PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



MARK SCHEME

TOPIC 1: KEY CONCEPTS IN BIOLOGY (PACK 2)

SCORE	PERCENTAGE
/64	%

STEMUP

These questions belong to Pearson Edexcel, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by Pearson Edexcel. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with Pearson Edexcel and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. Pearson Edexcel has not endorsed, approved or been involved in the production of it. Pearson Edexcel and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

Pearson Edexcel publishes its past papers, mark schemes and examiner reports. Always check the current specification at qualifications.pearson.com before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Mark Scheme

Q1.

Question number	Answer	additional guidance	Mark
	An answer linking: • mix the food in ethanol and pour into water (1) • white emulsion forms (1)	 accept add water and ethanol and mix accept white precipitate / goes cloudy / emulsion test accept rub pea / food on filter paper (1) and look for a translucent mark (1)	**(2)** **AO1 2**

Q2.

Question number	Answer	Additional guidance	Mark
	A description including **four** of the following: • use the {root tip / meristem} (1) • Soften the root (with alcohol/heat/acid) (1) • crush the root onto the slide/take a thin section (1) • Stain the root / named stain (1) • Add a drop of water to the slide (1) • Add a cover slip (1)	accept the end of the root for root tip accept description of a root squash accept use a layer of cells accept dye ignore ink accept another slide / description of a cover slip	**(4)** **A03 3a**

Q3.

Question Number	Answer	Additional Guidance	Mark
	Structure A • the mitochondria {**release energy** / for respiration} (1) **Structure B** • {acrosome / contains enzymes} to digest the egg cell membrane (1)	reject produces / creates energy	**(2)** **AO1 1**

Q4.

Question number	Answer	Additional Guidance	Mark
	An answer including: • measure the **start and end** temperature (of the water) (1) • burn the **food** (in the chamber) (1) • use the **increase** in the temperature of water to calculate the energy content (1)	 accept use the **thermometer** to measure the (water) temperature ignore heat the food accept use temperature **change** to calculate the energy content ignore the temperature rise is the energy content	**(3)** AO1 (2)

Q5.

Question Number	Answer	Additional Guidance	Mark
	An answer including: • use the x40 **objective** lens (1) and **one** from: • use the x10 **eye piece** lens (1) • use the focusing wheel (1)	 accept other combinations of x 400 lenses for two marks accept move the {stage / lens}	**(2)** **AO1 1**

Q6.

Question number	Answer	Additional guidance	Mark
(i)	Two from: • (meristem cells) are undifferentiated • (meristem cells) divide / produce more cells (1) • by mitosis (1)	accept are stem cells accept (the cells produced) can differentiate /become specialised/elongate (1)	(2) AO1 1

Question number	Answer	Additional guidance	Mark
(ii)	An answer including: • use a thin section of {cells/meristem} (1) • add a stain / named stain (1) • place a cover slip on top of the sample (1)	accept add a sample of the cells to the microscope slide accept a description of a coverslip	(3) AO1 2

Q7.

Question Number	Answer	Mark
(i)	An answer that provides a description by making reference to: • add iodine (solution) (1) • blue-black colour indicates presence of starch (1)	(2) AO 1 2

Question Number	Answer	Additional guidance	Mark
(ii)	• it is an insulator/reduces heat loss (1) • so energy from sugar is used to heat water / the result is more accurate (1)	accept stops water loss	(2) AO 2 2

Question Number	Answer	Additional guidance	Mark
(iii)	• ensures heat is distributed (evenly) throughout the water (1)	accept all the water is at the same temperature	(1) AO 2 2

Q8.

Question number	Answer		Mark
	A plan including three of the following: • mix starch solution with amylase (1) • use different pH values (1) • using buffers / test at pH solutions between pH 6.5 and 7.5 (1) • control named variables (1) • a method of testing for glucose/a method of testing for starch • the sample that produces glucose in the shortest time is closest to the **optimum** (1)	ignore mix the solutions accept ranges around 5 to 8 accept **test** the sample for starch/glucose	(3) **AO3 3b**

Q9.

Question number	Answer	Additional Guidance	Mark
	An answer that combines the following points to provide a plan: • Mix equal {number of beads/volume of lactase} with equal volume of lactose (1) • (incubate the tubes) at different temperatures (1) • test for (the presence of) glucose (at regular intervals) / time how long it takes to produce glucose (1)	accept heat for temperature accept the temperature that produces glucose quickest is the optimum	**(3)** AO3 3b

Q10.

	Answer	Acceptable answers	Mark
(a)	**C** peristalsis		**(1)**
(b)	• neutralisation (of stomach acid) / raise pH (1) • emulsification / break down of fats (1)	Accept makes stomach / intestine contents more alkaline Accept breaks down large droplets /globules / increases surface area of fats Reject molecules broken down	**(2)**

		Indicative Content	
QWC	***(c)**	A description including some of the following points in sequence Names of enzymes: • carbohydrases • named carbohydrase eg amylase • proteases • named protease eg pepsin • lipases • named lipase	

		General points about enzyme action: • breakdown of large / insoluble / named molecu / soluble / named molecules • for absorption • catalysts • speeds up reactions • active sites that bind to substrate • idea of specificity Specific points: • carbohydrates/ starch are broken down • into sugars / glucose • proteins /named protein are broken down • into amino acids • fats / oils / lipids / named lipid are broken dow • into fatty acids /glycerol	
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of enzyme action that includes at least three points • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of enzyme action that includes at least six points • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of at least nine points • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

	Answer	**Acceptable answers**	**Mark**
(d)	An explanation linking three of the following points • (E) more /fast / maximises diffusion / absorption (1) • (S) microvilli (1) • (E) large surface area (1) • (S) single layer of cells / one cell thick / thin walls (1) • (E) small diffusion distance (1)	To award all three marks at least one structure (S) and explanation (E) must be linked together. Award once, linked to any structure Ignore efficient (in stem) / easier Reject ref to cell wall	**(3)**

	• (S) capillary network / good blood supply / capillaries inside villus (1) • (E) maintains diffusion gradient (1)		

Q11.

	Answer	Acceptable answers	Mark
	C peristalsis		**(1)**

Q12.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	ligase	accept reasonable misspellings e.g. lygase reject lipase	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	Two from the following • leaves single stranded ends /overhangs / sticky ends (1) • complementary / bases pair up (1) • hold gene in place while ligase joins the DNA / makes inserting gene into plasmid more successful (1)	accept (single stranded DNA) matches up ignore join together easily	**(2)**

Question Number		Indicative Content	Mark
QWC	* **(b)**	A description to include some of the following points Sweets • made using invertase/sucrase • converts sucrose into glucose and fructose • reduces viscosity of sugar mixture • increases simple sugar content, increasing sweetness • production of soft centred sweets • production of lower calorie sweets Vegetarian Cheese • made using chymosin • produced by genetically modified organisms • Chymosin initiates clotting/protein coagulation • reduces the use of rennet extracted from animals Lactose free milk • made using lactase • using immobilised enzymes • lactose converted to galactose and glucose • beneficial to people with lactose intolerance	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of the use of enzymes in the production of at least one food **or** naming an enzyme linked to its use • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of at least two food products linked to their named enzyme **or** a detailed description of the production of one food including the name and role of the enzyme • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of most stages of the production of two or more food products made using enzyme technology including the name and role of the enzymes • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
(c)	A description including two from the following **digestive** enzymes/named digestive enzyme (1) breakdown **named biological** stain (1) stains into soluble products (1)		**(2)**

Q13.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** mRNA mRNA		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description linking two of the following: • leaves the nucleus / moves to the cytoplasm • through the nuclear membrane • attaches to ribosome	Accept through a nuclear pore	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	A explanation linking three of the following: • (enzyme and substrate have) complementary shapes • substrate fits into enzyme / enzyme substrate complex formed • reference to <u>active site</u> • enzymes break (chemical) bonds / form chemical bonds / (causes) reaction to occur / make products • Idea of products leaving enzyme (so that enzyme can be used again)	this may be awarded if clearly shown in an unlabelled diagram reject if active site is part of substrate	**(3)**

Question Number		Indicative Content	Mark
QWC	*** (d)**	A description to include some of the following points Temperature • (temperature) too low – not enough energy to make reactions occur (fast enough) • reference to optimum temperature • optimum for most (humans) - 37°C • over 37°C changes enzyme shape / changes active site shape of enzyme • therefore rate of reaction decreases / stops • enzymes denatured (if temperature too high) pH • optimum pH – around 7.3 / 6 to 8 for most enzymes • specific optimum quoted eg pepsin – pH 2 to 3 • pH either side of optimum – changes the shape of the enzyme / shape of the active site • therefore rate of reaction decreases / stops • enzymes denatured (if pH too high / too low) substrate / enzyme concentration • higher concentrations faster reactions • due to more collisions • until maximum rate reached / all enzymes being used	**(6)**
Level	**0**	No rewardable content	
1	**1 – 2**	• a limited description of how temperature OR pH OR substrate concentration affects the rate of enzyme action • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple description of two or more factors OR a detailed description of one factor • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed description of at least two factors • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q14.

Question Number	Indicative content	Mark
*	**AO2 3 marks/AO3 3 marks** **Analysis of data** • the egg in the water has gained mass / water • the egg in the 5% salt has no mass change • the egg in the 10% salt has lost mass / water • mass increase is 7 g for the egg in water • mass increase is 0 g for 5% salt • the mass decrease is 2g for 10% salt • % mass change +9% / 0% / -3% **Water movement** • osmosis is the movement of water • across a partially permeable membrane • from a high concentration of water molecules to a low concentration of water molecules • 5% salt is an isotonic solution	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • Presents an explanation with some structure and coherence.
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. • Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • Presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1–2	• a brief analysis of the experimental data. • with reference to the movement of water.
Level 2	3–4	• an evaluation of the data including a calculation of mass gain or loss. • with reference to the direction of movement of the water for tap water or 10% salt.
Level 3	5–6	• a detailed evaluation of the data including a % mass change calculation. • with reference to the direction of movement of water by osmosis for tap water and 10% salt.

Q15.

Question number	Indicative content	Mark
*	Answers will be credited according to the candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant ○ tube 1 will be larger ○ as water will move into the tube by osmosis ○ from a high water potential outside tube 1 ○ into the low water potential inside tube 1 ○ across the partially permeable membrane of the visking tubing ○ tube 2 will shrink ○ as water will move out of the tube by osmosis ○ moving from a high water potential inside tube 2 ○ to a lower water potential outside of tube 2 ○ across the partially permeable membrane of the visking tubing	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• The explanation attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3–4	• The explanation is mostly supported through by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5–6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)