

# Energy Resources and Electricity Generation

## Mark Scheme 2

<b>Level</b>	IGCSE(9-1)
<b>Subject</b>	Physics
<b>Exam Board</b>	Edexcel IGCSE
<b>Module</b>	Single Award (Paper 2P)
<b>Topic</b>	Energy resources and energy transfers
<b>Sub-Topic</b>	Energy resources and electricity generation
<b>Booklet</b>	Mark Scheme 2

**Time Allowed:** 52 minutes

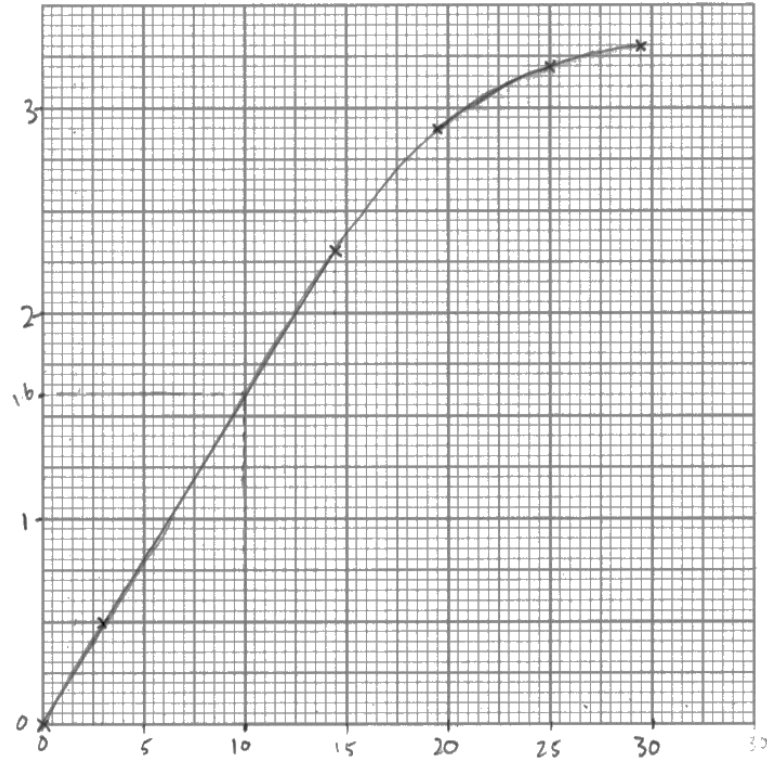
**Score:** /43

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	77.5%	70%	60%	55%	50%	<50%

Question number	Answer	Notes	Marks
1 (a)	A		1
(b) (i)	suitable scales;  6 points plotted;;  curve of best fit;	<ul style="list-style-type: none"><li>• Must use &gt; half width and half height of grid</li><li>• to nearest <math>\frac{1}{2}</math> square, up to two marks available for this, -1 each error</li><li>• reject dot to dot</li><li>• allow a reasonably smooth curve, points should be evenly distributed about the line</li></ul>	4



Voltage across X in V	Current in X in A
0	0
3.0	0.5
14.5	2.3
19.5	2.9
25.0	3.2
29.5	3.3

(ii)	$V = I \times R$	in words, or accepted symbols or rearranged	1
(iii)	value of I from graph; rearranged equation/sub into equation; evaluation; unit; e.g. $I = 1.6$ ( $\pm 1/2$ a small square) $10 = 1.6 \times R$ OR $R = 10/1.6$ $R = 6.3$ $\Omega$ / ohms	allow ECF from graph  answers without working can gain full marks  $R = 6.25$ allow answers which round to a number in the range 5.8 to 6.3	4
(iv)	any three <b>descriptions</b> from:- MP1. as V increases I increases (at first);  MP2. constant gradient/constant R (at first);  MP3. I is proportional to V;  MP4. gradient changes at high voltage/eq;  MP5. $\Delta I$ smaller (than previously) for $V > 15V$ ;	allow as I increases V increases  graph line linear (at first)  nonlinear above $\sim 15 V$ graph is less steep at high voltage  R increases for $V > 15V$ (to $\sim 8\Omega$ )  ignore slows down positive correlation	3

(v)	any two <b>conclusions</b> from: - MP1. resistance is constant at first;  MP2. <b>resistance</b> is not constant / <b>resistance</b> increases as V (or I) increases;  MP3. because X gets hot(ter);  MP4. X is a filament lamp;	allow V and I are proportional at first, it obeys Ohms law at first  non-ohmic /does not obey Ohms law / V and I are not proportional  increasing temperature  total marks = 15	2
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Question number	Answer	Notes	Marks
2 (a)	any 3 of:  MP1. idea of {rubbing / tearing} of {materials / surfaces};  MP2. idea of movement / transfer of electrons;  MP3. electrons have negative charge;  MP4. (object becomes) negatively charged by gaining electrons OR positively charged by losing electrons;  MP5. need for insulating material(s);	movement of positive {charge / electrons} can only score MP1 and MP5 ignore 'friction'	3
(b)	any 2 of: MP1. idea of <b>opposite</b> charges OR positive and negative charges;  MP2. idea of attraction;  MP3. idea of an (attractive) force larger than the weight of the loose end of tape;	reject if mentions positive electrons ignore 'different' condone 'unlike'	2

Total 5 marks

Question number		Answer	Notes	Marks
3 (a)		C (kinetic energy to electrical energy)		1
(b) (i)		Conversion to seconds; Substitution into correctly rearranged equation; Calculation; e.g. (time = ) 60 (s) $\frac{39\,000\,000}{(490 \times 60)}$ 1300 (V)	No mark for stating the formula, since $E = I \times V \times t$ is given on page 2  60 seen in working  1330, 1327, 1326.5 (V) Correct answer without working scores full marks Allow 1.3 kV for THREE marks Allow Power of Ten error , for a maximum of TWO marks e.g. $1.326 \times 10^{-3}$ , 1.33, 130	3
	(ii)	Any four of MP1 (High voltage leads to) low current;  MP2 mention of a relevant equation e.g. $P=IV$ , $P=I^2R$ ;  MP3 Less energy is lost (from the wires);  MP4 More efficient;  MP5 can use thinner wires;	Allow less heat loss  Ignore cost argument  Allow: Can transmit the energy further	4

(c)	(i)	Current that changes direction (continuously); 100 times per second;	Allow switches from +ve to -ve Allow 50 times/cycles per second. Allow time period e.g. 0.01 s, 0.02 s, 1/50s	2
	(ii)	Transformers change the voltage / current;  Transformers use alternating current / a.c.;	Allow step-up, step-down  Allow reverse argument	2

Total for question 6 = 12 marks



Question number	Answer	Notes	Marks
4 (a) (i)	idea that Energy source which cannot be <b>replaced</b> ;	allow: <ul style="list-style-type: none"> <li>• can't be used again</li> <li>• supply is limited in time</li> <li>• can't be replenished (for a long time)</li> <li>• can't be regenerated</li> </ul> ignore: <ul style="list-style-type: none"> <li>• can' be recycled</li> <li>• can't be stored</li> <li>• unqualifie 'finite/limited/will run out'</li> <li>• not sustainable</li> <li>• can be used up</li> </ul>	1
(ii)	Any from for 1 mark;  Coal Oil or named fuel Gas	allow: <ul style="list-style-type: none"> <li>crude oil</li> <li>fossil (fuel(s))</li> <li>petrol</li> <li>diesel</li> <li>gasoline</li> <li>kerosene</li> <li>paraffin</li> <li>methane</li> <li>butane</li> <li>propane</li> </ul> ignore: <ul style="list-style-type: none"> <li>burning</li> <li>fuel(s)</li> </ul>	1

Question number	Answer	Notes	Marks
4 (b) (i)	<p>AT WIND FARM: any one from</p> <ul style="list-style-type: none"> <li>• Step-up transformer used at the wind farm;</li> <li>• voltage increased (for transmission);</li> </ul> <p>DURING TRANSMISSION: any one from</p> <ul style="list-style-type: none"> <li>• transmitted at (high voltage and) low current;</li> <li>• no/little energy is wasted during transmission;</li> </ul> <p>AT CITY END: any one from</p> <ul style="list-style-type: none"> <li>• Step down transformer at 'other end'/OWTTE;</li> <li>• voltage reduced to 230V/for safety/for homes;</li> </ul>	<p>allow: description of a transformer</p> <p>Allow small voltage loss in transmission</p>	3

Question number	Answer	Notes	Marks
4 (b) (ii)	<p>Answer to a maximum of SIX marks to include:            up to 4 <b>ideas</b> from advantages            and            up to 4 <b>ideas</b> from disadvantages  <b>Annotate with ticks /underlining</b></p> <p>advantages</p> <ol style="list-style-type: none"> <li>1. Renewable energy resource;</li> <li>2. No /little carbon emission or air pollution <i>OR</i> will not add to global warming <i>OR</i> little pollution;</li> <li>3. Source of energy is free <i>OR</i> low running costs;</li> <li>4. Brings employment/construction to some remote areas <i>OR</i> good for the local economy;</li> <li>5. Lots of energy available <i>OR</i> abundant source <i>OR</i> wind farm can generate large amounts of electricity;</li> <li>6. wind turbines can be more <b>efficient</b> than conventional power stations;</li> </ol> <p>disadvantages</p> <ol style="list-style-type: none"> <li>1. Unsightly/ugly <i>OR</i> can damage views/ blight landscapes / local people may find them an intrusion;</li> <li>2. Can be noisy/ causes noise pollution;</li> <li>3. Only work when the wind blows/ above certain wind speed <i>OR</i> no constant output of electricity <i>OR</i> not reliable;</li> <li>4. Each generator can only generate a small amount of electricity <i>OR</i> many are needed to supply the amount of electricity required for a city;</li> <li>5. Costly to construct /maintain;</li> <li>6. can only be placed in certain areas <i>OR</i> require large areas;</li> </ol>	<p>If a single word list, penalise by ONE mark</p> <p>accept suitable/sensible alternatives</p> <p>ignore:</p> <ul style="list-style-type: none"> <li>• environmentally friendly</li> <li>• cheaper than fossil fuels</li> <li>• kills birds /harming animals</li> <li>• unqualified 'expensive' /'high costs'</li> <li>• safer</li> <li>• carbon-neutral</li> <li>• unqualified 'more efficient'/'high efficiency'</li> </ul>	6
		<b>Total</b>	<b>11</b>