Work, Energy & Power

Mark Scheme 1

Level	International A Level
Subject	Physics
Exam Board	CIE
Topic	Work, Energy & Power
Sub Topic	
Paper Type	Theory
Booklet	Mark Scheme 1

Time Allowed: **50 minutes**

Score: **/41**

Percentage: **/100**

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1	**(a**	(power =) work done / time (taken) or rate of work done	A1	[1]
	(b) (i)	$F - R = ma$	C1	
		$F = 1500 \times 0.82 + 1200$	C1	
		$= 2400\ (2430)$ N	A1	[3]
	(ii)	$P = Fv$	C1	
		$= (2430 \times 22) = 53\,000\ (53\,500)$ W	A1	[2]
	(c)	(there is maximum power from car and) resistive force = force produced by car hence no acceleration **or** suggestion in terms of power produced by car and power wasted to overcome resistive force	B1	[1]
2	**(a (i)**	change in kinetic energy $= \frac{1}{2}mv^2$	C1	
		$= 0.5 \times 25 \times (0.64)^2 = 5.1(2)$ J	A	[2]
	(ii)	zero	A1	[1
	(iii)	$(-)\,5.1(2)$ J	A	[1]
	(b) (i)	PE $= mgh$	C1	
		$= 350 \times 0.64 \times 25$	C1	
		$= 5600$ J	A1	[3]
		(If full length used allow 1/3)		
	(ii)	$P = Fv$ or gain in PE / t, E_P / t or work done / t, W / t	C1	
		$= 350 \times 0.64$ or $5600 / 25$		
		$= 220\ (224)$ W	A	[2]

3	**(a (i)**	work (done) / time (taken)	B1	[1]
	(ii)	work = force × displacement (in direction of force)	B1	
		power = force × displacement / time (taken) = force × velocity	B1	[2]
	(b) (i)	weight = mg	C1	
		$P = Fv = 2500 \times 9.81 \times \sin 9° \times 8.5$ (or use $\cos 81°$)	C1	
		= 33 (32.6) kW	A1	[3]
	(ii)	no gain or loss of KE	B1	
		no work (done) against air resistance	B1	[2]
4	**(a**	kinetic energy = $\frac{1}{2} mv^2$	C1	
		$= \frac{1}{2} \times 0.040 \times (2.8)^2 = 0.157$ J or 0.16 J	A	[2]
	(b) (i)	$k = F/x$ or $F = kx$	C1	
		$X_B = 14/800$		
		= 0.0175 m	A1	[2]
	(ii)	area under graph = elastic potential energy stored	C1	
		or $\frac{1}{2} kx^2$ or $\frac{1}{2} Fx$		
		(energy stored =) 0.1225 J less than KE (of 0.16 J)		[2]

5	**(a**	GPE: energy of a <u>mass</u> due to its position in a <u>gravitational field</u>	B1	
		KE: energy (a mass has) due to its motion / speed / velocity	B1	[2]
	(b) (i) 1.	KE $= \frac{1}{2} mv^2$	C1	
		$= \frac{1}{2} \times 0.4 \times (30)^2$	C1	
		$= 180\,\text{J}$	A1	[3]
	2.	$s = 0 + \frac{1}{2} \times 9.81 \times (2.16)^2$ *or* $s = (30 \sin 45°)^2 / (2 \times 9.81)$	C1	
		$= 22.88\ (22.9)\,\text{m}$ $= 22.94\ (22.9)\,\text{m}$	A	[2]
	3.	GPE $= mgh$	C1	
		$= 0.4 \times 9.81 \times 22.88 = 89.8\ (90)\ \text{J}$	A1	[2]
	(ii) 1.	KE = initial KE – GPE = 180 – 90 = 90 J	A	[1]
	2.	(horizontal) velocity is not zero / (object) is still moving / answer explained in terms of conservation of energy	B1	[1]