

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

- 2 (a)  $d = m/V$  in any form OR  $(V =) m/d$  OR  $200/8.4$   
 $24 \text{ cm}^3$  A1
- (b) (i) density less (than water) OR upthrust  $\geq$  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  $0.0050(4) \text{ kg}$  OR  $5.0(4) \text{ g}$  B
- (ii)  $(\rho =) m/V$  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  
 $8.3(3333) \times 10^2 \text{ kg/m}^3$  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  $60.7/2.70$   
 $= 22.48 \text{ cm}^3$  to 2 or more sig. figs C1  
A1
- (ii)  $V = A \times$  (average) thickness OR thickness =  $V/A$   
OR  $22.48 / (50 \times 30)$  C1  
 $0.01499 \text{ cm}$  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 in different places  
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  $\rho V$  words, symbols or numbers C1  
 $(M = 51 \times 20 \times 11 \times 1030 = 11\,556\,600 \Rightarrow) 1.2 \times 10^7 \text{ kg}$  [3]
- (b)  $p = \rho g(\Delta)h$  in any form words, symbols or numbers C1  
 $(\Delta h = 60\,000 / (1030 \times 10) \Rightarrow) 5.8(25) \text{ m}$  A [2]
- (c) use of  $F = pA$  in any form or  $pA$  words, symbols or numbers C1  
 $(F = 60\,000 \times 32.8 \times 8.3 = 60\,000 \times 272.2 \Rightarrow) 1.6(33) \times 10^7 \text{ N}$  A [2]  
 e.c.f. from (b)

**[Total: 7]**