Question number	Answer	Notes	Marks
4 (a)	(total) momentum before (a collision) = (total) momentum after (a collision);	ignore unqualified 'momentum is conserved'	1
(b)	correct value of momentum before collision seen anywhere in the calculation; substitution into balanced equation; evaluation of velocity; e.g. (momentum before =) 1.6 (kgm/s) 1.6 = 0.16 x 8 + 0.16 x v (v =) 2 (m/s)	either as 0.16 x 10 or 1.6	3
(c)	calculation of KE before collision; calculation of KE of either ball after collision; evaluation of energy difference; e.g. $0.5 \times 0.16 \times 10^2$ $(0.5 \times 0.16 \times 8^2)$ OR $(0.5 \times 0.16 \times 2^2)$ (8 - (5.12 + 0.32) =) 2.6 (J)	ecf from (b) 8 (J) 5.12 OR 0.32 (J) allow 2.56 (J)	3

Total for question 4 = 7 marks

Question number	Answer	Notes	Marks
5 (a)	any 4 from: MP1. fewer particles outside the balloon; MP2. (hence) fewer impacts (per second) on the outside of the balloon; MP3. (hence) pressure outside balloon is reduced; MP4. pressure inside balloon > pressure outside balloon; MP5. (hence) air inside the balloon expands until the pressures balance;	condone idea that all particles have been removed ignore references to vacuum reject 'air particles expanding'	4
(b) (i)	pressure increases; (because) volume (of trapped air) has decreased / particles collide with liquid surface more (often);	allow walls for liquid surface	2
(ii)	water level increases / rises; greater {force / pressure} acts on the water (so can support greater weight of water above);	allow formula as justification $p = h\rho g$ (because the increased pressure difference supports a greater height of water)	2
(iii)	water level decreases / falls; (because) pressure difference is now less/eq;		2

Total for question 5 = 10 marks

Question number	Answer	Notes	Marks
7 (a) (i)	measuring cylinder;	allow graduated cylinder, burette, pipette, syringe	1
(ii)	0.005 (cm^3)		1
(b) (i)	correctly calculated average; given to 3 significant figures; e.g. (average =) 300.8 (mm) (average to 3 s.f. =) 301 (mm)	 DOP	2
(ii)	 use of radius in calculation; substitution and rearrangement; evaluation; e.g. radius = 150(.4) (mm) (length =) 1.0 / (π x 150.4 x 150.4) (length =) 1.4 x 10^{-5} (mm)	allow ecf from (b)(i) throughout seen anywhere -1 for POT error answer of 3.5 x 10^{-6} (mm) gains 2 marks for using diameter instead of radius allow answers that round to 1.40-1.41	3

Total for question 7 = 7 marks