Question	Answer	Marks	AO Element	Notes	Guidance
1	torch - light (1) radio - sound (1) fan - kinetic (1)	**3**			
2	any **two** from: friction (in the brakes) (transfers 100 kJ / kinetic energy) into thermal energy (store) / internal energy (store) of brakes / car / surroundings **OR** is dissipated **OR** (transferred) into surroundings / environment	**2**			
3(a)	(gravitational) potential (energy)	**1**			
3(b)	the same	**1**			
4	elastic / strain / potential	**1**			
5	thermal energy **AND** in something specific (e.g. brakes / air / tyres) **OR** kinetic energy of air	**1**			
6(a)	E = Pt in any form (1) (E =) 6000 J (1)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
6(b)	E = mc ΔT in any form (1) $c = \frac{6000}{550\ (33 - 20)}$ (1) (c =) 0.84 J /(g °C) **OR** 840 J /(kg °C) (1)	**3**			
6(c)	**EITHER** some of energy supplied by the heater heats the heater / goes to lagging / goes to surroundings (1) specific heat capacity is lower than value in **(b)** (1) **OR** some energy may be absorbed from surroundings if they are at a higher temperature (1) specific heat capacity is higher than value in **(b)** (1)	**2**			
7	chemical (energy)	**1**			
8	energy transferred from battery = energy dissipated in lamp	**1**			
9	thermal (energy) (1) light (energy) (1)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
10	KE = ½ mv^2 in any form **OR** v^2 = 2 × KE / m **OR** 240 = ½ × 7.5 v^2(1) v^2 = 2 × 240 / 7.5 **OR** (v=) √{2 × 240 / 7.5 } **OR** (v=) √{2KE / m } (1) = 8.0 m / s (1)	**3**			
11(a)	(gravitational) potential energy	**1**			
11(b)	2nd (bag) as it has a greater load / force / weight (moved through same distance)	**1**			
11(c)	time (taken) (1) (vertical) height (raised) / distance (1)	**2**			
12	from chemical (potential energy) (1) to elastic (potential) / strain (at end) (1)	**2**			
13	chemical (potential energy)	**1**			
14	(maximum gravitational potential energy at) **A** (1) (maximum kinetic energy at) **B** (1)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
15	energy cannot be created or destroyed (1) but can be transformed/changed (from one form to another) (1)	**2**			
16	1. R = 0.4 (J) 2. Q = 0 or zero or no (J)	**2**			
17	KE = 1/2 mv^2 in any form **OR** (KE) = 1/2 × 1.2 x 10^6 × 0.04^2 (1) (KE =) 960 J (1)	**2**			
18(a)	energy cannot be created or destroyed (but can be transformed)	**1**			
18(b)	PE / KE / elastic energy of load / spring decreases / is transformed (1) any **one** from: to thermal energy (which is) dissipated (to surroundings)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
19	any **one** from: speed of air not reduced to zero (in passing through turbine) some air passes through blade area without change of speed / hitting blades not all kinetic energy of air transfers to blade / air retains some of its kinetic energy friction in bearings of blades	**1**			
20(a)	(gravitational) potential energy	**1**			
20(b)	**any 3 from:** water flows through tunnel / has kinetic energy when tide coming in / going out (moving) water causes turbines / (component) X to rotate / turn (the turbine)turns a generator	**3**			
21	thermal (1) dissipated to the air / surroundings (1)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
22	hovering **OR** stationary **OR** moving slowly owtte (1) at max height (1)	**2**			
23	chemical (1) gravitational potential energy **OR** kinetic (1)	**2**			
24	chemical (energy) to kinetic (energy) **OR** potential (energy) (1) any **one** of: kinetic (energy) to potential (energy) **OR** gravitational (energy) potential (energy) **OR** gravitational (energy) to kinetic (energy) kinetic (energy) to thermal (energy) **OR** heat (energy) (1)	**2**			
25	energy cannot be created or destroyed **OR** energy can only be transferred from one form to another **OR** total energy remains constant	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
26	elastic (energy) or strain (energy)	**1**			
27	from chemical (energy) to thermal / heat (energy) (1) from chemical (energy) to thermal / heat (energy) **AND** as a result of electrical working (1)	**2**			
28	**1 .** kinetic energy (of racquet) to elastic / strain energy (in ball or strings) (1) **2 .** elastic / strain energy (in ball or strings) to kinetic energy (of ball) (1)	**2**			
29	chemical (potential energy)	**1**			
30(a)	(KE =) ½ × m × v^2 (1) (KE =) ½ × 9500 × 75^2 (1) (KE =) 2.7 × 10^7 J (1)	**3**			

Question	Answer	Marks	AO Element	Notes	Guidance
30(b)	$KE = F \times l$ **OR** ($F =$) $KE \div l$ **OR** ($F =$) $2.671875 \times 10^7 \times 150$ **OR** $v^2 - u^2 = 2ax$ **OR** ($a =$) $v^2 - u^2 \div (2 \times x)$ **OR** ($a =$) $75^2 \div (2 \times 150) = 18.75$ (1) ($F =$) 1.8×10^5 N **OR** (($F =$) $m \times a = 9500 \times 18.75$) $= 1.8 \times 10^5$ N (1)	**2**			
31(a)(i)	($KE =$) ½ × $m \times v^2$ (1) ½ × 0.020×350^2 (1) 1200 J (1)	**3**			
31(a)(ii)	($\Delta h =$) $KE \div mg$ **OR** $1200 \div (0.020 \times 10)$ **OR** $1225 \div (0.020 \times 10)$ (1) 6000/6100 m (1)	**2**			
31(b)(i)	(force of) air resistance acts downwards (1) adds to gravitational force/resultant force increases/deceleration increases/deceleration > g (1)	**2**			

Question	Answer	Marks	AO Element	Notes	Guidance
31(b)(ii)	(kinetic energy) to gravitational potential energy (1) (kinetic energy) to thermal/internal energy (1)	**2**			
32(a)	kinetic	**1**			
32(b)	efficient	**1**			
33	(because g.p.e. is) the work done by the force **OR** the force × the distance that the object rises **OR** mgh and height is greater	**1**			
34(a)(i)	elastic	**1**			
34(a)(ii)	elastic	**1**			
	kinetic	**1**			
34(a)(iii)	kinetic	**1**			
	thermal	**1**			
34(b)	pull band further back / exert greater force on band / increase elastic potential energy	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
35	C - 4*h*	**1**			
					[Total: 85]