Question Number	Answer	Mark
15(a)	There is an upthrust which is equal to the weight of water displaced **(1)** The upthrust is equal to the weight of the cylinder (when it's partially submerged) **(1)** **OR** The (overall) density (of the cylinder) is less than the density of the water. **(1)** The weight of water displaced is equal to the weight of the cylinder **(1)**	**2**
15(b)(i)	Use of Volume = $\pi r^2 l$ **(1)** Use of 63% with their volume **(1)** Use of $\rho = m / V$ **(1)** $m = 8.8 \times 10^{-3}$ (kg) **(1)** <u>Example of calculation</u> volume of cylinder= $\pi \times (1.05\text{ cm})^2 \times 4\text{ cm} = 1.39 \times 10^{-5}\text{ m}^3$ volume submerged = $0.63 \times$ volume of cylinder $= 0.63 \times 1.39 \times 10^{-5}\text{ m}^3 = 8.76 \times 10^{-6}\text{ m}^3$ mass of cylinder = mass of water displaced $= 1\,000\text{ kg m}^{-3} \times 8.76 \times 10^{-6}\text{ m}^3 = 8.76 \times 10^{-3}\text{ kg}$	**4**
15(b)(ii)	Use of $\rho = m / V$ to calculate the volume of brass **(1)** Use of $\rho = m / V$ to calculate the mass of the same volume of gold (not volume of whole cylinder) **(1)** Use of $\rho = m / V$ to calculate the volume of water needed to float the cylinder **Or** Use of $\rho = m / V$ to calculate the maximum mass/weight of water that could be displaced **(1)** Correct conclusion from comparison of displaced volume of water required to float gold ($1.9 \times 10^{-5}\text{ m}^3$) with volume of cylinder ($1.4 \times 10^{-5}\text{ m}^3$) **Or** Correct conclusion from comparison of weight of gold cylinder (0.19 N) with max weight of water that could be displaced (0.14 N) (ecf from (b)(i)) **Or** Correct conclusion from comparison of mass of gold cylinder (0.019 kg) with max mass/weight of water that could be displaced (0.014 kg) (ecf from (b)(i)) **(1)** <u>Example of calculation</u> volume of gold = volume of brass $= 8.73 \times 10^{-3}\text{ kg} \div 8.7 \times 10^{3}\text{ kg m}^{-3} = 1.00 \times 10^{-6}\text{ m}^3$ mass of gold = $1.00 \times 10^{-6}\text{ m}^3 \times 19.3 \times 10^{3}\text{ kg m}^{-3} = 0.019\,3\text{ kg}$ volume of water required = $0.019\,3\text{ kg} \div (1.00 \times 10^{3}\text{ kg m}^{-3}) = 1.93 \times 10^{-5}\text{ m}^3$ $1.93 \times 10^{-5}\text{ m}^3 > 1.39 \times 10^{-5}\text{ m}^3 \therefore$ sinks	**4**
	Total for question 15	**10**