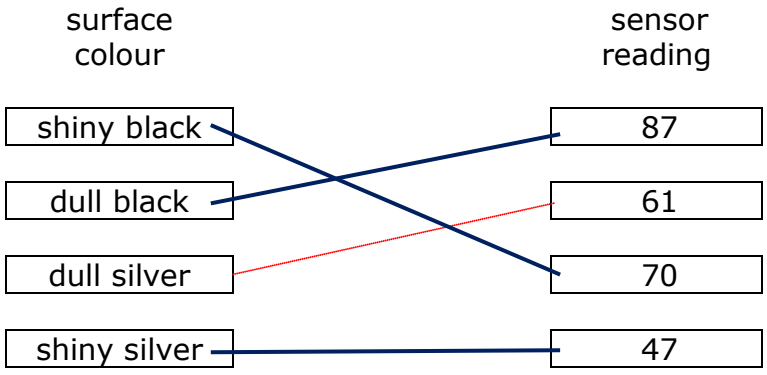
Question number	Answer	Notes	Marks
1 a i	newtons / N;	Reject n, Ns Allow Newtons	1
ii	any one of scales weighing scale electronic/electric balance newtonmeter;	newtonmetre	1
b	MP1. Record outline of foot; MP2. Attempt at evaluation of area; MP3. Detail of method of measurement; e.g. Draw round foot / 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)	 any one correct; all 3 correct;;		2
(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 = ρ x g x h ;	do not accept: • gravity for g • 10 for g • d for density accept: • word equations and rearrangements • for h allow height depth height difference	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 • N/m^2 • matching unit e.g. 3.15 kPa	3

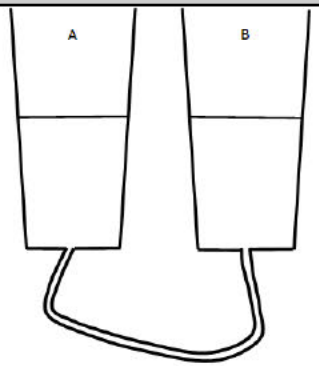
(iii)	any THREE from: MP1. black absorbs IR/heat; MP2. black heats up more than shiny; MP3. gas particles on black side move faster/get hotter/have more KE/move apart; MP4. pressure on left/black side increases;	Allow RA where appropriate allow gas expands allow force(/area) for pressure ignore: ideas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

(v)	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;	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	2

(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. ± 2g); 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; *PLUS* Any **one** of MP4 - Formula to use (density = mass ÷ 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 = hρg P= hdg	1
(ii)	Substitution into correct equation; Calculation; 0.91 x 1000 x 10 9100 Pa	correct answer with no working scores 2 marks Accept: • 9.1 kPa • 8918 Pa (from g = 9.8 m/s^2) • 8927 Pa (from g = 9.81 m/s^2) • h in cm / 910 000 Pa for a max of 1	2

Question number	Answer	Notes	Marks
4 (b) (i)	 the water level is the same on both sides	allow some wobbles on the B side area shaded	1
(ii)	Any **three** of the following ideas 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;	Allow force or weight instead of pressure for either MP1 OR MP2 but not both MP3 allow 'pressure pushes water' 'height difference pushes water'	3
		Total	**7**

Question number		Answer	Notes	Marks
5 (a) (i)		any three of		3
		Idea of collisions / impact (with walls);	Ignore collisions between particles	
		Continuous bombardment;		
		force produced;	Allow idea of momentum changing	
		Pressure = force ÷ area;		
(ii)		Idea that the student is right OR the pressure decreases;		3
		AND any two of	Both marks depend on previous correct response (e.g. pressure decreases)	
		The number(or mass) of molecules stays the same;		
		The gas volume increases;	Allow idea that area of can in contact with gas increases OR gas particles have more space	
		Pressure is inversely proportional to volume;	Allow mention of $p_1V_1 = p_2V_2$ in this context	
		Particles collide with the wall less frequently;	Allow "longer time between collisions"	
(b)		(Average speed) increases;		1