1 **(a** $W = mg$ in any form OR $(m =) W \div g$ OR $80\,000 \div 10$ C1
8000 kg A1

(b) $\rho = m \div V$ in any form OR $(V =) m \div \rho$ OR $8000 \div 1000$ C1
$= 8.0\,m^3$ ecf **(a)** A1

(c) mgh OR weight $\times h$ OR $8000 \times 10 \times 4$ C1
$= 320\,000$ J OR 320 kJ ecf **(a)** A1

(d) (efficiency =) output (energy) ÷ input (energy) ($\times$ 100)
OR 96 ÷ 320 ($\times$ 100) C1

= 0.30 OR 30% ecf **(c)** A1

[Total: 8]

2 **(a) (i)** $(W = mg = 1440 \times 10 =)$ 14 400 N B1

(ii) $(P =) F / A$ OR $14\,400 / (1.5 \times 1.2)$ C1

8000 Pa OR N / m^2 A1

(b) (i) $(P =) h\rho g$ OR $1.4 \times 1000 \times 10$ C1

14 000 Pa OR N / m^2 A1

(b) (ii) pressure on base of **P** smaller / **Q** greater

(with same volume removed) smaller decrease in depth in Q
OR height in **Q** is greater A1

[Total: 7]

3	**(a**	**(i)**	180 N	B1
		(ii)	(P =) $F \div A$ **OR** $180 \div (0.30 \times 0.04)$	C1
			15 000 Pa	A1
	(b)	**(i)**	arrow (labelled W) from / to correct centre of mass	B1
		(ii)	**1.** force × (perpendicular) distance **OR** 40×0.60 **OR** 180×0.15 in **2.**	C1
			24 N m	A1
			2. 27 N m e.c.f. from **(a)(i)**	A1
		(iii)	slab topples / rotates (about point D) **OR** corner C lifts from ground **OR** falls over	B1
			moment of force at B becomes bigger than moment of weight / W **OR** anticlockwise moment becomes bigger than clockwise moment **OR** weight/centre of mass outside base	B1

[Total: 9]

4	**(a**	85 000 N (accept 83 300 N)		
	(b)	**(**	(P =)F/A OR 85 000/3.4 OR $85\,000/3.4 \times 2$ OR 85 000/6.8 (e.c.f. from **(a)(i)**)	C1
			$1.2/1.25/1.3 \times 10^4$ Pa (e.c.f. from **(a)(i)**)	A
		(ii)	larger area	M1
			smaller pressure	A1
	(c)	(i**)**	(measure of) turning effect OR $F \times x$	B1
		(ii)	no resultant/net force	B1
			no resultant/net turning effect/moment	B1 [8]

5 **(a** mass = (1.5 × 10 × 12)/(30 × 10) OR = (1.5 × 12)/30
OR any correct moment equation with force or mass but not mixture C1
= 0.6(0) kg A1 [2]

(b) 21 N ecf from **(a)** B1 [1]

(c) **(i)** stays in position B1

(ii) any two from:
- clockwise moment = anticlockwise moment B1
- centre of mass at pivot B1
- no (resultant) moment/turning force acting on sculpture
- balanced/in equilibrium
- relative distances from pivot unchanged [3]

[Total: 6]