Enzymes

Mark Scheme 3

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Enzymes
Sub-Topic	
Paper Type	Alternative to Practical
Booklet	Mark Scheme 3

Time Allowed: **36 minutes**

Score: **/30**

Percentage: **/100**

1 (a) (i) Completion of table

tissue used	volume of oxygen collected from sample/cm³			
	samples			
	A		C	D
potato	4.5		0	0
liver	8.0	1	0	0

Correct values only. Ignore units in table. One mark per row;; **[2]**

(ii) **L** - labeling; [x - axis A, B, C, D clearly labelled] [y - axis volume of O_2 evolved cm^3]
S - suitable scale; [must fill more than half of grid, space for all letters even if no bar for C and D]
P - plotting accuracy; [+- 0.5 mm i.e. half a square - all correct for A and B samples]
B - bars separate and same width; [**R** if bars touching] **[4]**

(iii)

	liver	**p**
1 speed of reaction	faster more vigorous more reactions	slower less vigorous less reactions
2 volume of gas/O_2 produced	higher/larger/more	lower/less no O_2 is definite - R
3 calculation	1.8 times more almost double 3.5cm^3 more	1.8 times less almost half 3.5cm^3 less

Accept comparison or comparative point - er. **[Max: 2]**

(iv) A one piece and B many (small pieces);
2 link with surface area [A smaller/B larger];
3 interior of large piece not reacted or converse or more enzyme/catalase released from small pieces/more reactant or more collisions if appropriate/AW; **[Max: 2]**

(b) control for comparison to show an enzyme was involved/enzyme becomes denatured/deactivated/destroyed/AW; **[1]**

(c) rekindle a glowing splint/glow brighter; **[1]**

[Total: 12]

2 **(a (i)** **O** axes correctly orientated; (*x*-axis pH and *y*–axis time + units)
A axes labelled + units; (time per min – is minimum, do not accept time/m as m = metres) (R PH when both letters are in capitals or ph both lower case)
S even scale; (plots to fill more than ½ of printed grid, + or – 1/2 square for P and L)
P plot 5 points correctly for student 2; (R 2 curves – if student 1 data has been plotted accept O and A not P– if curve for student 1 has been erased or crossed through accept for P mark)
L ruled line point to point; (R extrapolation/line of best fit / thick line
Accept freehand if smooth and through all points if there is no 'sagging' between points)

Bar chart/histogram points **O, A and P** only (for **A** look for pH value in centre of each column./for **P** look at heights) [5]

(ii) Number points on ticks
Description:
1. enzyme/optimum pH 8/reaction works faster/fastest/better at pH 8; (do not awa neutral pH 8 as incorrect)
2. relevant comment re. rates slowing/speeding up either side pH 8/optimum/enzy works fastest in alkaline range (this is a general point – to cover many different ways of expressing the idea of the curve)
3. correct use of figures from graph (other than pH 8); (use of one other figure + pH8 or use of two other figures – minimum)

Explanation:
4. denaturi (at extremes); (ignore if only refer to destroyed or damaged but look for mention of active site for point 5)
5. correct reference to active site being changed or distorted;
6. reference to causes of change in shape/contamination/inhibition/AW; [MAX. 5]

(b) (i) Number points on ticks
1. **enzyme** – concentration/amount/volume of enzyme different – even if more or less used/older versus freshly prepared enzyme;
2. **substrate** – different concentration/amount/type/volume of substrate/protein/film;
3. temperature is different;
4. presence of inhibitor/contamination/clean apparatus/AW;
   Ignore points about method/different end points in film clearing/agitation.
5. same pH/check pH; [MAX. 3]

(ii) Number points on ticks
1. **enzyme** – use of same volumes/conc./amount/same number of enzyme molecules;
2. **substrate** – use of same amount of protein/same film/same area/same thickness;
3. sam temperature;
4. increase in range of pH tested;
5. agitat the same;
6. repea experiment;
7. keep all variables the same (as alternative to points 1, 2 or 3);
   (this is a general point to cover all variables – if candidate has mentioned enzyme or substrate or temperature then these can score 3 marks separately – this marking point covers all variables and is not to be awarded with marking points 1 and 2 and 3.)
8. chec buffers/pH;
9. clea apparatus/AW;
   (ignore ref. to humidity and light)
   (ignore ref to diff enzymes, diff types trypsin) [MAX. 5]

[Total: 18]