

# Energy Transfers

## Mark Scheme 1

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

**Time Allowed:** 77 minutes

**Score:** /64

**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	<p>any six from:</p> <p><b>discussion of conduction</b>                      MP1. metal spike conducts the thermal energy;                      MP2. thermal energy is conducted into middle of/inside the potato;</p> <p><b>discussion of convection</b>                      MP3. convection (current) occurs;                      MP4. due to density of air decreasing / air expanding;                      MP5. potato receives hotter air near the top;</p> <p><b>discussion of radiation</b>                      MP6. thermal energy is radiated/emitted from the black surface;                      MP7. potato absorbs thermal energy from all sides;</p> <p><b>general</b>                      MP8. electrical energy is transferred into thermal energy in the heating element;</p>	<p>allow 'heat' for thermal energy throughout</p> <p>metal is a good conductor (of thermal energy)                      allow potato is heated / cooked from the inside</p> <p>ignore references to absorption at walls                      allow potato is heated / cooked from the outside</p> <p>total marks = 6</p>	6

Question number	Answer	Notes	Marks
2 (a) (i)	C – a fuse		1
	(ii) Idea of independent switching for lamps / rooms;	Allow idea of one bulb blowing but not affecting others idea that bulbs in parallel are bright(er than in series)	1
(b)	MP1. Idea of current changing <b>direction</b> ;  MP2. Continuously;	vary is not enough  Allow + and – current Can be shown as a diagram /graph (assume axes labels) Minimum requirement: MP1 shows both + and - (e.g. approximate sine curve) MP2 more than one cycle	2

(c) (i)	<p>Conversion to seconds; Substitution in correct formula; Evaluation; e.g. <math>t = 7 \times 3600 (= 25200 \text{ s})</math> <math>E = 0.12 \times 230 \times 7 \times 3600</math> 700 000(J)</p>	<p>Allow 3600 or 25200 seen anywhere in working  (695520)  Correct answer without working scores full marks Accept alternative matching unit e.g. 696 kJ 11592 = 2 marks (time in mins) 193.2 = 2 marks (time in hours) Answer in Wh or Wmin with <u>matching</u> unit scores full marks.</p>	<p>3</p>
(ii)	<p><b>B</b> - same as - less than</p>		<p>1</p>

Total 8 marks

Question number	Answer	Notes	Marks
3 (a)	any 2 of:  MP1. so that lamps work independently;  MP2. so that they all get mains/same voltage/230V;  MP3. so that different areas/rooms can have different brightness/power/light intensities of lamps;	so that can light some rooms without all being on or off/each lamp has its own switch/if 1 lamp blows the others will still work  allow no reduction in light output for main voltage  allow different currents	2
(b)	D 1.38 A;		1
(c)	any 3 of:  MP1. <b>current</b> increases over max value of fuse; MP2. fuse wire melts; MP3. cuts off current; MP4. prevents wire(s) in circuit from overheating;	allow <b>current</b> gets too high  blows/breaks  breaks circuit ignore 'stops electricity' ignore electric shocks	3

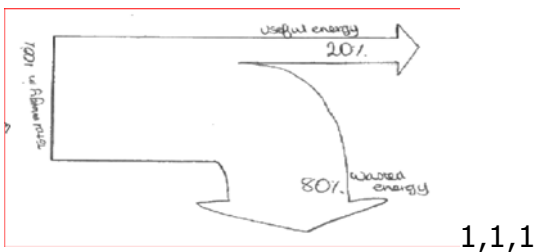
(d) (i)	power = voltage x current	allow in standard symbols or in words	1
(ii)	substitution into correct equation; evaluation;  e. 0.26 X 230 60 (W)	allow 240 V for mains but not incorrect current (62.4 W)  allow 59.8 (W)  condone 317(.4) (W) for 1 mark	2
(iii)	answer from (d)(ii) x <b>180</b> ; evaluation; unit; e.  60 X 180 11000 joules/J	accept correct use of $E = V \times I \times t$  allow ecf from (d)(ii) mark independently  allow 10800, 10764	3

3 (e) (i)	<table border="1" data-bbox="676 443 1138 764"> <thead> <tr> <th>S<sub>1</sub> position</th> <th>S<sub>2</sub> position</th> <th>lamp is lit</th> </tr> </thead> <tbody> <tr> <td>W</td> <td>X</td> <td>(yes)✓</td> </tr> <tr> <td>W</td> <td>Y</td> <td>(no) ×</td> </tr> <tr> <td>Z</td> <td>X</td> <td>(no) ×</td> </tr> <tr> <td>Z</td> <td>Y</td> <td>(yes)✓</td> </tr> </tbody> </table> <p data-bbox="550 802 793 867">any three correct; all 4 correct;;</p>	S <sub>1</sub> position	S <sub>2</sub> position	lamp is lit	W	X	(yes)✓	W	Y	(no) ×	Z	X	(no) ×	Z	Y	(yes)✓	<p data-bbox="1289 443 1600 540">allow 1 mark when middle two rows blank, but otherwise correct</p> <p data-bbox="1289 578 1600 675">allow 1 mark when top and bottom rows blank but otherwise correct</p>	2
S <sub>1</sub> position	S <sub>2</sub> position	lamp is lit																
W	X	(yes)✓																
W	Y	(no) ×																
Z	X	(no) ×																
Z	Y	(yes)✓																
(ii)	<p data-bbox="550 927 1121 1157">any sensible suggestion of 2 way switching; e. on a corridor on stairs basement/cellar bedroom/kitchen light room with 2 doorways</p>	<p data-bbox="1289 927 1617 1024">allow clear description of 2 switches controlling the same light</p>	1															

Total 15 marks

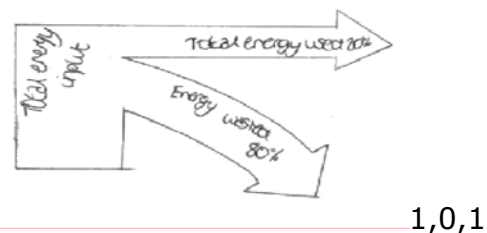
Question number	Answer	Notes	Marks
4 a i	B kettle		1
	ii A food mixer		1
b	any one from MP1 total energy always has the same value; MP2 energy cannot be created or destroyed; MP3 energy input = energy output ;	Allow student speak with two distinct ideas on energy e.g. none is lost or gained none is lost just transferred	1
c i	Both of: MP1 . is 20% of the energy input ; MP2 . (20%) is transferred usefully / as light; <b>OR both of:</b> MP3 . 80% of the energy input ; MP4 . (80%) is wasted / transferred as heat;	allow energy used for energy input 20% (or 80%) is not enough for the mark, 'energy input' or 'energy used' must be mentioned allow for 1 mark, a definition of efficiency condone power for energy  independent marks allow	1 1
	ii Sankey diagram giving – MP1. One input and ONLY two outputs; MP2. Roughly correct proportions; MP3. Two correct labels; e.g.	<ul style="list-style-type: none"> <li>• output arrows in either direction</li> <li>• both output arrows in same direction</li> <li>• 2 from                             <ul style="list-style-type: none"> <li>○ input/electrical/total,</li> <li>○ useful/light,</li> <li>○ wasted/heat/thermal</li> </ul> </li> </ul> ignore % on labels sound	1 1 1



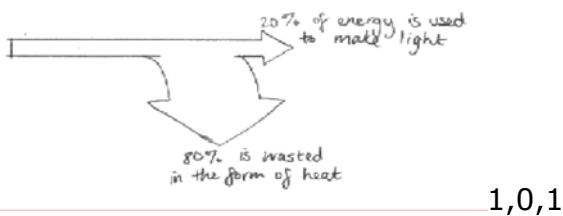


1,1,1

there must not be a size difference between input and outputs, even if the light is  $\sim 1/4$  of heat  
 i.e. 100 units in and 100 units out



1,0,1



1,0,1

(Total for Question 4 = 8 marks)



ii	MP1. temperature (difference); MP2. (surface) area or time; MP3. relevant units on both;	X and Y unimportant	1 1
iii	Any TWO from: MP1. use water that is at the same starting temp; MP2. Pour in and wait until that temperature is reached before timing; MP3. method to ensure small time gap between pouring water and starting; MP4. put (same volumes into) containers in a water bath;	Accept sensible alternative workable method(s), allow two different methods  e.g. do one at a time use other people to help	2

(Total for Question 5 = 12 marks)

Question number	Answer	Notes	Marks
6 a	a moon orbits a <u>planet</u> ; a planet orbits a star (/the Sun) ;	Ignore <ul style="list-style-type: none"> <li>• comments about eccentricity, oval, plane of orbit, time of orbit etc</li> </ul>	1 1
b	Substitution; Evaluation; Unit (to <b>match</b> the value of v); e.g. $V = \frac{(2 \times \pi \times 385000)}{27} = \frac{2\ 417\ 800}{27}$	Note value of n used may vary time values and corresponding approximate speeds are 27 days..... 89 600 km/days 648 hours..... 3 731 km/ hours 38 880 mins..... 62 km/min 2 332 800 s..... 1.04 km/s	1 1
	90 000 km/day	allow answers which round to 89 600 Accept suitable <b>matching</b> units	1
c i	$E = \frac{1}{2} mv^2$ ;	Accept <ul style="list-style-type: none"> <li>• rearranged equation</li> <li>• equation in words</li> </ul>	1
ii	substitution ; Mass converted to kg ; 47.(33.....) seen;	allow sub of mass as 50 g 1.496 or 1.5 seen gets 2 marks	3
d i	44(J) ;		1
ii	GPE = mgh;	Accept <ul style="list-style-type: none"> <li>• rearranged equation</li> <li>• equation using (all the) words</li> </ul> Allow for 'g' <ul style="list-style-type: none"> <li>• gravitational field strength but NOT gravity</li> </ul>	1

iii	Substitution and rearrangement; Calculation ; $\frac{12}{0.05 \times 1.6}$ 150 (m)	POT error loses 1 mark e.g. 0.15 (m) gets 1 mark	2
e	any Two from: <ul style="list-style-type: none"> <li>• Value of g lower(on the Moon)/RA;</li> <li>• lack of air resistance (on the Moon)/RA;</li> <li>• Time of flight greater;</li> </ul>	ignore <ul style="list-style-type: none"> <li>• 'no gravity'</li> </ul> allow <ul style="list-style-type: none"> <li>• less gravity</li> <li>• drag for air resistance</li> </ul>	2

(Total for Question 6 = 15 marks)