Markscheme

May 2018

Integrated Sciences

On-screen examination

14 pages

The following are the annotations available to use when marking responses.

Annotation	Explanation	Shortcut	Annotation	Explanation	Shortcut
	Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only.	Alt+1		No benefit of the doubt	Alt+4
AEr	Arithmetic error		NEX	No explanation given	
	Benefit of the doubt	Alt+3		Not good enough	
	Omission, incomplete	Alt+7		Not worthy of any marks	
CON	Contradiction	Alt+6	NWS	No working shown	
	Valid part (to be used when more than one element is required to gain the mark)			Test box used for additional marking comments	
	Error carried forward	Alt+8		Unclear	Alt+2
	Dynamic annotation, it can be expanded to surround work			Seen; must be stamped on all blank response areas	Alt+9
	Horizontal wavy line that can be expanded			Vertical wavy line that can be expanded	
	Highlight tool that can be expanded to mark an area of a response			Words to that effect	
	Not answered the question			Award 1, 2, 3, 4 marks. For use in holistically marked questions only	

Marking instructions

1 Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses.

2 Follow the markscheme provided and award only whole marks.

3 Each marking point appears on a separate line.

4 The maximum mark for each subpart is indicated in the "Total" column.

5 Where a mark is awarded a tick should be placed in the text at the precise point where it is clear the candidate deserves the mark.

6 Each marking point in a question part should be awarded separately unless there is an instruction to the contrary in the Notes column.

7 A question subpart may have more marking points than the total allows. This will be indicated by the word "***max***" in the Answer column. Further guidance may be given in the Notes column.

8 Additional instructions on how to interpret the markscheme are in bold italic text in the Answer column.

9 Alternative wording may be indicated in the Answer column by a slash (/). Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

10 Alternative answers are indicated in the Answer column by "***or***". Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

11 If two related points are required to award a mark, this is indicated by "***and***" in the answer column.

12 Words in brackets ( ) in the Answer column are not necessary to gain the mark.

13 Words that are <u>underlined</u> are essential for the mark.

14 In some questions a reverse argument is also acceptable. This is indicated by the abbreviation *ORA (or reverse argument)* in the Notes column. Candidates should not be rewarded for reverse arguments unless *ORA* is given in the Notes column.

15 If the candidate's response has the same meaning or is clearly equivalent to the expected answer the mark should be awarded. In some questions this is emphasized by the abbreviation *WTTE (or words to that effect)* in the Notes column.

16 When incorrect answers are used correctly in subsequent question parts the follow through rule applies. Award the mark and add ECF (error carried forward) to the candidate response.

17 The order of marking points does not have to be the same as in the Answer column unless stated otherwise.

18 Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.

19 Do not penalize candidates for errors in units or significant figures unless there is specific guidance in the Notes column.

20 Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. A candidate's work should be reviewed to determine holistically the mark for each row of the holistic grid and a mark awarded for each row.

Question		Answers	Notes	Total	Criterion
1	a	Electrical energy / electricity / electromagnetic energy	*Do **not** accept electromagnetism*	**1**	A
	b	**Useful energy output** 1. Sound 2. Light **Waste energy output** 1. Heat	*All must be correct for the mark*	**1**	A
	c	2.1 ***or*** $1s^2 2s^1$ ***or*** K2 L1	*Accept 2 electrons in the first shell and 1 electron in the second shell*	**1**	A
	d	Both metals are in group one /group 1A / alkali metals / single valence electron ***Any further two points [max 2]*** • 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	*Accept ORA for differences between sodium and lithium*	**3**	A A D
	e	electrons flow ***or*** move around (a circuit) collisions occur between electrons and the ions of the wire ***or*** when a current flows resistance causes a heating effect kinetic energy is transferred to thermal energy	*Accept "atoms"*	**3**	A

2	**a**	***Any appropriate reason, for example [max 1]*** • voltage is too high for use by appliances • fuses/ circuit breakers might blow • appliances might overheat • could cause a fire		**1**	A
	b	correct substitution into the formula 55 ***or*** 55:1 ***or*** 55/1	*Award 1 mark for an equivalent correct ratio* *Award 2 marks for a correct answer* *Ignore all units*	**2**	A
	c	the turn ratio might be incorrect for the phone ***any reasonable justification linked to incorrect turn ratio, for example [max 1]*** • the voltage supplied may be incorrect • damage the phone • give a slow rate of charging	*Accept answers in any box* *Do **not** accept "the transformer will be different" for the first mark as this is in the question*	**2**	A

3	**a**	3250±50 ***and*** 2500 mAh seen once	*Tolerance for the first value only*	**2**	A
	b	3250/300 10.8(33333..)	*ECF* *Accept 10.833333 if seen as copied from the calculator* *Award 2 marks for 10.8*	**2**	A
	c	selection of V=IR 13(.3333) (Ω) Ω ***or*** selection of V=IR 0.013(3333…) (VmA^{-1}) VmA^{-1}	*Seen or implied*	**3**	A
	d	(2500/300 =) 8.3 10.8 – 8.3 = 2.5 (hours) ***or*** (3250-2500 =)750 750/300 = 2.5 (hours)	*ECF from parts a and b* *Award 2 marks for 2.5 (hours)*	**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:*** • type of phone ***or*** battery • two hours charging interval • (initial) electrical capacity of battery • types of apps		**2**	B

4	**a**	A material that is a poor conductor of thermal energy/heat ***or*** A material that retains ***or*** traps thermal energy/heat	*Do **not** accept "contains heat" or any answer referencing thermal insulation only as this is contained in the question*	**1**	A
	b	***Accept any reasonable answer relating thermal energy to different coffee cups, for example [max 1]*** • which coffee cup insulates the best • which coffee cup keeps the coffee warm • which material prevents the heat loss	*Accept reference to heat*	**1**	B

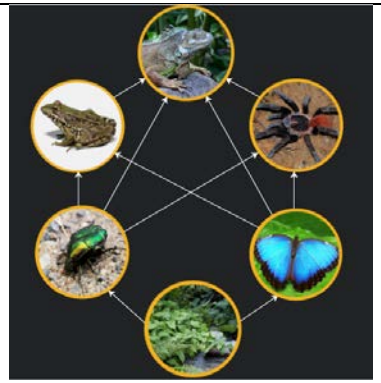
c

	1	2	3	4
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 repeated by another student	
Safety (S)	a safety precaution is stated	a safety precaution is stated ***and*** linked to hazard		

17 B

	d	***Accept reasonable references to validity, for example [max 1]*** • to allow valid comparison of results • fair test of only one (independent) variable • so that results are not affected by multiple changing factors	*WTTE* *Do not accept answers referring to accuracy or precision*	**1**	C
	e	polypropylene does not have the smallest temperature drop answer supported by data about polypropylene from the graph polystyrene has the smallest temperature drop answer supported by data about polystyrene from the graph (so) hypothesis is not valid / supported ***or*** hypothesis is partially valid as polypropylene is a better insulator than cardboard	*First three marking points may be seen in the same statement* *This mark scores the first mark also* *Do **not** award "hypothesis is valid or partially valid" if there is no support*	**5**	C C C C C
	f	***any reasonable improvement, for example [max 1]*** • increase range of independent variable • increase time range (until water reaches room temperature) correctly linked justification ***any reasonable additional independent variable as an extension, for example [max 1]*** • different starting temperature • use of a lid any correctly linked justification		**4**	C
	g	valid because black coffee is an aqueous solution ***or*** invalid because coffee will have different (physical) properties to pure water	*Do **not** accept valid or invalid alone*	**1**	C

5	**a**	***Any reasonable suggestion, for example [max 1]*** • (carbohydrates) provide energy • (electrolytes) replace ions ***or*** minerals lost during or after exercise		**1**	A
	b	does drinking a sports ***or*** an energy drink change the time taken to run (a race) ***or*** does drinking a sports ***or*** an energy drink change the speed of an athlete	*Do **not** accept performance*	**1**	B
	c	170.6 171 (to 3 sig figs)	*Award 2 marks if only 171 is seen*	**2**	C
	d	B simple title linking time with (and without) sports drink complete title including 500m *y* axis: time unit of *y* axis: s / seconds	*WTTE* *Do **not** accept sec(s)*	**5**	C
	e	the time for most students ***or*** the (average) time is reduced (so) the hypothesis is valid ***or*** the reduction in time is not significant (so) the hypothesis is invalid ***or*** only partially valid	*Do not award a mark for the hypothesis is valid unless a reason relating to the **data** is given* *Do **not** accept answers referring to the method*	**2**	C
	f	***Any two reasonable limitations, for example [max 2]*** • 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 ***A correctly linked <u>improvement</u> to each limitation [max 2]***	*The second mark for each limitation must be an improvement **not** a justification*	**4**	C C

	g	***Accept any reasonable suggestion, for example [max 1]*** • excess sugar can cause dental problems • excess sugar can lead to obesity • excess blood sugar can lead to diabetes		**1**	D
6	**a**	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	*WTTE*	**1**	A
	b	a greater land area supports increasing numbers of species ***or*** organisms ***or*** increasing population sizes ***Any additional relevant point, for example [max 1]*** • (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	 plants at bottom ***and*** iguana at top beetle ***and*** butterfly correct frog ***and*** spider correct	*Position doesn't matter trophic level does*	**3**	A

7

	1	**2**	**3**	**4**
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		

13 D

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