

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%;"> <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"> • gravity for g • 10 for g • d for density accept: <ul style="list-style-type: none"> • word equations and rearrangements • for h allow height depth height difference 	1
(ii)	sub into eqn for P; evaluation; unit; e.g. (P=) $1260 \times 10 \times 0.25$ 3150 Pa	no POT error as 'g' used allow 9.8(1) for g $1260 \times 9.8 \times 0.25$ 3090 allow <ul style="list-style-type: none"> • N/m^2 • matching unit e.g. 3.15 kPa 	3

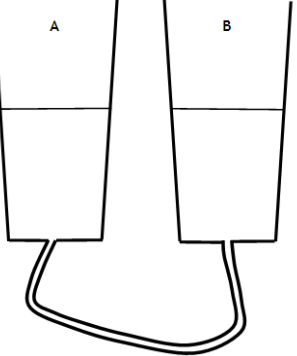
(iii)	<p>any THREE from: MP1. black absorbs IR/heat; MP2. black heats up more than shiny; MP3. gas particles on black side move faster/get hotter/have more KE/move apart; MP4. pressure on left/black side increases;</p>	<p>Allow RA where appropriate</p> <p>allow gas expands</p> <p>allow force(/area) for pressure</p> <p>ignore: ideas of collisions</p>	3
(iv)	<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>	2

(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</p> <p>amount of water for water level amount of air for air volume speed of molecules /particles</p> <p>water would reach the bulb</p> <p>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 two 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 two of MP1 - Measure/find volume; MP2 - Using a displacement method; MP3 - A sensible experimental precaution e.g. tied to thread OR awareness of meniscus OR repeat readings OR average; <i>PLUS</i> Any one of MP4 - Formula to use (density = mass \div volume); MP5 - A correct density unit mentioned (e.g. kg/m^3);	For MP2 Ignore calculation of volume geometry	3
		Total	5

Question number	Answer	Notes	Marks
4 (a) (i)	pressure difference = height x density x g	Accept $P = h\rho g$ $P = hdg$	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"> • 9.1 kPa • 8918 Pa (from $g = 9.8 \text{ m/s}^2$) • 8927 Pa (from $g = 9.81 \text{ m/s}^2$) • h in cm / 910 000 Pa for a max of 1 	2

Question number	Answer	Notes	Marks
4 (b) (i)	 <p data-bbox="451 509 1060 540">the water level is the same on both sides</p>	<p data-bbox="1386 148 1795 243">allow some wobbles on the B side area shaded</p>	1
	<p data-bbox="378 650 945 682">(ii) Any three of the following ideas</p> <ol data-bbox="451 721 1239 1113" style="list-style-type: none"> 1. pressure difference (relating to flow); 2. pressure equality (relating to flow ending); 3. reference to relevant pressure equation ; e.g. pressure causes force on water, pressure = force / area pressure = $h\rho g$; 4. (more) gravitational potential energy (in A) /ORA; (fluid) <u>pressure</u> acts in all directions; 	<p data-bbox="1386 650 1785 776">Allow force or weight instead of pressure for either MP1 OR MP2 but not both</p> <p data-bbox="1386 901 1753 1027">MP3 allow 'pressure pushes water' 'height difference pushes water'</p>	3
Total			7

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
	(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"	3
(b)		(Average speed) increases;		1