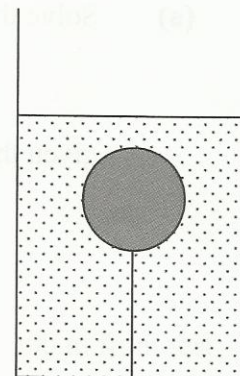2007 9   **(b)**   A uniform solid sphere is held completely immersed in 500 cm^3 of water by means of a string tied to a point on the base of the container.
The tension in the string is 0.0784 N.

When 300 cm^3 of another liquid, of relative density 1.2 is added and thoroughly mixed with the water, the volume of the mixture is 800 cm^3 and the tension in the string is 0.1078 N.

Find
(i)   the relative density of the mixture

(ii)   the mass of the sphere.

(i)   mass of water + mass of liquid = mass of mixture

$$1000 \times 500 \times 10^{-6} + 1200 \times 300 \times 10^{-6} =$$

$$1000 \times s_m \times 800 \times 10^{-6}$$

$$s_m = \frac{43}{40} \quad \text{or} \quad 1.075$$

(ii) $B = T + mg$

water $(1000Vg$ or$)$ $\dfrac{mg(1)}{s} = 0.0784 + mg$

mixture $(1075Vg$ or$)$ $\dfrac{mg\left(\dfrac{43}{40}\right)}{s} = 0.1078 + mg$

$$(0.0784 + mg)\left(\frac{43}{40}\right) = 0.1078 + mg$$

$$m = 0.032 \text{ kg.}$$

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5	
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