



| Question | Answer   | Mark   |
|----------|--|--|
| 1(a)(i)  | (P =) hdg OR $1.5 \times 850 \times 10$<br>OR<br>mg / area of base OR $850 \times 2.4 \times 1.5 \times 1.5 \times 10 / (2.4 \times 1.5)$<br>13 000 Pa or N/m <sup>2</sup>                       | <b>C1</b><br><br><b>(C1)</b><br><b>A1</b>                |
| (a)(ii)  | P = F/A OR (F =) PA OR $12\,750 \times 1.5 \times 2.4$ OR $12\,750 \times 3.6$<br>46 000 N<br>OR<br>(Force = ) weight of oil = mg = $2.4 \times 1.5 \times 1.5 \times 850 \times 10$<br>46 000 N | <b>C1</b><br><b>A1</b><br><br><b>(C1)</b><br><b>(A1)</b> |
| (b)      | (46000 / 10 = ) 4600 kg<br>OR $m = Vd = (2.4 \times 1.5 \times 1.5) \times 850 = 4600$ kg  | <b>B1</b>  |
| (c)(i)   | (density of brass) greater than that of oil / $850 \text{ kg/m}^3$<br>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  $200/8.4$  A1  
 $24 \text{ cm}^3$
- (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 (B1)  
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)  $V = A \times (\text{average}) \text{ thickness}$  OR  $\text{thickness} = V/A$   
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  
( $M = 51 \times 20 \times 11 \times 1030 = 11\,556\,600 = 1.2 \times 10^7 \text{ kg}$ ) [3]
- (b)  $p = \rho g(\Delta)h$  in any form words, symbols or numbers C1  
( $\Delta h = 60\,000 / (1030 \times 10) = 5.8(25) \text{ m}$ ) A [2]
- (c) use of  $F = pA$  in any form or  $pA$  words, symbols or numbers C1  
( $F = 60\,000 \times 32.8 \times 8.3 = 60\,000 \times 272.2 = 1.6(33) \times 10^7 \text{ N}$ ) A [2]  
e.c.f. from (b)

[Total: 7]