Topic 8 Biology

Booklet 2 of 3

Revision Questions

The Eye, Tropic Responses and Phytochrome

MARK SCHEME

Question number	Answer	Mark
1(a)(i)	C	(1)

Question number	Answer	Mark
1(a)(ii)	A	(1)

Question number	Answer	Mark
1(a)(iii)	D	(1)

Question number	Answer	Mark
1(b)(i)	1. Idea that lack of (visual) stimulation limits brain development ; 2. Idea that this due to of lack of connections ; 3. within the {visual cortex / eq} / eq ; 4. Idea that the brain cannot interpret this visual information correctly / eq ; 5. reference to critical {period / window} ; 6. idea that mice are different from humans ;	(3)

Question number	Answer	Mark
1(b)(ii)	1. Idea that embryo supplies cells ; 2. Idea that some people have {ethical / eq} objections to the use of embryonic cells / eq ; 3. Idea of objections to the use of animals ; 4. Idea of risk of stem cells becoming cancerous ;	(2)

Question number	Answer	Mark
1(c)(i)	1. Idea that (cerebral hemisphere) is the site of vision perception ; 2. reference to visual cortex / eq ; 3. idea that stem cells differentiate ; 4. this treatment will help to establish (neurone) connections / eq ; 5. Idea that can not get stem cells to this location any other way (than injection) ;	(2)

Question number	Answer	Mark
1(c)(ii)	1. reduce number of variables / to keep all variables constant / eq ; 2. so that only the effect of the {treatment / eq} is measured / eq ;	(2)

Question Number	Answer	Mark
5 (a)(i)	{pigment / eq} at back of eye absorbs light / no light is reflected out (from the choroid) ;	**(1)**

Question Number	Answer	Mark
5 (a)(ii)	1. circular muscles contract (and radial muscles relax) to {constrict / eq} pupil ; 2. radial muscles contract (and circular muscles relax) to {dilate / eq} pupil ; 3. need for fine control of aperture to allow pupil to be reset to a different size / allow changing to take account of varying light intensity ; 4. (these) muscles can only shorten / eq ; 5. antagonistic muscles have opposite effects / eq ; 6. idea that contraction of one muscle set stretches the other ;	**(3)**

Question Number	Answer	Mark
5 (a)(iii)	1. details of impulse e.g. depolarisation / eq ; 2. reference to bipolar {neurone / cell / eq} ; 3. reference to sensory neurone / eq ; 4. reference to optic nerve ; 5. reference to {motor / eq} neurone connected to (radial) muscles ; 6. reference to contraction of radial muscle ;	**(3)**

Question Number	Answer	Mark
5 (b)	1. has an effect on nervous system of iris / eq ; 2. radial muscles contract / eq ; 3. idea of prevention of pupil constriction ; 4. larger aperture / pupil dilates / eq ; 5. letting more light in / eq ; 6. (so) can see {more / all / eq} retina ;	**(3)**

Question Number	Answer	Mark
5 (c)	1. retinol and retinal are very similar in structure / eq ; 2. idea of retinol is needed to make retinal / eq ; 3. idea that shortage of retinol in diet leads to less retinal ; 4. in rods ; 5. idea that this leads to reduced vision in {low light / at night / eq} ;	**(3)**

Question Number	Answer	Mark
1(a)(i)	B ;	**(1)**

Question Number	Answer	Mark
1(a)(ii)	D ;	**(1)**

Question Number	Answer	Mark
1(a)(iii)	A ;	**(1)**

Question Number	Answer	Mark
1(a)(iv)	D ;	**(1)**

Question Number	Answer	Mark
1(a)(v)	A ;	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)	1. Ideas of (muscles) work antagonistically ; 2. circular muscle relaxes ; 3. radial muscle contracts;	ACCEPT 2 stretched	**(2)**

Question Number	Answer	Additional Guidance	Mark
4 (a)	1. idea that opsin uncouples from the (rod cell) cell surface membrane ; 2. trans retinal {converts / eq} to cis retinal ; 3. rhodopsin is (re)formed / eq ; 4. from opsin and retinal ; 5. idea that this results in dark adaptation ; 6. permeability of the cell surface membrane to Na^+ increases / eq ; 7. hyperpolarisation of cell decreases / eq ; 8. (more) neurotransmitter is released / eq ;	**NB IGNORE** ***references to bipolar neurone responses*** **IGNORE** reference to retinol **6. ACCEPT** Na^+ {enters /channels unblocked / channels open} **7. ACCEPT** (partial) depolarisation / reduced potential difference **8. ACCEPT** glutamate for neurotransmitter	**(5)**

Question Number	Answer	Additional Guidance	Mark
4 (b)(i)	1. mean peak voltage increases as light intensity increases up to 9 AU / eq ; 2. idea of {non linear increase / increase decreases} ; 3. no further increase in change in mean peak voltage as light intensity increases from 9AU / eq ;	**IGNORE** speed references **2. ACCEPT** greatest change is mean peak voltage is when light intensity increases from 1 to 3	**(2)**

Question Number	Answer		Mark
4 (b)(ii)	*As light intensity increases up to 9AU* 1. idea that the greater the light intensity, the less {neurotransmitter/eq} there is binding to the neurone present ; 2. idea that inhibition removed e.g. (more) Na^+ channels open, (more) Na^+ diffuses into neurone ; 3. so peak voltage of depolarisation becomes more positive / eq ; *At high light intensities (from 9AU) :* 4. idea of no {neurotransmitter/eq} binding ; 5. sufficient Na^+ enters / eq ; 6. so action potential achieved ;	**NB ACCEPT** glutamate for neurotransmitter **ACCEPT** converse for decreasing light intensity **3 ACCEPT** increasing depolarisation **5 ACCEPT** threshold potential achieved	**(4)**

Question Number	Answer	Additional Guidance	Mark
4(c)	1. idea of rats have rights ; 2. rats made {blind/ eq } ; 3. 15 samples may not be sufficient for a reliable investigation / eq ; 4. idea that rat retina may not behave like human retina (so investigation has no (potential) medical application) ;	1. **ACCEPT** lack of consent given 2. **ACCEPT** harmed, causes pain, requires killing rats 4. **ACCEPT** tissue culture available	(2)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	1. opsin ; 2. retinal / eq ;	**2. DO NOT ACCEPT** retinol	(2)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	1. increasing day length reduces the amount of rhodopsin per eye / eq ; 2. idea of linear relationship ;	1. ACCEPT negative correlation 2. IGNORE manipulation of figures	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)	the rats choose to avoid light areas (when the day length is long) **Or** (when the days are long) the rats { have their eyes shut / are asleep } for part of the daylight hours / eq ;	ACCEPT rats are nocturnal	(1)

Question Number	Answer	Additional Guidance	Mark
6(c)	1. the rat will have {more hours of darkness / longer nights} / eq ; 2. rod cells work well in low light levels / eq ; 3. rats need to be able to see (in dark) to {find food / avoid predators} / eq ;	2. ACCEPT better vision in dark / dim light	(3)

Total for Question 6 = 8 MARKS

Question Number	Answer	Mark
2(a)(i)	between 7 and 8 hours / 8 hours ;	(1)

Question Number	Answer	Mark
2(a)(ii)	1. idea of not enough time (in the dark) ; 2. idea that {Pfr /active phytochrome} levels remain too high ; 3. reference to threshold e.g. once Pfr below a certain level (flowering happens) ; 4. flowering {stimulated / eq} (by fall in Pfr) ;	max (2)

Question Number	Answer	Mark
2(b)	1. reference to control ; 2. idea of comparison e.g. to show that flowering would not happen (without the cover) / eq ;	(2)

Question Number	Answer	Mark
2(c)	1. six hours too short (to cause flowering in plant E) / eq ; 2. eight hours {is long enough / causes flowering / eq} ; 3. idea of enough stimulus if part of the plant is in the dark for {8 hours / long time / enough time / eq} ; 4. leaf is (photo) receptor / eq ; 5. {phytochrome / Pfr / Pr} in leaves ; 6. signal must be passed to {growing points/site of flower production} from leaves / eq ;	max (4)

Question Number	Answer	Mark
2(d)	1. idea of {flowering / development /eq} happens at the right time ; 2. therefore flowers when insects available / leaf fall in autumn / same species flower at the same time / seeds germinate at the right time / eq ; 3. idea that day length changes to a set pattern e.g. always {short days in winter / long days in summer} ; 4. comparison with other less regular stimuli e.g. temperature ;	max (3)

Question Number	Answer	Mark
2(a)	shoot bends to right /eq ;	**(1)**

Question Number	Answer	Mark
* 2(b) QWC	(QWC - Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) 1. reference (photo)tropism ; 2. light causes {redistribution / eq} of {auxin / IAA / eq} ; 3. high concentration {away from light / in block B} / eq ; 4. (auxin / eq) diffuses (down) into shoot ; 5. stimulates cell elongation / eq ; 6. description of change in cell e.g. fewer cross links in cellulose, cell wall more plastic, acidification, stimulation of enzyme production, vacuolation ; 7. {side away from / eq} light longer / eq ;	**(4)**

Question Number	Answer	Mark
2(c)	1. both chemical / eq ; 2. both transported away from production site / eq ; 3. comparison of mechanism of transport described e.g. diffusion in plants, blood system in animals ; 4. speed of action compared e.g. slower in plants, some animal hormones are faster ; 5. duration of effect compared e.g. some animal hormones have a shorter term effect ; 6. idea that this plant response involves {growth / cell elongation} only e.g. animal hormones do not just affect growth ; 7. comparison of stimuli ;	**(4)**

Question Number	Answer	Mark
3(a)	(leave it) in the dark / eq ;	**(1)**

Question Number	Answer	Mark
3 (b)(i)	1. mass higher in A (compared with B) for both studies ; 2. the difference is less in repeat study ; 3. comparative manipulation of data e.g. 13g decrease for A to B for original and 5 g for repeat ; 4. mass lower in repeats (of both A and B) / eq ;	**(3)**

Question Number	Answer	Mark
3(b)(ii)	1. { increase / eq} in stem length ; 2. correct manipulation of the data e.g. by 23cm / 18.4% ; 3. reference to {taller / faster growing / eq} seedling ; 4. to receive {more light / higher red light / eq} / to maximize photosynthesis / eq ; 5. idea of allows {active phytochrome / eq} to be made ;	**(3)**

Question Number	Answer	Mark
3(b)(iii)	1. less red light {increases / eq} mean stem length / more far red light increases stem length / eq ; 2. the (significant) difference in mean stem length is not due to {chance / eq} / eq ; 3. the mean length for repeat was close to the original ; 4. suggesting it is likely to be reliable ;	**(3)**

Question Number	Answer	Additional guidance	Mark
6(a) (i)	(cut shoot) without IAA present / without agar blocks ;	ACCEPT - agar block with no IAA, empty agar block, agar block with water ACCEPT - auxin(s) as alternative to IAA	**(1)**

Question Number	Answer	Additional guidance	Mark
6(a) (ii)	1. (both sides of) shoot taller / eq ; 2. than the control / eq ; 3. both IAA's diffuse {down / out of agar / to zone of elongation} / eq ; 4. reference to cell elongation / eq ; 5. details of cell elongation / eq ; 6. shoot bends to the right / eq ; 7. (due to) more growth on {left side of shoot / side with artificial IAA} / eq ;	ACCEPT - auxin as alternative to IAA throughout ACCEPT 1 – grow {taller/higher/up/ towards the light} ACCEPT 3 – away from the light/agar block ACCEPT 6 - bends away from side with artificial IAA	**(5)**

Question Number	Answer	Additional guidance	Mark
6(b)	1. idea that IAA enters the cell ; 2. reference to movement within cell / IAA in cytoplasm to nucleus ; 3. effect when binds to transcription factor e.g. forms a transcription initiation complex or countering an inhibitor ; 4. reference to switching on gene ; 5. activity at promoter region / eq ; 6. allows formation of (m)RNA / eq ; 7. idea of translation produces protein ;	ACCEPT - auxin as alternative to IAA throughout ACCEPT 3 - joins to promoter region or activates transcription factor ACCEPT 5 – ref to RNA polymerase activity	**(4)**

Question Number	Answer	Mark
5(a)(i)	B (between 12 and 15 hours) ;	(1)

Question Number	Answer	Mark
5(a)(ii)	D (phytochrome) ;	(1)

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	any two of the following standardised: water / eq mineral ion concentrations / eq light intensity / eq wavelength of light CO_2 concentration, temperature pH soil type ;	IGNORE seed ACCEPT named mineral ion	(2)

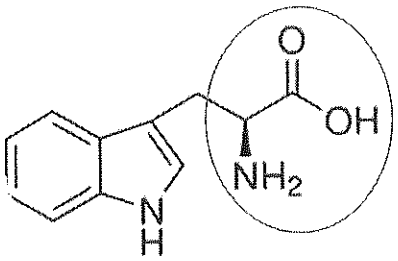
Question Number	Answer	Additional Guidance	Mark
5(a)(iv)	idea of using shorter time intervals e.g. 1 hour intervals ;	ACCEPT a description e.g. repeat with 12 hours of light, 13 hours, etc Ignore ref to more data collected unqualified	(1)

Question Number	Answer	Additional Guidance	Mark
5(b)	any one from: temperature water availability the {wavelength / quality} of light intensity of light {edaphic / named edaphic} factor ;	IGNORE ref to pollinators	(1)

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	outer segment / internal membranes / inner membranes / vesicles ;	IGNORE ref to top, end, outer layer	(1)

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	Any two correct for 1 mark ;	IGNORE blank boxes IGNORE hybrid tick/crosses (✓)	(3)

Description	Statement		
	Opsin binds to the rod cell membrane	Rhodopsin bleaches	ATP used
Rhodopsin responding to light	✓	✓	×
Rhodopsin being reset	×	×	✓

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	NH_2 and COOH groups are circled ;	ACCEPT one or more circles Only NH_2 and COOH groups should be circled 	(1)

Question Number	Answer	Mark
3(a)(ii)	**3(a)(ii). The only correct answer is B** ***A*** *is not correct because proteins do not contain ester bonds* ***C*** *is not correct because proteins do not contain glycosidic bonds* ***D*** *is not correct because proteins do not contain phosphodiester bonds*	(1)

Question Number	Answer	Additional Guidance	Mark
3(b)	1. idea that substrate binds to (complementary) active site ; 2. idea that bonds are broken in intermediate **Or** idea that ketone group is removed ;	**1. ACCEPT** ES Complex formed **2. ACCEPT** (C)=O or =O or C=O or CO for ketone group	**(2)**

Question Number	Answer	Mark
3(c)(i)	**The only correct answer is D** ***A*** *is not correct because the light dependent reaction is one of the stages of photosynthesis* ***B*** *is not correct because photolysis is the splitting of a molecule using energy from light* ***C*** *is not correct because photophosphorylation is the addition of a phosphate group to a molecule using energy from light*	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	1. IAA moves away from light / there is more IAA on the darker side of the stem / eq ; 2. (H) bonds between cellulose molecules weakened / broken / eq ; 3. the cells elongate due to {uptake of water / turgor pressure / eq} / eq ; 4. IAA causes (more) cell elongation (on the dark side of the stem) / eq ;	2. ACCEPT cell walls become {less rigid / more stretchy} / eq	(4)

Total for Question 3 = 9 MARKS