	
	$F = 1500 \times 0.0144$	this mark may be awarded if base area is incorrectly calculated	1	
	$F = 21.6$ (N)	this mark may be awarded if base area is incorrectly calculated allow 22 (N)	1	

Total Question 1	17

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 08 · Mark scheme

June 2024 | 8463/2H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	the height of the (column of) water above the submarine increases	allow volume / mass for height	1	AO1 4.5.5.1.2
	which increases the force / weight (of the water) acting on the submarine so pressure increases	allow $p = \rho gh$ and ρ and g remain constant so pressure increases	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	p = 110 000 000 Pa		1	AO2 4.5.5.1.2
	110 000 000 = 1026 × 9.8 × Δh	allow a correct substitution of an incorrectly / not converted value for p	1	
	$\Delta h = \frac{110\,000\,000}{1026 \times 9.8}$	allow a correct re-arrangement using an incorrectly / not converted value for p	1	
	Δh = 10 940 (m)	allow a correct calculation from using an incorrectly / not converted value for p allow 11 000 (m) if correct working shown	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	P-waves are longitudinal and S-waves are transverse		1	AO1 4.6.1.5

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 08 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	D only P-waves can travel through liquids	 allow only P-waves can travel through the outer core allow S waves cannot travel through liquids allow S waves cannot travel through the outer core MP2 dependent on MP1	1 1	AO3 4.6.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	$4500 = 3.6 \times \lambda$ $\lambda = \frac{4500}{3.6}$ $\lambda = 1250$ (m)	allow a correct substitution of an incorrectly / not converted value for v allow a correct re-arrangement using an incorrectly / not converted value for v allow 1300 (m) only allow an answer consistent with a correctly converted value for v	1 1 1	AO2 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	the distance is (directly) proportional to the time between the two waves arriving (at the seismometer)	allow they are (directly) proportional allow a greater distance means a greater time for **1** mark allow there is a positive correlation for **1** mark	2	AO3 4.5.6.1.2

Total Question 4	14

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 09 · Mark scheme

June 2025 | 8463/2H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	at right angles (to surfaces) **or** normal (to surfaces)		1	AO1 4.5.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	$774 = \frac{1.50}{A}$		1	AO2 4.5.5.1.1
	$A = \frac{1.50}{774}$		1	
	$A = 0.0019379\ldots$		1	
	0.00194 (m^2)	allow an answer calculated using all the data in the question given to three significant figures	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	pressure increases with depth	allow the vinegar has a greater density than the oil	1	AO3 4.5.5.1.2
	(so) the pressure on the bottom of the garlic (from the vinegar) is greater than the pressure on the top of the garlic (from the oil)		1	
	(therefore) the upwards force on the bottom is greater than the downwards force on the top		1	
	the resultant of these two forces is the upthrust	this mark is dependent on MP2 **or** MP3	1	

Total Question 8	9

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 04 · Examiner comments June 2018 | 8463/2H | Original Q4

Question 4 (Standard and Standard/**high** demand)

04.1 Less than 50% of the students realised that the shape of the container makes no difference to the liquid level and that the level in each tube would be the same.

04.2 Many students were able to give a statement matching the first mark point, but few were then able to relate the increase in pressure to an increase in force to score the second mark.

04.3 This question was well done with nearly 90% of the students calculating a correct numerical answer. However only 50% knew the unit for pressure.

Answer 05 · Examiner comments June 2018 | 8463/2H | Original Q6

Question 6 (Standard/**high** demand)

06.1 Most students knew there should be two arrows in opposite directions and there was evidence of attempts by most to use a ruler and to make the arrows the same length. Most put arrow heads on their lines. A small number of students did not know that the arrows should start from the same point and drew them on a diagram of the boat. Most students added a label but only 50% of the students used 'upthrust'. Incorrect labels included gravity, water resistance, buoyancy, air resistance, drag and upward pressure.

06.2 Many students used the values 24, 24.5 or 25 kN and so knew how to use the scale correctly. A common incorrect value was 5 kN. A wide variety of marks were given for values not in the range but correctly used. In general the conversion to newtons was done correctly, but a significant number of students did not do the conversion. A number of students were unable to re-arrange W = mg correctly.

06.3 Just over 64% of the students identified the correct law.

06.4 9% of the students scored all four marks. Most drew two lines to scale, usually with the 150N horizontal, but sometimes vertical. Many lines did not have arrows to indicate the direction of the forces and it was rare for the resultant force to have an arrow drawn. Values for the tension force were often obtained by calculation rather than scale drawing. Few students measured the direction of the force from the diagram and gave vague compass directions with no numerical angle.

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 07 · Examiner comments June 2023 | 8463/2H | Original Q1

01.1

72% scored a mark on this question. The most frequent incorrect response was ‘parallel’.

01.2

Most responses were levels 1 and 2. Many failed to gain marks because they did not think it was necessary to explain the need for additional equipment. Very few students explained the need to calculate the temperature change or to compare the readings on infrared detectors, which was a requirement to get into level 3. A number of students suggested using cold water, or even described a different practical. Students were not penalised for using tiny volumes of water, but it is clear that students have no concept of how much 50 ml is, for example. There was a lot of confusion relating to use of infra red detectors and what they measured.
Many students stated they would take readings every minute, and lots suggested repeating to get averages, or producing graphs. This was not required by the question.
There were some pleasing summaries referring to the evidence and the hypothesis.

01.3

80 % of students scored the first mark, but only 47% scored both marks. Some students simply reworded the stem. There was a small amount of confusion with radioactivity, because of the use of the word radiation, and a number who seemed to think a chemical reaction was taking place.

01.4

A majority of students gained this mark, but there seemed to be some confusion as to what is meant by the dependent variable.

01.5

The most common response related to the matt black surface and the shiny white surface. This was awarded 1 mark. Some did mention that black was the best absorber but failed to adequately describe the relative absorbance of matt versus shiny surfaces, as they did not explain this only applied for the same colour surface. In addition, some gave their response in terms of emission or reflection of IR radiation, both of which scored zero. Only 3% of students successfully gave both conclusions.

01.6

99% of students identified the equation for calculating pressure.

Answer 07 · Examiner comments June 2023 | 8463/2H | Original Q1

01.7

78% of students scored all 4 marks for this calculation. Some scored zero, as they calculated the total surface area, the volume or used the length of the cube.

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 08 · Examiner comments June 2024 | 8463/2H | Original Q4

04.1
This question asked students to explain the effect of increasing depth on the pressure on a submarine. A common error was repeating the question stem “as depth increases” rather than referring to increasing height (volume or mass) of water above the submarine.

04.2
Quite a well answered question with over 72% of students gaining all 4 marks for calculating the depth of the Mariana Trench. Another 20% did not convert the pressure, or converted incorrectly.

04.3
75% of students knew what types of waves P and S-waves are.

04.4
68% of students selected the position where only P-waves are detected following an earthquake. However, the reasons often referred to “it was in a straight line” or “it was below the earthquake”. A number of students just referred to the core without specifying the inner or outer core. Others confused which layers are liquid and which are solid, even though this information was given in the diagram.

04.5
95% of students gained at least 2 marks in this calculation of wavelength. Converting was sometimes unclear, often being done at the end rather than the beginning of the working, preventing students gaining all 3 marks. .

04.6
This question was about the relationship between the distance an earthquake is from a seismometer, and the time difference between P and S-waves arriving at it. 15% of students gained both marks and 30% gained 1 mark. Those who didn’t score had misunderstood the question stem. A small number had identified that greater distance meant a greater time difference, but then called this inversely proportional.

Answer 09 · Examiner comments June 2025 | 8463/2H | Original Q8

8.1
Student responses for this question were poor. 'Outwards' was a very common and insufficient response to this question. Some students added arrows to the diagram to support their answer, but this was not seen regularly and was often done without care.

8.2
Overall, this question was well answered by about three quarters of the students. Many gave the correct answer to 3 significant figures. Some students did not write down their working or did not write down the value before they rounded it. Some students counted the zeros as significant figures or truncated their answer.

4.5.5.1.2 Pressure in a fluid 2 (HT only)

Answer 09 · Examiner comments June 2025 | 8463/2H | Original Q8

8.3

This question was aimed at the most able students and was challenging. This was reflected in the responses. Very few of the students scored all the available marks, but approximately 40 % scored at least one mark. Most were able to compare the densities of the two liquids. The biggest issue was that students tried to explain why the garlic was floating in terms of balanced forces, which didn't answer the question.