PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



MARK SCHEME

TOPIC 2: CELLS AND CONTROL (PACK 3)

SCORE	PERCENTAGE
/94	%

STEMUP

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Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
	An explanation linking the following: • synapse is a gap between neurones (1) • (electrical) impulse stimulates the release of chemical (1) • neurotransmitter (1) • (chemical/neurotransmitter) **diffuses** across the {gap/synapse} (1) • **stimulates** an (electrical) impulse in the **next neurone** (1)	accept by neurotransmission (1)	**(4)** AO1(1)

Q2.

Question number	Answer	Additional guidance	Mark
	An explanation linking the following: • synapse is a gap between neurones (1) • (electrical) impulse stimulates the release of chemical (1) • neurotransmitter (1) • (chemical/neurotransmitter) **diffuses** across the {gap/synapse} (1) • **stimulates** an (electrical) impulse in the **next neurone** (1)	accept by neurotransmission (1)	**(4)** AO1(1)

Q3.

Question number	Answer	Mark
(i)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark): • measure the distance between the electrodes (1) • and using the time taken for the impulse to travel (to calculate speed) (1)	**(2)**

Question number	Answer	Additional guidance	Mark
(ii)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark): • impulses are conducted more slowly / fewer impulses transmitted (1) • {reduces / prevents} **muscle contraction** (needed for movement) / because the neurone is not insulated (1)	accept no impulses transmitted accept the role of myelin sheath is to insulate the neurone	**(2)**

Q4.

Question number	Answer	Additional guidance	Mark
	An explanation linking four of the following: • people do not finish their course (of Colistin) (1) • natural selection /evolution (occurs) (1) • some bacteria have a mutation/ (genetic) variation (1) • (these) resistant bacteria survive /resistant bacteria reproduce (1)	accept overuse / repeated exposure (to the antibiotic) accept they have evolved accept some bacteria have a {**gene/allele**} for resistance accept the non-resistant bacteria die	**(4)** AO2 1

		/ the fittest bacteria survive ignore immune bacteria	

Q5.

Question number	Answer	Additional guidance	Mark
	An explanation linking four of the following: • people do not finish their course (of Colistin) (1) • natural selection /evolution (occurs) (1) • some bacteria have a mutation/ (genetic) variation (1) • (these) resistant bacteria survive /resistant bacteria reproduce (1)	accept overuse / repeated exposure (to the antibiotic) accept they have evolved accept some bacteria have a {**gene/allele**} for resistance accept the non-resistant bacteria die / the fittest bacteria survive ignore immune bacteria	**(4)** AO2 1

Q6.

Question Number	Answer	Acceptable answers	Mark
(a)	**B** Two cells that are genetically identical		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	A description to include 2 of the following points: select a species that glows (when UV light is shone on it) (1) identify the gene location (1) cut the gene out (1) using a (restriction) enzyme (1)		**(2)**

Question Number		Indicative Content	Mark
QWC	***(b)(ii)**	a description to include some of the following: • diploid nucleus is removed from the genetically engineered cell • making a lone nucleus • a donor egg is enucleated/its nucleus is removed • the diploid nucleus from the GE cell is inserted into the enucleated egg cell • division of the nucleus is stimulated • by electric shock/chemicals • cell divides by mitosis • cells put into surrogate mother • cells divide further and differentiates to form an embryo • Tegon born and is a glow in the dark beagle The above points could be made diagrammatically, but a written description is also required.	**(6)**

Level	0	No rewardable content
1	**1 - 2**	• a limited description including at least one stage of cloning in an appropriate context • 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 stages of cloning linked sequentially in an appropriate context • 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 of most of the stages of cloning • answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q7.

Question Number	Answer	Acceptable answers	Mark
(a)	**B** Two cells that are genetically identical		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	A description to include 2 of the following points: select a species that glows (when UV light is shone on it) (1) identify the gene location (1) cut the gene out (1) . using a (restriction) enzyme (1)		**(2)**

Question Number		Indicative Content	Mark
QWC	***(b)(ii)**	a description to include some of the following: • diploid nucleus is removed from the genetically engineered cell • making a lone nucleus • a donor egg is enucleated/its nucleus is removed • the diploid nucleus from the GE cell is inserted into the enucleated egg cell • division of the nucleus is stimulated • by electric shock/chemicals • cell divides by mitosis • cells put into surrogate mother • cells divide further and differentiates to form an embryo • Tegon born and is a glow in the dark beagle The above points could be made diagrammatically, but a written description is also required.	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited description including at least one stage of cloning in an appropriate context • 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 stages of cloning linked sequentially in an appropriate context • 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 of most of the stages of cloning • answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q8.

Question number	Answer	Additional guidance	Mark
(i)	Any **one** from: • pig kidneys cannot be used in humans (1) • pig kidneys would be rejected (by humans) (1) • to prevent competition between the pig and the human organ (1) • so the human kidneys form properly (1)	 ignore so it grows human kidneys accept so there is room for the human kidneys	**(1)** **AO2 1**

Question number	Answer	Mark
(ii)	An explanation linking **two** from: • stem cells {are undifferentiated / are unspecialised / can differentiate / become specialised / form any type of cell} (1) • so can produce the {kidney / kidney cells / kidney tissue} (1) • that won't be rejected (when transplanted) (1)	**(2)** **AO1 1**

Q9.

Question number	Answer	Mark
	An explanation that combines identification – amplification of knowledge (1 mark) and reasoning / justification – application of understanding (1 mark): • stem cells can develop into specific cells / stem cells are undifferentiated / stem cells are unspecialised (1) • used to replace damaged cells (which don't otherwise regrow) (1)	**(2)**

Q10.

	Answer	Acceptable answers	Mark
(a)(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)**
(a)(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)**
(a)(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)**
(b)(i)	transcription (1)	Accept phonetic spelling	**(1)**
(b)(ii)	A		**(1)**

Q11.

	Answer	Acceptable answers	Mark
(a)(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)**
(a)(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)**
(a)(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)**
(b)(i)	transcription (1)	Accept phonetic spelling	**(1)**
(b)(ii)	A		**(1)**

Q12.

Question Number	Answer	Mark
(i)	C 215 milliseconds **The only correct answer is C** ***A*** *is not correct because the median is not 200 milliseconds* ***B*** *is not correct because the median is not 210 milliseconds* ***D*** *is not correct because the median is not 225 milliseconds*	**(1)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description including **three** from: • measure their reaction time using red squares (1) • keep everything else the same (as using blue squares) (1) • repeat measurements (for each student) (1) • calculate a mean reaction time (1) • control other variables (1)	 accept see how fast they react with red squares accept examples of other variables e.g. tiredness / environment / health	**(3)** **AO3 3a**

Q13.

Question Number	Answer	Mark
(i)	A metaphase anaphase **The only correct answer is A** ***B*** *is not correct because cell Q is not telophase* ***C*** *is not correct because cell R is not interphase* ***D*** *is not correct because cell R is not interphase*	**(1)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description including **two** from: • chromatids condense (1) • identical chromatids are joined (1) • nuclear membrane breaks down (1)	accept chromosomes condense / coil up / become visible accept chromosomes join accept nucleus breaks down accept spindle fibres form (1)	**(2)** **AO1 1**

Question Number	Answer	Mark
(iii)	cytokinesis	**(1)** **AO1 1**

Question Number	Answer	Mark
(iv)	B 75 µm **The only correct answer is B** ***A*** *is not correct because 0.75 µm is 0.00075 mm* ***C*** *is not correct because 750 µm is 0.75mm* ***D*** *is not correct because 75 000 µm is 75 mm*	**(1)** **AO1 1**

Q14.

Question Number	Answer	Mark
(i)	A metaphase anaphase **The only correct answer is A** ***B*** *is not correct because cell Q is not telophase* ***C*** *is not correct because cell R is not interphase* ***D*** *is not correct because cell R is not interphase*	**(1)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description including **two** from: • chromatids condense (1) • identical chromatids are joined (1) • nuclear membrane breaks down (1)	 accept chromosomes condense / coil up / become visible accept chromosomes join accept nucleus breaks down accept spindle fibres form (1)	**(2)** **AO1 1**

Question Number	Answer	Mark
(iii)	cytokinesis	**(1)** **AO1 1**

Question Number	Answer	Mark
(iv)	B 75 µm **The only correct answer is B** ***A*** *is not correct because 0.75 µm is 0.00075 mm* ***C*** *is not correct because 750 µm is 0.75mm* ***D*** *is not correct because 75 000 µm is 75 mm*	**(1)** **AO1 1**

Q15.

Question number	Answer	Mark
(i)	B 85 000 **The only correct answer is B** **A** *is not correct because the number of affected males is not 42 500* **C** *is not correct because the number of affected males is not 166 666* ***D*** *is not correct because the number of affected males is not 1 020 000*	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking two of the following: • allele is located on the X chromosome (1) • men are XY/have one X chromosome (1) • if they have one {recessive/affected} allele they are colour blind (1)	 ignore sex-linked ignore X/Y genes. accept the idea that if woman have one affected allele, they have a second allele/women would need two recessive alleles	**(2)** **AO2 1**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking: • 0% / he will not be colour blind (1) • he will inherit the Y chromosome from his father that does not have the allele / inherits an X chromosome from his mother with the {dominant / normal / unaffected} allele (1)		(2) AO2 1

Q16.

Question Number	Answer	Mark
(i)	D refracts light | refracts light **The only correct answer is D** ***A*** *is not correct because structure Y does not detect light* ***B*** *is not correct because structure X does not detect light* ***C*** *is not correct because structure X does not reflect light*	(1) AO1 1

Question Number	Answer	Additional Guidance	Mark
(ii)	A description including **two** from: • pupil becomes smaller (1) • the iris changes shape (1) • correct light intensity is detected by {retina / rods / cones} (1)	accept the iris get larger accept reduces the amount of light entering the eye / protects the retina	(2) AO2 1

Q17.

Question Number	Answer	Mark
(i)	C 215 milliseconds **The only correct answer is C** ***A*** *is not correct because the median is not 200 milliseconds* ***B*** *is not correct because the median is not 210 milliseconds* ***D*** *is not correct because the median is not 225 milliseconds*	**(1)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description including **three** from: • measure their reaction time using red squares (1) • keep everything else the same (as using blue squares) (1) • repeat measurements (for each student) (1) • calculate a mean reaction time (1) • control other variables (1)	 accept see how fast they react with red squares accept examples of other variables e.g. tiredness / environment / health	**(3)** **AO3 3a**

Q18.

Question number	Answer	Mark
	C cones **The only correct answer is C** ***A*** *is not correct because the iris controls the size of the pupil* ***B*** *is not correct because the lens focuses the light rays onto the retina* ***D*** *is not correct because the cornea refracts light*	**(1)** AO1 (1)

Q19.

Question Number	Answer	Mark
(i)	B $R \rightarrow Q \rightarrow S \rightarrow P$ **1. The only correct answer is B** ***A*** *is not correct because Q is after R* ***C*** *is not correct because S is after Q* ***D*** *is not correct because R is before Q and S*	**(1)** AO 3 1b

Question Number	Answer	Mark
(ii)	A anaphase **1. The only correct answer is A** ***B*** *is not correct because R is prophase* ***C*** *is not correct because P is telophase* ***D*** *is not correct because Q is metaphase*	**(1)** AO 3 1a

Question Number	Answer	Additional guidance	Mark
(iii)	Any two from: • DNA is replicated (1) • production of cell {components /proteins / organelles}(1) • {metabolic activities / cell reactions} occur / **cell** growth(1)	accept DNA duplicates /chromosomes duplicate accept sub-cellular structures / named structures chromosomes coil up / condense (1)	**(2)** AO 1 1

Q20.

Question Number	Answer	Mark
(i)	B $R \rightarrow Q \rightarrow S \rightarrow P$ **1. The only correct answer is B** ***A** is not correct because Q is after R* ***C** is not correct because S is after Q* ***D** is not correct because R is before Q and S*	**(1)** AO 3 1b

Question Number	Answer	Mark
(ii)	A anaphase **1. The only correct answer is A** ***B** is not correct because R is prophase* ***C** is not correct because P is telophase* ***D** is not correct because Q is metaphase*	**(1)** AO 3 1a

Question Number	Answer	Additional guidance	Mark
(iii)	Any two from: • DNA is replicated (1) • production of cell {components /proteins / organelles}(1) • {metabolic activities / cell reactions} occur / **cell** growth(1)	accept DNA duplicates /chromosomes duplicate accept sub-cellular structures / named structures chromosomes coil up / condense (1)	**(2)** AO 1 1

Q21.

Question number	Answer	Mark
	D	**(1)**

Q22.

Question number	Answer	Mark
(i)	D tip of the root	**(1)**

Question number	Answer	Additional guidance	Mark
(ii)	to make the {chromosomes / nucleus / DNA / cell division / stages of mitosis} visible	accept mitosis can be seen more clearly	**(1)**

Question number	Answer	Mark
(iii)	An explanation that combines identification of knowledge (2 marks) and reasoning / justification –understanding (1 mark): • start with the {lowest / X4 / X10} objective lens / magnification (1) • {use the focusing wheel / adjust the stage / alter the resolution} until the image is clear (1) • increase the magnification of / use the objective lens to 40X (to give a total magnification X400) (1)	(3)

Q23.

Question number	Answer	Mark
	interphase	(1)

Q24.

Question number	Answer	Mark
(a)	Any **three** improvements from the following: • vary the time for computer usage (1) • the activity used on the computer must be the same for each person (1) • control the intake of food/drink/drugs before and during the test (1) • repeat the test at different times of the day (1) • repeat the test using more people (1)	(3)

Question number	Answer	Additional guidance	Mark
(b)(i)	• $\frac{0.258+0.685+0.236+0.246+0.268}{5}$ = 0.339 (1) • 339 (ms) (1)	award full marks for correct numerical answer without working	(2)

Question number	Answer	Mark
(b) (ii)	• it is the median value	(1)

Q25.

Question Number	Answer	additional guidance	Mark
(i)	differentiation (1)	accept specialisation	(1) AO 2 1

Question Number	Answer		Mark
(ii)	A logical description including two of the following: • many plants produced (1) • quicker than sexual reproduction (1) • genetically identical/ clones produced (1) • with the desired characteristics (1) • plants from {endangered/rare} plants (1)	accept gives more of that plant/higher yield of that plant ignore plants grow faster obtain plants difficult to grow from seed (1)	(2) AO 1 1

Question Number	Answer	Additional guidance	Mark
(iii)	Any two from: • sterilises agar growth medium (1) • destroys unwanted {bacteria /pathogens/fungi/microorganisms/viruses} /there is no contamination (1) • so microorganisms don't {affect growth of plantlets / don't compete with plantlets/ don't use nutrients needed by plantlets} (1)	 ignore prevents microorganisms getting in accept only the plantlets grow	(2) AO 2 2

Question Number	Answer	Additional guidance	Mark
(iv)	• mutation / disease	accept different alleles/ genotypes/genetic variation	(1) AO 2 1

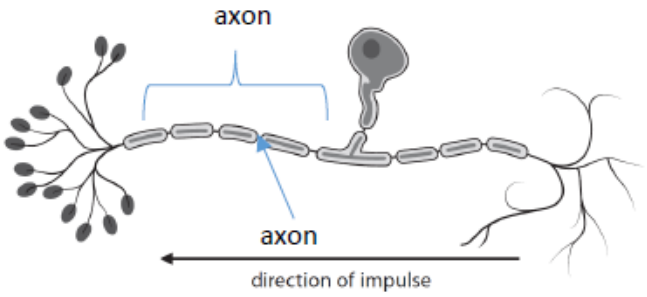
Q26.

Question number	Answer	Mark
(i)	D	(1)

Question number	Answer	Mark
(ii)	C	(1)

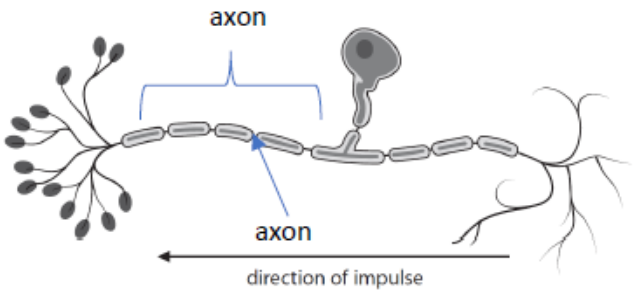
Question number	Answer	Mark
(iii)	cerebrum	(1)

Q27.

Question number	Answer	Mark
(i)	 accept label line to any part of axon as indicated ignore lines to the myelin sheath	**(1)** AO1(1)

Question number	Answer	Additional Guidance	Mark
(ii)	An answer including: • transmit **electrical** impulses (1) • from {receptors / sense organ / named sense organ} to the {CNS /brain / spinal cord / relay neurone} (1)	 accept signals/ messages for impulses accept named receptors ignore detect stimuli	**(2)** AO1(1)

Q28.

Question number	Answer	Mark
(i)	 accept label line to any part of axon as indicated ignore lines to the myelin sheath	(1) AO1(1)

Question number	Answer	Additional Guidance	Mark
(ii)	An answer including: • transmit **electrical** impulses (1) • from {receptors / sense organ / named sense organ} to the {CNS /brain / spinal cord / relay neurone} (1)	accept signals/ messages for impulses accept named receptors ignore detect stimuli	(2) AO1(1)

Q29.

Question number	Answer	Mark
(i)	D retina **The only correct answer is D** ***A*** *is incorrect because the cornea does not contain light receptor cells* ***B*** *is incorrect because the iris does not contain light receptor cells* ***C*** *is incorrect because the lens does not contain light receptor cells*	**(1)** **AO1 1**

Question number	Answer	Mark
(ii)	mitochondria / mitochondrion accept phonetic spellings	**(1)** **AO1 1**

Question number	Answer	Mark
(iii)	nucleus / nuclei accept phonetic spellings	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
(iv)	rods / rod cells	reject cones	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
(v)	A description including **two** of the following: • cell B is a cone cell (1) • involved in colour vision (1)	 accept respond to bright light / high light intensities accept responds to different {wavelengths / frequencies} of light (1)	**(2)** **AO1 1**

Q30.

	Answer	Acceptable answers	Mark
(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)**
(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)**