

- 1 (a) (i) $(W = mg = 2.8 \times 10^6 \times 10 =) 2.8 \times 10^7 \text{ N}$ B
- (ii) $3.2 \times 10^7 - 2.8 \times 10^7$ C1
 4.0×10^6 OR $0.4 \times 10^7 \text{ N}$ A1
- (iii) $F = ma$ in any form OR $(a =) F \div m$ OR $4.0 \times 10^6 \div (2.8 \times 10^6)$ C1
 1.4 m/s^2 A1
- (b) Mass of rocket decreases (as fuel is used up)
OR
Value of g /gravitational force on rocket decreases as rocket rises B1
OR
Air resistance decreases

[Total: 6]

- 2 (a) (immediately below / above the / at) 50 cm mark **OR** at pivot B1
- (b) (i) anticlockwise moment = clockwise moment **OR** $45 \times 0.40 = 25 \times W$ C1
 0.72 N A1
- (ii) 0.072 kg **OR** 72 g e.c.f from (b)(i) B1
- (c) (i) no net moment **OR** two moments cancel C1
moment due to weight of rule cancels moment due to weight of apple A1
- (ii) weight of the rule / it is bigger B1

[Total: 7]

- 3 (a) (i) $(P =) F/A$ in any form OR $1000/0.01$ C1
 100 000 Pa accept N/m^2 A1
- (ii) multiplication of either force or area by 4 C1
 $0.08 \times$ his (i) OR $0.02 \times$ his (i) C1
 8000 N e.c.f. from (i) A1
 (2000 N gets C0, C1, A1)
- (b) his (ii) – 2000 correctly evaluated C1
 600 kg e.c.f. A1

[Total: 7]

- 4 (a) two masses chosen with ratio 2:1 or 3:1 or 3:2 M1
 chosen masses in correct holes to balance A1
- (b) disc does not rotate/is balanced/in equilibrium/no movement B1
 NOT spin the disc NOT anything to do with calculating moments
 NOT when disturbed, returns to original position
- (c) moment of one mass correct (ignore units) B1
 accept mass \times distance calculated B1
 equal answers
- (d) correct addition of masses/weights, including 200g B1
 any mass correctly converted to N B1 [7]

5	(a)	(i)	$t = v/g$ or $32/10$ $= 3.2$ s			C1 A1		
		(ii)	straight line starting at zero, inclined line joining 0,0 and 3.2, 32, accept c.f. from time (i)			C1 A1		
		(iii)	2.4 kg			A1	[5]	
	(b)	(i)	take volume of water before use (totally) immerse stone and take new volume (Not clearly measured before and after C1)			B1 B1		
		(ii)	hang rock from balance and take reading			B1		
		(iii)	density = mass/volume			B1		
		(iv)	need to tie "sinker" or cork or press cork down need volume with sinker then volume with sinker and cork or just completely submerge cork			B1 B1	[6]	
							[Total: 11]	

6	(a)	one mark for each labelled diagram both diagrams sensible but no labels	max 1	2			
	(b)	newtons/10 is kg or equivalent		1			
	(c)	volume/level/reading of water then volume etc. water + rock		1			
	(d)	difference in the two readings		1	1		
	(e)	density = mass/volume		1	1		
							(6)