

# MARK SCHEME

## FORCES + MOTION

3	(a)	(i)	Extension proportional to load however expressed	B1	
		(ii)	Any relevant arithmetic to show direct proportion (or straight line graph <u>with values</u> )	B1	2
	(b)	(i)	Work done = force x distance / 400 x 0.210 84.0 J	C1 A1	
		(ii)	(total) work/time or (24 x) 84/60 (apply e.c.f from (i) ) 33.6 W	C1 A1	4
					[6]
2	(a)		750 N	A1	1
	(b)		p.e. lost / converted = mgh or weight x height 750 x 15 or 75 x 10 x 15 = 11250 (J) p.e. lost = k.e. gained = 11250 (J)	C1 C1 A1	
		(c)		Any 3 of: heat in water / rock (kinetic) energy of (moved) water / to make water move/ make waves some k.e. still in (sinking) rock sound energy on impact / of splash	B3
					[7]
				(just heat and sound C1)	

Accept D & E  
marked on time  
axis  
No labels -1

1	a		BD correct, (straight line i.e. constant acceleration) DE correct, ( constant speed or slightly reducing speed only) EF correct, (speed reduced to zero, gradient steeper than BD)	B1 B1 3 B1	3
		b(i)	force = 2 (N) work = (2 x 0.6) = 1.2 J*	C1 A1	2
		(ii)	k.e. = $0.5mv^2$ = $0.5 \times 0.2 \times 2.5 \times 2.5$ = 0.625 J*	C1 C1 3 A1	5
	c		velocity - vector, speed scalar direction changes so velocity changes	B1 2 B1	2
	d		work done against friction (more) friction on EF (k)e. changed to heat less k.e. changed to p.e.	B1 B1 B1 3 B1 M3	*
					QT 13

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- 3 (a) one slightly nearer the centre than the other  
20 kg is the nearer one to the pivot
- (b) Clockwise moments = anticlockwise moments (about point/pivot)  
(accept opposite directions and equal)
- (c)  $18 \times 2.5 = 20 \times B$   
distance = 2.25(m)

C1  
A1 2  
A1 1  
C1  
A1 2

[5]

- 2 (a) pressure = depth x g x density of water  
pressure =  $50 \times 10 \times 1000$   
so value is 500 000 Pa or  $N/m^2$
- (b) force = pressure x area in any form  
force =  $500\,000 \times 0.15 \times 0.07$   
force = 5250 N

C1  
C1  
A1 3  
C1  
C1  
A1 3

[6]

- 3 (a) attempt to use triangle or parallelogram of forces  
stated scale used  
950 N and 1220 N in correct relative directions  
correct resultant drawn in  
weight = 1785 N [limits 1700 N to 1850 N]
- (b) (i) work = force x distance or  $1500 \times 3.0$   
work = 4500 J  
(ii) power = work/time or  $4500/2.5$   
power = 1800 W

M1  
A1  
C1  
C1  
A1 5  
C1  
A1  
C1  
A1 4

[9]

