

# Enzymes

## Mark Scheme 1

<b>Level</b>	IGCSE
<b>Subject</b>	Biology
<b>Exam Board</b>	CIE
<b>Topic</b>	Enzymes
<b>Sub-Topic</b>	
<b>Paper Type</b>	Alternative to Practical
<b>Booklet</b>	Mark Scheme 1

**Time Allowed:** 60 minutes

**Score:** /50

**Percentage:** /100

Question	Mark Scheme	Marks	Comments
1 (a)	drawing uses single clear unbroken lines with no shading ; drawing occupies at least half of the space provided ; minimum detail is outer layer and central area with segments indicated ; correctly labelled structure ;	[4]	
(b)	pH of buffer X = 4 ; pH of buffer Y = 8 ;	[2]	
(c)	comparison/control/keep the same volume or amount (at the start) /AW ;	[1]	
(d)	A – 10, B – 19, C – 11, D – 11 ; cm <sup>3</sup> in column heading ;	[2]	all 4 correct measurements = 1 mark
(e) (i)	A has (9 cm <sup>3</sup> ) less volume or amount than B / ora ; B is clear and A is cloudy/AW ;	[2]	
(ii)	C and D are both the same volume or amount /11 cm <sup>3</sup> ; both (as) cloudy/AW/look the same ;	[2]	

Question	Mark Scheme	Marks	Comments
(f)	<p><i>effect of pH on volume:</i></p> <p>pH 4/acidic – more juice or pH 8/alkaline – less juice ;</p> <p><i>effect of pH on appearance:</i></p> <p>pH 4/acidic – juice more clear or pH 8/alkaline – juice more cloudy/AW ;</p> <p><i>effect of pH on enzyme:</i></p> <p>enzyme works better / faster at pH 4 or acidic, works less well / slower at pH 8 or alkaline/AW ;</p>	[3]	

Question	Mark Scheme	Marks	Comments
(g) (i)	<p><i>any two from:</i></p> <p>type of fruit / volume or amount of fruit /                      total volume of mixture / time to filter fruit / volume of                      buffer / AW ;;</p>	max [2]	
(ii)	<p><i>two improvements from:</i></p> <p>wider range of pH values / (stand for) longer time /                      stir (continuously for longer) / filter for longer /                      maintain same temperature /                      repeat for reliability or to eliminate anomalies or to                      calculate mean results /                      AVP ;;</p>	max [2]	
		<b>[Total 20]</b>	

Question	Answer	Mark	Comments
2 (a)	reagent: iodine solution / iodine in KI ; brown to blue-black ; eye protection / lab coat / gloves ;	[3]	ignore treatment of food, e.g. heating.
(b) (i)	axes labelled and scaled evenly <i>x-axis</i> pH, <i>y-axis</i> time / mins ; size to fill at least half or more of printed grid ; points plotted accurately and not larger than $\frac{1}{2}$ of a small square in size if dots used ; clear unbroken line ;	[4]	
(ii)	pH4 ;	[1]	
(iii)	2 ;	[1]	

Question	Answer	Mark	Comments
(iv)	<p><i>any 3 from:</i></p> <p>below optimum pH/pH4 – as pH increases (from pH3–4) the activity increases ;</p> <p>above optimum pH/pH4 – as pH increases (from pH4–8) the activity decreases ;</p> <p>use of <u>calculated</u> data ;</p> <p>reference to gradient/AW ;</p>	max [3]	<p><b>A</b> below optimum pH, activity decreases/time increases/rate decreases</p> <p><b>A</b> above optimum pH, time increases/rate decreases</p> <p><b>A ora</b> as pH decreases from 8–4 the activity increases</p> <p>e.g. between pH3 and 4 the time is 3.6 minutes less and between pH4 and 5 the time is 0.3 minutes more. Not just quoting figures.</p> <p><b>A</b> gradient is steeper before pH4/gradient is less steep after pH4</p>
(c) (i)	<p><i>any two from:</i></p> <p>fresh enzyme/temperature/amount of agitation or shaking of test-tubes/same concentration or volume of enzyme/same concentration or volume of starch solution ;;</p>	max [2]	<p><b>A</b> amount/mass of enzyme or starch solution</p>

Question	Answer	Mark	Comments
(ii)	<p><i>any two from:</i></p> <p>repeat/test pH values at smaller intervals between pH3–8/                      test at pH values between (4–5) at smaller intervals to find a                      more accurate optimum pH/ colour standard to compare                      end points / AVP ;;</p>	<p>max [2]</p>	<p><b>A</b> put test-tubes in a water bath to control temp  <b>A</b> test each pH one at a time</p>
		<p><b>[Total: 16]</b></p>	

Question	Mark scheme	Mark	Guidance / comments
3 (a)	Blue / blue black / black;	[1]	<b>Ignore</b> purple / mauve / brown
(b)	(Change in colour ) to white / yellow / <b>paler</b> blue / <b>paler</b> blue black / <b>paler</b> black;	[1]	<b>Accept</b> grey / colourless / brown / yellow orange / blue black weakened <b>Ignore</b> reference to "change in colour" only / black colour disappears / bleach
(c) (i)	72; 78;	[2]	Correct answers = 2 Mark independently If both incorrect allow 1 mark for correct working
(ii)	<b>O</b> – Orientation; <b>A</b> – Axes labels; <b>S</b> – Scale; <b>P</b> – Plots; <b>L</b> – Line;	[5]	<b>O</b> 'x' axis – time in mins and 'y' axis – number of new areas or total areas ( where there had been a reaction) If total number plotted (wrong curve) = max 4 do not award <b>A</b> <b>S</b> plots to fill at least ½ the grid in both dimensions <b>P</b> accept +/- 0.5 mm (½ a small square). <b>L</b> points joined by ruled lines point to point or a smooth curve Do not allow extrapolation or double/thick lines
(iii)	<b>Two marks from:</b> age difference / gender difference / different types of goat / genetic difference / health of goat / concentration of enzyme (in saliva) / diet / hunger level / AVP;;	<b>MAX [2]</b>	<b>Ignore</b> references to pH and temperature <b>Ignore</b> references to paper starch levels



<b>(d)</b>	<b>Three marks from:</b> <ol style="list-style-type: none"><li>1. longer final time period;</li><li>2. more frequent readings;</li><li>3. do a control or description of boil and cool the saliva or use water;</li><li>4. <b>One</b> control variable ( paper, pH, temperature, saliva amount, same volume of sample, type of goat etc);</li><li>5. repeats or replicates;</li><li>6. calculate mean / average;</li><li>7. more precise timing device;</li><li>8. AVP;</li></ol>	<b>MAX [3]</b>	
		<b>[Total: 14]</b>	