Question Number	Answer	Mark
19(a)	• Upthrust/U upwards (1) • Tension/T upwards (1) • Weight/W/mg downwards (1) (-1 for each extra force over three, -1 if any arrow does not touch the dot, -1 if any arrow is not close to vertical. Accept a single line up with two labelled arrowheads.)	**(3)**
19(b)(i)	• Water exerts upward force on sphere. (1) **Or** Water exerts an upthrust on the sphere. • Sphere exerts a downwards/opposite force on water by Newton's Third Law. (1) • Extra downward force on water (increases reading on balance). (1)	**(3)**
19(b)(ii)	• Mass of displaced water = 150 g (1) • Use of $V = m/\rho$ for water with ρ = 1 000 kg m^{-3} (150 ml) (1) • Use of $m = \rho V$ for sphere WITH ρ = 2 000 kg m^{-3} (1) • m = 0.30 kg (1) <u>Example of calculation</u> Increase in weight of water = force of ball on water = upthrust on ball Mass of displaced water = 465 g – 315 g = 150 g Volume of sphere = $\frac{0.150 \text{ kg} \times \cancel{g}}{1000 \text{ kg m}^{-3} \times \cancel{g}} = 1.5 \times 10^{-4}$ m^3 Mass of sphere = 2000 kg m$^{-3}\times$ 1.5 × 10^{-4}	**(4)**
19(b)(iii)	• Upthrust less in oil **or** weight of displaced oil less **or** downward force of sphere on oil less (1) • (Therefore increase in) balance reading less (than for water). (1) (MP2 dependent on MP1)	**(2)**
	Total for question 19	**12**