Eduqas Physics GCSE Topic 3.2: Pressure and pressure differences in fluids

Mark Schemes for Questions by topic

1.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	air molecules colliding with a surface create pressure		1	AO1/1 4.5.5.2
	at increasing altitude distance between molecules increases **or** at increasing altitude fewer molecules (above a surface)		1	
	so number of collisions with a surface decreases **or** or so always less weight of air than below (the surface)		1	

2.

Question			Marking details
(a)			$\dfrac{725\,000}{250} = 2\,900$ (1) $2\,900$ (**ecf**) $\times 7 = 20\,300$ (1)
(b)			Box 2 - pressure $= \dfrac{\text{force}}{\text{area}} = \dfrac{500}{100} = 5\,\text{N/cm}^2$
(c)			$15 \times 100 = 1\,500\ [\text{cm}^2]$ (1) 5 (**ecf**) $\times 1\,500 = 7\,500\ [\text{N}]$ (1) **or** Force $= 500 \times 15$ (1) $= 7\,500\ [\text{N}]$ (1)
(d)			Gases can be compressed / gas molecules squeezed together when force applied at X (1) The force at Y would be much smaller (1)
			Question 2 total

3.

Question	Answer	Mark
1(a)(i)	(P =) hdg OR 1.5 × 850 × 10 OR mg / area of base OR 850 × 2.4 × 1.5 × 1.5 × 10 / (2.4 × 1.5) 13 000 Pa or N/m²	C1 (C1) A1
(a)(ii)	P = F/A OR (F =) PA OR 12 750 × 1.5 × 2.4 OR 12 750 × 3.6 46 000 N OR (Force =) weight of oil = mg = 2.4 × 1.5 × 1.5 × 850 × 10 46 000 N	C1 A1 (C1) (A1)
(b)	(46000 / 10 =) 4600 kg OR m = Vd = (2.4 × 1.5 × 1.5) × 850 = 4600 kg	 B1
(c)(i)	(density of brass) greater than that of oil / 850 kg/m³ OR brass denser <u>than oil</u>	 B1
(c)(ii)	(It won't sink as average) density of wood + key less than density of oil	B1
		Total: 7

4.

(a $V = W \times L \times D$ in any form words, symbols or numbers   C1
use of $M = \rho V$ in any form OR ρV words, symbols or numbers   C1
$(M = 51 \times 20 \times 11 \times 1030 = 11\,556\,600 =) \, 1.2 \times 10^7$ kg   [3]

(b) $p = \rho g(\Delta)h$ in any form words, symbols or numbers   C1
$(\Delta h = 60\,000 / (1030 \times 10) =) \, 5.8(25)$ m   A   [2]

(c) use of $F = pA$ in any form or pA words, symbols or numbers   C1
$(F = 60\,000 \times 32.8 \times 8.3 = 60\,000 \times 272.2 =) \, 1.6(33) \times 10^7$ N   A   [2]
e.c.f. from **(b)**

                                                             [Total: 7]

5. D

6. B

7.

Question number	Indicative content	Mark
*9(d)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (3 marks)** • upthrust is the force on the submarine in the water (submerged) in a fluid • upthrust on the submarine and its weight act in opposite directions • upthrust is equal to the weight of water displaced by the submarine • the difference in pressures on the upper and lower surfaces of the submarine causes the upthrust **AO2 (3 marks)** • the volume of the submarine is fixed so the upthrust on the submarine is constant • increasing/decreasing volume of water in tanks increases/ decreases weight of submarine but does not affect upthrust • if weight increases to become greater than upthrust there is a resultant downward force on the submarine so the submarine sinks • if weight decreases to become less than upthrust there is a resultant upward force on the submarine so the submarine rises	(6)

Level	Mark	Descriptor
	0	No awardable content.
Level 1	1–2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of

8.

Question number	Answer	Mark
2(a)(i)	pressure = force ÷ area	(1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	rearrangement (1) $(F =) P \times A$ calculation of area (1) $2.4 \times 1.5 = 3.6$ substitution (1) $(F =) 12\,000 \times 3.6$ answer (1) $43\,200$ (N)	award full marks for correct numerical answer without working maximum 3 marks if kPa not converted to Pa	(4)

Question number	Answer	Mark
2(a)(iii)	B	(1)

Question number	Answer	Additional guidance	Mark
2(b)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (2 marks): • pressure in A is the highest and pressure in C is the lowest (pressure in B is between them) (1) • pressure depends on depth of liquid (so) can compare A and C because same liquid (hence) pressure in A is twice that of C (1) • pressure depends on density of liquid (so) can compare A and B since same depth hence pressure in A greater than pressure in B (1)	allow a mathematical approach, i.e. calculating all three pressures from the relevant data	(3)