Pressure

Mark Scheme 3

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Pressure
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 3

Time Allowed: **80 minutes**

Score: **/67**

Percentage: **/100**

1 **(a) (i)** P × V values are 7500 or about 7500
OR If P / pressure doubles, V / volume halves OR vice versa B1
(so) PV = constant OR P α 1 / V OR either in words B1

(ii) temperature B1

(b) (i) P = hdg OR 5.0 × 10 × 1000 C1
50 000 Pa or 50 kPa A1

(ii) Volume of bubble increases
Mass of gas stays the same B2
Density of gas decreases

[Total: 7]

2 **(a) (i)** ($W = mg$ =1440 × 10 =) 14 400 N B1

(ii) (P =) F / A OR 14 400 / (1.5 × 1.2) C1

8000 Pa OR N / m^2 A1

(b) (i) (P =) $h\rho g$ OR 1.4 × 1000 × 10 C1

14 000 Pa OR N / m^2 A1

(b) (ii) pressure on base of **P** smaller / **Q** greater

(with same volume removed) smaller decrease in depth in Q
OR height in **Q** is greater A1

[Total: 7]

3 **(a) (i)** 180 N B1

(ii) (P =) $F \div A$ **OR** $180 \div (0.30 \times 0.04)$ C1
15 000 Pa A1

(b) (i) arrow (labelled W) from / to correct centre of mass B1

(ii) **1.** force × (perpendicular) distance **OR** 40×0.60 **OR** 180×0.15 in **2.** C1
24 N m A1

2. 27 N m e.c.f. from **(a)(i)** A1

(iii) slab topples / rotates (about point D) **OR** corner C lifts from ground
OR falls over B1

moment of force at B becomes bigger than moment of weight / W
OR anticlockwise moment becomes bigger than clockwise moment
OR weight/centre of mass outside base B1

[Total: 9]

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
($M = 51 \times 20 \times 11 \times 1030 = 11\,556\,600$ =) 1.2×10^7 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 **(a** 85 000 N (accept 83 300 N)

(b) **(** $(P =)F/A$ OR 85 000/3.4 OR 85 000/3.4 × 2 OR 85 000/6.8 (e.c.f. from **(a)(i)**) C1
1.2/1.25/1.3 × 10^4 Pa (e.c.f. from **(a)(i)**) A

(ii) larger area M1
smaller pressure A1

(c) **(i)** (measure of) turning effect OR $F \times x$ B1

(ii) no resultant/net force B1
no resultant/net turning effect/moment B1 [8]

6 **(a)** No resultant/net force OR no resultant force in any direction
OR no resultant force in any two perpendicular directions B1

No resultant/net moment/turning effect/couple/torque
OR (total) clockwise moment = (total) anticlockwise moment B1

Either order

(b) **(i)** F × 120 / F × 0.12 C1
= 20 × 500 OR 20 × 0.5 C1
F = 83.3 N at least 2 significant figures. Allow $83^1/_3$ *Unit penalty applies A1

(ii) F/A or in words OR 83.3/0.0036 ecf from **(b)(i)** C1
= 23100 Pa / N/m^2 OR 2.31 N/cm^2 OR 23.1 kPa *Unit penalty applies A1 [7]

*Apply unit penalty once only

7 **(a** racing car + 1 correct reason M1
2nd correct reason A1
correct reasons:
- wider (car)
- lower (centre of mass/gravity) NOT wider tyre/surfaces o.w.t.t.e.

(b) larger/wider tyres/area (of contact) ignore base area B1

(c) *F*/*A* OR 9600/0.012 OR 9600/0.048 OR 9600/(4 × 0.012)
OR 800,000 C1
2 x 10^5 Pa OR 200 000 Pa (accept N/m^2) c.a.o. A1

[Total: 5]

8 **(a** moment of W down/anticlockwise, moment of steam opposite C1

when moment of steam > moment of W, steam escapes
OR when clockwise moment > anticlockwise moment, steam escapes A1 [2]

(b) (i) 12 = 0.2 F C1

F = 60 N c.a.o. allow 60–61 for ans if working for 60 N shown A1 [2]

(ii) (P =) F/A or 60/0.0003 e.c.f. C1

2 × 10^5 Pa or 200 000 Pa e.c.f. (accept N/m^2) OR 20 N/cm^2 A1 [2]

[Total: 6]

9	**(a)**	in a straight line or (vector) has direction	B1	**1**
	(b)	f = ma or f = 3.0 x 2.0 = 6(.0) N	C1 A1	**2**
	(c)	P = F/a or P = 120/0.05 = 2400 N/m^2 (or Pa)	C1 A1	**2** **[5]**

10 **(a)** pressure = hdg or 20 x 1000 x 10 **1**
= 2 x 10^5 Pa **1** **2**

(b) force = pressure x area or 2 x 10^5 x 0.5 e.c.f. **1**
= 1 x 10^5 N **1** **2**

(c) potential energy (at water surface) **1**
changed to kinetic energy (at pipe exit) **1** **2**
(6)