

BIOLOGY



EXAM QUESTION PACK

TOPIC 2: CELLS AND CONTROL (PAPER 1, PACK 1)

SCORE

/76

PERCENTAGE

%

STEMUP

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Q1.

There is a shortage of kidneys for organ transplants.

Scientists are investigating how to grow kidneys using genetically modified pig embryos.

Figure 5 shows this process.

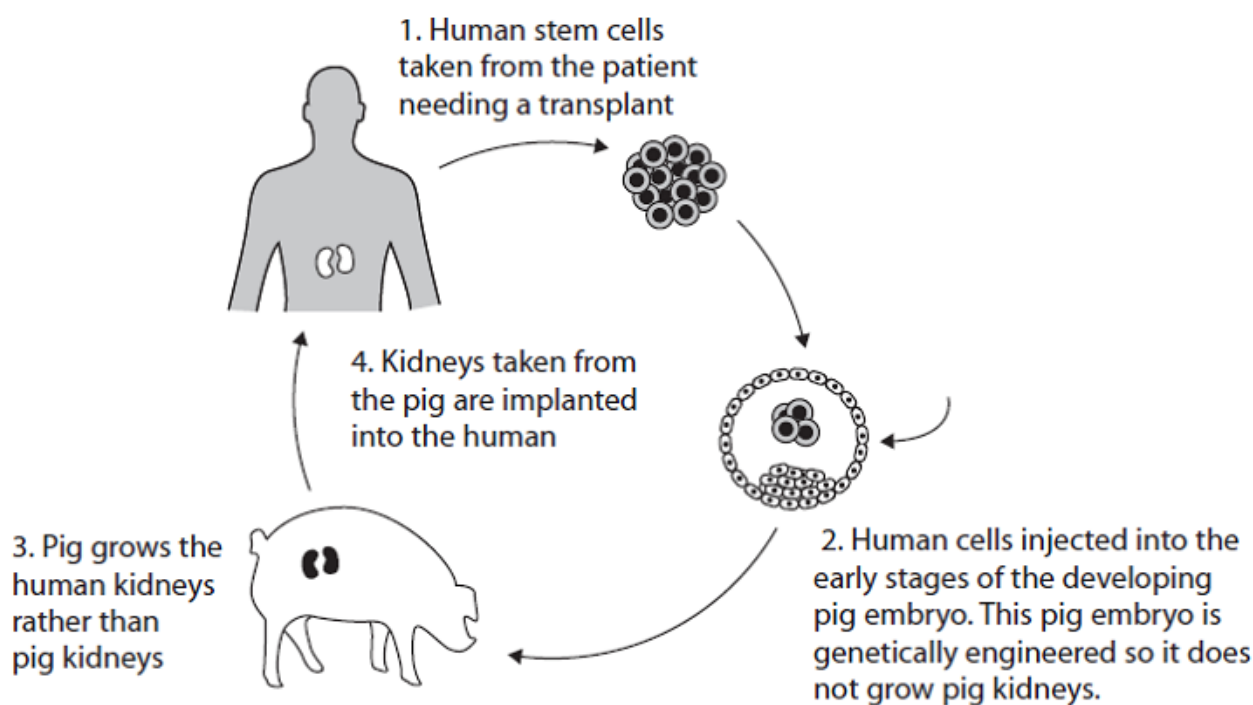


Figure 5

(i) State why the embryo of the pig must be engineered so it does not grow pig kidneys.

(1)

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(ii) Explain why human stem cells are used for this process.

(2)

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(Total for question = 3 marks)

Q2.

Figure 8 shows the number of neurones in the brain of different animals.

animal	number of neurones in the brain
lobster	1.0×10^5
frog	1.6×10^7
rat	2.0×10^8
human	8.6×10^{10}

Figure 8

(i) Calculate the difference between the number of neurones in the brain of the rat and the brain of the frog.

Give your answer in standard form.

(2)

..... neurones

(ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

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(Total for question = 5 marks)

Q3.

The reaction time of five people was tested using a computer.

These people were then given 100 cm³ of a liquid to drink.

Their reaction times were recorded 10 minutes after drinking the liquid.

Figure 6 shows the results.

person	reaction time in seconds		
	before drinking the liquid	after drinking the liquid	difference
1	0.256	0.245	-0.011
2	0.234	0.232	-0.002
3	0.268	0.259	-0.009
4	0.254	0.248	-0.006
5	0.215	0.208	-0.007

Figure 6

(i) Calculate the mean difference in reaction time.

Give your answer in milliseconds.

(2)

..... ms

(ii) The drinks manufacturer wants to advertise the effect of the drink on reaction time.

The manufacture needs to confirm the effect on reaction time by improving the investigation.

Give **two** improvements the manufacturer would need to make to this investigation.

(2)

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(Total for question = 4 marks)

Figure 5 shows how alcohol consumption increases the risk of developing liver cancer.

Someone who does not drink alcohol has a 1.0 risk of developing liver cancer.

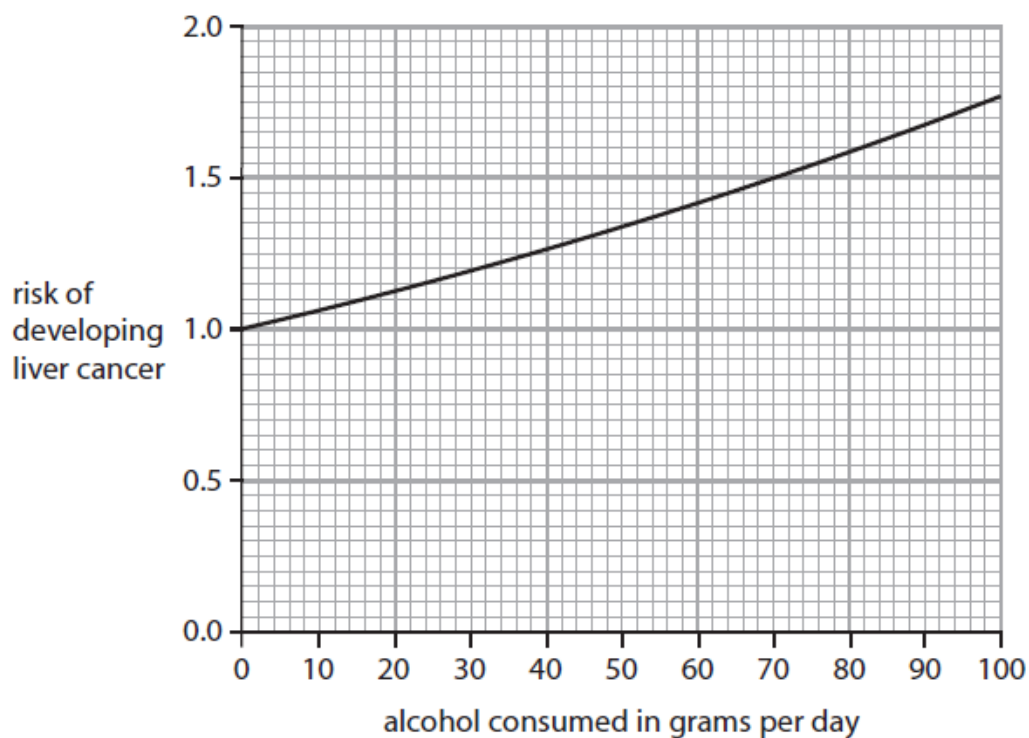


Figure 5

(i) One unit of alcohol contains 8 grams of alcohol.

Calculate the risk of developing liver cancer for someone who consumes 4 units of alcohol a day.

(2)

..... risk of developing liver cancer

(ii) Describe how cancer develops in the liver.

(2)

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(Total for question = 4 marks)

Q5.

Mitosis and meiosis are processes that produce new cells.

Compare the outcomes of mitosis and meiosis.

(3)

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(Total for question = 3 marks)

Q6.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

Figure 1 shows part of a reflex arc in the spinal cord.

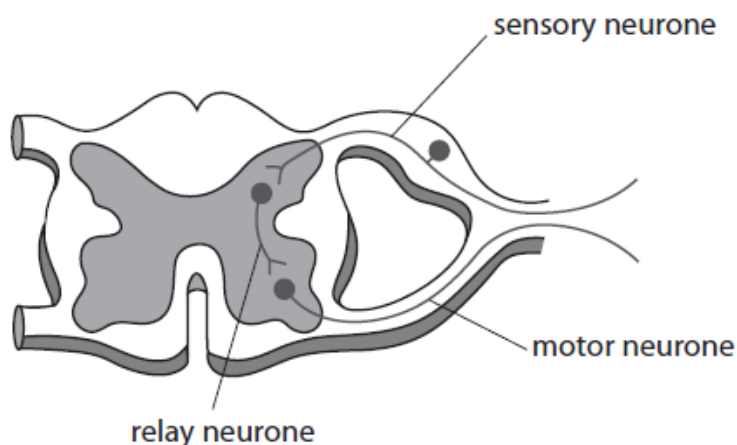


Figure 1

(i) Describe how an impulse passes from the relay neurone to the motor neurone.

(3)

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(ii) Explain the function of a reflex arc.

(2)

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(Total for question = 5 marks)

Q7.

Figure 2 shows a banana plantation.



© warmer/Shutterstock

Figure 2

After the bananas have been harvested, the old plants are cut down.

The suckers then develop into mature plants producing the next crop of bananas.

The tip of each sucker contains a group of cells called a meristem.

(i) Describe the function of a meristem in the growth of a plant.

(2)

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(ii) A student took a sample of cells from a meristem to view under a light microscope.

Describe how the student would prepare a microscope slide using these cells.

(3)

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(Total for question = 5 marks)

Q8.

In 2012, two scientists were awarded the Nobel prize for their research on stem cells.

They showed that adult cells could be reprogrammed to become cells with the properties of embryonic stem cells.

Describe the possible benefits of this research.

(3)

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(Total for question = 3 marks)

Q9.

Describe what is produced when a single cell divides by mitosis.

(3)

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(Total for question = 3 marks)

Q10.

Figure 5 shows a plant cell in anaphase of mitosis.



Figure 5

Describe what occurs during anaphase of mitosis.

(3)

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(Total for question = 3 marks)

Q11.

Arthritis is a condition that occurs when cells in joints get damaged or destroyed.

Stem cell therapy can be used to treat arthritis.

Discuss the benefits and risks of using stem cell therapy to treat arthritis.

(4)

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(Total for question = 4 marks)

Q12.

Some painkillers prevent neurotransmitters binding to receptors in a synapse.

Explain how a signal is transmitted at a synapse and how the painkillers reduce the pain felt by the person.

(6)

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(Total for question = 6 marks)

Q13.

Explain how impulses are transmitted at synapses.

(4)

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(Total for question = 4 marks)

Q14.

Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

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(Total for question = 4 marks)

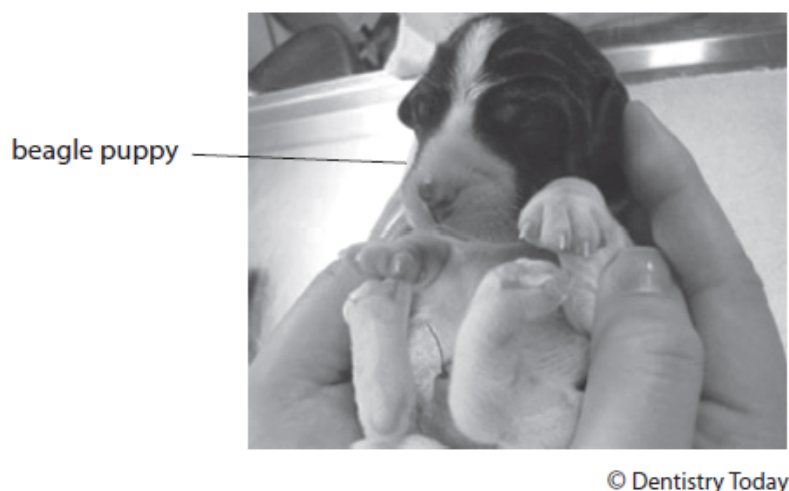
Q15.

In 2011, South Korean scientists genetically engineered a cell from a beagle.

They then cloned this cell to create a beagle.

They called this beagle Tegen.

Tegen glows in the dark when UV light is shone on him.



Cloning involves cells that divide by mitosis.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

When a cell divides by mitosis it produces

(1)

- ☐ **A** two cells that are genetically different
- ☐ **B** two cells that are genetically identical
- ☐ **C** four cells that are genetically different
- ☐ **D** four cells that are genetically identical

(b) To genetically engineer the original cell so that it would glow, the scientists had to obtain a suitable gene.

(i) Describe the stages that a scientist would complete to obtain this gene.

(2)

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*(ii) Describe the stages used in the laboratory to clone and produce Tegen from the genetically engineered cell.

(6)

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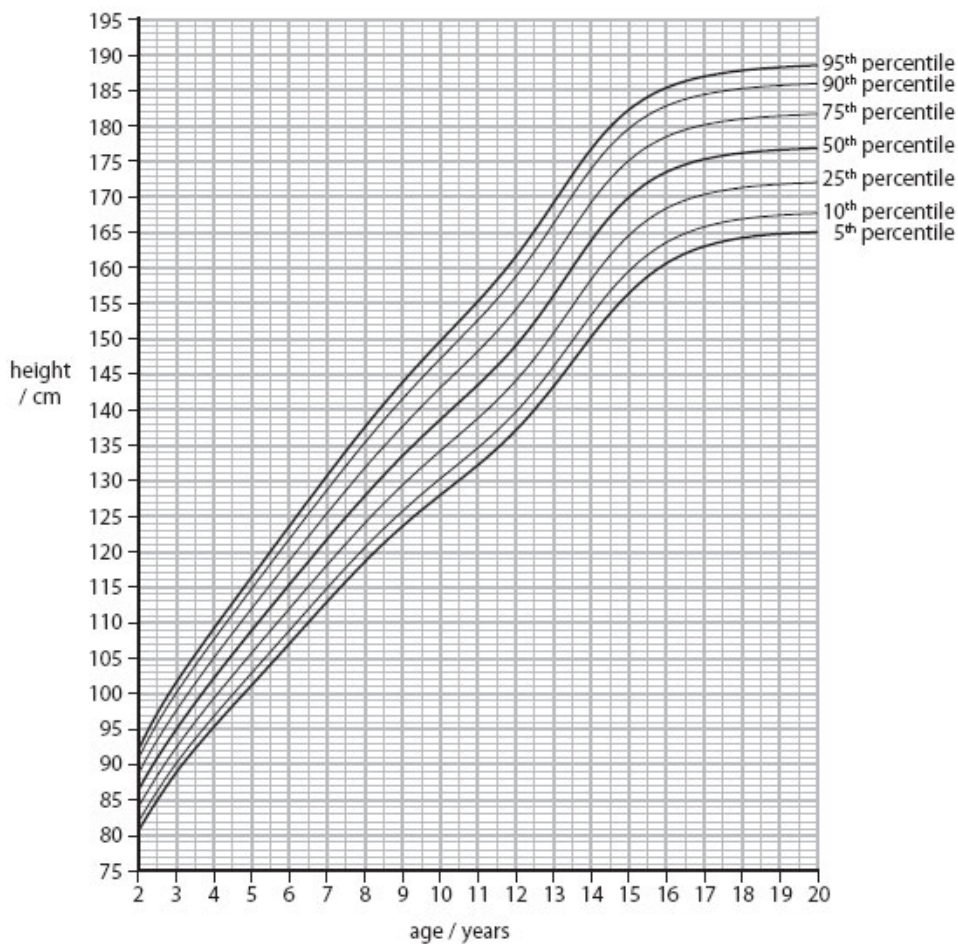
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Q16.

Height can be used to monitor growth.

(a) The graph shows a percentile chart for height for males aged between 2 and 20 years.



(i) Describe how the height of males changes from the age of 2 to 20 years.

(2)

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(ii) Calculate the difference in height of an 11 year old male in the 95th percentile and an 11 year old male in the 5th percentile.

(2)

answer = ... cm

(iii) Explain what is meant by the 95th percentile on this graph.

(2)

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(b) Protein is needed for growth.

(i) Name the first stage of protein synthesis.

(1)

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(ii) Complete the sentence by putting a cross (☐) in the box next to your answer.

The second stage of protein synthesis produces a

(1)

- ☐ **A** polypeptide made of amino acids
- ☐ **B** polypeptide made of bases
- ☐ **C** strand of mRNA made of amino acids
- ☐ **D** strand of mRNA made of bases

(Total for Question is 8 marks)

Q17.

Answer the questions with a cross in the boxes you think are correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

Figure 4 shows cells from an onion root tip as seen using a light microscope.



(Source: © Rattiya Thongdumhyu/Shutterstock)

Figure 4

(i) Identify the stages of mitosis shown in cell Q and cell R.

(1)

	cell Q	cell R
☐ A	metaphase	anaphase
☐ B	telophase	anaphase
☐ C	metaphase	interphase
☐ D	telophase	interphase

(ii) Describe **two** processes that occur in cells during prophase.

(2)

1

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2

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(iii) State the term used to describe the process which occurs after mitosis, when the cell divides into two.

(1)

.....

(iv) The diameter of one cell in Figure 4 is 0.075 mm.

Which is this diameter in μm ?

(1)

- ☐ **A** 0.75 μm
- ☐ **B** 75 μm
- ☐ **C** 750 μm
- ☐ **D** 75 000 μm

(Total for question = 5 marks)

Q18.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

A scientist investigated the reaction times of five students using a computer program.

The computer screen showed a blue square at the start.

As soon as the blue square turned yellow, each student had to press a key on the keyboard as fast as possible.

Figure 2 shows the results for the five students.

student	reaction time in milliseconds
1	245
2	200
3	210
4	215
5	225

Figure 2

(i) Which is the median result for these students?

(1)

☐ **A** 200 milliseconds

☐ **B** 210 milliseconds

☐ **C** 215 milliseconds

☐ **D** 225 milliseconds

(ii) The scientist wanted to investigate if the colours of the squares used on the computer program affected reaction time.

The computer program started with blue squares that turned into yellow squares.

Describe how the scientist could compare the reaction times of these students when they respond to red squares turning into yellow squares.

(3)

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(Total for question = 4 marks)

Q19.

Figure 11 shows four stages of mitosis, labelled P, Q, R and S.



Figure 11

(i) Which is the correct order for these stages?

(1)

☐ **A** Q → R → S → P

☐ **B** R → Q → S → P

☐ **C** R → S → Q → P

☐ **D** Q → S → R → P

(ii) The stage of mitosis labelled S in figure 11 is

(1)

☐ **A** anaphase

☐ **B** prophase

☐ **C** telophase

☐ **D** metaphase

(iii) Interphase is part of the cell cycle.

Describe what happens during interphase.

(2)

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(Total for question = 4 marks)

Q20.

During prophase of mitosis, the

(1)

☐ **A** cell elongates

- ☐ **B** cell halves in size
- ☐ **C** cytoplasm divides
- ☐ **D** nuclear membrane breaks down

(Total for question = 1 mark)

Q21.

Give the name of the phase of the cell cycle during which DNA replication takes place.

(1)

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(Total for question = 1 mark)

Q22.

Figure 9 shows a sensory neurone.

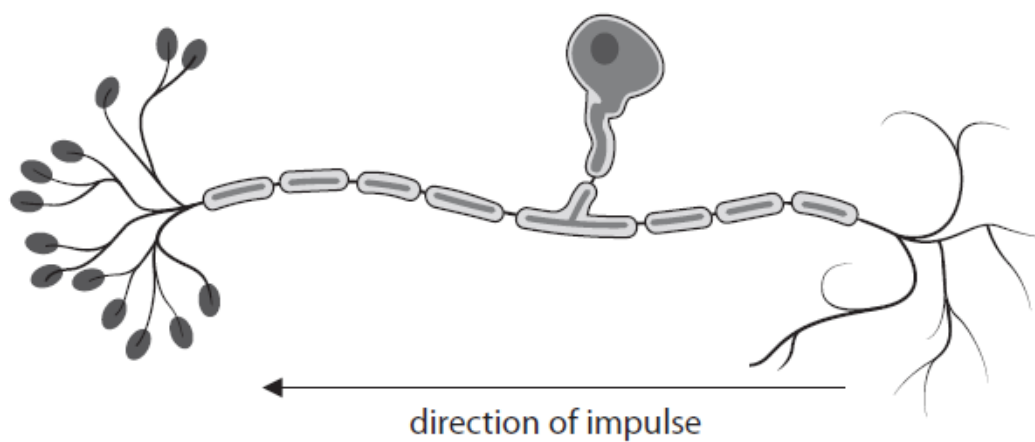


Figure 9

(i) Label the axon on Figure 9.

(1)

(ii) Describe the role of sensory neurones.

(2)

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(Total for question = 3 marks)

Q23.

Corals are animals that live on the sea bed.

The photograph shows some species of coral.



After fertilisation, mitosis takes place to form an embryo.

The embryo develops into new coral.

(i) Describe mitosis.

(3)

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(ii) Describe how the embryo develops into new coral.

(3)

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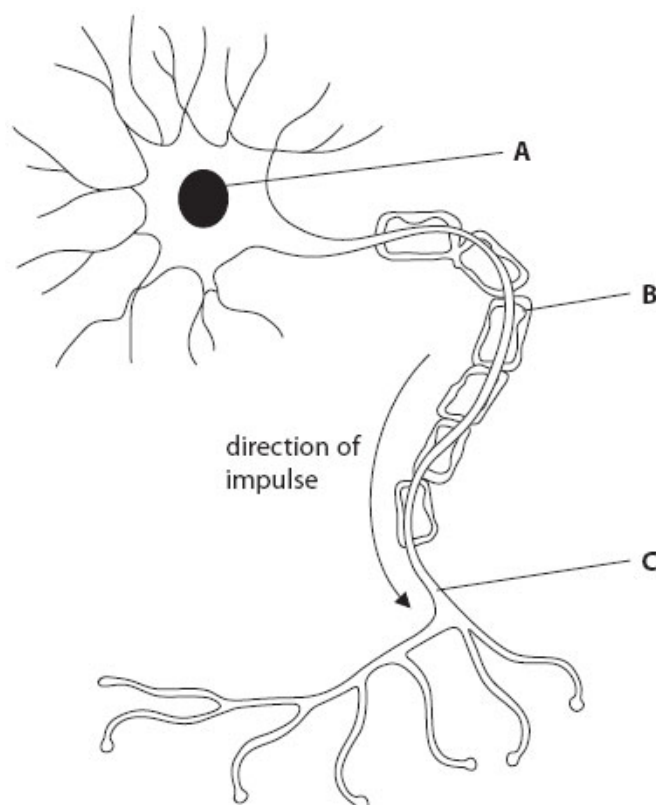
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Q24.

The diagram shows a motor neurone.



(i) Name the structures labelled **A**, **B** and **C**.

(3)

A

B

C

(ii) When the brain receives impulses from receptor cells it coordinates a response.

Complete the sentence by putting a cross (✕) in the box next to your answer.

Responses are carried out by

(1)

- ☐ **A** alleles
- ☐ **B** dendrons
- ☐ **C** effectors
- ☐ **D** senses

Q25.

Answer the question with a cross in the box you think is correct ✕. If you change your mind about an answer, put a line through the box ✕ and then mark your new answer with a cross ✕.

Figure 7 shows a neurone.

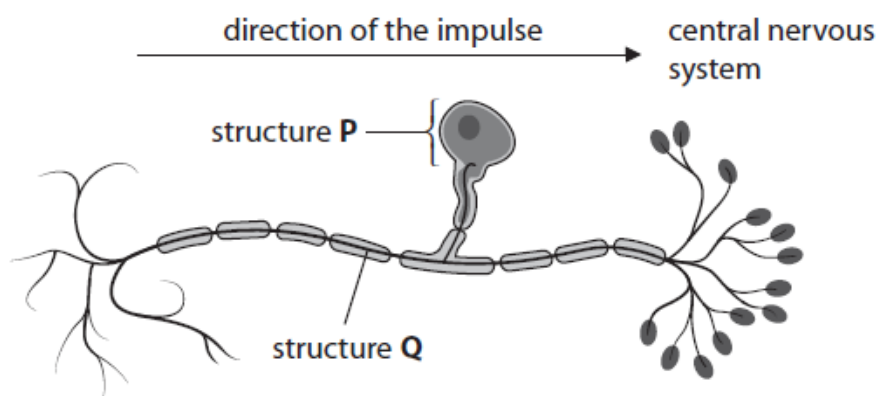


Figure 7

(i) Name the type of neurone shown in Figure 7.

(1)

(ii) Which row identifies structure **P** and structure **Q**?

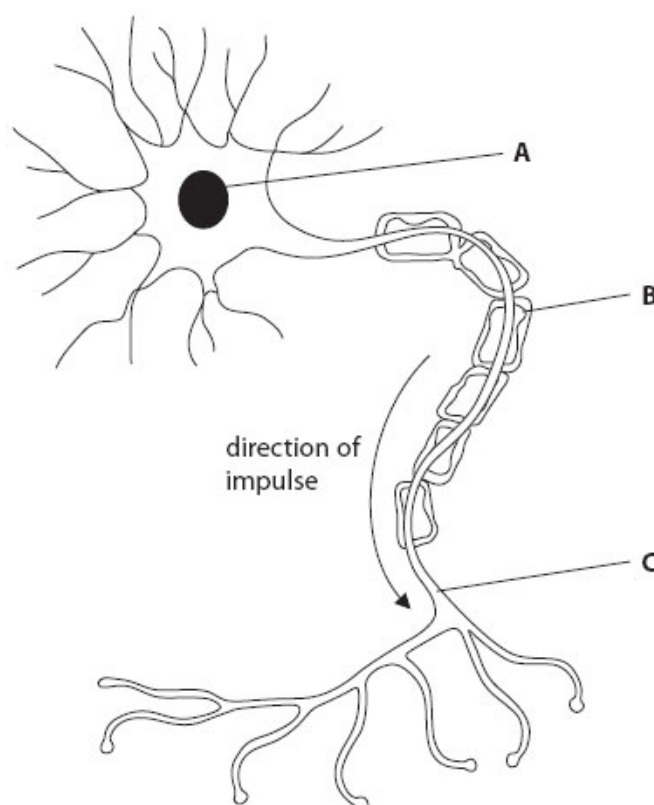
(1)

	structure P	structure Q
☒ A	myelin sheath	axon
☒ B	cell body	dendron
☒ C	myelin sheath	dendron
☒ D	cell body	axon

(Total for question = 2 marks)

Q26.

The diagram shows a motor neurone.



(a) (i) Name the structures labelled **A**, **B** and **C**.

(3)

A

B

C

(ii) When the brain receives impulses from receptor cells it coordinates a response.

Complete the sentence by putting a cross (✕) in the box next to your answer.

Responses are carried out by

(1)

- ☐ **A** alleles
- ☐ **B** dendrons
- ☐ **C** effectors
- ☐ **D** senses

(b) A response can be affected by drugs.

The effect of drinking alcohol on reaction time was investigated using five adult volunteers A, B, C, D and E.

After drinking a number of units of alcohol, the reaction time for each volunteer was measured three times.

The results are shown in the table.

		Reaction time / ms			
Volunteer	Number of units of alcohol drunk	1 st attempt	2 nd attempt	3 rd attempt	Mean
A	0.5	34	38	27	33
B	1.5	36	47	40	41
C	3.0	59	62	59	60
D	4.5	67	60	62	
E	6.0	80	68	83	77

(i) Calculate the mean reaction time for volunteer D.

(2)

Answer ms

(ii) Explain why alcohol causes a change in reaction time.

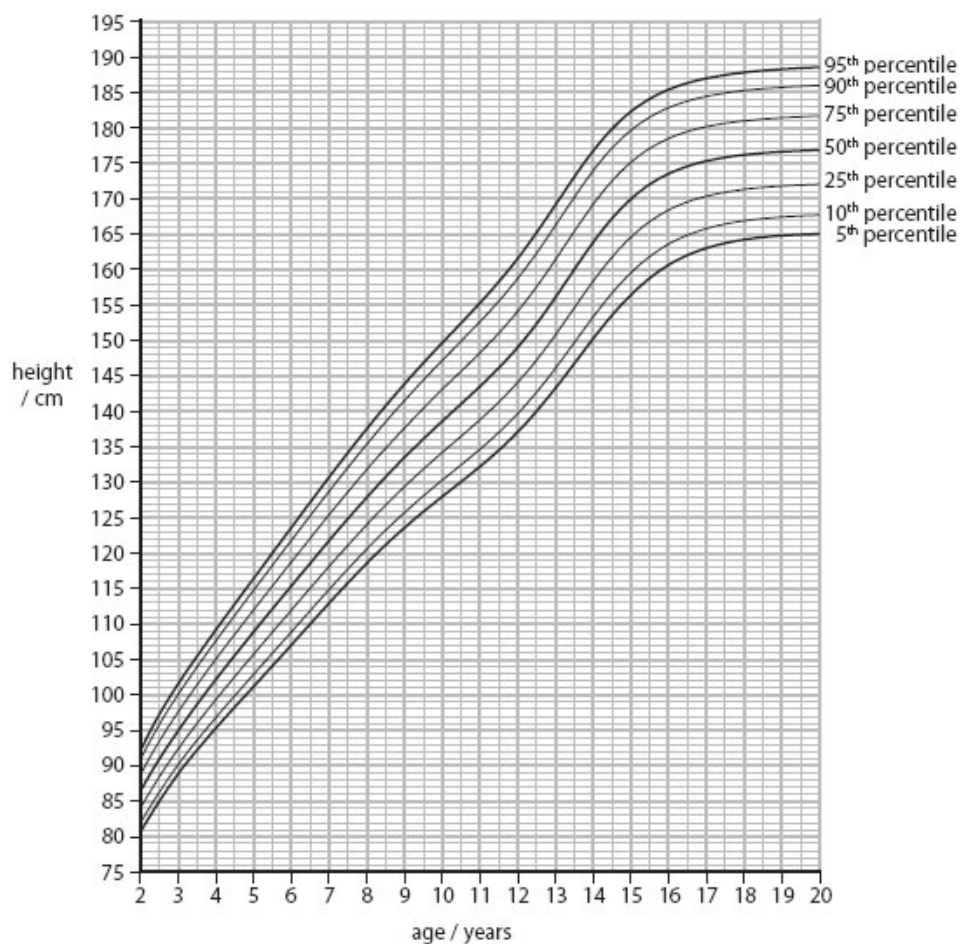
(2)

(Total for Question is 8 marks)

Q27.

Height can be used to monitor growth.

The graph shows a percentile chart for height for males aged between 2 and 20 years.



(i) Describe how the height of males changes from the age of 2 to 20 years.

(2)

.....

(ii) Calculate the difference in height of an 11 year old male in the 95th percentile and an 11 year old male in the 5th percentile.

(2)

answer = ... cm

(iii) Explain what is meant by the 95th percentile on this graph.

(2)

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Q28.

Humans have reflexes.

Describe the route of an impulse through a reflex arc.

(4)

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Mark Scheme

Q1.

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) A02 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) A01 1

Q2.

Question number	Answer	Additional Guidance	Mark
(i)	$2.0 \times 10^8 - 1.6 \times 10^7 /$ $200\,000\,000 - 16\,000\,000 / 184$ $000\,000 (1)$ $1.84 \times 10^8 / 1.8 \times 10^8$	award full marks for correct answer accept 18.4×10^7 or 18×10^7 for 1 mark	(2) AO2(1)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking: • (myelination) speeds up impulses (1) • insulates the {axon/neurone} (1) • motor neurones transmit information from the CNS / motor neurones transmit information to effectors / neurones in the brain connect to other neurones in the brain (1) • (motor neurones) transmit information over a greater distance (than neurones in the brain) (1)	accept signals/messages for impulses accept brain/spinal cord/relay neurone for CNS accept muscles/ glands for effectors accept idea that motor neurones can be part of a reflex so need quick impulses (1)	(3) AO2(1)

Q3.

Question number	Answer	Additional guidance	Mark
(i)	$0.035 \div 5 = 0.007$ (1) $7 / -7$ (ms)	award two marks for correct answer with no working accept $0.033 \div 4 = 0.008$ for 1 mark if working shown accept $8 / -8$ (ms) for 2 marks if working shown. allow ecf for incorrect mean converted into ms for 1 mark	(2) AO2 1

Question number	Answer	Additional guidance	Mark
(ii)	Any two from: - test the drink on more people / different people (1) - more repeats on the same people (1) - repeat using different volumes of the drink (1) - repeat using different times between drinking and the test (1) - repeat the experiment with just water (1) - control other environmental factors/named factors (1)	accept different amounts accept use a control/use a placebo accept tiredness/health/drug intake/food intake	(2) AO3 3b

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	$(8 \times 4) = 32$ (grams of alcohol) (1) $1.2 / 1.20$ (x risk)	award full marks for the correct answer with no workings	(2) AO3

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer including two from: • mutations in DNA (1) • cell division is uncontrolled (1) • leading to the formation of a tumour / growth / mass of cells (1)	accept change in the gene/cell mutates accept {rapid / continuous} cell division	(2) AO2 1

Q5.

Question number	Answer	Additional Guidance	Mark
	Any three from: • mitosis produces 2 cells and meiosis produces 4 cells (1) • mitosis produces genetically identical cells and meiosis produces genetically different cells (1) • mitosis produces diploid cells and meiosis produces haploid cells (1) • mitosis produces body cells and meiosis produces {gametes /sex cells} (1)	accept offspring for cells mitosis is involved in asexual reproduction and meiosis is involved in sexual reproduction (1)	(3) AO1 1

Q6.

Question Number	Answer	Additional guidance	Mark
(i)	A description including three from: - the impulse (in the relay neurone) triggers the release of a chemical (1) - neurotransmitter (1) (neurotransmitter) diffuses (1) - across the synapse (1) - new impulse triggered in {motor neurone / next neurone} (1)	accept chemical messenger accept across the gap	(3) AO1 1

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation linking two from: - a process that occurs in response to danger (1) - which bypasses the {brain / parts of the brain} / is an {involuntary process / subconscious process} (1) - so there is a faster transmission (of electrical impulses) / faster response / allows a quick reaction (1) - to protect the body from harm (1)	accept goes to the spinal cord accept react without thinking accept examples of actions to protect the body e.g. pulling hand away	(2) AO1 1

Q7.

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

Q8.

Question Number	Answer	Additional guidance	Mark
	Any three from: • have the potential to produce any cell type (1) • no need to use embryonic stem cells (1) • less chance of patient rejecting their own cells (1) • used to treat conditions which are currently incurable / used for cell transplants /used to replace faulty cells (1)	accept can turn into many cell types /pluripotent /totipotent accept embryos do not need to be killed accept named conditions e.g Parkinson's / diabetes ignore references to cloning body parts / replace organs / treat cancer unless qualified	(3) AO 2 1

Q9.

Question number	Answer	Additional guidance	Mark
	A description including three from: • two cells (1) • diploid cells / same number of chromosomes as parent cell (1) • genetically identical cells (1) • body cells (1)	accept 23 pairs of chromosomes / 46 chromosomes accept cells for growth / repair	(3) A01 1

Q10.

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)

Q11.

Question Number	Answer	Additional Guidance	Mark
	An answer including four from: Benefits (maximum 2 marks): - stem cells can differentiate / become specialised (1) - replace (damage) cells (1) - reduce symptoms of arthritis (1) Risks (maximum 2 marks): - new cells do not function correctly (1) - stem cells continue to divide (1) - risk of side effects / symptoms worsen / rejecting cells (1)	accept can become {joint cells / any type of cell} accept repair damaged joints accept cell division could develop into cancer accept may have to take medication to prevent rejection / suppress immune system	(4) AO2 1

Question number	Indicative content	Mark
	AO2 (6 marks) Synapse transmission • neurones transmit electrical impulses • the synapse is a gap between 2 neurones • triggering the release of neurotransmitters • which diffuse across the synapse • as a chemical signal • neurotransmitters bind to receptors on the next neurone • triggering an electrical impulse in the next neurone Painkillers • prevent neurotransmitters binding to receptors in the next neurone • electrical impulse is not triggered • signal is not received by the central nervous system • person does not feel pain	(6)

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

Level	Mark	Descriptor
Level 1	1-2	A simple explanation of how messages are transmitted either over the synapse or along the neurone Linked to the effect of painkillers
Level 2	3-4	At least one link between how messages are transmitted between the neurone and the synapse or across the synapse Linked to the effect of painkillers
Level 3	5-6	A detailed description of how messages are passed across the synapse Linked to the effect of painkillers binding to receptors

Level	Mark	Examples of possible responses
	0	No rewardable material.
Level 1	1	Messages are passed along neurones as electrical impulses
	2	A synapse is a gap between neurones and the painkillers prevent the pain message getting through to the brain
Level 2	3	Synapses are gaps between neurones. Neurotransmitters diffuse across the gap to the next neurone.
	4	Synapses are gaps between neurones. Neurotransmitters diffuse across the gap to the next neurone. The painkillers bind to receptors stopping the message being passed on to the CNS so the person does not feel pain.
Level 3	5	Synapses are gaps between neurones. The electrical impulse reaches the synapse and causes neurotransmitters to diffuse across the gap to the next neurone. A new impulse is initiated in the next neurone.
	6	Synapses are gaps between neurones. The electrical impulse reaches the synapse and causes neurotransmitters to diffuse across the gap to the next neurone. A new impulse is initiated in the next neurone. The painkillers prevent the neurotransmitters binding to the next neurone, so a new impulse is not generated and the message is not passed to the CNS.

Q13.

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)

Q14.

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

Q15.

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

Q16.

	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)

Q17.

Question Number	Answer	Mark
(i)	A metaphase anaphase The only correct answer is A <i>B is not correct because cell Q is not telophase</i> <i>C is not correct because cell R is not interphase</i> <i>D is not correct because cell R is not interphase</i>	(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 <i>A is not correct because 0.75 μm is 0.00075 mm</i> <i>C is not correct because 750 μm is 0.75mm</i> <i>D is not correct because 75 000 μm is 75 mm</i>	(1) AO1 1

Q18.

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

Question Number	Answer	Mark
(ii)	A anaphase 1. The only correct answer is A <i>B is not correct because R is prophase</i> <i>C is not correct because P is telophase</i> <i>D is not correct because Q is metaphase</i>	(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

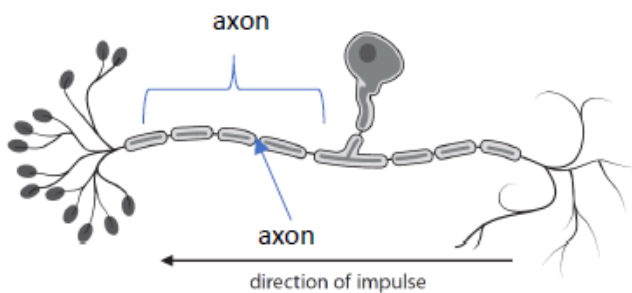
Q20.

Question number	Answer	Mark
	D	(1)

Q21.

Question number	Answer	Mark
	interphase	(1)

Q22.

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)

Q23.

	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 <u>genetically</u> 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)

Q24.

	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)
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Q25.

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 <i>A is not correct because P is the cell body</i> <i>C is not correct because P is the cell body</i> <i>D is not correct because Q is the dendron</i>	(1) AO1 1

Q26.

	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) $(189) / 3 \text{ ans} = 63 \text{ (ms)}$ (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	Reject stimulant (no further marks awarded) Ignore references to CNS accept sedative	

(1)	accept: slows reactions / reactions take longer / reaction time increases	(2)
(slows down) neurotransmission (1)		
(slows down) transmission at the synapse (1)		

Total for question = 8 marks

Q27.

	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)

Q28.

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)