

# Density and Pressure

## Mark Scheme 2

<b>Level</b>	IGCSE(9-1)
<b>Subject</b>	Physics
<b>Exam Board</b>	Edexcel IGCSE
<b>Module</b>	Double Award (Paper 1P)
<b>Topic</b>	Solids, Liquids and Gases
<b>Sub-Topic</b>	Density and Pressure
<b>Booklet</b>	Mark Scheme 2

**Time Allowed:** 50 minutes

**Score:** /41

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	77.5%	70%	60%	55%	50%	<50%

Question number	Answer	Notes	Marks	
1	a i	newtons / N;	Reject n, Ns Allow Newtons	1
	ii	any one of scales weighing scale electronic/electric balance newtonmeter;	newtonmetre	1
	b	MP1. Record outline of foot;  MP2. Attempt at evaluation of area;  MP3. Detail of method of measurement;  e.g. Draw round foot / feet Count / estimate the squares On squared / graph paper	Allow suitable alternatives  dip foot into paint/ink and make footprint  find area of rectangle around foot  area of rectangle minus area of spaces around the foot use of ruler is insufficient for MP3	3
	c i	Pressure = force / area;		1
	ii	Substitution into correct equation; Evaluation; e.g. Pressure = $\frac{650}{270}$  2.4	ACCEPT • rearranged equation • equation in recognised symbols Ignore triangle or units equation  allow 2.41 or 2.4074 etc	1 1

(Total for Question 1 = 8 marks)

Question number	Answer	Notes	Marks										
2 (a) (i)	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 50%;">surface colour</td> <td style="text-align: center; width: 50%;">sensor reading</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">shiny black</td> <td style="border: 1px solid black; padding: 2px;">87</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">dull black</td> <td style="border: 1px solid black; padding: 2px;">61</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">dull silver</td> <td style="border: 1px solid black; padding: 2px;">70</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">shiny silver</td> <td style="border: 1px solid black; padding: 2px;">47</td> </tr> </table> <p>any one correct; all 3 correct;;</p>	surface colour	sensor reading	shiny black	87	dull black	61	dull silver	70	shiny silver	47		2
surface colour	sensor reading												
shiny black	87												
dull black	61												
dull silver	70												
shiny silver	47												
	(ii) (different surfaces) emit heat at different rates/eq;	allow emit different amounts of heat / radiation	1										

Question number	Answer	Notes	Marks
2 (b) (i)	$P = \rho \times g \times h$ ;	do not accept: <ul style="list-style-type: none"> <li>• gravity for g</li> <li>• 10 for g</li> <li>• d for density</li> </ul> accept: <ul style="list-style-type: none"> <li>• word equations and rearrangements</li> <li>• for h allow height depth height difference</li> </ul>	1
(ii)	sub into eqn for P;  evaluation; unit; e.g. (P=) 1260x10x0.25 3150 Pa	no POT error as 'g' used allow 9.8(1) for g  1260x9.8x0.25 3090 allow <ul style="list-style-type: none"> <li>• N/m<sup>2</sup></li> <li>• matching unit e.g. 3.15 kPa</li> </ul>	3

<p>(iii)</p>	<p>any THREE from: MP1. black absorbs IR/heat; MP2. black heats up more than shiny; MP3. gas particles on black side move faster/get hotter/have more KE/move apart; MP4. pressure on left/black side increases;</p>	<p>Allow RA where appropriate</p> <p>allow gas expands</p> <p>allow force(/area) for pressure</p> <p>ignore: ideas of collisions</p>	<p>3</p>
<p>(iv)</p>	<p>difference in liquid height is less; more difficult/harder to move ;</p>	<p>height goes down less /decrease in h is less allow: argument in terms force /pressure</p>	<p>2</p>

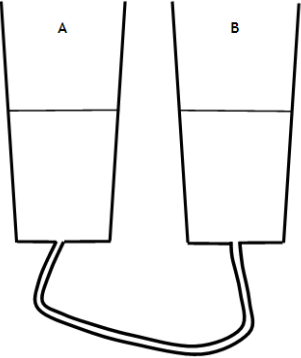
(v)	<p>MP1 it will give a bigger temperature (range)/eq;                  AND                  DOP a suitable comment                  e.g.                  MP2 a larger difference in water level;                    MP3 a larger difference in air volume;                    MP4 a larger difference in (kinetic) energy of                  air/gas molecules/particles;                    MP5 idea of upper limit to range;</p>	<p>Allow                  the girl is right                    amount of water for                  water level                  amount of air for air                  volume                  speed of molecules                  /particles                    water would reach the                  bulb                    if the second statement                  is chosen, no marks</p>	2
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(Total for Question 2 = 14 marks)

Question number	Answer	Notes	Marks
3 (a)	Student is right / wrong = no mark Any <b>two</b> of  1. Balance might not be levelled; 2. zero error; 3. mass could be worn; 4. mass could be mislabelled; 5. value could be within acceptable accuracy of the mass (e.g. $\pm 2\text{g}$ ); 6. battery of scales is running down/eq;	Ignore idea of anomaly accept  tare, reset error rusty inaccurate marking it rounds to 500 g	2
(b)	Any <b>two</b> of  MP1 - Measure/find volume; MP2 - Using a displacement method; MP3 - A sensible experimental <b>precaution</b> e.g. tied to thread OR awareness of meniscus OR repeat readings OR average;  <i>PLUS</i>  Any <b>one</b> of MP4 - Formula to use (density = mass $\div$ volume); MP5 - A correct density unit mentioned (e.g. $\text{kg/m}^3$ );	For MP2 Ignore calculation of volume geometry	3
		<b>Total</b>	5

Question number	Answer	Notes	Marks
4 (a) (i)	pressure difference = height x density x g	Accept $P = h\rho g$ $P = h\rho g$	1
(ii)	Substitution into correct equation; Calculation;  $0.91 \times 1000 \times 10$ 9100 Pa	correct answer with no working scores 2 marks  Accept: <ul style="list-style-type: none"> <li>• 9.1 kPa</li> <li>• 8918 Pa (from <math>g = 9.8 \text{ m/s}^2</math>)</li> <li>• 8927 Pa (from <math>g = 9.81 \text{ m/s}^2</math>)</li> <li>• h in cm / 910 000 Pa for a max of 1</li> </ul>	2



Question number	Answer	Notes	Marks
4 (b) (i)	 <p>the water level is the same on both sides</p>	<p>allow some wobbles on the B side area shaded</p>	1
(ii)	<p>Any <b>three</b> of the following ideas</p> <ol style="list-style-type: none"> <li>1. pressure difference (relating to flow);</li> <li>2. pressure equality (relating to flow ending);</li> <li>3. reference to relevant pressure equation ; e.g. pressure causes force on water, pressure = force / area pressure = <math>h\rho g</math>;</li> <li>4. (more) gravitational potential energy (in A) /ORA; (fluid) <u>pressure</u> acts in all directions;</li> </ol>	<p>Allow force or weight instead of pressure for either MP1 OR MP2 but not both</p> <p>MP3 allow 'pressure pushes water' 'height difference pushes water'</p>	3
		<b>Total</b>	<b>7</b>

Question number		Answer	Notes	Marks
5 (a) (i)		any three of  Idea of collisions / impact (with walls);  Continuous bombardment;  force produced;  Pressure = force ÷ area;	Ignore collisions between particles    Allow idea of momentum changing	3
(b)		(Average speed) increases;		1

(ii)

Idea that the student is right OR the pressure decreases;

AND any two of

The number(or mass) of molecules stays the same;

The gas volume increases;

Pressure is inversely proportional to volume;

Particles collide with the wall less frequently;

Both marks depend on previous correct response (e.g. pressure decreases)

Allow idea that area of can in contact with gas increases OR gas particles have more space

Allow mention of  $p_1V_1 = p_2V_2$  in this context

Allow "longer time between collisions"