

Question number	Answer	Notes	Marks
2 (a)	9 (kPa);		1
(b)	(liquid) pressure = depth (of liquid) $\times$ density $\times g$ ;	accept d, h, height for depth rho, $\rho$ for density g.f.s or gravitational field strength for $g$  reject gravity for $g$	1
(c)	substitution; rearrangement; evaluation;  e.g. pressure difference = 9 kPa $9\,000 = d \times 960 \times 10$ $d = 9000 / (9600)$ $d = 0.94 \text{ (m)}$	allow ecf from (a)  allow use of $g = 9.8(1) \text{ m/s}^2$ giving 0.96 m  allow 0.937(5) POT error penalty of 1 mark, except if formula is incorrect i.e. no 'g'	3

Total for Question 2 = 5 marks

Question number	Answer	Notes	Marks
5 (a)	substitution into given equation $v^2 = u^2 + (2 \times a \times s)$ ; evaluation of $v^2$ ; evaluation of $v$ to 3sf or more i.e. 16.1 (m/s);  e.g. $v^2 = u^2 + (2 \times a \times s)$ $v^2 = 0^2 + (2 \times 10 \times 13)$ $v^2 = 260$ $v = \sqrt{260} = 16.1 \text{ (m/s)}$	accept $mgh = 1/2mv^2$  accept use of $g = 9.8(1) \text{ m/s}^2$ giving $v = 16.0, 15.97$ etc.	3
(b)	any FIVE from:  MP1 ball has weight;  MP2 ball accelerates;  MP3 drag increases (while accelerating);  MP4 resultant force decreases;  MP5 (so) acceleration decreases;  MP6 drag = weight / resultant = 0 / forces balanced;  MP7 terminal velocity/constant speed /acceleration=0;	allow 'has gravitational force' REJECT 'has gravity'  REJECT 'balls slows down'  allow 'air resistance' for 'drag'	5

Total for Question 5 = 8 marks

Question number	Answer	Notes	Marks
9 (a) (i)	4; 2;		2
(ii)	removal of electron(s) (from an atom);	allow gaining electron(s)	1
(iii)	alpha particles are <b>absorbed</b> by/cannot <b>penetrate/</b> <b>stopped</b> by a few cm in air;  so alphas do not reach the workers;	allow do not penetrate <b>casing</b> (of deioniser) condone 'do not penetrate skin/clothes'	2
(b) (i)	time taken;  for (radio)activity/mass/number of (remaining) nuclei to half;	accept any synonym e.g. period/amount of time/	2
(ii)	evidence of halving of 70; 420 days means 3 half-lives;  evaluation of 8.75 (kBq);	accept however presented i.e. 70→35→17.5→8.75 allow 9 (kBq)	3

Total for Question 9 = 10 marks

Question number	Answer	Notes	Marks
12 (a)	A - arrangement W;  B cannot be correct as arrangement X would give a downwards force C and D cannot be correct because at the position of the wire, the magnetic field is zero, so there cannot be a magnetic force on the wire		1
(b) (i)	substitution into " $W = mg$ "; evaluation;  e.g. $W = 0.0065 \times 10$  $W = 65 \text{ (mN)}$	ignore POT for this mark  accept use of $g = 9.8(1) \text{ m/s}^2$ giving 63.7 or 63.8 (mN)	2
(ii)	resultant force is difference between weight and magnetic force; resultant force = 31 mN; substitution in " $F=ma$ "; re-arrangement; evaluation;  e.g. resultant force = $65 - 34 = 31 \text{ mN}$ resultant force = $31 \times 10^{-3} = 6.5 \times 10^{-3} \times a$ $a = 31 \times 10^{-3} / 6.5 \times 10^{-3}$ $a = 4.8 \text{ (m/s}^2\text{)}$	allow ecf from (b)(i)  POT error gives 1 mark penalty 5.2(3) scores 3 MAX (no evidence of resultant idea)  allow 4.76(9) (m/s <sup>2</sup> ) use of $g = 9.81 \text{ m/s}^2$ gives 4.57 (m/s <sup>2</sup> )	5
(iii)	EITHER <ul style="list-style-type: none"> <li>increase the current;</li> <li>by increasing the voltage of power supply;</li> </ul> OR <ul style="list-style-type: none"> <li>increase the magnetic field strength;</li> <li>by using stronger magnets/moving the poles closer together;</li> </ul>	ignore unqualified reference to increasing the turns/creating a coil	2
(iv)	use a.c. rather than d.c.; since a.c. current has alternating/changing current direction;		2

Total for Question 12 = 12 marks