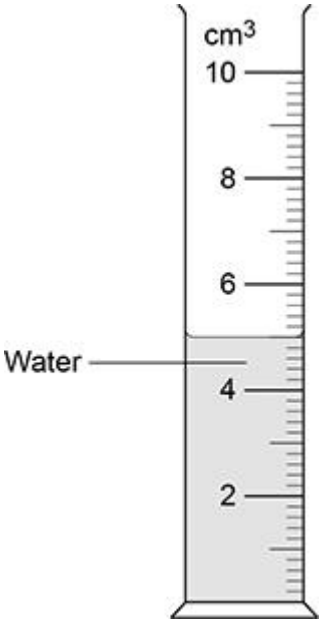
Questions are for both separate science and combined science students

Q1.

The figure below shows a measuring cylinder containing some water, which a student used to measure the volume of a metal ring.



(a) When measuring the volume, the student s eye was in line with the level of the water.

Which type of error would have been caused if the student s eye was **not** in line with the level of the water?

Tick (✓) **one** box.

Random error	✓
Systematic error	
Zero error	

(1)

(b) The student tied a piece of thick string to the metal ring and lowered the ring into the water.

Suggest **one** reason why the student should have used thin string instead of thick string.

Thin string would displace less water than thick string, and so affect the measurement less.

(1)

The table below shows the results.

Volume of water in cm^3	Volume of water and ring in cm^3	Volume of ring in cm^3
5.0	5.4	0.4

(c) The true volume of the ring was 0.44 cm^3.

Even without using the string, the measuring cylinder could not give an accurate value for the volume of the ring.

Give **one** reason why.

The resolution of the measuring cylinder is only 0.2 cm^3 and so cannot be used to measure to 2 d.p.

(1)

(d) The student used a balance to measure the mass of the ring.

After the ring was removed from the balance, the reading on the balance was 0.02 g.

How could the student use the readings from the balance to determine the correct mass of the ring?

Subtract 0.2g from the measured value.

(1)

1m = 100 cm

$1m^3 = 100^3 cm^3$

(e) The student determined that the density of the ring was 21 500 kg/m³.

The volume of the ring was 0.44 cm³.

Calculate the mass of the ring.

Use the Physics Equations Sheet.

Give your answer in kg.

$\rho = \frac{m}{V}$ $\quad m = V \times \rho$

$m = V \times \rho$ $\quad m = 4.4 \times 10^{-7}\ m^3 \times 21500\ kg/m^3$

$m = 9.46 \times 10^{-3}\ kg$

$V = 0.44\ cm^3$

$= 0.44 \div 100^3$

$= 4.4 \times 10^{-7}\ m^3$

$\rho = 21500\ kg/m^3$

Mass = 9.46×10^{-3} kg kg

(4)

(Total 8 marks)

density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$