

Question	Answers	Notes	Total	Criterion	
1	a	Electrical energy / electricity / electromagnetic energy	<i>Do not accept electromagnetism</i>	1	A
	b	<p>Useful energy output</p> <p>1. <input type="text" value="Sound"/></p> <p>2. <input type="text" value="Light"/></p> <p>Waste energy output</p> <p>1. <input type="text" value="Heat"/></p>	<i>All must be correct for the mark</i>	1	A
	c	2.1 <i>or</i> 1s ² 2s ¹ <i>or</i> K2 L1	<i>Accept 2 electrons in the first shell and 1 electron in the second shell</i>	1	A
	d	<p>Both metals are in group one /group 1A / alkali metals / single valence electron</p> <p>Any further two points [max 2]</p> <ul style="list-style-type: none"> • both very reactive (because of single valence electron) • sodium is more reactive than lithium (because it is below in the periodic table) • (sodium is more reactive than lithium) because the valence electron is more weakly held • reactivity increases down group one/alkali metals 	<i>Accept ORA for differences between sodium and lithium</i>	3	A A D
	e	<p>electrons flow <i>or</i> move around (a circuit)</p> <p>collisions occur between electrons and the ions of the wire</p> <p><i>or</i></p> <p>when a current flows resistance causes a heating effect</p> <p>kinetic energy is transferred to thermal energy</p>	<i>Accept "atoms"</i>	3	A

2	a	<p>Any appropriate reason, for example [max 1]</p> <ul style="list-style-type: none"> • voltage is too high for use by appliances • fuses/ circuit breakers might blow • appliances might overheat • could cause a fire 		1	A
	b	<p>correct substitution into the formula</p> <p>55 or 55:1 or 55/1</p>	<p><i>Award 1 mark for an equivalent correct ratio</i></p> <p><i>Award 2 marks for a correct answer</i></p> <p><i>Ignore all units</i></p>	2	A
	c	<p>the turn ratio might be incorrect for the phone</p> <p>any reasonable justification linked to incorrect turn ratio, for example [max 1]</p> <ul style="list-style-type: none"> • the voltage supplied may be incorrect • damage the phone • give a slow rate of charging 	<p><i>Accept answers in any box</i></p> <p><i>Do not accept “the transformer will be different” for the first mark as this is in the question</i></p>	2	A

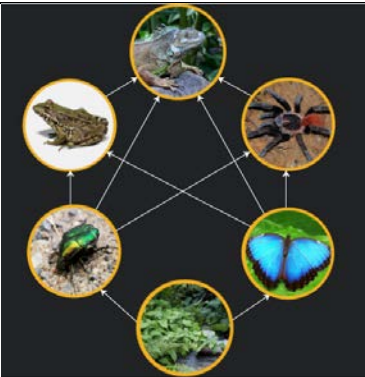
3	a	3250±50 and 2500 mAh seen once	<i>Tolerance for the first value only</i>	2	A
	b	3250/300 10.8(33333..)	<i>ECF</i> <i>Accept 10.833333 if seen as copied from the calculator</i> <i>Award 2 marks for 10.8</i>	2	A
	c	selection of V=IR 13(.3333) (Ω) Ω or selection of V=IR 0.013(3333...) (VmA ⁻¹) VmA ⁻¹	<i>Seen or implied</i>	3	A
	d	(2500/300 =) 8.3 10.8 – 8.3 = 2.5 (hours) or (3250-2500 =)750 750/300 = 2.5 (hours)	<i>ECF from parts a and b</i> <i>Award 2 marks for 2.5 (hours)</i>	2	A
	e	IV: number of running apps DV: total charging hours or number of times charging in a day		2	A
	f	Two types of control variable, for example: <ul style="list-style-type: none"> • type of phone or battery • two hours charging interval • (initial) electrical capacity of battery • types of apps 		2	B

4	a	<p>A material that is a poor conductor of thermal energy/heat or A material that retains or traps thermal energy/heat</p>	<p><i>Do not accept “contains heat” or any answer referencing thermal insulation only as this is contained in the question</i></p>	1	A
	b	<p>Accept any reasonable answer relating thermal energy to different coffee cups, for example [max 1]</p> <ul style="list-style-type: none"> • which coffee cup insulates the best • which coffee cup keeps the coffee warm • which material prevents the heat loss 	<p><i>Accept reference to heat</i></p>	1	B

c		1	2	3	4	17	B
	Independent and dependent variables (V)	Material as independent variable is implied or dependent variable is identified	Material is identified as the independent variable and the dependent variable is identified as temperature or as the time taken to decrease to a stated temperature				
	Control Variables (CV)	One control variable is identified	Two control variables are identified	Starting temperature and volume of water are identified as control variables			
	Equipment (E)	Equipment to measure volume or temperature is listed	Equipment to measure volume and temperature is listed	Equipment to measure volume and temperature and one further piece of appropriate equipment listed	Equipment to measure volume and temperature and one further piece of appropriate equipment listed and with justification for one item		
	Measurements (Me)	Plans to measure values for 3 different materials or plans 3 repeats	Plans to measure values for 3 different materials and plans 3 repeats	Plans to measure values for 3 different materials and plans 3 repeats and plans to calculate mean data			
	Method (Md)	Attempt at a relevant method but could not be followed by another student	Method is described and could be followed by another student	Method is described, fully explained and could be repeated by another student			
	Safety (S)	a safety precaution is stated	a safety precaution is stated and linked to hazard				

d	<p>Accept reasonable references to validity, for example [max 1]</p> <ul style="list-style-type: none"> • to allow valid comparison of results • fair test of only one (independent) variable • so that results are not affected by multiple changing factors 	<p>WTTE</p> <p><i>Do not accept answers referring to accuracy or precision</i></p>	1	C
e	<p>polypropylene does not have the smallest temperature drop</p> <p>answer supported by data about polypropylene from the graph</p> <p>polystyrene has the smallest temperature drop</p> <p>answer supported by data about polystyrene from the graph</p> <p>(so) hypothesis is not valid / supported or hypothesis is partially valid as polypropylene is a better insulator than cardboard</p>	<p><i>First three marking points may be seen in the same statement</i></p> <p><i>This mark scores the first mark also</i></p> <p><i>Do not award "hypothesis is valid or partially valid" if there is no support</i></p>	5	C C C C C
f	<p>any reasonable improvement, for example [max 1]</p> <ul style="list-style-type: none"> • increase range of independent variable • increase time range (until water reaches room temperature) <p>correctly linked justification</p> <p>any reasonable additional independent variable as an extension, for example [max 1]</p> <ul style="list-style-type: none"> • different starting temperature • use of a lid <p>any correctly linked justification</p>		4	C
g	<p>valid because black coffee is an aqueous solution or invalid because coffee will have different (physical) properties to pure water</p>	<p><i>Do not accept valid or invalid alone</i></p>	1	C

5	a	<p>Any reasonable suggestion, for example [max 1]</p> <ul style="list-style-type: none"> • (carbohydrates) provide energy • (electrolytes) replace ions or minerals lost during or after exercise 		1	A
	b	<p>does drinking a sports or an energy drink change the time taken to run (a race)</p> <p>or</p> <p>does drinking a sports or an energy drink change the speed of an athlete</p>	<i>Do not accept performance</i>	1	B
	c	<p>170.6</p> <p>171 (to 3 sig figs)</p>	<i>Award 2 marks if only 171 is seen</i>	2	C
	d	<p><input type="text" value="B"/></p> <p>simple title linking time with (and without) sports drink</p> <p>complete title including 500m</p> <p>y axis: time</p> <p>unit of y axis: s / seconds</p>	<p><i>WTTE</i></p> <p><i>Do not accept sec(s)</i></p>	5	C
	e	<p>the time for most students or the (average) time is reduced</p> <p>(so) the hypothesis is valid</p> <p>or</p> <p>the reduction in time is not significant</p> <p>(so) the hypothesis is invalid or only partially valid</p>	<p><i>Do not award a mark for the hypothesis is valid unless a reason relating to the data is given</i></p> <p><i>Do not accept answers referring to the method</i></p>	2	C
	f	<p>Any two reasonable limitations, for example [max 2]</p> <ul style="list-style-type: none"> • the sample size was small eg range of drinks, number of runners • the distance was short or long • a named variable was not controlled eg recovery time <p>A correctly linked <u>improvement</u> to each limitation [max 2]</p>	<p><i>The second mark for each limitation must be an improvement not a justification</i></p>	4	C

	g	<p>Accept any reasonable suggestion, for example [max 1]</p> <ul style="list-style-type: none"> • excess sugar can cause dental problems • excess sugar can lead to obesity • excess blood sugar can lead to diabetes 		1	D
6	a	<p>there is less space to grow food or plants or resources or less space to capture solar energy to grow food or plants or increased competition for resources</p>	WTTE	1	A
	b	<p>a greater land area supports increasing numbers of species or organisms or increasing population sizes</p> <p>Any additional relevant point, for example [max 1]</p> <ul style="list-style-type: none"> • (so) the number of interactions increases • (so) the complexity of food chains/food webs increases • there are more trophic levels/pathways between consumers 	Accept answers in either box WTTE	2	A
	c	 <p>plants at bottom and iguana at top</p> <p>beetle and butterfly correct</p> <p>frog and spider correct</p>	Position doesn't matter trophic level does	3	A

7		1	2	3	4	13	D
	Environment (air, ocean, physical features, forests) (L)	Suggestion of an impact on the environment	Statement of an impact on the environment	At least two statements of an impact on the environment	One statement of an impact on the environment and one description of a different impact		
	Impact on individual organisms (O)	Suggestion of an impact on organisms	Statement of an impact on organisms in the ecosystem	At least two statements of an impact on organisms in the ecosystem	One statement of an impact on organisms and one description of a different impact		
	Economic impacts (E)	Statement of an economic impact	At least two statements of an economic impact	One statement of an economic impact and one description of a different impact			
	Concluding appraisal (C)	A relevant concluding statement	Concluding statement linking economic and environmental impacts				

<p>8</p>	<p>Renewable energy source: correctly identified</p> <p>strength</p> <p>limitation</p> <p>Non-renewable energy source: Petrol(eum) correctly identified</p> <p>strength</p> <p>limitation</p> <p>justification: simple justification of their recommended source</p> <p>justification of their recommended source including comparison of both</p>	<p><i>Strength and limitation can be awarded for non-renewable sources other than petrol</i></p>	<p>8</p>	<p>D</p>
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