PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 5: ENERGY FOR BIOLOGICAL PROCESSES

PHOTOSYNTHETIC PIGMENTS

SCORE	PERCENTAGE
/40	%

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Mark Scheme

Q1.

Question Number	Answer	Mark
(i)	An answer that makes reference to the following: • decreases chlorophyll **and** carotenoid / plant pigment (synthesis) (1) • chlorophyll a (synthesis) is less than chlorophyll b (synthesis) / chlorophyll a more inhibited / chlorophyll b less inhibited (1) • carotenoid (synthesis) is less than chlorophyll (synthesis) / carotenoid more inhibited than chlorophyll / chlorophyll less inhibited than carotenoid (1) • SD show difference is significant (1)	**(3)**

Question Number	Answer	Mark
(ii)	An answer that makes reference to five of the following: • grown in darkness for a week so leaves big enough to obtain discs / so leaves contain {less / no pigment} (1) • discs same {diameter / leaves / leaf age} because affects pigment {amount / content / concentration} (1) • 25 discs used so that sufficient pigment obtained / calculate SD (1) • {control / 0.0} solution allows comparison (1) • same temperature as it affects enzymes (1) • same light {wavelength / source / intensity} as light affects synthesis of pigments (1) • 48 hours allows time for pigment synthesis (1)	(5)

Q2.

Question Number	Acceptable Answers	Additional Guidance	Mark
(a)(i)	An explanation that makes reference to the following: • red is absorbed (1) • because of the presence of chlorophyll (1)		(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
(a)(ii)	An explanation that makes reference to the following: • {chlorophyll / leaf pigment} was present (1) • because some cells are damaged / discs not washed (1)		(2)

Question Number	Answer	Additional Guidance	Mark
(a)(iii)	An explanation that makes reference to the following: • ethanol {disrupts / damages / dissolves / affects} the phospholipid (1) • therefore the membrane {becomes more permeable / allows pigment out} (1)		(2)

Question Number	Answer	Additional Guidance	Mark
(b)	An answer that makes reference to the following: • starts at 0.05 absorbance value (1) • flat line along 0.05 absorbance value (1)		(2)

Question Number	Answer	Additional Guidance	Mark
(c)	An answer that makes reference to five of the following: • use leaves of {same age / same position on plant} because this affects concentration of pigment (1) • obtain leaf discs from the same part of the leaf because this affects concentration of pigment (1) • use same {cork borer / size of leaf disc / diameter of leaf disc} because this affects concentration of pigment (1) • use same temperature because temperature affects the rate of diffusion (1) • use same volume of ethanol so chlorophyll is diluted the same (1) • replicate each ethanol concentration to {see if results are consistent / identify anomaly / to calculate standard deviation / allow statistical test} (1) • wash discs to remove pigment (1)		(5)

Q3.

Question Number	Answer	Additional Guidance	Mark
(i)	absorption spectrum shows absorption of light of different wavelengths and action spectrum shows rate of photosynthesis at each wavelength	**ACCEPT** absorption spectrum involves wavelengths only and action spectrum involves photosynthesis / oxygen production only	(1)

Question Number	Answer	Additional Guidance	Mark
(ii)	spectra are similar / spectra overlap / peaks and troughs follow similar pattern	**ACCEPT** similar peak at blue / similar peak at red / similar trough at green	(1)

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to the following: divide energy in producers by energy in sunlight (1) multiply by 100 (1)	 85 000 ÷ 7 000 000 × 100 = 1.21 Correct answer gains full marks, with no working shown.	(2)

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer that makes reference to one of the following: • light reflected (from leaf) (1) • light misses {chloroplast / chlorophyll} (1) • only certain wavelengths absorbed (1)	 Accept transmitted / not absorbed by {chloroplast / chlorophyll} Accept limiting factors eg lack of CO_2, water etc may reduce rate	(1)

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference to two of the following: • because some of the energy is lost through {respiration / heat / movement} (1) • some of the producers not eaten (1) • some of the producers not digested (1)		(2)

Q5.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that includes four of the following: • obtain DNA (from the two types of plants) (1) • {use of restriction enzymes to cut DNA into fragments / use of PCR to amplify DNA} (1) • {DNA / fragments} (loaded) on (agarose) gel with {current passed through / voltage or potential difference applied} (1) • fragments of DNA are separated (1) • {same / similar} (banding) pattern suggests they are the same species (1)	Accept movement of (negatively charged) DNA moves to positive electrode Accept description / diagram of banding pattern Accept shorter fragments travel further Accept converse	Exp (4)

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer that includes two of the following: • (if leaf is green it contains) chlorophyll / photosynthetic pigments (1) • so more {light / more wavelengths of light} absorbed for photosynthesis (1) • so more glucose produced for growth (1) OR • (if flower is brightly coloured) it attracts {pollinators / insects} (1) • so (more likely to) reproduce successfully (1) • to produce seeds / pass trait on (1)	 Accept more light / wavelengths of light leads to higher rate of photosynthesis Accept more GALP / TP / GP for growth Accept so increased genetic variation (as less self- pollination) Accept asexual reproduction (through bulb) still possible if pollination does not occur	**Exp (2)**

Q6.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to three of the following: • each pigment will absorb different wavelengths (of light) (1) • each pigment will absorb different amounts of light at eachwavelength (1) • action spectrum is different because the seaweeds are absorbingdifferent wavelengths of light (1) • the rate of photosynthesis will therefore be different at each wavelength(1)	**ACCEPT** each pigment will reflect different wavelength (of light) description of which colour light is {reflected / absorbed}	(3)

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to three of the following: • green seaweeds found in shallow water as they {cannot absorb thegreen light / can absorb the red light} (1) • {brown / red} seaweeds can absorb {green / blue / other} wavelengths of light so are positioned further down as thesewavelengths can penetrate further (1) • seaweeds positioned so that they can absorb light for {photosynthesis / light-dependent reactions / photolysis} (1) • seaweeds positioned to avoid competition with the other types of seaweed (1)	**ALLOW** plants for seaweeds	(3)