PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



MARK SCHEME

TOPIC 2: CELLS AND CONTROL (PACK 4)

SCORE	PERCENTAGE
/58	%

STEMUP

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Mark Scheme

Q1.

	Answer	Acceptable answers	Mark
(i)	A description including **three** of the following points: • cell divides / cell division / cell		**(3)**

	splits(1) • two cells produced (1) • (both) diploid (1) • (both) cells are genetically identical (1)	credit correct reference to stages of mitosis: DNA replication / chromosomes duplicate (1) Chromosomes line up along the equator / middle of the cell (1) chromosomes pulled to either end of cell (1) cytokinesis / cytoplasm splits (1)	
(ii)	A description including three of the following points: • ref (to many) cell divisions / eq (1) • growth (1) • ref to differentiation / specialisation (1) • ref to stem cells (1)	accept: gets bigger / larger accept: become specific cells	**(3)**

Q2.

	Answer	Acceptable answers	Mark
(i)	A – nucleus (1) B – myelin (sheath) (1) C – axon (1)	A – cell body B – Schwann cell / fatty layer	**(3)**
(ii)	C - effectors		**(1)**

Q3.

	Answer	Acceptable answers	Mark
(i)	A – nucleus (1) B – myelin (sheath) (1) C – axon (1)	A – cell body B – Schwann cell / fatty layer	**(3)**
(ii)	C - effectors		**(1)**

Q4.

Question number	Answer	Additional Guidance	Mark
(i)	cortex /cerebral {hemisphere/cortex} / cerebrum	accept parietal lobe reject cerebellum	**(1)** AO1(1)

Question number	Answer	Additional Guidance	Mark
(ii)	0.15 ÷ 100 = 0.0015 (1) 134 250 ÷ 0.0015 = 89 500 000 (1) 8.95×10^7 or 9.0×10^7 OR 134 250 ÷ 0.15 = 895 000 (1) 895 000 × 100 = 89 500 000 (1) 8.95×10^7 or 9.0×10^7 OR 100 ÷ 0.15 = 666.67 (1) 666.67 x 134250 = 89 500 000 (1) 8.95×10^7 or 9.0×10^7	award full marks for correct answer accept 8.9×10^7 / accept 89.5×10^6 / 89 500 000 for 2 marks accept 8.95×10^5 or 9.0×10^5 for 2 marks	**(3)** AO2(1)

Q5.

Question number	Answer	Additional guidance	Mark
(i)	sensory (neurone)	accept phonetically correct misspellings	**(1)** **AO1 1**

Question number	Answer	Mark
(ii)	B cell body dendron **The only correct answer is B** **A** *is not correct because P is the cell body* ***C*** *is not correct because P is the cell body* ***D*** *is not correct because Q is the dendron*	**(1)** **AO1 1**

Q6.

Question number	Answer	Additional guidance	Mark
(i)	sensory (neurone)	accept phonetically correct misspellings	**(1)** **AO1 1**

Question number	Answer	Mark
(ii)	B cell body dendron **The only correct answer is B** **A** *is not correct because P is the cell body* ***C*** *is not correct because P is the cell body* ***D*** *is not correct because Q is the dendron*	**(1)** **AO1 1**

Q7.

	Answer	Acceptable answers	Mark
a(i)	A – nucleus (1) B – myelin (sheath) (1) C – axon (1)	A – cell body B – Schwann cell / fatty layer	**(3)**

a(ii)	C - effectors		**(1)**
b(i)	(67 + 60+ 62) = 189 (1) (189) / 3 ans = 63 (ms) (1)	Two marks for correct bald answer ECF for incorrect calculation carried out correctly.	**(2)**
b(ii)	An explanation to include the following points: alcohol is a depressant (1) slows down the activity of the brain (1) (slows down) neurotransmission (1) (slows down) transmission at the synapse (1)	**Reject**stimulant (no further marks awarded) **Ignore**references to CNS accept sedative accept: slows reactions / reactions take longer / reaction time increases	**(2)**

Total for question = 8 marks

Q8.

	Answer	Acceptable answers	Mark
a(i)	A – nucleus (1) B – myelin (sheath) (1) C – axon (1)	A – cell body B – Schwann cell / fatty layer	**(3)**
a(ii)	C - effectors		**(1)**
b(i)	(67 + 60+ 62) = 189 (1) (189) / 3 ans = 63 (ms) (1)	Two marks for correct bald answer ECF for incorrect calculation carried out correctly.	**(2)**
b(ii)	An explanation to include the following points: alcohol is a depressant (1) slows down the activity of the brain (1) (slows down) neurotransmission (1) (slows down) transmission at the synapse (1)	**Reject**stimulant (no further marks awarded) **Ignore**references to CNS accept sedative accept: slows reactions / reactions take longer / reaction time increases	**(2)**

Total for question = 8 marks

Q9.

	Answer	Acceptable answers	Mark
(i)	• height / growth increases until 15/18 (years old) (1) • height / growth starts to level off / plateau / slows down after 15/18 (1)	Accept increases and then levels off / height increases (until 20) for 1 mark ecf on figures quoted Accept growth stops after 18	**(2)**
(ii)	• 155 / 155.5 – 132 / 132.5 (cm) (1) • answer between 22 and 23.5 (cm) (1)	Two marks for correct bald answer ecf 2 marks cannot be awarded if mp 1 not correct	**(2)**
(iii)	An explanation linking two points • 95% will be smaller / that height or smaller OR 5% will be taller / at that height or taller (1) • at that age (1)		**(2)**

Q10.

	Answer	Acceptable answers	Mark
(i)	• height / growth increases until 15/18 (years old) (1) • height / growth starts to level off / plateau / slows down after 15/18 (1)	Accept increases and then levels off / height increases (until 20) for 1 mark ecf on figures quoted Accept growth stops after 18	**(2)**
(ii)	• 155 / 155.5 – 132 / 132.5 (cm) (1) • answer between 22 and 23.5 (cm) (1)	Two marks for correct bald answer ecf 2 marks cannot be awarded if mp 1 not correct	**(2)**

(iii)	An explanation linking two points • 95% will be smaller / that height or smaller OR 5% will be taller / at that height or taller (1) • at that age (1)		**(2)**

Q11.

Question Number	Answer	Acceptable answers	Mark
	A description linking four of the following {receptor} detects a stimulus (1) sensory neurone passes (impulse)to {relay neurone / spinal cord / CNS} (1) relay neurone in spinal cord /CNS (1) relay neurone passes (impulse) onto motor neurone (1) motor neurone passes (impulse) to {effector / muscle /gland} (1) {effector / muscle /gland} initiates response (1)	accept sensory neurone to motor neurone for 1 mark	**(4)**

Q12.

Question Number	Answer	Acceptable answers	Mark
	A description linking four of the following {receptor} detects a stimulus (1) sensory neurone passes (impulse)to {relay neurone / spinal cord / CNS} (1) relay neurone in spinal cord /CNS (1) relay neurone passes (impulse) onto motor neurone (1) motor neurone passes (impulse) to {effector / muscle /gland} (1) {effector / muscle /gland} initiates response (1)	accept sensory neurone to motor neurone for 1 mark	**(4)**

Q13.

Question Number	Answer	Acceptable answers	Mark
	D haploid and haploid		**(1)**

Q14.

Question Number	Answer	Acceptable answers	Mark
	D haploid and haploid		**(1)**

Q15.

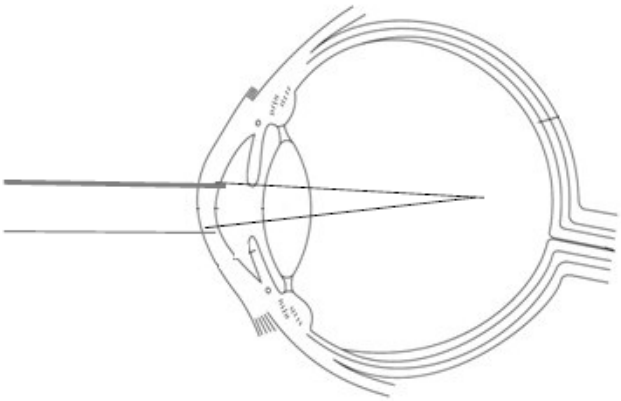
	Answer	Acceptable answers	Mark
(a)(i)	0.5 / 0.5 picogram	Accept: 0.5 picograms accept: the same (mass) as the sperm cell	**(1)**
(a)(ii)	**C** haploid		**(1)**
(a)(iii)	**A** thymine with adenine, cytosine with guanine		**(1)**
(a)(iv)	weak hydrogen bonds / hydrogen bonds / hydrogen (1)	H (bond)	**(1)**
(b)(i)	A description including **three** of the following points: • cell divides / cell division / cell splits(1) • two cells produced (1) • (both) diploid (1) • (both) cells are genetically identical (1)	credit correct reference to stages of mitosis: DNA replication / chromosomes duplicate (1) Chromosomes line up along the equator / middle of the cell (1) chromosomes pulled to either end of cell (1) cytokinesis / cytoplasm splits (1)	**(3)**
(b)(ii)	A description including three of the following points: • ref (to many) cell divisions / eq (1) • growth (1) • ref to differentiation / specialisation (1) • ref to stem cells (1)	accept: gets bigger / larger accept: become specific cells	**(3)**

Q16.

	Answer	Acceptable answers	Mark

(a)(i)	0.5 / 0.5 picogram	Accept: 0.5 picograms accept: the same (mass) as the sperm cell	**(1)**
(a)(ii)	**C** haploid		**(1)**
(a)(iii)	**A** thymine with adenine, cytosine with guanine		**(1)**
(a)(iv)	weak hydrogen bonds / hydrogen bonds / hydrogen (1)	H (bond)	**(1)**
(b)(i)	A description including **three** of the following points: • cell divides / cell division / cell splits(1) • two cells produced (1) • (both) diploid (1) • (both) cells are genetically identical (1)	credit correct reference to stages of mitosis: DNA replication / chromosomes duplicate (1) Chromosomes line up along the equator / middle of the cell (1) chromosomes pulled to either end of cell (1) cytokinesis / cytoplasm splits (1)	**(3)**
(b)(ii)	A description including three of the following points: • ref (to many) cell divisions / eq (1) • growth (1) • ref to differentiation / specialisation (1) • ref to stem cells (1)	accept: gets bigger / larger accept: become specific cells	**(3)**

Q17.

Question number	Answer	Mark
i)	 the rays converging (1) rays meeting at a point before the retina (1)	(2)

Question number	Answer	Mark
ii)	An explanation that combines application of knowledge (1 marks) and reasoning/justification – application of understanding (1 mark): • laser used to reshape the cornea/lens (1) • so that light rays are refracted on to the retina (1)	(2)

Question number	Answer	Mark
iii)	B	(1)

Q18.

	Answer	Acceptable answers	Mark
(i)	0.5 / 0.5 picogram	Accept: 0.5 picograms accept: the same (mass) as the sperm cell	(1)
(ii)	**C** haploid		(1)
(iii)	**A** thymine with adenine, cytosine with guanine		(1)
(iv)	weak hydrogen bonds / hydrogen	H (bond)	(1)

	bonds / hydrogen (1)		

Q19.

	Answer	Acceptable answers	Mark
(i)	0.5 / 0.5 picogram	Accept: 0.5 picograms accept: the same (mass) as the sperm cell	**(1)**
(ii)	**C** haploid		**(1)**
(iii)	**A** thymine with adenine, cytosine with guanine		**(1)**
(iv)	weak hydrogen bonds / hydrogen bonds / hydrogen (1)	H (bond)	**(1)**

Q20.

Question Number	Answer	Additional Guidance	Mark
(i)	{CT / PET} scanning	accept MRI / X-ray	**(1)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description including two from: • brain is protected by skull (1) • it is difficult to access (1) • nerves do not {repair / regenerate} (1) • the risk of damage to the brain (1)	accept bone for skull accept must not damage healthy cells/can cause side effects	**(2)** **AO1 1**

Q21.

Question number	Answer	Additional Guidance	Mark
	(makes cell division) uncontrolled	accept idea of cell division being rapid / increased ignore references to mutation / tumour	**(1)** **A01 1**

Q22.

Question number	Answer	Additional Guidance	Mark
	(makes cell division) uncontrolled	accept idea of cell division being rapid / increased ignore references to mutation / tumour	**(1)** **A01 1**

Q23.

Question Number	Answer	Mark
(i)	structure A – dendron / dendrite structure B – nucleus answers must be in the correct order	**(2)**

Question Number	Answer	Acceptable answers	Mark
(ii)	**B** ☒ electrical impulses		**(1)**

Question Number	Answer	Acceptable answers	Mark
(iii)	A description to include: **insulates** the (electrical) impulse / **insulates** the {axon / neurone} (from surrounding tissue) (1) allows quicker (electrical) conductance (1)	accept: speeds up transmission / sends {impulses / signals} faster ignore references to protection of the axon ignore reference to messages	**(2)**

Question Number	Answer	Mark
iv	synapse(s) / synaptic cleft / synaptic gap	**(1)**

Q24.

Question Number	Answer	Mark
(i)	structure A – dendron / dendrite structure B – nucleus answers must be in the correct order	**(2)**

Question Number	Answer	Acceptable answers	Mark
(ii)	**B** ☒ electrical impulses		**(1)**

Question Number	Answer	Acceptable answers	Mark
(iii)	A description to include: **insulates** the (electrical) impulse / **insulates** the {axon / neurone} (from surrounding tissue) (1) allows quicker (electrical) conductance (1)	accept: speeds up transmission / sends {impulses / signals} faster ignore references to protection of the axon ignore reference to messages	**(2)**

Question Number	Answer	Mark
iv	synapse(s) / synaptic cleft / synaptic gap	**(1)**

Q25.

Question number	Answer	Mark
	An answer that combines points of interpretation and evaluation to provide a logical description: • the chromosomes are split (1) • then the chromatids are pulled to either side of the cell (1) • by spindle fibres (1)	**(3)**

Q26.

	Answer	Acceptable answers	Mark
(i)	(67 + 60+ 62) = 189 (1) (189) / 3 ans = 63 (ms) (1)	Two marks for correct bald answer ECF for incorrect calculation carried out correctly.	**(2)**
(ii)	An explanation to include the following points: alcohol is a depressant (1) slows down the activity of the brain (1) (slows down) neurotransmission (1) (slows down) transmission at the synapse (1)	**Reject** stimulant (no further marks awarded) **Ignore** references to CNS accept sedative accept: slows reactions / reactions take longer / reaction time increases	**(2)**

Q27.

	Answer	Acceptable answers	Mark
(i)	(67 + 60+ 62) = 189 (1) (189) / 3 ans = 63 (ms) (1)	Two marks for correct bald answer ECF for incorrect calculation carried out correctly.	**(2)**
(ii)	An explanation to include the following points: alcohol is a depressant (1) slows down the activity of the brain (1) (slows down) neurotransmission (1) (slows down) transmission at the synapse (1)	**Reject** stimulant (no further marks awarded) **Ignore** references to CNS accept sedative accept: slows reactions / reactions take longer / reaction time increases	**(2)**

Q28.

Question number	Answer	Additional guidance	Mark
(i)	Change the subject of the equation: time = distance ÷ speed (1) Conversion of mm to m: 47 ÷ 1000 = 0.047(m) (1) Substitution: 0.047 ÷ 75 = 0.0006267 (seconds) **OR** Change the subject of the equation: time = distance ÷ speed (1) Conversion of m to mm: 75 x 1000 = 75000 (mm) (1) Substitution: 47 ÷ 75000 = 0.0006267 (seconds)	award full marks for correct answer no working accept answers in standard form accept any correct rounding - 0.00063 / 0.000626(recurring) / 0.0006 accept any correct rounding - 0.00063 / 0.000626(recurring) / 0.0006 accept answers in standard form	**(3)** **AO2 1**

Question number	Answer	Mark
(ii)	A cerebral hemispheres **The only correct answer is A** ***B*** *is incorrect because the occipital lobe is not located in the medulla oblongata* ***C*** *is incorrect because the occipital lobe is not located in the cerebellum* ***D*** *is incorrect because the occipital lobe is not located in the hypothalamus*	**(1)** **AO1 1**

Question number	Answer	Mark
(iii)	(eye)sight / vison / seeing / being able to see	**(1)** **AO2 1**

Q29.

Question number	Answer	Mark
	interphase	(1)

Q30.

Question number	Answer	Mark
	D	(1)

Q31.

Question Number	Answer	Acceptable answers	Mark
(i)	**C** ☒ hypothalamus		**(1)**

Question Number	Answer	Acceptable answers	Mark
(ii)	An explanation linking **four** of the following: vasodilation occurs when the body is hot (1) blood vessels near the surface of the skin widen / the blood vessels increase the amount of blood flow near the surface of the skin (1) vasoconstriction occurs when the body is cold (1) blood vessels near the surface narrow /the blood vessels reduce the blood flow near the surface of the skin (1)	accept: description of shunt valve (1)	**(4)**

Q32.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	Correct substitution i.e. (-0.5 ÷ 10.3) x 100 (1) - 4.85 / - 4.9	Accept data correctly put into other acceptable methods. Accept answer with more decimal places eg: - 4.8543 / - 4.854368932 Full marks for correct bald answer award max of one mark if negative is not written eg 4.85 / 4.9	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	better / easier / more valid comparison can be made between values /can make more valid conclusion / because the original / starting masses of potato were not the same / Idea of easier to visualise the size of the change	Ignore makes the results / test reliable / accurate	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description including the following: • Produce two (daughter) cells • which are **genetically** identical • and diploid	Accept DNA for chromosomes throughout Also credit details of the process of mitosis chromosomes replicates (1) spindle fibres form / chromosomes attached to spindle (1) Chromosomes arranged on equator / middle of cell / chromosomes pulled apart /pulled to poles /separation of sets of chromosomes (1) Idea of nucleus reforming / New cell wall formed (to divide cell) / cytokinesis / description of cytokinesis (1)	**(3)**

Question Number		Indicative Content	Mark
QWC	* **(c)**	A explanation to include some of the following points • active transport requires energy • (active transport moves mineral ions) from the soil • into root (hair cells) • reference to pumps (in the cell membranes) • from a low concentration to a high concentration/against their concentration gradient • reference to mineral ions / mineral salts accept named minerals eg nitrates • diffusion is a passive process • gases diffuse from high to low concentration/down their concentration gradient • gas exchange in the leaf occurs by diffusion • carbon dioxide diffuses in • to air spaces in leaves / into cells • for photosynthesis / produces glucose • oxygen diffuses in • for respiration	**(6)**

Level	**0**	No rewardable content
1	**1 - 2**	• a limited explanation that gives information about active transport **OR** diffusion in the correct context e.g. minerals ions are transported into root (hair cells) • 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 explanation that gives details of active transport or diffusion transporting materials e.g. carbon dioxide diffuses into leaves down their concentration gradient OR a limited explanation of both active transport and diffusion • 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 explanation that describes **both** processes e.g. active transport requires energy to transport mineral ions into the root hair cell AND carbon dioxide diffuses into the leaf for photosynthesis • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q33.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	Correct substitution i.e. (-0.5 ÷ 10.3) x 100 (1) - 4.85 / - 4.9	Accept data correctly put into other acceptable methods. Accept answer with more decimal places eg: - 4.8543 / - 4.854368932 Full marks for correct bald answer award max of one mark if negative is not written eg 4.85 / 4.9	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	better / easier / more valid comparison can be made between values /can make more valid conclusion / because the original / starting masses of potato were not the same / Idea of easier to visualise the size of the change	Ignore makes the results / test reliable / accurate	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	A description including the following: • Produce two (daughter) cells • which are **genetically** identical • and diploid	Accept DNA for chromosomes throughout Also credit details of the process of mitosis chromosomes replicates (1) spindle fibres form / chromosomes attached to spindle (1) Chromosomes arranged on equator / middle of cell / chromosomes pulled apart /pulled to poles /separation of sets of chromosomes (1) Idea of nucleus reforming / New cell wall formed (to divide cell) / cytokinesis / description of cytokinesis (1)	**(3)**

Question Number		Indicative Content	Mark
QWC	* **(c)**	A explanation to include some of the following points • active transport requires energy • (active transport moves mineral ions) from the soil • into root (hair cells) • reference to pumps (in the cell membranes) • from a low concentration to a high concentration/against their concentration gradient • reference to mineral ions / mineral salts accept named minerals eg nitrates • diffusion is a passive process • gases diffuse from high to low concentration/down their concentration gradient • gas exchange in the leaf occurs by diffusion • carbon dioxide diffuses in • to air spaces in leaves / into cells • for photosynthesis / produces glucose • oxygen diffuses in • for respiration	**(6)**

Level	**0**	No rewardable content
1	**1 - 2**	• a limited explanation that gives information about active transport **OR** diffusion in the correct context e.g. minerals ions are transported into root (hair cells) • 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 explanation that gives details of active transport or diffusion transporting materials e.g. carbon dioxide diffuses into leaves down their concentration gradient OR a limited explanation of both active transport and diffusion • 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 explanation that describes **both** processes e.g. active transport requires energy to transport mineral ions into the root hair cell AND carbon dioxide diffuses into the leaf for photosynthesis • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q34.

Question Number	Answer	Mark
(i)	B the lens gets thicker to bend the light rays more **1. The only correct answer is B** ***A** is not correct because it would not bend the light rays more.* ***C** is not correct because the light rays need to be bent more.* ***D** is not correct because the light rays need to be bent more.*	**(1)** AO 2 1

Question Number	Answer	Additional guidance	Mark
(ii)	light rays meet in front of the retina (1)	accept eye is too long/too big accept light is refracted too much	**(1)** AO 1 1

Question Number	Answer	Additional guidance	Mark
(iii)	concave /diverging / minus (lens)	ignore contact lens	**(1)** AO 1 1

Q35.

Question number	Answer	Additional guidance	Mark
	Select 45 cells in mitosis (1) (45) ÷ 89 x 100 = 50.561 (1) 50.6	Award full marks for correct answer with no working ecf for workings that show the use of an incorrect number of cells up to and including 89 cells ecf if the workings show their answer to 3 s.f.	**(3)** **A03 2ab**