BIOLOGY MIND

# Edexcel

## A-Level

# BIOLOGY

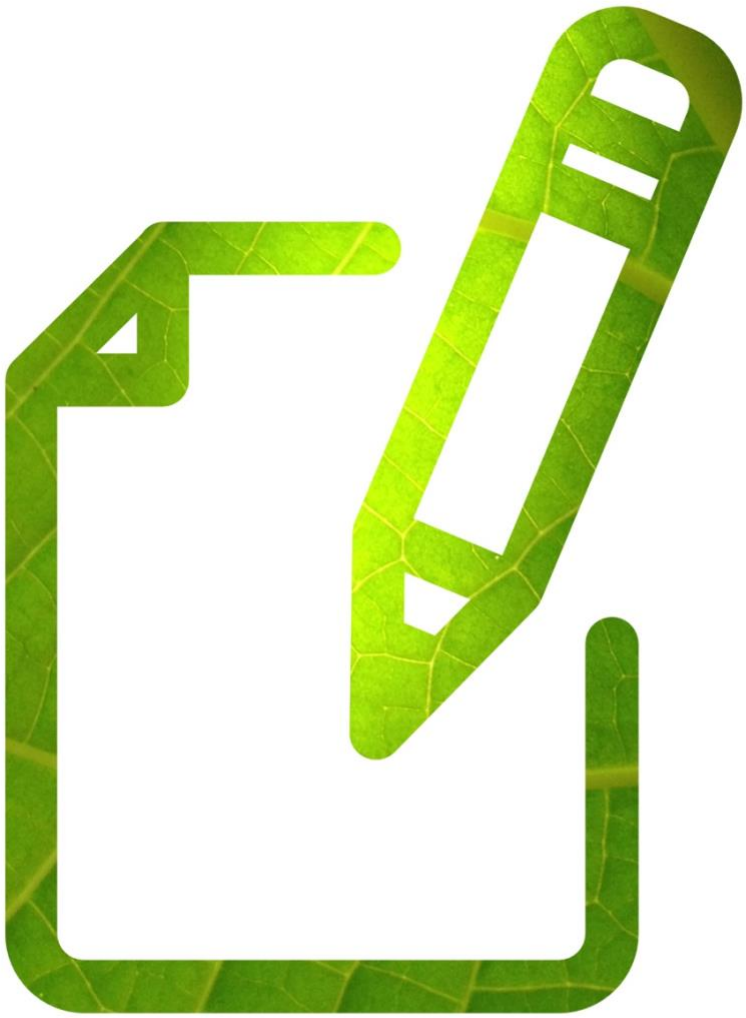
Biological Molecules

Enzymes 1

Time allowed

**54 minutes**

**MARK SCHEME**



| Score | Percentage |
| --- | --- |
| /45 | % |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(a) | correct answer only gains both marks<br><br>1. 2.2 – 7.6 = 24.6 ;<br><br>2. (÷ 32.2) × 100 = 76.4 / 76. 40 ; | <br><br>**ACCEPT 7.6** ÷ 32.2<br><br>100 – 23.6 = 76.4 / 76.40 | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(b) | 1. idea of producing liquid extract of cabbage;<br><br>2. description of titration ;<br><br>3. reference to use of DCPIP ;<br><br>4. correct colour change described ;<br><br>5. compare volumes with standard e.g. reference to use of calibration curve / eq ;<br><br>6. description of appropriate standardisation of extract e.g. mass of cabbage, volume of liquid added to cabbage ; | <br><br>2. e.g. se volume of extract and find the volume of DCPIP needed or converse<br><br><br>4. e.g. it oes colourless when extract added, add DCPIP until it goes blue | **(4)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(c)(i) | 1. cell membranes {damaged / permeable / eq} ;<br><br>2. vitamin C leaves the {cells / cabbage} (because it is water soluble) ;<br><br>3. vitamin C is destroyed by {boiling / enzyme / ascorbic acid oxidase } ; | | (2) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(c)(ii) | the { enzyme / ascorbic acid oxidase } would have been denatured (quicker when added to the boiling water) ; | **ACCEPT** for cold water: enzyme is more active as water is heated up or vitamin C leaks out as it heats up | (1) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1(d) | 1. idea that stored sauerkraut still contains some vitamin C.<br><br>2. cabbage would {rot / decompose / eq } ; | **ACCEPT** sauerkraut does not rot | (1) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(a) | 1. idea that enzyme activity decreases ;<br>2. credit calculated reduction e.g. 0.6, 2.7 , 3.3 ;<br>3. idea that an increase in temperature results in increase in kinetic energy ;<br>4. causing changes in bonds (in the enzyme) / eq ;<br>5. idea that enzyme is denaturing (above 40 ºC) ;<br>6. idea that carbon fixation is reduced ; | **5 ACCEPT** fewer enzyme-substrate complexes<br>**NOT** starts to denature | **(5)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2(b) | {RuBP / ribulose bisphosphate} AND {carbon dioxide / $CO_2$} ; | **ACCEPT** Rubp / ribulose biphosphate<br>NOT CO / $CO^2$ | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| 2(c)(i) | **D** valid ; | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| 2(c)(ii) | **C** measuring the activity at 1ºC intervals between 35ºC and 45ºC ; | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3 (a)** | 1. idea of formation of secondary or tertiary structure ;<br><br>2. idea of bonding between R groups ;<br><br>3. amed bond e.g. ionic, disulfide, hydrogen ; | 1. **ACCEPT** e.g. alpha helix, beta pleated sheet, globular structure<br>**ACCEPT** folding (of primary structure)<br>**IGNORE** 3D shape<br><br>2. **ACCEPT** hydrophilic R groups go to outside/ hydrophobic R groups go to inside / eq<br><br>3. **DO NOT ACCEPT** peptide | **(3)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3 (b) (i)** | 1. as the enzyme concentration increase the rate of reaction increases / eq ;<br><br>2. idea that enzyme lowers activation energy / provides alternative reaction pathway ;<br><br>3. idea that the higher concentration of enzyme means that more active sites are available ;<br><br>4. more chance of a collision between {enzyme / active site } and substrate ;<br><br>5. reference to {enzyme – substrate complex / specific interaction between enzyme active site and substrate } ;<br><br>6. idea that substrate is in excess / enzyme concentration is limiting factor ; | **ACCEPT** bacteria as substrate<br>1. **ACCEPT** enzyme increases rate of reaction | **(3)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3 (b) (ii)** | there were {anomalies / sources of error / random error / measurement inconsistencies / lack of precision / lack of accuracy / eq} ; | **ACCEPT** example of random error e.g. volume<br>**IGNORE** systematic error, outliers | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3 (c)** | 1. idea that this increased temperature changes the bonding in the enzyme ;<br><br>2. the active site is {denatured / changes shape} ;<br><br>3. the substrate no longer fits into the active site / the enzyme no longer {catalyses the reaction / lowers the activation energy / eq} ; | **IGNORE** enzyme is denatured<br>**ACCEPT** bonds are broken<br><br>3. **ACCEPT** no enzyme substrate complex can form / eq | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(a)(i)** | 1. the larger the diameter the less tensile strength / negative correlation / eq ;<br>2. greatest decrease 0.05-0.08 to 0.09-0.12 (mm) ;<br>3. idea of little change between 0.13-0.16 and 0.33- 0.36 (mm) / no difference between 0.21-0.24 and 0.29 -0.36 (mm) ;<br>4. slight increase 0.21-0.24 to 0.25-0.28 (mm) ;<br>5. appropriate manipulation of data ; | | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(a)(ii)** | 1. {length / mass / eq} of fibre ;<br>2. age of fibre ;<br>3. source of fibre / eq ;<br>4. temperature ;<br>5. humidity ; | IGNORE discussion of retting or extraction method<br>3. ACCEPT part of leaf fibre taken from, same leaf / same plant<br>5. ACCEPT water content of fibre | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(b)** | 1. idea of renewable e.g. more sisal plants can be grown ;<br>2. resources can be made available for future generations / eq ; | IGNORE biodegradable | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(c)** | 1. idea of { thick walls / lignin } for strength ;<br>2. idea of lignin making fibres waterproof ;<br>3. flexible therefore do not break easily / eq ;<br>4. light because they are { hollow / not solid } / eq ; | 1. ACCEPT tough<br>4. IGNORE dead | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| 5(a (i) | D ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 5(a (ii) | B ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 5(a)(iii) | B ; | (1) |

| Question Number | Answer | Mark |
|---|---|---|
| 5(a)(iv) | A ; | (1) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 5(b)(i) | 1. (total) cholesterol levels in people with mutation are not higher than people without mutation / eq ;<br>2. LDL (cholesterol) levels in people with mutation are not higher than people without mutation / eq ;<br>3. HDL (cholesterol) levels in people with mutation are not lower than people without mutation / eq ;<br>4. credit correct use of manipulated figures ; | 1, 2, 3: ACCEPT converse, similar / little difference. Decreased/reduced is **not** equivalent to lower.<br>1. IGNOR same<br>2. IGNOR same<br>3. CCEPT ref to HDL to LDL ratio higher in people with the mutation.<br>4. m t be manipulated e.g. difference calculated and not just quoted (difference in LDL= 10, total cholesterol= 7)<br>ACCEPT without units | (2) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 5(b)(ii) | (plant) statin ; | IGNORE named drug, sterol, stanin | (1) |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 5(b)(iii) | 1. muscle {inflammation / pain / eq}<br>2. liver {damage / failure / eq}<br>3. joint {aches / pains / eq}<br>4. nausea/ constipation / diarrhoea / indigestion / flatulence / loss of appetite / eq<br>5. kidney {damage /failure /eq}<br>6. cataracts / blurred vision<br>7. diabetes<br>8. allergies / skin inflammation / skin rash / eq<br>9. respiratory problems / persistent cough / nosebleeds / eq<br>10. headaches / dizziness / depression / insomnia / ringing in ears / fatigue / eq ; | NOT cancer or reduced vitamin absorption IGNORE affect<br>ACCEPT problems as equivalent to damage etc<br>2. CCEPT disease<br>4. CCEPT vomiting<br>5. CCEPT kidney disease<br>10. CCEPT mood swings | (1) |