

**2019 HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION**



BIOLOGY

General Instructions

- Reading time 5 minutes
- Working time – 3 hours
- Write using black pen
- Write student number on each page
- Multiple Choice to be completed on attached answer sheet back page
- Draw diagrams using pencil
- For questions in section II, show all relevant working
- NESA approved calculators may be used

Total marks: 100

Section I – 20 marks (pages 2-12)

- Attempt Questions 1-20
- Allow about 35 minutes for this section

Section II - 80 marks (pages 13- 24)

- Attempt Questions 21 – 33
- Allow about 2 hours and 25 minutes for this section

Section I

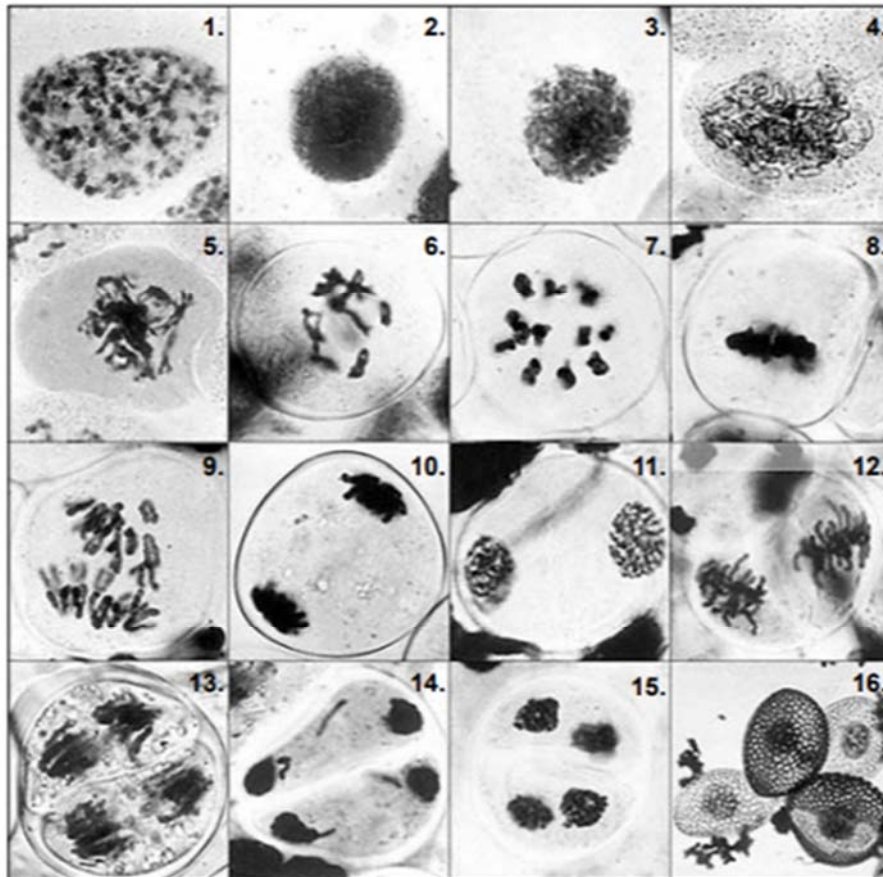
20 marks

Attempt Questions 1 -20

Allow about 35 minutes for this section

Use the multiple choice answer sheet for Questions 1 – 20

1. The following images show stages in meiosis in the order in which they occur



Source: Radboud University Nijmegen, Faculty of Science,
www.vcbio.science.ru.nl (Virtual Classroom Biology)

Which one of the following statements is correct?

- A. During the stage shown in image 12, crossing over occurs.
- B. After the stage shown in image 12, cells are haploid.
- C. During the stage shown in image 11, DNA will be replicated.
- D. Homologous chromosomes pair up in the stage shown in image 2.

2. The following is a sequence of amino acids located within a polypeptide:

– Asn – Gly – Pro –

The table below shows the base triplets in mRNA for amino acids.

		<i>Second Base</i>					
		U	C	A	G		
<i>First Base</i>	U	Phe	Ser	Tyr	Cys	<i>Third Base</i>	U
		Phe	Ser	Tyr	Cys		C
		Leu	Ser	Stop	Stop		A
		Leu	Ser	Stop	Trp		G
	C	Leu	Pro	His	Arg		U
		Leu	Pro	His	Arg		C
		Leu	Pro	Gln	Arg		A
		Leu	Pro	Gln	Arg		G
	A	Ile	Thr	Asn	Ser		U
		Ile	Thr	Asn	Ser		C
		Ile	Thr	Lys	Arg		A
		Met	Thr	Lys	Arg		G
	G	Val	Ala	Asp	Gly		U
		Val	Ala	Asp	Gly		C
		Val	Ala	Glu	Gly		A
		Val	Ala	Glu	Gly		G

Using the table provided, the DNA template sequence that could code for this amino acid sequence is:

- A. TTG / GTT / GGT
- B. TTU / CCC / GGT
- C. UUG / CCC / GGU
- D. TTG / CCC / GGT

3. In garden pea plants, *Pisum sativum*, the shape of the pods can be inflated or constricted, while the colour of the pods can be yellow or green.



Source (both): jara3000/Shutterstock.com

Experiment 1: Pea plants homozygous for inflated pods were crossed with pea plants homozygous for constricted pods. The offspring were then crossed among themselves.

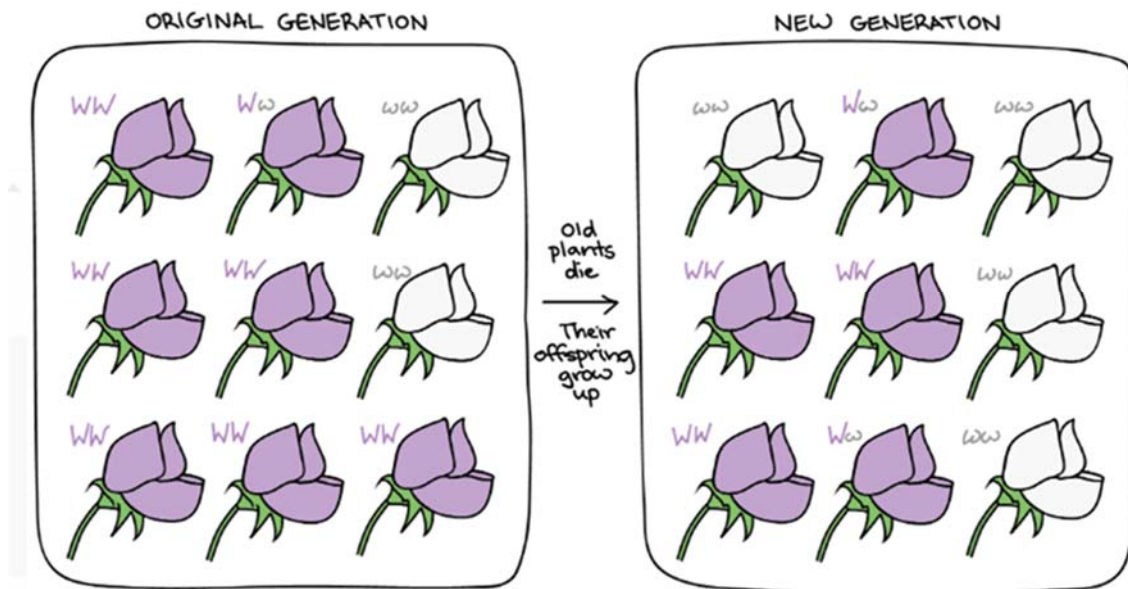
Experiment 2: Pea plants homozygous for yellow pods were crossed with pea plants homozygous for green pods. The offspring were then crossed among themselves. The resulting phenotypic data for the F₂ generations from each experiment are shown below.

Experiment 1		Experiment 2	
Shape of pod	Number of offspring in F ₂	Colour of pod	Number of offspring in F ₂
inflated	882	yellow	152
constricted	299	green	428
Total	1181	Total	580

Based on the data, it can be stated that in garden peas that

- A. further crosses are required to determine the nature of pod colour inheritance.
- B. inflated pod shape is dominant to constricted pod shape.
- C. pod colour and shape are co-dominant characteristics.
- D. green pod colour is recessive to yellow pod colour.

4. Mendel studied a gene that controls flower colour in pea plants. This gene comes in a white allele, w , and a purple allele, W . Each pea plant has two gene copies, which may be the same or different alleles. When the alleles are different, the dominant allele, W may hide the recessive allele, w .

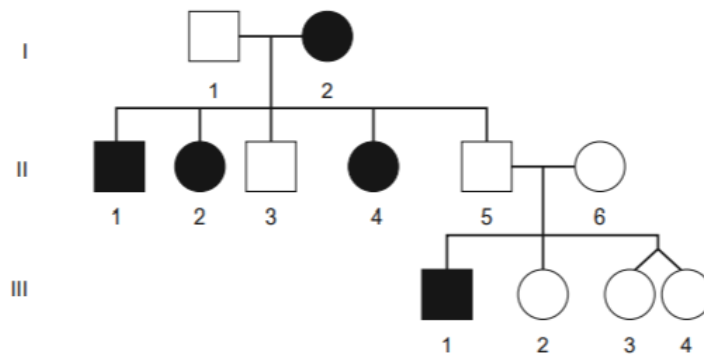


Use the diagrams to calculate the allele frequency of the W allele in the original generation and the w allele in the new generation.

Which is the correct frequency of the alleles?

	Frequency of allele W	Frequency of allele w
A	13/18	10/18
B	7/18	5/18
C	9/18	7/18
D	5/18	13/18

5. A pedigree chart of an inherited characteristic is shown below.



The correct mode of inheritance of the trait is:

- A. X-linked dominant
 - B. X-linked recessive
 - C. Autosomal dominant
 - D. Autosomal recessive
6. Which of the following is true of a somatic mutation?
- A. It is not passed onto offspring
 - B. It is when a mutation occurs in sex cells
 - C. It is present in all of the cells in an organism
 - D. It only occurs in one type of cell in the body.
7. Advances in DNA technology have made it possible to carry out genetic screening for particular genetic diseases. Many people may decide not to have children based on the result of their genetic screening. This decision will
- A. alter the frequency of an allele and will, therefore, have an impact on future human evolution.
 - B. have no impact on future human evolution since the genes or DNA are not altered in the testing.
 - C. increase genetic variation in the human population and will, therefore, have an impact on future human evolution.
 - D. result in complete loss of an allele from a population and will, therefore, have an impact on future human evolution.

- 8.** Artificial insemination is a modern reproductive technology that is widely used in agriculture. The sperm of a selected animal is collected and used to fertilise a large number of females.

Which one of the following is the main advantage to farmers of this technology?

- A. It increases the genetic diversity in an agricultural species.
- B. It allows for the production of offspring with desired characteristics.
- C. It ensures that all of the offspring are identical to the high quality male.
- D. It can allow for the production of more vigorous offspring by mixing sperm from several different males.

- 9.** Which of the following is true of mutations that occur in coding DNA?

- A. Affect the type or sequence of amino acids in a polypeptide.
- B. Will always have a neutral effect so have no impact on the phenotype.
- C. Are responsible for checking the order of amino acids in a polypeptide.
- D. Have no effect on amino acids as they do not play a part in polypeptide synthesis.

- 10.** Fertilisation is a process that leads to genetic variation in organisms. One way to explain this is:

- A. Fertilisation is not a random combination of gametes.
- B. Fertilisation is a process that brings somatic cells together.
- C. Fertilisation involves a combination of gametes with the same alleles.
- D. Fertilisation is a combination of gametes with a number of alleles for a particular gene.

- 11.** Amoxicillin is used against a number of infections in humans. Amoxicillin prevents the synthesis of the cell walls of bacteria. From this information, it is correct to state that amoxicillin is:

- A. A vaccine
- B. An antibiotic
- C. An antiviral drug
- D. A DNA polymerase

12. An example of a non-specific response by the immune system is:

- A. Production of memory T cells.
- B. Phagocytes engulfing non-self material.
- C. Cloning of B cells to produce plasma cells
- D. Cytotoxic T cells releasing chemicals into infected cells.

13. Which of the following is an example of quarantine used to control the spread of disease?

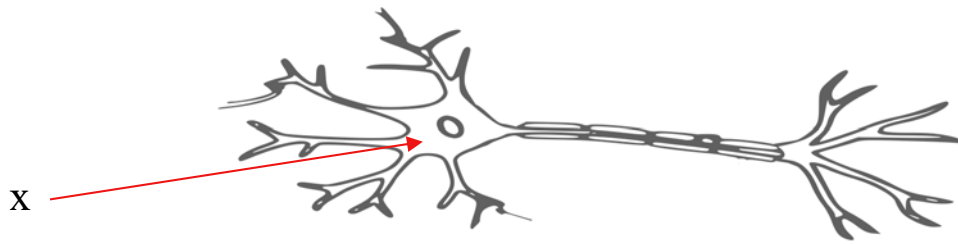
- A. Sterilisation of all food products before packaging.
- B. Installation of hand sanitisers in all commercial kitchens.
- C. Removal of all fruit from cars entering disease-free orchards.
- D. Killing weeds in infested forests using herbicides and direct removal.

14. Dengue fever is a widespread disease in southeast Asia. In Australia, north Queensland is the only region where people can contract Dengue Fever. Cases of Dengue Fever in the remainder of Australia only occur when people infected overseas return to Australia.

Which of the following is the best explanation for the lack of new infections in the southern states of Australia?

- A. The widespread use of antibiotics in Australia.
- B. The lack of mosquito vectors in the southern states.
- C. The colder weather inactivates the Dengue pathogen.
- D. The higher population densities of people in southern states.

15. The diagram below shows a microscopic view of a neurone.



The structure labelled X is the:

- A. Synapse
- B. Cell body
- C. Myelin Sheath
- D. Axon terminal

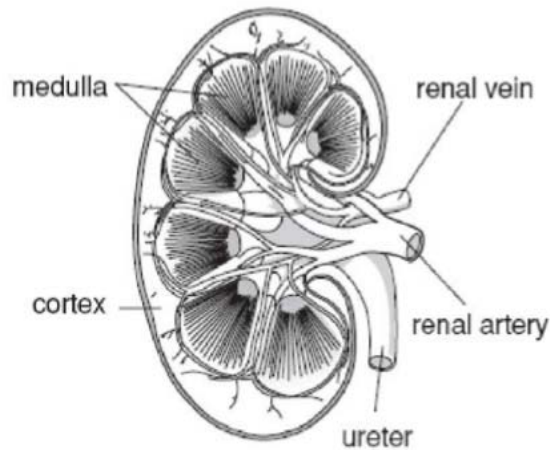
16. The correct order for a stimulus response pathway is:

- A. Stimulus: receptor: effector: control centre: response
- B. Stimulus: effector: receptor: control centre: response
- C. Stimulus: receptor: control centre: effector: response
- D. Stimulus: control centre: receptor: effector: response

17. When a nerve impulse reaches the axon terminal, it moves across a small gap called the synapse. A chemical is released to continue the nerve impulse to the next nerve. The chemical is best described as a:

- A. Protein
- B. Hormone
- C. Sodium channel
- D. Neurotransmitter

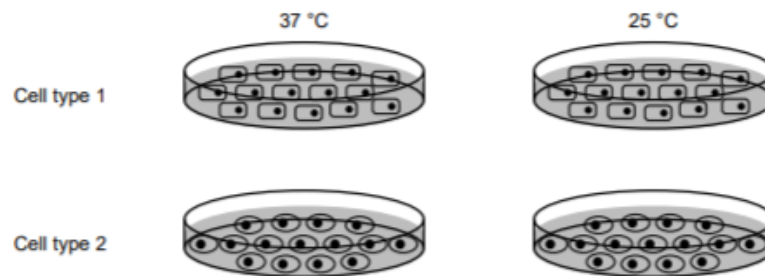
18. The diagram shown represents an important organ in the body



The name and main functions of this organ is

	Name	Functions
A	Kidney	Osmoregulation and sodium production
B	Liver	Remove toxic waste and make lymphocytes
C	Lung	Osmoregulation and remove toxic waste
D	Kidney	Osmoregulation and remove toxic waste

19. In an investigation into the uptake of a protein by cells, scientists immersed two cell types in solutions of this protein. The investigation was carried out at two different temperatures and the percentage of the protein taken up by the two cell types was recorded over 10 minutes.



The data was presented in a table, as shown below.

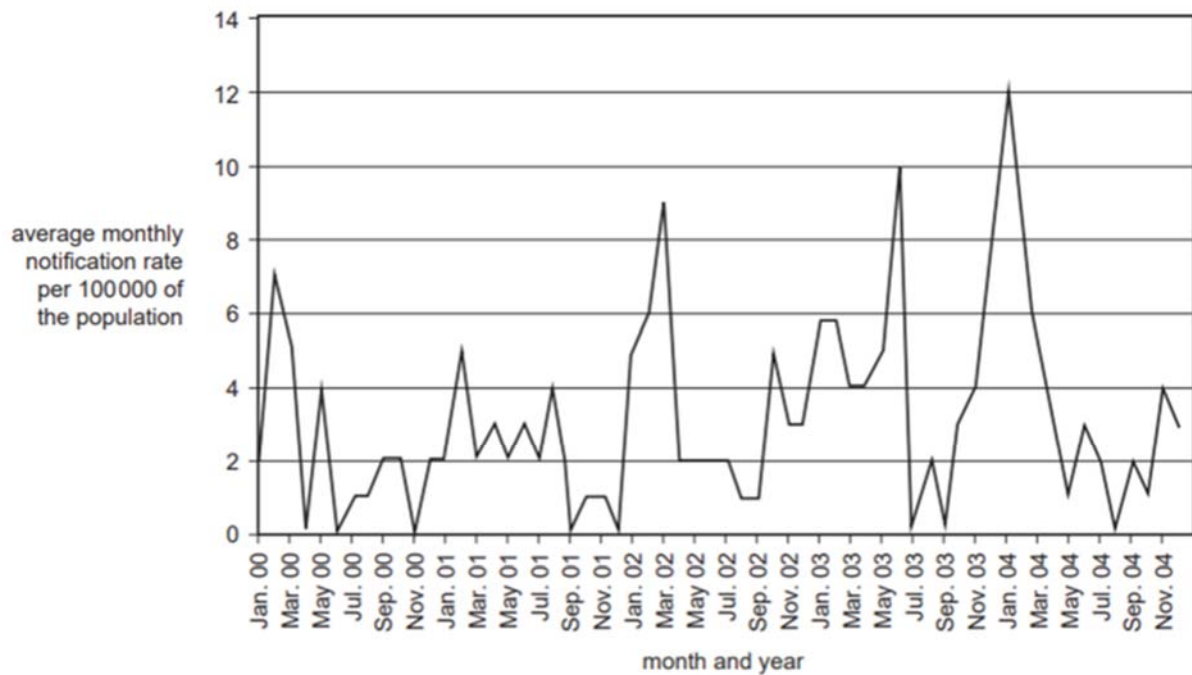
Time (mins)	Cell type 1 Percentage of protein taken up by cell		Cell type 2 Percentage of protein taken up by cell	
	At 25 °C	At 37 °C	At 25 °C	At 37 °C
0	0	0	0	0
2	2	5	5	10
4	4	10	10	20
6	6	12	12	24
8	8	16	16	32
10	8	16	18	36

Which one of the following conclusions is supported by the data?

- A. The rate of uptake of this protein at 25° C is not affected by the cell type.
- B. The rate of uptake of this protein by Cell type 2 is faster at 37° C than at 25° C.
- C. The percentage of this protein taken up by Cell type 1 is not affected by temperature.
- D. If the experiment continued for another 10 minutes, the percentage of this protein taken up by Cell type 1 would increase.

20. *Salmonella anatum* is not a common cause of food poisoning. Data has been collected and analysed for the occurrence of illness caused by this organism in Queensland over a five year period.

The graph below displays the average monthly notification rate per 100 000 of the population for the illness caused by *Salmonella anatum*.



It can be concluded from the data that:

- A. The notification period was highest in May
- B. The notification rate is fairly steady over the five year period.
- C. The notification rate is always lowest during September of each year.
- D. There are four periods in which the notification rate is greater than six per 100,000.

Section II - 80 marks

Question 21 (6 marks)

- a. Contrast features of internal and external fertilisation.

4

- b. Explain why internal fertilisation is needed for the colonisation of land but is not necessarily needed for life in water.

2

Question 22 (3 marks)

- a. Identify the hormone that plays a key role in childbirth in humans.

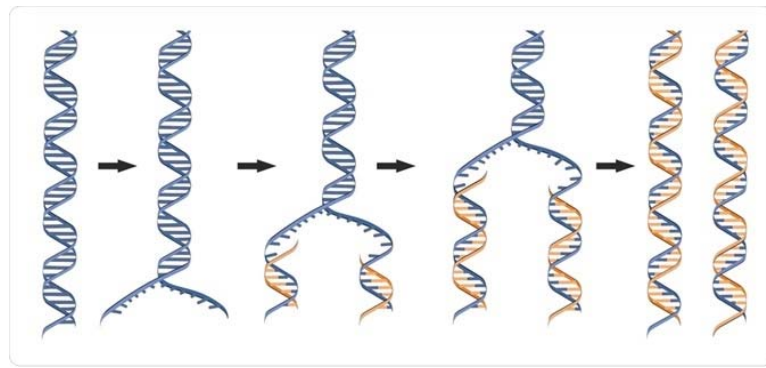
1

- b. Describe the role of this hormone in childbirth.

2

Question 23 (7 marks)

Model of a DNA replication



- a. Draw a fully labelled section of DNA below that includes three matched base pairs. On your diagram circle a single nucleotide. 4

- b. Explain why it is important for DNA to be replicated as accurately as possible. 3

Question 24 (8 marks)

- a. Identify a transgenic species and state its use. 2

- b. Describe ONE process used to produce a transgenic species. 3

- c. Discuss two ethical issues arising from the use of the transgenic species named in part a) above. 4

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Question 25 (4 marks)

Design a table with appropriate headings to compare the causes and effects of point mutations and chromosomal mutations.

4**Question 26** (3 marks)

Fungal Colony



Mycotoxins are potentially toxic chemicals produced by fungal species such as black mould. Some mycotoxins are naturally occurring mutagens that can chemically bond to DNA. Mycotoxins often cause nausea, diarrhoea, and memory loss. In the long term, mycotoxins can even lead to immune deficiency or cancer.

Explain how the mycotoxin mutagen could cause permanent damage to DNA.

3

Question 27 (6 marks)

- a. You undertook an investigation to examine plant pathogens. Using the information you gathered, complete the table. **3**

Name of Australian plant	
Type of pathogen	
Evidence pathogen is present	

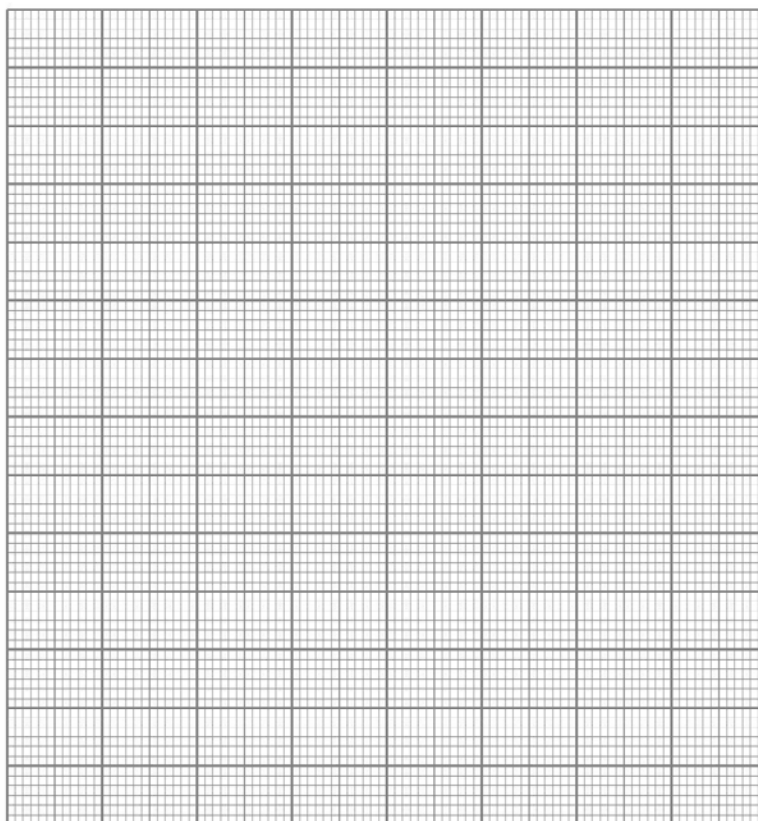
- b. Explain the impact of a named plant disease on agricultural production. **3**

Question 28 (10 marks)

The table below shows the number of deaths from polio in Australia between 1926 and 2004. A vaccine became available for this disease in 1955.

Year	Deaths per 100,000 people
1926-1935	6.5
1936-1945	6.8
1946-1955	11.8
1956-1965	1.1
1966-1975	0.1
1976- 1985	0.1
1986- 1995	0
1996- 2004	0

- a. Plot the data on the grid in the form of a column graph.

4

(Question 28 continues on the next page)

Question 28 *continued*

b. Outline the trends in the data.

2

c. Discuss how the work of Robert Koch can be used to identify the cause of an infectious bacterial disease.

4

Question 29 (4 marks)

Plants have structures to prevent the loss of water in hot dry conditions.

Describe TWO structures and how they assist in water maintenance in the plant.

4

Question 30 (7 marks)

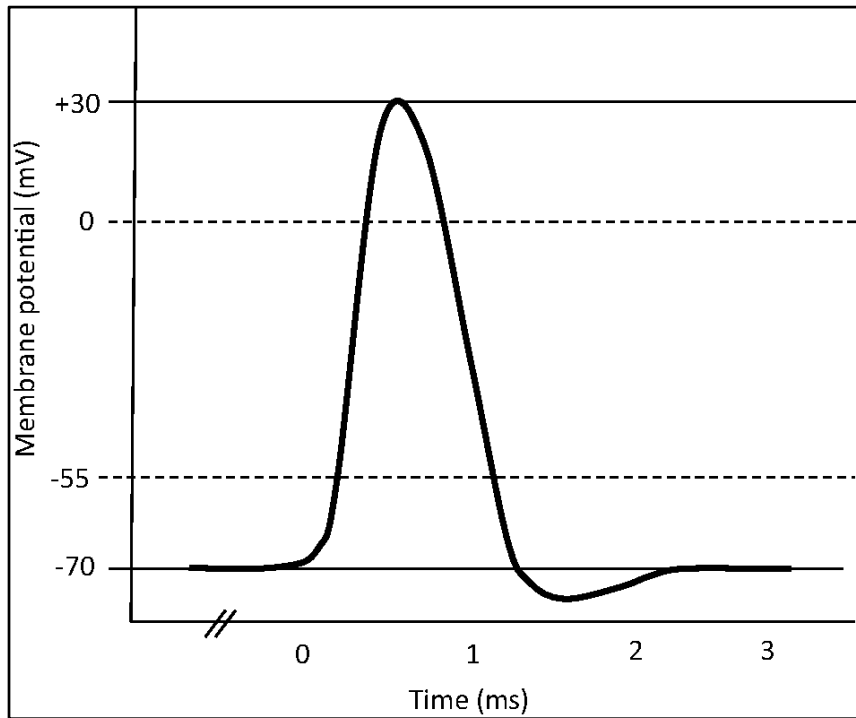
An experiment was conducted to determine the effects of decreasing ambient temperature on body function. Participants (50 individuals) were asked to lie down and remain as still as possible during the entire experiment. The following observations were made. The starting temperature of the room was 25°C. The mean body temperature of all participants at the start of the experiment was 37.1°C. As the room temperature decreased all participants started to shiver. As the room temperature returned to 25°C, the shivering ceased. In a control group of 50 participants who were lying down in a room where the ambient temperature was maintained at 25°C, no changes were observed.

- a. Draw and label a model of a feedback mechanism that explains the observations made in the experiment. **3**

- b. Draw a table to identify a behavioural, structural and physiological adaptation (*i.e.* one of each) for a named endotherm to maintain homeostasis in a hot dry environment. You may use a different named endotherm for each type of adaptation **3**

Question 31 (5 marks)

The graph below represents a typical action potential.



a. On the graph above label the following four regions:

3

- Threshold
- Repolarisation
- Depolarisation
- Resting membrane potential

b. Explain why not all stimuli generate an action potential

2

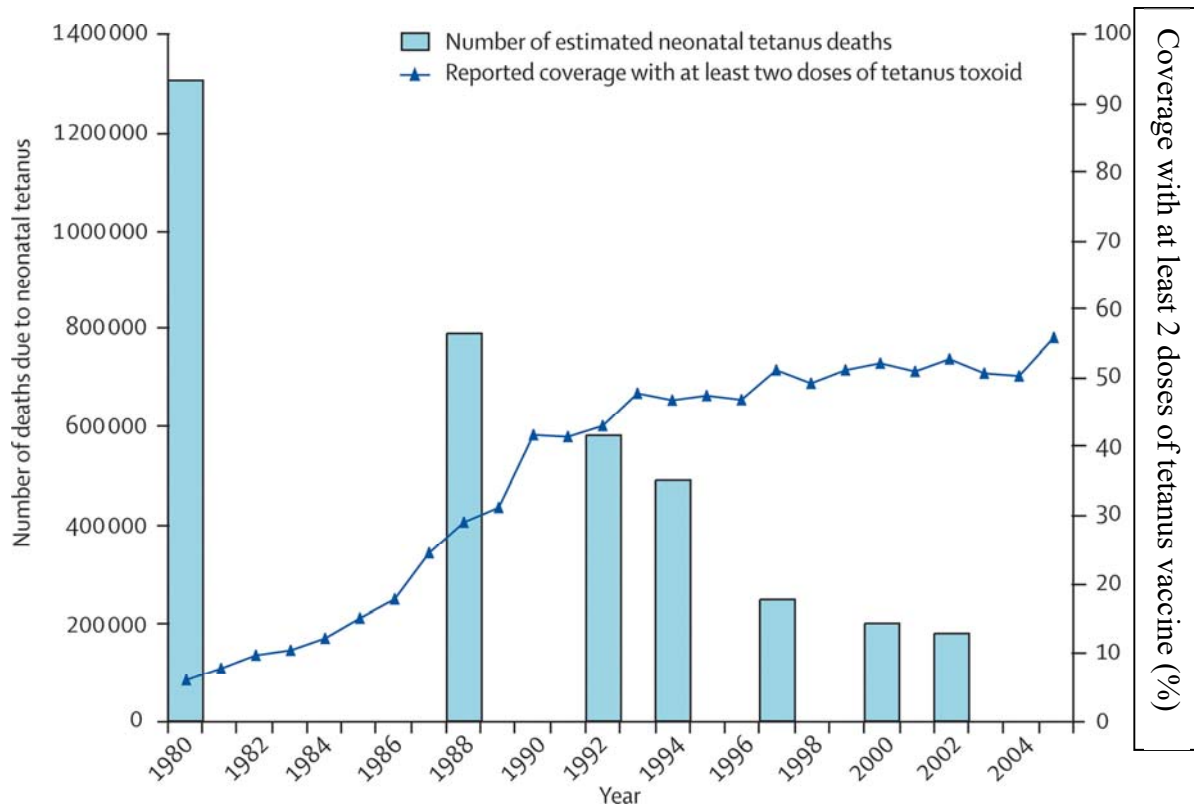
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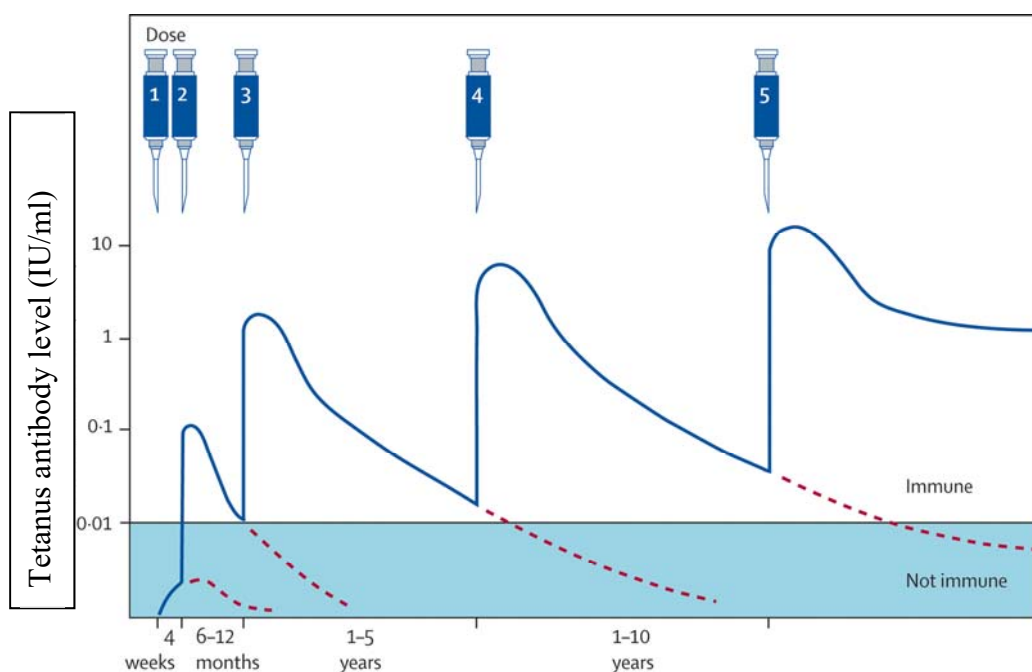
Question 32 (9 marks)

Maternal and neonatal tetanus (*i.e.* tetanus in newborn babies) are important causes of maternal and neonatal mortality, claiming about 180,000 lives worldwide in 2002, almost exclusively in developing countries. Although easily prevented by immunisation, tetanus still persists as a public health problem in over 48 countries.

Graph 1: neonatal tetanus deaths following a 2-dose vaccination program in a developing country. Note that years with no estimate of deaths (no blue column) are due to missing data. There are no available estimates of neonatal tetanus deaths in those years.



Graph 2: Antibody response (IU/ml) to the tetanus vaccine from birth to early adulthood



Source: Roper *et al.* (2007) *The Lancet*, 370:1947-1959

Question 32 *continued*

The adaptive immune system plays a key role in the prevention of diseases such as tetanus. Understanding the role of the immune system in the body and the internal response to vaccinations has led to a decrease in mortality.

Evaluate the impact of vaccination on the prevention of disease. In your answer, include a description of the body's response to immunisation. Your answer should also include references to the data provided on the previous page.

9

[illegible]

Question 33 (8 marks)

Renal dialysis is an effective technology to treat people who suffer from kidney disease. The treatment requires a biological understanding of how the kidneys work.

Justify this statement.

8

[illegible]

End of paper

ANSWER SHEET**General Instructions**

- Write your Student Number at the top of this page.
 - Answer ALL multiple choice questions on this Answer Sheet.
 - Use a pencil to fill in the circle indicating your answer.
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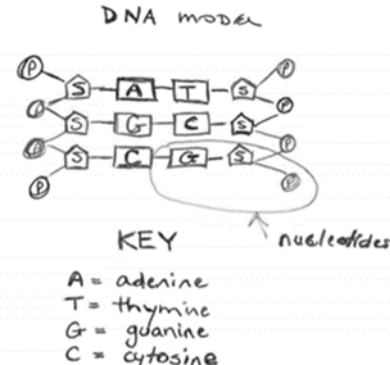
Section I

1	A	☐	B	☐	C	☐	D	☐
2	A	☐	B	☐	C	☐	D	☐
3	A	☐	B	☐	C	☐	D	☐
4	A	☐	B	☐	C	☐	D	☐
5	A	☐	B	☐	C	☐	D	☐
6	A	☐	B	☐	C	☐	D	☐
7	A	☐	B	☐	C	☐	D	☐
8	A	☐	B	☐	C	☐	D	☐
9	A	☐	B	☐	C	☐	D	☐
10	A	☐	B	☐	C	☐	D	☐
11	A	☐	B	☐	C	☐	D	☐
12	A	☐	B	☐	C	☐	D	☐
13	A	☐	B	☐	C	☐	D	☐
14	A	☐	B	☐	C	☐	D	☐
15	A	☐	B	☐	C	☐	D	☐
16	A	☐	B	☐	C	☐	D	☐
17	A	☐	B	☐	C	☐	D	☐
18	A	☐	B	☐	C	☐	D	☐
19	A	☐	B	☐	C	☐	D	☐
20	A	☐	B	☐	C	☐	D	☐

Biology 2019 trial marking guideline

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
B	D A is almost but has Gln instead of Gly	B	A	D	A	A	B	A	D
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
B	B	C	B	B	C	D	D	B	D

	Marking Grid	suggested answer	Markers Comments																	
21 a	<table><tr><td>Contrasts internal and external fertilisation with 2 matching comparisons for each</td><td>4</td></tr><tr><td>Missing one of the above</td><td>3</td></tr><tr><td>Missing two of the above</td><td>2</td></tr><tr><td>Missing three of the above</td><td>1</td></tr></table>	Contrasts internal and external fertilisation with 2 matching comparisons for each	4	Missing one of the above	3	Missing two of the above	2	Missing three of the above	1	May be done in a table BUT not vital. Any correct information. This is just a sample <table><tr><th>characteristic</th><th>External fertilisation</th><th>Internal fertilisation</th></tr><tr><td>gametes</td><td>Large numbers of male and female gametes</td><td>Fewer (female) gametes</td></tr><tr><td>union</td><td>Occurs in open water</td><td>Male inserts the sperm into the female reproductive tract</td></tr></table>	characteristic	External fertilisation	Internal fertilisation	gametes	Large numbers of male and female gametes	Fewer (female) gametes	union	Occurs in open water	Male inserts the sperm into the female reproductive tract	
Contrasts internal and external fertilisation with 2 matching comparisons for each	4																			
Missing one of the above	3																			
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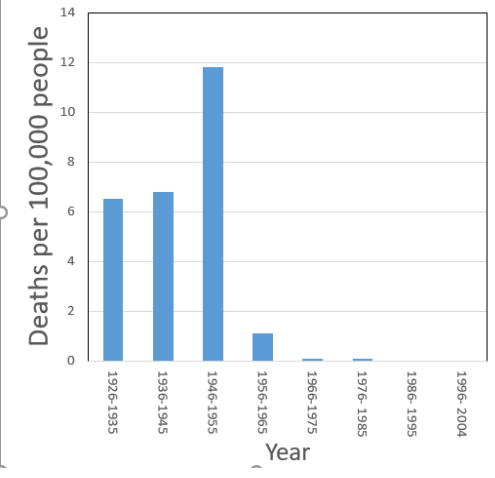
		survival	Low survival rate	High survival rate							
b	<table><tr><td>Explains the need for internal fertilisation to colonise land. (cause and effect)</td><td>2</td></tr><tr><td>Outlines the need internal fertilisation to colonise land.</td><td>1</td></tr></table>	Explains the need for internal fertilisation to colonise land. (cause and effect)	2	Outlines the need internal fertilisation to colonise land.	1	Land poses a danger of dehydration of the gametes unlike in water. The gametes cannot be released near each other as they will dry out and become non- viable. Internal fertilisation ensures that the gametes successfully unite (fertilise) in a moist environment					
Explains the need for internal fertilisation to colonise land. (cause and effect)	2										
Outlines the need internal fertilisation to colonise land.	1										
22 a	<table><tr><td>Identifies the correct hormone</td><td>1</td></tr></table>	Identifies the correct hormone	1	oxytocin							
Identifies the correct hormone	1										
b	<table><tr><td>Describes the role of the hormone in childbirth</td><td>2</td></tr><tr><td>Outlines one role of the hormone in childbirth</td><td>1</td></tr></table>	Describes the role of the hormone in childbirth	2	Outlines one role of the hormone in childbirth	1	Oxytocin promotes the contraction of the uterus (1) and release of prostaglandins (1) OR the softening of the cervix (1) so that the baby can be born.					
Describes the role of the hormone in childbirth	2										
Outlines one role of the hormone in childbirth	1										
23 a	<table><tr><td>Draws a fully labelled DNA with correct structure (1) with 3 matched base pairs (1) and indicates the nucleotide (1) PLUS key (1)</td><td>4</td></tr><tr><td>Missing one of the above</td><td>3</td></tr><tr><td>Missing two of the above</td><td>2</td></tr></table>	Draws a fully labelled DNA with correct structure (1) with 3 matched base pairs (1) and indicates the nucleotide (1) PLUS key (1)	4	Missing one of the above	3	Missing two of the above	2	DNA model  KEY A = adenine T = thymine G = guanine C = cytosine S = sugar P = phosphate			
Draws a fully labelled DNA with correct structure (1) with 3 matched base pairs (1) and indicates the nucleotide (1) PLUS key (1)	4										
Missing one of the above	3										
Missing two of the above	2										

	<table><tr><td>Missing more than two of the above</td><td>1</td></tr></table>	Missing more than two of the above	1						
Missing more than two of the above	1								
b	<table><tr><td>Explains the importance of exact DNA replication</td><td>3</td></tr><tr><td>Describes the DNA replication</td><td>2</td></tr><tr><td>Outlines DNA replication</td><td>1</td></tr></table>	Explains the importance of exact DNA replication	3	Describes the DNA replication	2	Outlines DNA replication	1	DNA must be replicated accurately. For 2 main reasons • To maintain heredity and ensure that each new daughter cell has the correct genetic code so that cell function is maintained and/or so cells interact correctly • Gene expression is vital for polypeptide synthesis. For example the gene codes for an enzyme which is vital for cellular metabolism or (chemical functions of the cell). If DNA is not replicated exactly, an incorrect enzyme will be made and cellular metabolism will be adversely affected.	
Explains the importance of exact DNA replication	3								
Describes the DNA replication	2								
Outlines DNA replication	1								
24									
a	<table><tr><td>Identifies a specific transgenic species AND states it use</td><td>2</td></tr><tr><td>Identifies a specific transgenic species OR states the use</td><td>1</td></tr></table>	Identifies a specific transgenic species AND states it use	2	Identifies a specific transgenic species OR states the use	1	Bt Cotton OR any correct example Use: Transgenic cotton is able to produce its own toxin to kill Bollworm so it is used in to make farming cotton more economical/ help environment			
Identifies a specific transgenic species AND states it use	2								
Identifies a specific transgenic species OR states the use	1								
b	<table><tr><td>Outlines a process used to produce a transgenic species</td><td>2</td></tr><tr><td>Identifies a process</td><td>1</td></tr></table>	Outlines a process used to produce a transgenic species	2	Identifies a process	1	The gene of interest from one species is inserted into the gene of a different species using restriction enzymes and ligase and microinjection. This is called a recombinant DNA. Agrobacterium in plants			
Outlines a process used to produce a transgenic species	2								
Identifies a process	1								

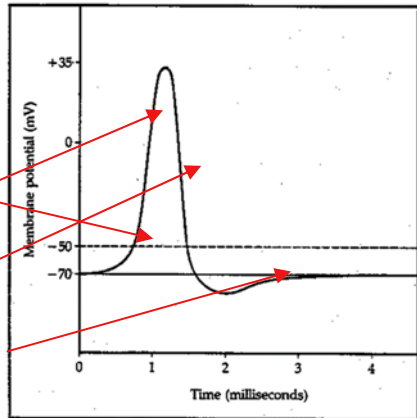
c	<table><tr><td>Discusses TWO ethical issues (positive and negative) arising from the species named in part b</td><td>4</td></tr><tr><td>Missing one of the above</td><td>3</td></tr><tr><td>Missing two of the above</td><td>2</td></tr><tr><td>Missing 3 of the above</td><td>1</td></tr></table>	Discusses TWO ethical issues (positive and negative) arising from the species named in part b	4	Missing one of the above	3	Missing two of the above	2	Missing 3 of the above	1	Example for Bt cotton (needs to relate to the example in part b) <table><tr><td>Bt cotton</td><td>FOR</td><td>AGAINST</td></tr><tr><td></td><td> Creates high yields of cotton plants that also resist the effects/damage from the bollworm without killing other insects in the ecosystem </td><td> Under developed countries may not have the same access to these crops as developed countries so they fall even further behind economically </td></tr><tr><td></td><td> Farmers have less exposure to pesticides which has positive long term health benefits Lass farm land required/ less pesticides </td><td> Potential long term health implications from GM use is not yet known </td></tr></table>	Bt cotton	FOR	AGAINST		Creates high yields of cotton plants that also resist the effects/damage from the bollworm without killing other insects in the ecosystem	Under developed countries may not have the same access to these crops as developed countries so they fall even further behind economically		Farmers have less exposure to pesticides which has positive long term health benefits Lass farm land required/ less pesticides	Potential long term health implications from GM use is not yet known	
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25		Table to compare the effects of point and chromosomal mutations																		

	Designs an appropriate table to compare the effects of BOTH point mutations and chromosomal mutations.	4		Point mutations	Chromosomal mutations	
	Missing one of the above	3	causes	A change in nucleotide due to sequence insertion, deletion, substitution of a one or a few base pairs. Can be DNA replication error or environmental mutagens.	Entire chromosome or large segment of chromosome is deleted or repeated. Due to non-disjunction at meiosis or chromosome breakage.	
	Missing two of the above	2				
	Missing three of the above	1	effects	may cause a disease eg sickle cell anaemia	Leads to disease such as Downs Syndrome	
26			Chemical mutagens/ (or just mycotoxins) could bind to DNA (1)			
	Explains how a CHEMICAL mutagen binds DNA, disrupts replication, how it is repaired or not, affect on coding seq (4 possible marks	3	During DNA replication this will prevent the polymerase properly recognising which base to insert on the new strand (1)			
	2 of the above points	2	Permanent aspect (1) Most altered bases will be cut out (excised) by error-correcting polymerases but not all			
	1 point	1	This leads to changes in coding sequences in cells which leads to altered proteins/cancer...			

27 a					
	Correctly completes the table	3			
	Table with one incorrect point	2			
	Table with two incorrect points	1			
b					
	Explains the impact of a NAMED plant disease on agricultural production	3	Panama disease of bananas is caused by a fungus. If the fungus invades the crop it causes damage to the conductive tissue of the plant. It appears to be an open wound. The impact to the farmers is that yield is lowered and income is depleted as the fungus invades the plant the soil and the machinery. Cost of bananas in the supermarket increases dramatically.		
	Describes the impact of a NAMED plant disease on agricultural production	2			
	Outlines the impact of disease on agriculture	1			

28		Example graph to be scanned in.																											
a	<table><tr><td>Correct graph (1) including axes with units (1) plots correct (1) and scale on both axes (1)</td><td>4</td></tr><tr><td>Missing one of the above</td><td>3</td></tr><tr><td>Missing two of the above</td><td>2</td></tr><tr><td>Missing three of the above</td><td>1</td></tr></table>	Correct graph (1) including axes with units (1) plots correct (1) and scale on both axes (1)	4	Missing one of the above	3	Missing two of the above	2	Missing three of the above	1	Column GRAPH: y axis deaths (per 100,000). X axis Time (years) Marks: 1 for correct points plotted 1 axes with scale correct way 1 scale on axes 1 appropriate column graph	 <table><caption>Data for Column Graph</caption><thead><tr><th>Year</th><th>Deaths per 100,000 people</th></tr></thead><tbody><tr><td>1926-1935</td><td>6.5</td></tr><tr><td>1936-1945</td><td>6.8</td></tr><tr><td>1946-1955</td><td>11.8</td></tr><tr><td>1956-1965</td><td>1.2</td></tr><tr><td>1966-1975</td><td>0.2</td></tr><tr><td>1976-1985</td><td>0.1</td></tr><tr><td>1986-1995</td><td>0.1</td></tr><tr><td>1996-2004</td><td>0.1</td></tr></tbody></table>	Year	Deaths per 100,000 people	1926-1935	6.5	1936-1945	6.8	1946-1955	11.8	1956-1965	1.2	1966-1975	0.2	1976-1985	0.1	1986-1995	0.1	1996-2004	0.1
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b	<table><tr><td>Correctly describes two trends</td><td>2</td></tr><tr><td>If only one trend</td><td>1</td></tr></table>	Correctly describes two trends	2	If only one trend	1	Increase 1926 – 1955 Post-1955 drops to almost nothing quickly																							
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c	<table><tr><td>Discusses how the work of Koch explains the cause of disease. Includes Koch's 4 postulates correctly.</td><td>4</td></tr><tr><td>Missing one of the above</td><td>3</td></tr><tr><td>Missing two of the above</td><td>2</td></tr><tr><td>Missing three of the above</td><td>1</td></tr></table>	Discusses how the work of Koch explains the cause of disease. Includes Koch's 4 postulates correctly.	4	Missing one of the above	3	Missing two of the above	2	Missing three of the above	1	Koch was the first scientist to establish a method of identifying the microorganism that caused a specific disease.. His work was based on 4 postulates. 1. All organisms have the same symptoms. 2. The microorganism must be isolated and grown in pure culture. 3. The organisms from the pure culture are inoculated into a healthy organism and develop the same symptoms. 4. The same microorganism must be isolated from the second host and cultured and identifies as the same species.																			
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29		starting mean body temp 37.1	Mostly well done										
a	<table><tr><td>Draws a correct labelled model of feedback for the stimulus provided.</td><td>3</td></tr><tr><td>Draws a labelled model of feedback for the stimulus provided with one piece of information missing</td><td>2</td></tr><tr><td>Draws a model of feedback with some correct information.</td><td>1</td></tr></table>	Draws a correct labelled model of feedback for the stimulus provided.	3	Draws a labelled model of feedback for the stimulus provided with one piece of information missing	2	Draws a model of feedback with some correct information.	1	room temp 25 °C Shivering as room Temp drops below 25 degrees	Quite a few did both cooling and heating stimulus				
Draws a correct labelled model of feedback for the stimulus provided.	3												
Draws a labelled model of feedback for the stimulus provided with one piece of information missing	2												
Draws a model of feedback with some correct information.	1												
	Include - stimulus - Receptor/sensor - Control/co-ordination - Effector - response												
b	<table><tr><td>Draws a table and includes Behavioural, Structural and Physiological adaptations for a named example.</td><td>4</td></tr><tr><td>Missing one of the above</td><td>3</td></tr><tr><td>Missing two of the above</td><td>2</td></tr></table>	Draws a table and includes Behavioural, Structural and Physiological adaptations for a named example.	4	Missing one of the above	3	Missing two of the above	2	<table><tr><td>Adaptation for hot dry environment</td><td>Red Kangaroo</td></tr><tr><td>Structural</td><td>The fur reflects 30% of the suns heat</td></tr></table>	Adaptation for hot dry environment	Red Kangaroo	Structural	The fur reflects 30% of the suns heat	Lots of simple errors Some ignored “hot dry” and did penguins etc Tables generally well constructed
Draws a table and includes Behavioural, Structural and Physiological adaptations for a named example.	4												
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Missing two of the above	2												
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Structural	The fur reflects 30% of the suns heat												

	<table><tr><td>Missing 3 of th4e above</td><td>1</td></tr></table>	Missing 3 of th4e above	1	<table><tr><td>Behavioural</td><td>Seeks shade in the heat of the day</td></tr><tr><td>physiological</td><td>Produces concentrated urine to conserve water</td></tr></table>	Behavioural	Seeks shade in the heat of the day	physiological	Produces concentrated urine to conserve water			
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30	<table><tr><td>Correctly describes TWO structures and how they assist in water maintenance</td><td>4</td></tr><tr><td>Correctly describes TWO structures and how one assists in water maintenance</td><td>3</td></tr><tr><td>Describes one structure and how it maintains water</td><td>2</td></tr><tr><td>Outlines how plants maintain water</td><td>1</td></tr></table>	Correctly describes TWO structures and how they assist in water maintenance	4	Correctly describes TWO structures and how one assists in water maintenance	3	Describes one structure and how it maintains water	2	Outlines how plants maintain water	1	Any TWO correct structures and how they assist (see3 text book page 497) Leaf orientation: leaves hang vertically, this reduces direct leaf exposure to the sun and reduces the sun reaching stomates during the hottest parts of the day. Reduced flower size: reduces the amount of water the plant requires and reduces evaporation of water from flower surfaces. Other examples could be: sunken stomates; small leaves or phyllodes, cladodes,	
Correctly describes TWO structures and how they assist in water maintenance	4										
Correctly describes TWO structures and how one assists in water maintenance	3										
Describes one structure and how it maintains water	2										
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31 a	<table><tr><td>Correctly labelled all 4 locations on the graph</td><td>3</td></tr><tr><td>2-3 correct</td><td>2</td></tr><tr><td>1 correct</td><td>1</td></tr></table>	Correctly labelled all 4 locations on the graph	3	2-3 correct	2	1 correct	1	threshold depolarisation repolarisation resting membrane potential 	Lots confused de-and re-polarisation		
Correctly labelled all 4 locations on the graph	3										
2-3 correct	2										
1 correct	1										

b	<table><tr><td>Explains why some stimuli do not generate an action potential –</td><td>2</td></tr><tr><td>Outlines an action potential/ no reference to details of mV or sodium channels</td><td>1</td></tr></table>	Explains why some stimuli do not generate an action potential –	2	Outlines an action potential/ no reference to details of mV or sodium channels	1	Some stimuli do not generate an action potential because a minimum threshold needs to be reached before an impulse is produced. Stimuli of + 15 millivolts is required to cause the polarity (i.e. to get to -55mV) of the axon to be changed/ depolarised. This threshold is what causes the voltage-gated sodium channels to open.	Poorly done. Most only one mark. For a 2 marker need to add some detail about threshold value										
Explains why some stimuli do not generate an action potential –	2																
Outlines an action potential/ no reference to details of mV or sodium channels	1																
32	<table><tr><td>A correct evaluation of the statement is made AND 3 relevant references are made to the data. (the data shows that tetanus needs boosters this MUST be mentioned. The adaptive immune response is described in detail with reference to the specific T cells and B cells.</td><td>9</td></tr><tr><td>Missing one of the above</td><td>8</td></tr><tr><td>Missing two of the above</td><td>7</td></tr><tr><td>Missing three of the above</td><td>6</td></tr><tr><td>Missing four of the above</td><td>5</td></tr><tr><td>Missing five of the above</td><td>4</td></tr><tr><td>Missing six of the above</td><td>3</td></tr></table>	A correct evaluation of the statement is made AND 3 relevant references are made to the data. (the data shows that tetanus needs boosters this MUST be mentioned. The adaptive immune response is described in detail with reference to the specific T cells and B cells.	9	Missing one of the above	8	Missing two of the above	7	Missing three of the above	6	Missing four of the above	5	Missing five of the above	4	Missing six of the above	3	E= evaluates the impact of vaccination on disease prevention (1) D = refers to the data 4 times correctly. Must mention data from both graphs. (4) A – correctly describes the role of B and T cells following a vaccination with antigen. With reference to the significance of B and T memory cells and the role of vaccines to prevent disease. (4) Describes the basis of the response to immunisation. Points to gain marks: • Introduction of antigen/presentation by macrophages/DC in lymph node • Matching B cell cloned • Antibodies/ cytokines released • Memory B cells formed • Memory B cells are the basis of immunisation Impact of vaccination • Vaccination stops infection • Vaccination stops transmission • Graph 1 – as coverage increases, NT decreases • Graph 1 – 100% coverage not required	Eval – well done – almost all had a positive statement. IR – immune response. Generally well done, but needed to refer to mechanics of response to get 4 marks.
A correct evaluation of the statement is made AND 3 relevant references are made to the data. (the data shows that tetanus needs boosters this MUST be mentioned. The adaptive immune response is described in detail with reference to the specific T cells and B cells.	9																
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	<table><tr><td>Missing seven of the above</td><td>2</td></tr><tr><td>Missing eight of the above</td><td>1</td></tr></table>	Missing seven of the above	2	Missing eight of the above	1	Graph 2: a single dose elicits a poor antibody response. More than one dose needed to achieve immunity 1 mark Evaluate: overall determination of value of vaccination													
Missing seven of the above	2																		
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33	<table><tr><td>Makes a correct justification statement AND describes in detail the role of the Kidney, how the nephron works, (filtration and reabsorption with examples) and describes renal dialysis with a link to the understanding of the kidney is necessary to be able to create the technology</td><td>8</td></tr><tr><td>Missing one of the above</td><td>7</td></tr><tr><td>Missing two of the above</td><td>6</td></tr><tr><td>Missing three of the above</td><td>5</td></tr><tr><td>Missing four of the above</td><td>4</td></tr><tr><td>Missing five of the above</td><td>3</td></tr><tr><td>Missing six of the above</td><td>2</td></tr><tr><td>Missing seven of the above</td><td>1</td></tr></table>	Makes a correct justification statement AND describes in detail the role of the Kidney, how the nephron works, (filtration and reabsorption with examples) and describes renal dialysis with a link to the understanding of the kidney is necessary to be able to create the technology	8	Missing one of the above	7	Missing two of the above	6	Missing three of the above	5	Missing four of the above	4	Missing five of the above	3	Missing six of the above	2	Missing seven of the above	1	J = justified – support with examples (1) K = role of the kidney (osmoregulation and remove waste) (1) N = nephron (filtration with example + reabsorption with 2 examples) (3) Other possible points: secretion active transport (to contrast with dialysis) T = technology. 3 correct important details; such as; - haemodialysis is an artificial system to remove waste from the blood using a machine called a dialyser. - The blood with waste passes through the dialyser, waste is removed and clean blood is returned to the body. - There is no reabsorption of products into the blood. - Relies on diffusion - Dialysate fluid continually exchanged - Dialysate content adjusted to match desired blood properties (glucose, salt but no urea) (3) This is a true statement. The role of the kidneys, removal of waste/urea and osmoregulation using the nephron is vital in order to create a dialysis machine. The main role of the kidney is to remove urea and regulate blood water levels.	Not well answered. Too general. Many students did not make the correct judgement. The statement to judge is An understanding of how the kidneys work is required to create dialysis. Judgement is required to get 1 mark The role of the kidney is needed to get 1 mark. Osmoregulation and removal of toxic waste. 3 specific functions of the nephron with molecules (glucose, water, amino acids ANY correct 3) to get 3 marks 3 specific details about dialysis to get 3 marks. (they must be 3 different features of the process)
Makes a correct justification statement AND describes in detail the role of the Kidney, how the nephron works, (filtration and reabsorption with examples) and describes renal dialysis with a link to the understanding of the kidney is necessary to be able to create the technology	8																		
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		The nephron is the unit that filters the blood under pressure at the glomerulus allowing urea to enter the tubule at the Bowmans capsule. Once the filtrate has entered the tubule some substances are reabsorbed back into the blood. For example at the proximal convoluted tubule, glucose is required for cellular respiration and is reabsorbed by active transport. Amino acids for polypeptide synthesis also reabsorb actively into the blood at this location. Along the loop of Henle water moves passively back into the blood to maintain blood water levels. Some substances are secreted into the tubule from the blood, eg the chemical from the breakdown of drugs such as Panadol and alcohol. Some people suffer kidney disease so these processes do not work. Knowing the structure and function of the nephron has allowed scientists to create dialysis machines. Haemodialysis removes toxins/urea from the blood by using a semipermeable membrane. The blood containing the waste passes through the dialyser, waste is removed by diffusion and returned to the patient. The dialysate content is continually adjusted to match the desired properties of the blood, eg glucose concentration. There is no reabsorption of products back into the blood during dialysis.	
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