GCSE Science – Investigative Skills Assignment – Marking Guidelines

Biology 2.1 – Enzymes and Temperature

For use until May 2009

Last date for submission for moderation May 2010

Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen.

Subtotals for each part of each question should be written in the right hand margin.

Please add annotations where necessary to explain why marks have or have not been awarded.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must **not** be returned to candidates.

The marking guidelines show examples of typical responses that candidates may make. However, teachers should use their professional judgement in deciding whether or not to award marks. If, in the judgement of the teacher, the candidate has provided a response which correctly answers the question, then a mark should be awarded even if this response is not shown in the mark guidance. If necessary, the teacher should annotate the script and/or mark guidance to justify the decision.

In the mark guidance:

- the use of a solidus (/) indicates an alternative answer
- the use of brackets ( ) indicates wording that is not essential in the candidate's answer, but makes the guidance more clear.

SECTION 1

	Answer	Additional Guidance	
1	Statement referring to change in the dependent variable eg to see if number of bubbles produced changes. Just number of bubbles is not sufficient	Dependent variable must be identified	1 mark
	Independent variable correctly identified and linked to dependent variable eg when I changed the temperature		1 mark
2(a)	Mark response based on candidate's table / graph	Answers may be in either order eg 20 – 65 °C or 65 – 20 °C Units **are** required at least once	1 mark
(b)	(Using) beakers of (hot / cold / mixed) water / adding hot / cold water	Allow using water bath	1 mark
	(Use of) thermometer	Allow thermostatically controlled, if answer for first mark is "using water bath"	1 mark
3	So reaction does not start at wrong temperature		1 mark

	Answer	Additional Guidance	
4	Any **one** from: eg • volume / amount of substrate / named substrate • volume / amount of enzyme / source of enzyme	Accept pH at start if this was measured	1 mark
5	Mark depends on particular investigation carried out	**Discrete** if eg number of bubbles was measured **Continuous** if eg height of froth or volume of gas was measured	1 mark
6	Any **one** from: eg • carry out further repeats **and** calculate new mean • check with others • use different technique • use different equipment		1 mark
7	Amplified statement for **2** marks eg the reaction rate depends on temperature **1** mark **plus** the reaction rate at first increases with temperature for **2** marks **or** eg there is no relationship between temperature and the rate of the reaction for **1** mark **plus** as there is no trend / the results are random for **2** marks	Simple correct statement, stating whether or not there is a relationship between the two variables, for **1** mark only **NB** statement **must** relate to candidate's own results	2 marks
8	Any sensible suggestion eg a method of controlling temperature more precisely **or** a way of controlling size of potato cubes more precisely **or** measuring volume of gas produced more precisely / method for this	Allow use of any instrument that has a smaller scale division than the one used	1 mark

	Answer	Additional Guidance	
9	**Table:** Correct headings AND units all correct for all measured variables	Table with incomplete headings or units for the measured variables gains **1** mark eg all headings present = 1 eg all units present = 1	2 marks
	Graph/chart:		
	X axis: suitable scales chosen and labelled with quantity and units	Accept axes reversed	1 mark
	Y axis: suitable scales chosen and labelled with quantity and units		1 mark
	Points or bars plotted correctly to within ± 1mm	Allow **one** plotting error out of every 5 points plotted. Allow error carried forward from incorrect plots	1 mark
	Suitable line drawn on graph or bars correctly labelled on bar chart		1 mark
	If wrong type of graph / chart, maximum **3** marks		
	If the independent variable is: *continuous* should draw a *best fit line graph* *categoric* should draw a *bar chart* *discrete* may draw either a *best fit line graph* or a *bar chart* (but allow dot-to-dot joining of points in this case)		
			Max 18 marks

SECTION 2

10	(fatty) acid is produced		1 mark
11	194 correct figure not rounded gains **1** mark eg 193.6	If there is no answer in the table, accept an answer in the space for calculations	2 marks
12(a)	Circle round "174" on table		1 mark
(b)	Any **one** from: eg • wrong volume / amount of / too little lipase / enzyme (**not** too much enzyme) • wrong amount / volume / too much oil (**not** too little oil) • incorrect timing / recording		1 mark
(c)	ignored / left out		1 mark
13	The time taken to reach pH 6.0		1 mark

	Answer	Additional Guidance	
14(a)	(Drops of lipase) may be different sizes / don't know exact volume		1 mark
(b)	measure volume		1 mark
	using a syringe / burette / pipette		1 mark
15	Any **two** from: eg • biological washing powder / powder with enzyme works at low temperature • low temperature reduces energy needed to heat water • enzymes ineffective / may not work at high temperatures • not tested on other types of stain • may take longer to wash clothes using biological powder so cost / energy not less • don't know cost of adding enzymes / cost of enzymes may be high		2 marks
16	Any **three** from: eg • same volume / mass / amount of powder • same volume / amount of water • same extent of staining / same volume of stain • same temperature / range of temperatures • record time to clean cloth / extent of cleaning after fixed time • one further controlled variable, eg same type of cloth / same manufacturer's powders		3 marks
	Quality of written communication The mark is to be awarded when the response is written in a logical order	It should be possible to determine the candidate's methodology from a single reading through of the plan Annotate below candidate answer with *Q✓ for mark given or Q× for mark not given*.	1 mark
			Max 16 marks

ISA Total 34 Marks