| Question number | | Answer | Notes | Marks |
|---|---|---|---|---|
| 1 (a) (i) | | pressure difference = height (or depth) x density x *g* ; | Allow h × ρ × *g* (and rearrangements)<br>Reject "gravity" for *g* in 7(a)(i) | 1 |
| (ii) | | substitution into correct equation;<br>evaluation;<br>e.g. 1028 X 10 X 700<br>7 196 000 (Pa) | Allow standard form<br><br><br>Allow use of g = 9.8(1) → 7 059 276 or 7 052 080 | 2 |
| (iii) | | (total pressure =) 72 x$10^5$ + 1 x $10^5$ (Pa); | Allow 7 296 000 (Pa) OR answer to 7(a)(ii) + 100 000 | 1 |
| (b) (i) | | pressure = force/area | Allow *p* = F/A | 1 |
| (ii) | | Substitution into correct equation;<br>Transformation;<br>Evaluation;<br>e.g. 41 × $10^5$ = F/3.1<br>F= 41 × $10^5$ x 3.1<br>1.271 x $10^7$ (N) | Substitution and transposition either order<br><br><br><br>12 710 000, 127.1 x $10^5$ , 1.3 x $10^7$ | 3 |
| (c) | | because fresh water has a lower density than sea water OR reverse argument; | | 1 |
| (d) | | any five of<br>MP1 suitable measuring instruments mentioned;<br>e.g. measuring cylinder and (electronic) balance<br>MP2 method of obtaining correct mass;<br>e.g. subtract mass of container, use of tare<br>MP3 detail to ensure accuracy of liquid volume;<br>e.g. burette, pipette, density bottle, account taken of meniscus<br>MP4 equation stated - density = mass ÷ volume;<br>MP5 suitable units used,<br>e.g. g for mass and $cm^3$ for volume<br>MP6 Idea of appropriate repeating or averaging at any stage | <br>Allow scales<br>Ignore newtonmeter, weighing machine<br>Ignore weight<br><br>Allow keep temperature constant<br><br>Allow ρ=m/V<br><br>Allow ml, l<br>Allow "discard anomalous results" | 5 |

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 2 (a) (i) | pressure = force ÷ area; | pressure = force ÷ area<br>area = force ÷ pressure<br>force = pressure x area<br>Accept standard symbols (P, F, A) – upper or lower case acceptable for this item<br>REJECT relationship 'triangle' on its own | 1 |
| (ii) | Substitution into correct equation / 8 times the force;<br>Calculation;<br>e.g. pressure = 8 x 0.036 ÷ 0.0013 =<br><br>220 (Pa) | Correct final value = 2 irrespective of working<br><br>Final value of 27.7 or 28 scores 1 (since it is a correct calculation that has missed the x8 factor)<br><br>ALLOW<br>222 (Pa), 221.5..... (Pa), 220 (Pa)<br>for final value<br>NO significant figure penalty | 2 |
| (b) (i) | (total) force is unchanged / the same;<br>same mass/number/weight (of coins); | ACCEPT<br>'force is the same because the weight is the same'=2<br>'force is the same because the mass is the same'=2 | 2 |
| (ii) | Reduced / less;<br><br>ONE of -<br>(reduced) by a factor of 8;<br>same mass/weight/force spread over a larger area;<br>calculates the new pressure; | <br><br><br><br>NOT ACCEPT 'larger surface area' alone | 1<br><br><br>1 |

**Total 7 Marks**

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 3 (a) | Substitution into correct equation;<br>Calculation;<br>e.g. 10 000 x 10 = $p_2$ x 270<br>$p_2$ = 370 (kPa) | correct answer = 2 marks<br><br>ACCEPT 370.37….. (kPa) | 2 |
| (b) | press decreases;<br><br>Any two from:<br>molecules slow down;<br>less frequent collisions with walls / don't collide as much with walls;<br>less hard /less force (on same area); | <br><br>ACCEPT less kinetic energy / less momentum<br>IGNORE collisions with each other<br><br>ACCEPT smaller momentum change (in collisions) | 3 |
| (c) (i) | Pressure decreases;<br><br>One of<br>Fewer molecules (bombarding container);<br>Less force from the molecules; | | 2 |
| (ii) | Gas leaves (the liquid)/Expands/Foams the cream; | ACCEPT Cools; | 1 |

**Total 8 Marks**

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 4 (a) (i) | Any three of<br><br>MP1. idea of (continuous) random movement;<br>MP2. collisions / impact/eq with (inside) fabric/walls;<br>MP3. idea that force is produced (by bombarding molecules);<br>MP4. idea of pressure as force on an area; | <br><br>ignore moves freely<br><br><br>allow momentum or NIII argument | (3) |
| (ii) | any four from:<br><br>MP1. pressure inside stays constant;<br><br>MP2. pressure difference across the balloon fabric;<br>MP3. (resultant) force acting down on the fabric;<br>MP4. balloon fabric becomes concave / moves downwards;<br>MP5. (free end of) pointer moves up; | allow<br><br>for MP1, pressure increases slightly,<br>for MP2 volume of air in can decreases,<br><br><br><br><br>for MP5 end of pointer on the fabric moves down | (4) |
| (iii) | accept any two sensible suggestions e.g.<br>longer stick/lever;<br>narrower (diameter of) can;<br>more stretchy material;<br>less taut material; | | (2) |
| (b) (i) | either<br>it/the reading would decrease;<br><br>OR<br>(right end of) pointer goes down;<br><br>OR<br>left end of pointer goes up; | | (1) |
| (ii) | more pressure inside the can ;<br><br>plus any one from:<br>particles inside can now move faster / have more KE;<br>(hence) particles hit the balloon fabric more frequently;<br><br>(hence) particles hit the fabric harder; | allow if seen in (i)<br><br><br><br><br>look for idea of time implied<br>more often<br>allow momentum idea | (2) |

**Total for Question 4 = 12 marks**