Question	Answer	Mark
1(a)(i)	(P =) hdg OR 1.5 × 850 × 10 OR mg / area of base OR 850 × 2.4 × 1.5 × 1.5 × 10 / (2.4 × 1.5) 13 000 Pa or N/m^2	**C1** **(C1)** **A1**
(a)(ii)	P = F/A OR (F =) PA OR 12 750 × 1.5 × 2.4 OR 12 750 × 3.6 46 000 N OR (Force =) weight of oil = mg = 2.4 × 1.5 × 1.5 × 850 × 10 46 000 N	**C1** **A1** **(C1)** **(A1)**
(b)	(46000 / 10 =) 4600 kg OR m = Vd = (2.4 × 1.5 × 1.5) × 850 = 4600 kg	**B1**
(c)(i)	(density of brass) greater than that of oil / 850 kg / m^3 OR brass denser than oil	**B1**
(c)(ii)	(It won't sink as average) density of wood + key less than density of oil	**B1**
		Total: 7

2 **(a** d = m / V in any form OR (V =) m / d OR 200 / 8.4
24 cm^3 A1

(b) (i) density less (than water) OR upthrust ≥ weight B1

(ii) determine any volume of any liquid (V_1) B
states viable method to submerge wood B1
reads volume (V_2) from previous line and determines volume of (wood + brass) ($V_2 - V_1$) B
subtract volume of brass from above (to give volume of wood) B1

[Total: 7]

3 **(a (i)** $5.0(4) \times 10^{3}$ OR 0.0050(4) kg OR 5.0(4) g B

(ii) (ρ =) m / V OR $0.00504 / (0.30 \times 0.21 \times 0.048)$ OR $0.080 / (1 \times 0.048)$ C1
$0.00504 \times 500 / (0.30 \times 0.21 \times 0.048)$ OR $0.080 / (1 \times 0.048 / 500)$) C1
$8.3(3333) \times 10^2$ kg / m^3 A1

(b) micrometer OR screw gauge OR digital / electronic caliper B1
practical detail of use of micrometer OR micrometer (much) more precise than rule OR repeat and average OR measure mass with balance / scale B1

OR
tear into 500 pieces (B1)
pile up **and** press down OR measure mass with balance / scale (B1)

[Total: 6]

4 **(a** (density =) mass / volume

(b) water used in measuring / graduated cylinder B1

volume of water known or read / recorded / taken

place the coins in the water and read / record / take new level of water in cylinder B1

subtract readings B1

OR ALTERNATIVE METHOD:
pour water into displacement can to level of spout (B1)

place the coins / several coins in the water (B1)

collect overflow (B1)

measure volume of overflow water using measuring graduated cylinder (B1)

measure mass / weigh the coins used with balance / spring balance B1

(c) one from:
read measuring cylinder levels at bottom of meniscus
repeat volume measurement and find average
place eye level with surface in measuring cylinder (to avoid parallax error)
place coins one at a time to avoid air bubbles between coins
avoid splashing when adding coins to water
make sure coins are dry / clean
use narrow / small measuring cylinder
place containers on horizontal surface
check zero of balance / spring balance / scales
displacement can method: make sure dripping finishes before and after adding coins B1

[Total: 7]

5 **(a** (if no diagram, max. mark is 3)
measuring / graduated cylinder B1

water **AND** initial reading **OR** known volume
alternative method: water **AND** filled eureka can owtte B1

immerse stone **AND** final reading
alternative method: immerse stone **AND** catch overflow B1

final reading – initial reading
alternative method: reading on measuring cylinder B1

(b) (i) mass, **NOT** with other quantity B1

(ii) ($\rho =$)m / V in symbols or words B1

(c) attach weight to wood
OR different liquid
OR push down with stick M1

accuracy mark must match method
subtract volume of weight from total volume
OR new liquid less dense than wood
OR no part of stick in water / thin stick A1

[Total: 8]

6 **(a** (density =) mass/volume OR mass per unit volume
OR m/V with symbols explained B1

(b) (vol =) mass/density OR 60.7/2.70 C1
= 22.48 cm^3 to 2 or more sig. figs A1

(ii) $V = A \times$ (average) thickness OR thickness = V/A
OR 22.48 / (50 × 30) C1
0.01499 cm to 2 or more sig. figs. e.c.f. **(b)(i)** A1

(c) micrometer/screw gauge / (vernier/digital) callipers B1

(ii) check zero of device used / cut sheet into several pieces / detail of how to use device / fold sheet B1

measure thickness of sheet <u>in different places</u>
OR measure thickness of several pieces together B1
calculate/obtain average thickness OR divide answer by number of measurements/ pieces/places B1

[Total 9]

7 **(a** $V = W \times L \times D$ in any form words, symbols or numbers C1
use of $M = \rho V$ in any form OR ρV words, symbols or numbers C1
($M = 51 \times 20 \times 11 \times 1030 = 11\,556\,600$ =) 1.2×10^7 kg [3]

(b) $p = \rho g(\Delta)h$ in any form words, symbols or numbers C1
($\Delta h = 60\,000 / (1030 \times 10)$ =) 5.8(25) m A [2]

(c) use of $F = pA$ in any form or pA words, symbols or numbers C1
($F = 60\,000 \times 32.8 \times 8.3 = 60\,000 \times 272.2$ =) $1.6(33) \times 10^7$ N A [2]
e.c.f. from **(b)**

[Total: 7]