

Work and Power

Mark Scheme 1

Level	IGCSE(9-1)
Subject	Physics
Exam Board	Edexcel IGCSE
Module	Double Award (Paper 1P)
Topic	Energy resources and energy transfers
Sub-Topic	Work and Power
Booklet	Mark Scheme 1

Time Allowed: 72 minutes

Score: /60

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	775%	70%	60%	55%	50%	<50%

Question number	Answer	Notes	Marks
1 (a)	(i) Current that passes in one direction only ;	ignore current varies	1
	(ii) Any three of - MP1 provides a connection / current to the coil/commutator; MP2 idea of reverses the current in the coil; MP3 Every half turn; MP4 Reverses (coil) field /polarity (every half turn); MP5 So that the force is always in the same direction; MP6 So that the motor keeps turning (the same way);	allow swops the contacts/ ensures that current always flows clockwise through the coil/eq so the moment is always in the same direction	3
	(iii) Any one of - Still spins clockwise; No (overall) effect/direction remains the same; The two changes cancel out/nothing changes;	Ignore "nothing happens" unless clear that rotation continues	1

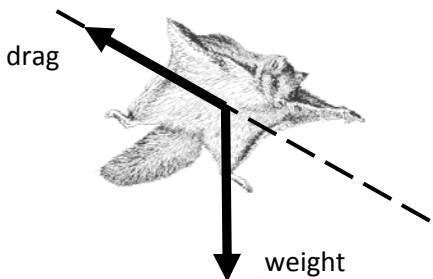
(b)	(i)	power = voltage \times current;	Accept symbols $P=I \times V$ Condone a mix of correct symbols and words	1
	(ii)	Substitution and calculation; Conversion to megawatts; e.g. $P=I \times V$ $P= 4000 \times 600 = 2\,400\,000 \text{ (W)}$ $= 2\,400\,000 \div 1\,000\,000$ $= 2.4 \text{ (MW)}$	division by 10^6 or 1 000 000 seen correct answer without working scores two marks	2

Continued

Question number	Answer	Notes	Marks
1 (c)	(i) work done = force × distance (moved)	Accept symbols $W = F \times d$ $W = Fd$	1
	(ii) Substitution; Calculation; e.g. Work = 400 000 × 190 76 000 000 (J)	Accept 76 MJ with correct unit 7.6×10^7 (J) 76×10^6 (J)	2
(d)	(i) Substitution into given equation; $P = W/t$ Rearrangement; Calculation; e.g. $1.9 = 67 \div t$worth 1 $t = 67 \div 1.9$worth 2 $= 35$ (s).....worth 3	No mark for the equation as it is given in QP Substitution and rearrangement in either order Or (in joules and watts) $67\,000\,000 \div 1\,900\,000$ (35.26) correct answer without working =3	3
	(ii) Any one of :- Takes longer /eq; More time needed to raise coal; Load moves more slowly;	Ignore: unqualified comments about the amount of work done	1

Total 15 marks

Question number	Answer	Notes	Marks
2 (a) (i)	gravitational potential energy = mass \times g \times height	Allow abbreviations e. g.p.e. = mgh for g/gravitational field strength reject 'gravity'	1
(ii)	Substitution into correct equation; Evaluation; e.g. g.p.e. = $0.19 \times 10 \times 17$ = 32 (J)	32.3 (J) (or 31.6 J when $g = 9.8 \text{ ms}^{-2}$) allow 32300 for 1 mark	2
(iii)	Value same as for (a)(ii)	Allow "the same"	1

(b) (i)	<p>Judge by eye</p> <p>Weight shown acting downwards;</p> <p>Drag shown acting against motion;</p> 	<p>NB NO label = no mark</p> <p>Allow abbreviations for labels e.g W, mg</p> <p>ignore gravity</p>	2
(ii)	<p>k.e. = $\frac{1}{2} \times \text{mass} \times \text{velocity}^2$</p>	<p>Allow abbreviations</p> <p>e.g. k.e. = $\frac{1}{2}mv^2$</p>	1
(iii)	<p>Substitution into correct equation;</p> <p>Evaluation;</p> <p>e.g. k.e. = $\frac{1}{2} \times 0.19 \times 13^2$</p> <p>= 16 (J)</p>	<p>(16.055)</p> <p>16055 gets 1 mark</p>	2
(iv)	<p>A an unbalanced force acts on the squirrel</p>		1

Total 10 marks

Question number	Answer	Notes	Marks
3	<p>any six points from the following 2 groups:</p> <p><u>Relating to energy and position</u> MP1 statement re KE values e.g. KE is zero at top and bottom OR KE is greatest/4J in the middle;</p> <p>MP2 statement re GPE values e.g. GPE is greatest/25J at the top OR GPE is least/5J at the bottom;</p> <p>MP3 statement re EPE values e.g. EPE is greatest/21J at the bottom OR EPE is least/1J at the top;</p> <p>MP4 the change in GPE/EPE is 20J OR the change in KE is 4J;</p> <p>MP5 change in GPE/EPE > change in KE;</p> <p>MP6 total energy is constant (in all three charts)/eq;</p> <p><u>Relating to speed and position</u> MP7 in the middle speed is greatest;</p> <p>MP8 in the middle $v = 2.8$ (m/s);</p> <p>MP9 ball is stationary at the top/bottom;</p>	<p>allow GPE decreases as the ball moves down</p> <p>allow EPE increases as the ball moves down</p> <p>allow ball moves through height of 2 metres</p>	6

Total 6 marks

Question number	Answer	Notes	Marks
4 (a) (i)	can all be switched separately ; others stay alight when 1 bulb blows/eq;		2
	(ii) One of - to prevent overheating in the circuit / appliance/ wiring/ lamps; to switch off the circuit; to prevent current exceeding a certain value;	IGNORE live wire/plug	1
	(iii) (if or when) current exceeds stated value/current too high; the fuse (over heats and) melts; this breaks the circuit/stops the current/ turns the circuit off;	allow "fuse blows" ignore burns ignore 'stops the electricity'	3

Question number	Answer	Notes	Marks
4 (b) (i)	$P = I \times V$;	Allow <ul style="list-style-type: none"> rearrangements standard abbreviations equation in words 	1
(ii)	rearrangement; sub into equation; evaluation; e.g. $I = P/V$ $= 250 / 230$ $= 1.1$ (A)	rearrange and sub in either order allow a power of ten (POT) error for -1	3
(iii)	value 3 (A); fuse (value should only be) a little bigger than the current;	1.09 (A) Allow ecf from bii	2
(iv)	In ANY order Any two from: - MP1. circuit breakers are resettable/eq; MP2. circuit breakers work instantly/ fuses do not work instantly; MP3. doesn't require earth wire; MP4. Circuit breakers are more sensitive;		2
(c)	D		1

(Total for Question 4 = 15 marks)

Question number	Answer	Notes	Marks
5 (a) (i)	work done = force \times distance moved;	accept standard abbreviations rearrangements	(1)
(ii)	Substitution into correct equation; evaluation; e.g. $= 23 \times 0.34$ 7.8 (J)	allow a POT error for -1 7.82	(2)
(b)	determination of time for 1 movement/eq; substitution; evaluation; e.g. 15 times in 60 s = 4 s $= \frac{7.8}{4}$ 2.0 (W)	ecf from (aii) allow: calculation of total work done /60 allow 1 mark for correct use of 15 1.955, 2 (W) allow 1 mark only for 7.82/60 or 782/60	(3)

Total for Question 5 = 6 marks

Question number			Answer	Notes	Marks
6	(a)	(i)	power = voltage x current;	Accept rearrangements and symbols e.g. current = power ÷ voltage, $P=IV$, $I=P/V$ ignore a triangle mnemonic an eqn in units	1
		(ii)	2.9 (A);	Accept 2.92 (A), 2.916 (A)	1
	(b)	(i)	Any three of : MP1. if current gets too high/exceeds 13A or a set value; MP2. fuse (wire) melts / breaks; MP3. breaking circuit / switching off; MP4. prevents cable over heating;	allow: fuse blows stops current /flow of electrons	3
		(ii)	any one of: MP1. cable can't be fully extended; MP2. limits the use of the extension cable; MP3. can't exceed 1200 W; MP4. can't reach 10.0 (A) / max working value/eq; AND (because otherwise) 5 A fuse will blow/ will cut the power;	allow RA ignore vague comments re energy or power being too much or too high	2
		(iii)	(to prevent) the cable overheating/OWTTE;		1

Total 8 marks