



2012

HIGHER SCHOOL CERTIFICATE

TRIAL EXAMINATION

1

BIOLOGY

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black or blue pen
- Draw diagrams using pencil
- Board-approved calculators may be used
- *Write your name and class at the top of the Part A Answer Sheet, the Part B Written Answer Booklet and the Section II Answer Booklet*

Total marks - 100

Section I

75 marks

This section has two parts, Part A and Part B

Part A – 20 marks

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

Part B – 55 marks

- Attempt Questions 21 - 37
- Allow about 1 hour and 40 minutes for this part

Section II

25 marks

- Attempt all parts of this question (Question 38)
- Allow about 45 minutes for this section

Section I**75 marks****Part A – 20 marks****Attempt Questions 1 – 20****Allow about 35 minutes for this part**

Use the multiple choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response circle completely.

Sample $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9A ☐ B ☐ C ☐ D ☒

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ☐ B ☐ C ☐ D ☒If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:

correct ↘

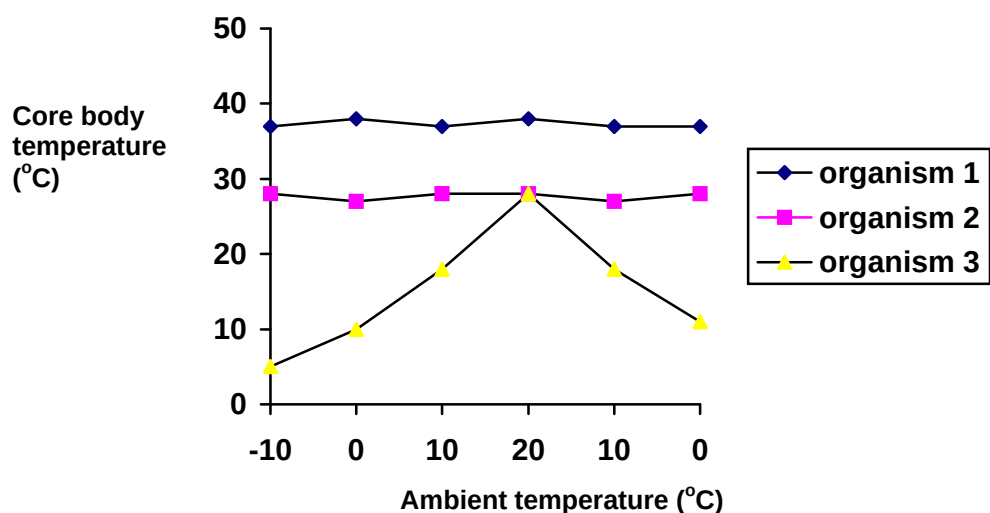
A ☐ B ☐ C ☒ D ☒

1. Which of the following are appropriate Australian plant responses to changes to the ambient temperature during daytime and to dry environments?

	Ambient Temperature Changes	Dry Environment
(A)	Leaf rolls or curls	Sunken stomates close
(B)	Small, thick cuticle leaves	Stomates open
(C)	Excreting salt via leaf salt glands	thick, waxy cuticle
(D)	Sunken stomates	Hairy leaves

2. What is the role of differentiation in maintaining health?
- (A) Results in different types of cells having different functions to perform
 - (B) Enables certain cells to undergo rapid cell division by mitosis
 - (C) Controls the production of proteins called antibodies
 - (D) Programming cell death
3. In which form is the majority of carbon dioxide transported in mammals?
- (A) Dissolved in plasma
 - (B) Carbon dioxide molecules bound to haemoglobin
 - (C) In the form of hydrogen carbonate ions dissolved in plasma
 - (D) In the form of chylomicrons released into blood vessels

4. The graph shows the relationship between the ambient temperature and the core body temperature for three different animals living in an Australian desert.



A student examines the graph and makes some inferences about the organisms.

		Temperature regulation classification	Response of animal to an ambient temperature of 0°C	Response of animal to an ambient temperature of 20°C
Inference 1	Organism 1:	endotherm	basking in the sun	sheltering
Inference 2	Organism 2:	ectotherm	sheltering	moving
Inference 3	Organism 3:	ectotherm	shivering	basking in the sun

Which inference(s) are correct?

- (A) Inference 1 only
- (B) Inference 2 only
- (C) Inference 3 only
- (D) Inferences 2 and 3

5. A patient's blood pH is well below normal. Which process would be the most accurate in assisting with diagnosing the patient's condition?
- (A) Attach a pulse oximeter and measure the blood oxygen saturation level.
 - (B) Attach a pulse oximeter and measure the blood carbon dioxide saturation level.
 - (C) Take a sample of arterial blood and use a blood gas analyser to measure the blood carbon dioxide concentration.
 - (D) Take a sample of arterial blood and use a blood gas analyser to measure the blood oxygen concentration.
6. The amounts of certain chemicals found in blood before it enters an organ/tissue and after it leaves the organ/tissue are shown in the table.

Blood chemical	Relative amount of blood chemical: in artery of organ/tissue	Relative amount of blood chemical: in vein of organ/tissue
oxygen	high	low
sugars	high	low
urea	medium	medium

What organ/tissue is responsible for the changes in the three blood chemicals?

- (A) capillaries
- (B) heart muscle
- (C) kidney
- (D) lung

7. Many people that inhabited a small village suffered the same type of disease. All the people in the village obtained their drinking water from two tanks. It is suspected that the disease resulted from infection with protozoans such as *Giardia* or *Cryptosporidium*.

Which procedure would represent one of Koch's postulates employed in order to prove which protozoan caused the disease in the villagers?

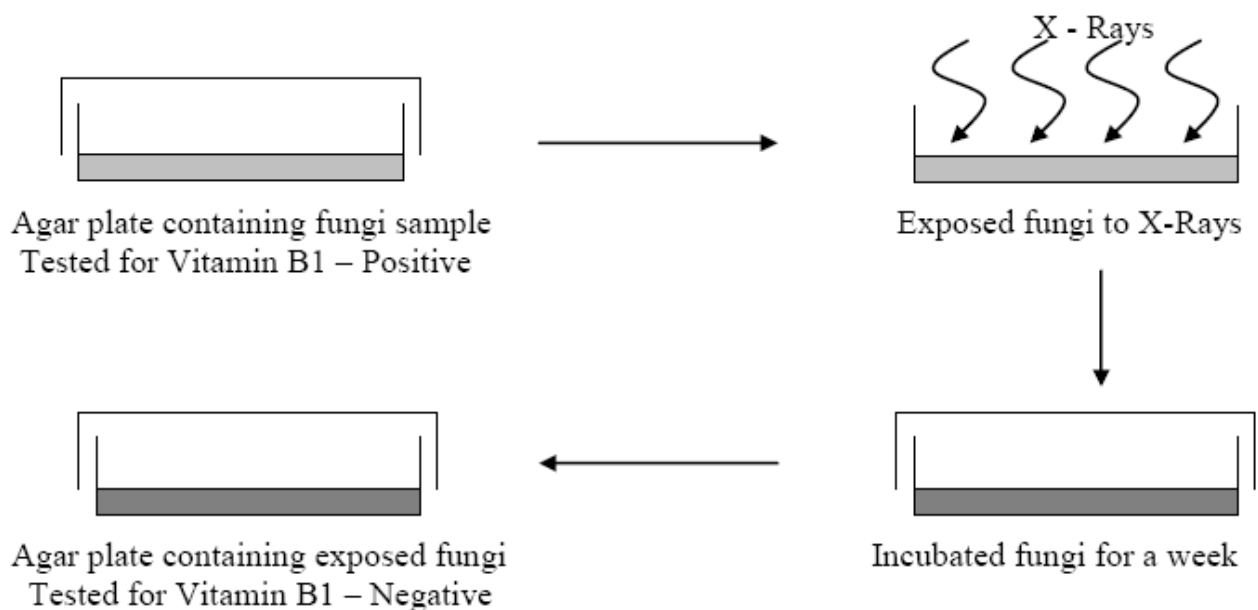
- (A) Both types of protozoans must be cultured from all disease hosts.
 - (B) Infect a diseased host with the suspected protozoan and look for an increased in the symptoms.
 - (C) Infect a healthy host with a sample from the pure culture of the isolated protozoan and look for the same symptoms as the original host.
 - (D) Isolate the suspect protozoan from the second host, grow it in pure culture and infect a third, diseased host and look for the different symptoms as the original host.
8. Which of the following statements can be used to describe pathogens classed as prions and viruses?
- (A) Both contain protein.
 - (B) Only viruses are infectious.
 - (C) They consist only of polypeptides.
 - (D) They contain DNA.
9. Which of the following helps prevent the entry of pathogens into humans?
- (A) Antibodies
 - (B) Antigens
 - (C) Phagocytosis
 - (D) Stomach acid

10. Which process is not affected by the presence of antigens?
- (A) Kidney donation
 - (B) Phagocytosis
 - (C) Salt levels in the blood
 - (D) Vaccination
11. At the end of a marathon race a runner's body is dehydrated. How does the body control the two hormones, ADH and aldosterone, to help to re-establish normal water balance?
- (A) ADH is released and aldosterone is inhibited.
 - (B) ADH is inhibited and aldosterone is released.
 - (C) Both ADH and aldosterone are released.
 - (D) Both ADH and aldosterone are inhibited.
12. In which of the following ways will a person acquire long-lasting natural immunity to a particular antigen?
- (A) When they receive a small amount of vaccine by injection.
 - (B) When they are given antibodies produced by another mammal.
 - (C) When they respond to the antigen by making antibodies.
 - (D) When they receive antibodies as a baby during suckling.
13. Mangroves are the plants that grow in conditions of varying salinity. Which one of the following correctly identifies the process and the adaptation that assist mangroves to survive in saline conditions?

	Process	Adaptation
(A)	Homeostasis	Have bladder-like hairs on their leaves to store salt.
(B)	Enantiostasis	Accumulate salt in their leaves and do not shed their leaves
(C)	Homestasis	Have thick waxy cuticle on their leaves.
(D)	Enantiostasis	Excrete salts through special glands in their leaves.

14. Which one of the following was demonstrated by Morgan?
- (A) Chromosomes are made of DNA.
 - (B) A full set of chromosomes is necessary for normal development and chromosomes carry hereditary units.
 - (C) Sex linkage is associated with chromosomes.
 - (D) There is a cellular basis to explain the results of Mendel.
15. The variability of offspring produced in sexual reproduction can occur as a result of which meiosis process?
- (A) cell division
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16. Which sequence represents the repeating unit of chemicals that form the chemical composition of DNA? Note that the hyphen line (-) shown between the molecules represents a chemical bond.
- (A) sugar-phosphate-lipid
 - (B) sugar-base-phosphate
 - (C) phosphate-sugar-base
 - (D) lipid-sugar-phosphate
17. Plants growing in areas of water scarcity show a variety of adaptations to reduce water loss.
- Which of the following DOES NOT represents an example of an adaptation to reduce water loss?
- (A) ability to close stomates during hot conditions
 - (B) leaves with thick and waxy cuticle
 - (C) leaves with a very large surface area
 - (D) hairs on leaves

18. Which statement best describes the effect of mutations during the process of natural selection?
- (A) Mutations cannot result in new characteristics.
 - (B) New mutations may increase the survival chances of a species.
 - (C) Mutations are harmful and cannot improve the survival chances of a species.
 - (D) Mutations that interfere with the survival of an organism are eliminated.
19. Which of the following always involves an organism containing a foreign gene, often from another species?
- (A) Artificial pollination
 - (B) Cloning
 - (C) Hybridisation within a species
 - (D) Transgenic species
20. A student performed the following experiment.



Which pair of scientists conducted a similar experiment to the one the student conducted?

- (A) Beadle and Tatum
- (B) Darwin and Wallace
- (C) Watson and Crick
- (D) Sutton and Boveri

Student Name	
Class	
Mark /	

Write your Name and Class at the top of this Part A Answer Sheet.

Select the alternative A, B, C or D that best answers the question and fill in the response circle completely.

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 ○
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20. A ○ B ○ C ○ D ○

Student Name	
Class	
Mark /	

Write your Name and Class at the top of this Part B Answer Booklet.

Section I (continued)

Part B – 55 marks

Attempt Questions 21 - 37

Allow about 1 hour and 40 minutes for this part

Answer the questions in the spaces provided

Question 21 (4 marks)

State the name of one theory that accounts for the movement of water in the xylem tissue of plants. Explain this theory with the aid of a labelled diagram of the longitudinal section of xylem.

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Question 22 (4 marks)

In your course, you conducted a first-hand investigation on observing red and white blood cells and measuring their sizes.

(a) Explain how you estimated the size of red and white blood cells. (2 marks)

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(b) Construct a scaled diagram of red and white blood cells. (2 marks)

Question 23 (4 marks)

Enzymes are considered to be essential components of metabolic functioning in all cells.

- (a) With respect to enzyme activity, compare the effect of increasing temperature with the effect of changing the substrate concentration (2 marks)

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- (b) Describe the features of an enzyme activity experiment that you performed in the school laboratory that enabled you to collect valid data. (2 marks)

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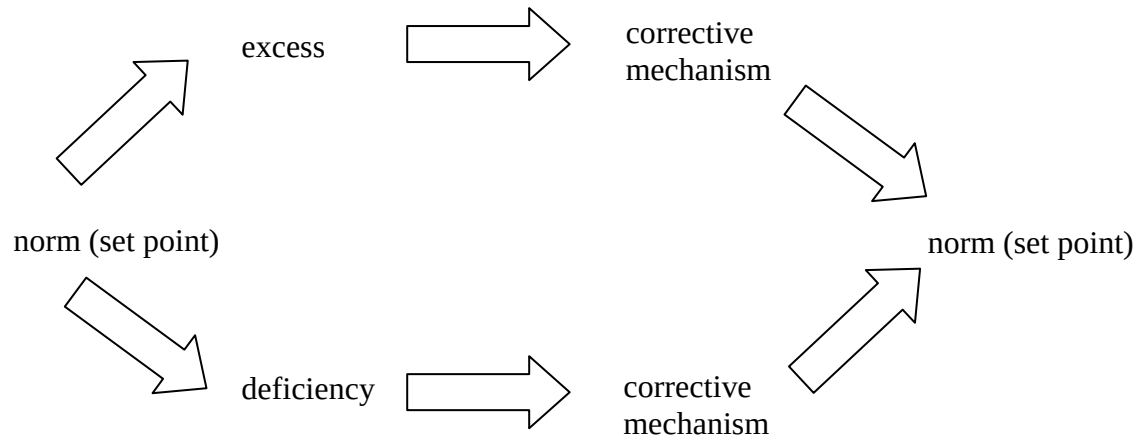
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Question 24 (3 marks)

The diagram represents a general scheme for homeostasis.



Using an example, explain how this scheme represents the process of homeostasis.

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Question 25 (3 marks)

Discuss the use of antibiotics in the management of diseases.

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Question 26 (3 marks)

Diseases may be caused by a variety of organisms.

- (a) Explain how an identified disease may be caused by an imbalance of human microflora.
(2 marks)

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- (b) Identify a disease caused by a macro-parasite. (1 mark)

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Question 27 (2 marks)

A person falls to the ground, grazing her skin. She notices that, shortly after falling, her skin is swollen and starts to bleed.

Compare the roles of inflammation and the lymph system as non-specific body defence adaptations in dealing with this injury.

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Question 28 (4 marks)

Malaria has caused more deaths to humans than any other disease.

(a) Identify the cause of malaria. (1 mark)

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(b) Describe the major symptoms of malaria. (1 mark)

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(c) Outline one important historical development in malaria research that has assisted in controlling malaria. (2 marks)

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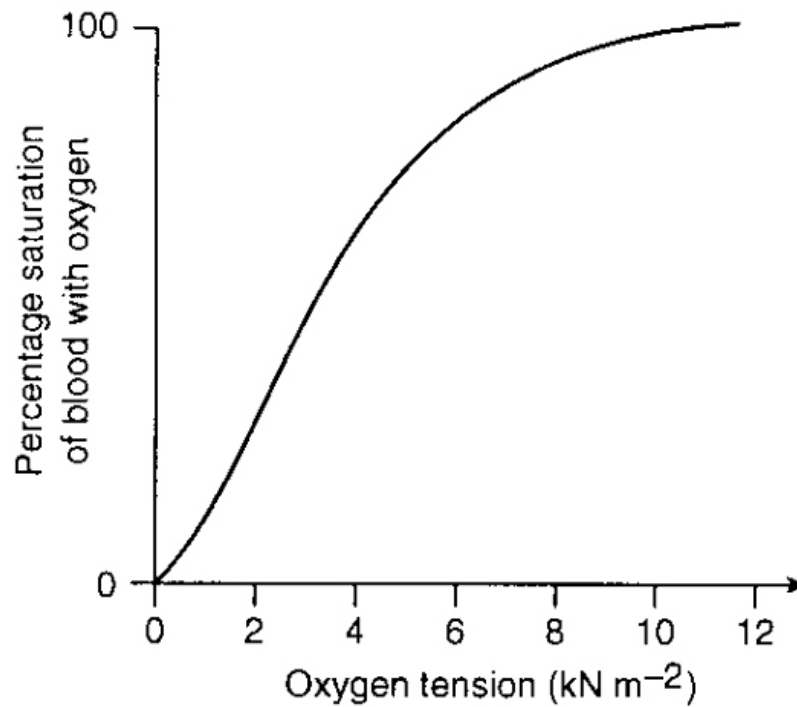
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Question 29 (2 marks)

The graph below shows the relationship between the percentage oxygen saturation of haemoglobin in the blood and the partial pressure (or tension) of oxygen in the blood.



Explain the effect of a decrease in oxygen tension in the blood on the functioning of muscle tissue.

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Question 30 (2 marks)

Outline why a transplanted kidney from the genetically identical twin of a kidney transplant patient is more likely to survive than a kidney from an unrelated individual.

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Question 31 (3 marks)

Outline the impact of changes in the physical conditions in the environment on the evolution of an identified Australian plant or an animal species.

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Question 32 (5 marks)

- (a) Explain how an understanding of the source of variation in sexually reproducing organisms has provided support for Darwin's theory of evolution by natural selection. (2 marks)

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- (b) Describe a method for cloning an organism and explain the potential impact of this reproductive technology on the evolution of the species involved. (3 marks)

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Question 33 (6 marks)

Vaccination programs have been commonly used in countries around the world for several years.

(a) Assess the effectiveness of vaccination programs. (3 marks)

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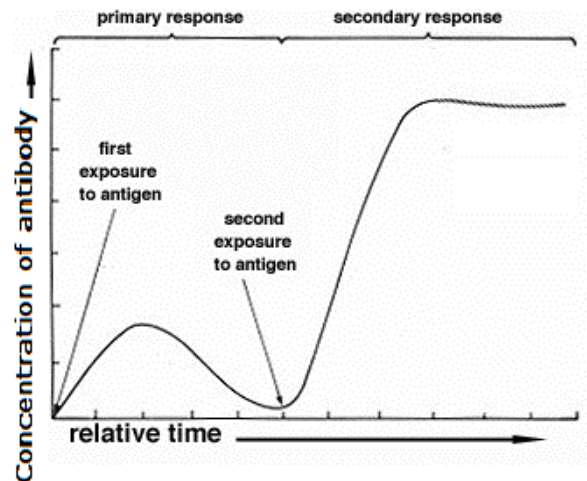
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Question 33 *Continued*

- (b) X and Y are the two children that belong to families X and Y respectively. Family X takes part in an immunisation program and consequently child X is immunised against all target diseases. Family Y does not take part in the immunisation program and as a result child Y is not immunised.

When an outbreak of whooping cough occurred at school, child X did not contract whooping cough while child Y contracted whooping cough and was hospitalised with serious complications, but eventually recovered.



Use the information provided in the graph above to explain how the immunisation program has worked to provide long term immunity to whooping cough in child X. (3 marks)

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Question 34 (4 marks)

The following table shows the concentrations of various substances in blood plasma, the glomerular filtrate in the kidney nephrons and in urine.

Substance	% concentration in blood plasma	% concentration in glomerular filtrate	% concentration in urine
glucose	0.10	0.10	nil
Urea	0.03	0.03	2.0
water	99	99	96
salts	0.72	0.72	1.5

Identify and explain the processes involved in the transport of each of the above substances in order to produce these results.

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Question 35 (1 mark)

Mangroves are one type of plant that can survive saline (salt) environments.

Identify another saline environment plant and describe an adaptation of this plant that enables it to survive its saline environment.

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Question 36 (2 marks)

The *Proteaceae* are a diverse plant family, including rainforest species such as the Tree Waratah (*Alloxylon*), as well as species like the Waratah (*Telopea*) and *Banksia*, which are adapted to dry sandstone ridges around Sydney.

Describe how technology could be used to demonstrate the evolutionary relationship between *Alloxylon*, *Telopea* and *Banksia*.

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Question 37 (3 marks)

Explain the immune response in the human body in terms of the mechanisms that allow interaction between B and T lymphocytes.

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Write your Name and Class at the top of the Section II Answer Booklet.

Section II

25 marks

Attempt ALL parts of Question 38 Biotechnology - Parts (a) – (i)

Allow about 45 minutes for this part

Answer the question parts in a writing booklet. Extra writing booklets are available.

Question 38 Biotechnology

Question parts (a) to (e) are based on the article below.

New breakthrough gives hope to cancer sufferers

By [Rachel Carbonell](#)



Researchers are trialling a breakthrough treatment aimed at killing cancerous blood cells while leaving healthy cells largely unharmed.

"The trial will be open for both lymphomas and leukaemias that have not responded optimally to other treatments," Professor McArthur said. Professor McArthur says the treatment is unique because it is able to target cancerous cells and have minimal effect on healthy ones. "All cells in our body need to make proteins to be able to grow," he said. "You can actually turn off protein synthesis and selectively treat the cancer cells without killing the normal cells. (This is) a new approach to treating cancer," he said. "It's not damaging DNA, it's not directly destroying the enzymes that are called protein kinases# that are now very commonly targets in cancer cells; it's an entirely new process to target for drug treatment in cancer."

Updated July 10, 2012 13:10:12

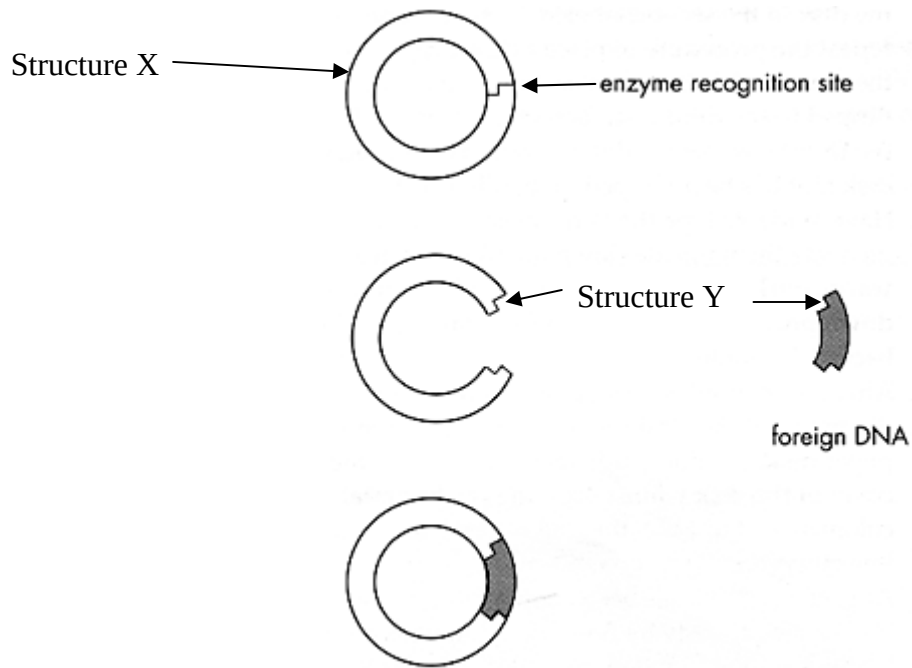
<http://www.abc.net.au/news/2012-07-10/newbreakthrough-gives-hope-to-cancer-sufferers/4120714>

protein kinases play an important role in cell division and an instrumental role in processes such as cancerous growths.

- (a) Outline the steps of protein synthesis required for the formation of proteins such as the protein kinases in cancer cells. (3 marks)
- (b) Explain how "turning off protein synthesis" can stop cancer growth. (2 marks)
- (c) Outline how changing the pH of blood will influence the activity of protein kinase enzymes if they are found in blood which has a pH range of 7.35 – 7.45. (1 mark)
- (d) Assess the validity and reliability of the information provided by the article. (3 marks)

Questions continue on next page →

- (e) The diagram below outlines the cutting and inserting steps used to form recombinant DNA.

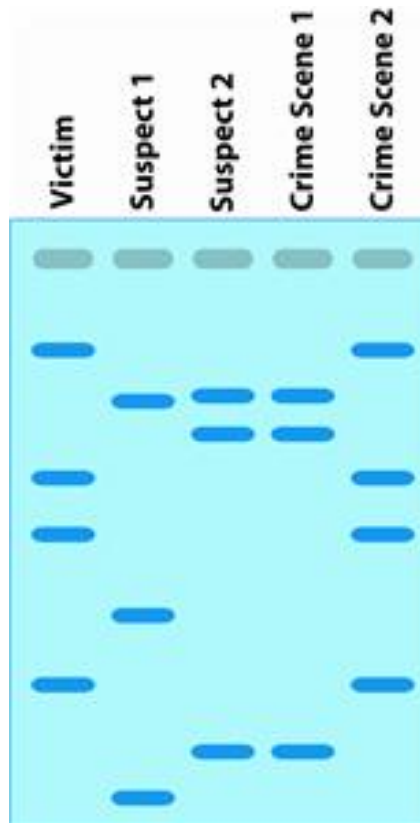


Identify the structures labelled X and Y. (1 mark)

- (f) Compare the use of DNA vectors with microinjection for inserting DNA to form transgenic organisms. (3 marks)
- (g) Outline the process of polymerase chain reactions. (3 marks)

Questions continue on next page

- (h) The diagram represents the DNA profiles from a murder case.



Justify which one of the suspects could have been the murderer. (2 marks)

- (i) In your course you have prepared case studies on applications of biotechnology for human purposes. Describe two named applications and evaluate the efficiency of each of the processes for BOTH applications. (7 marks)

End of Trial paper



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SOLUTIONS

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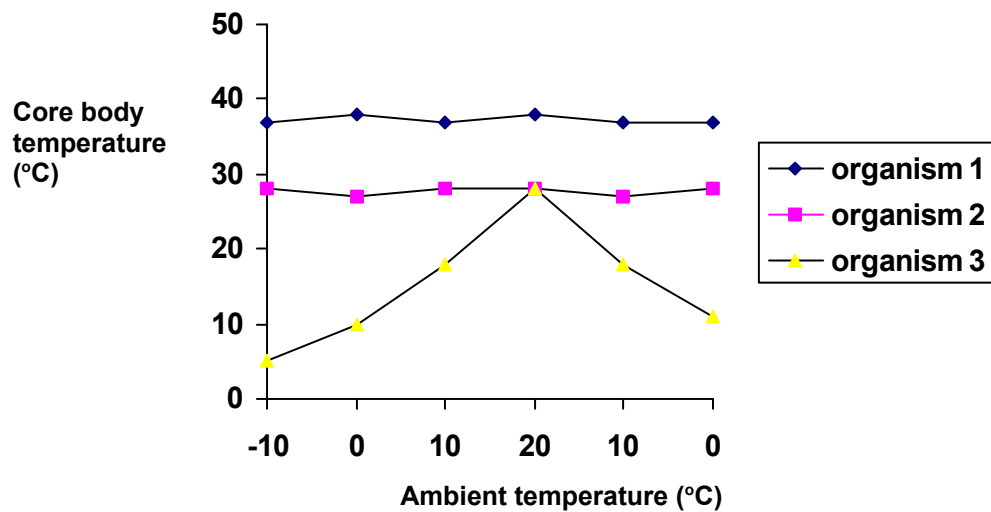
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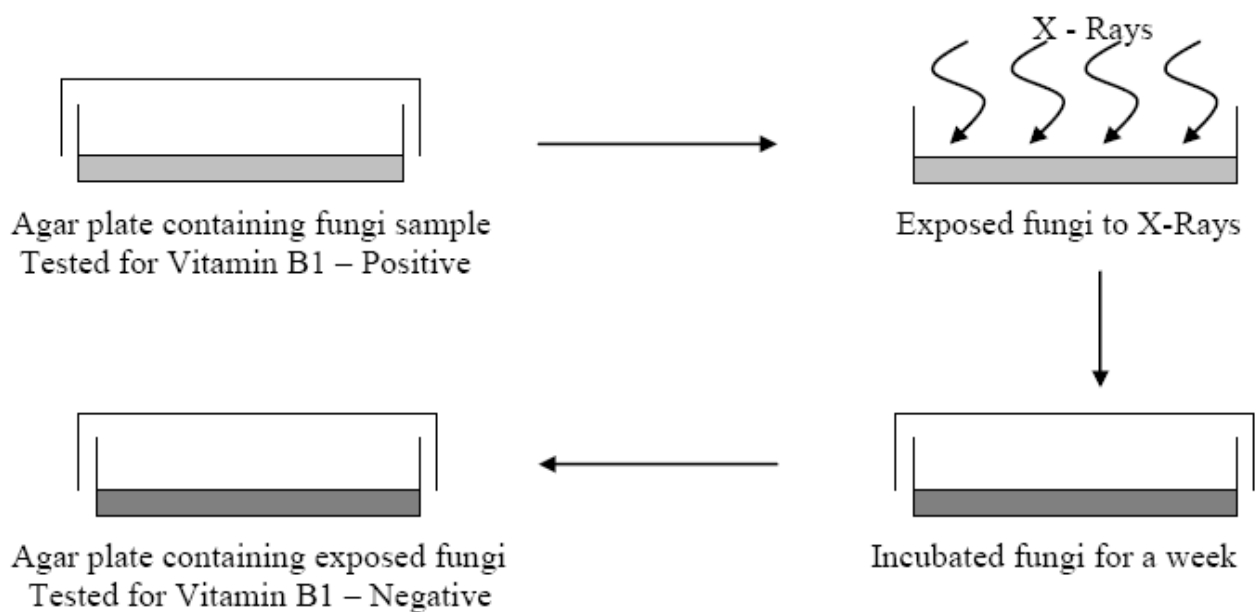
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- (A) Artificial pollination
 - (B) Cloning
 - (C) Hybridisation within a species
 - (D) Transgenic species**
20. A student performed the following experiment.



Which pair of scientists conducted a similar experiment to the one the student conducted?

- (A) Beadle and Tatum**
- (B) Darwin and Wallace
- (C) Watson and Crick
- (D) Sutton and Boveri

Write your Name and Class at the top of this Part A Answer Sheet.

Select the alternative A, B, C or D that best answers the question and fill in the response circle completely.

- | | | | | |
|-----|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 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 ☐ |

Write your Name and Class at the top of this Part B Answer Booklet.

Section I (continued)

Part B – 55 marks

Attempt Questions 21 - 37

Allow about 1 hour and 40 minutes for this part

Answer the questions in the spaces provided

Question 21 (4 marks)

State the name of one theory that accounts for the movement of water in the xylem tissue of plants. Explain this theory with the aid of a labelled diagram of the longitudinal section of xylem.

Evaporation (transpiration)-cohesion-tension theory accounts for the movement of water, and thus ions, in the xylem. Water molecules attract each other and are also attracted to the walls of the xylem. As water evaporates from the leaf, each molecule of water drags another upwards. This stream carries ions as well.

Criteria	Marks
(1): Identifies “Evaporation (transpiration)-cohesion-tension theory” (T) (1): Describes water attracts water (C) (1): Explains water movement occurs as a result of the evaporation of water from the leaf or other thus tugging the solution to other parts of the plant (E) (1): labelled diagram of longitudinal xylem (vessels - lignified walls or pits in cylinders or tracheids – tapered cell ends with pits) with at least one distinguishable feature for xylem labelled and drawn (D)	4
• Only three of the above points given.	3
• Only two of the above points given.	2
• Only one of the above points given.	1

Evaporation (transpiration)-cohesion-tension theory (1) (E)

water attracts water; water movement occurs a result of the evaporation of water from the leaf or other thus tugging the solution to other parts of the plant. (1) (T)

Labelled diagram: micro-diagram option = water molecules + cohesive nature of water molecules + xylem

Macro-diagram: continuous stream of water through labelled xylem to leaves (evaporation)

Note: transpiration is not a theory but a process

Question 22 (4 marks)

In your course, you conducted a first-hand investigation on observing red and white blood cells and measuring their sizes.

(a) Explain how you estimated the size of red and white blood cells. (2 marks)

Created a microscope slide of graph paper or used a mini-grid slide. Observed slide using a light microscope and estimated the size of the field of view diameter for the appropriate magnification (graph paper is 40x; mini-grid is 100x). Extrapolated the diameter estimate to the 400x magnification. Observed a prepared slide of blood at 400x and counted the number of red blood cells across the diameter. Repeated this count procedure several times, each time using a different angle of the diameter. Calculated the mean size of the red blood cells. Compared the size of the white blood cells with the red blood cells and extrapolated the size of the white blood cells.

Criteria	Marks
Describes the use of a reference such as graph paper or mini-grid to estimate the size of the diameter of the field of view. (R)	2
Describes an appropriate counting procedure and calculation for estimating the size of red blood cells at 400x (C)	
Describes how the sizes of white blood cells were estimated (W)	
• Only one of the above points given.	1

(b) Construct a scaled diagram of red and white blood cells. (2 marks)

_____ White blood cells

_____ red blood cells

10 mm (scale)

Criteria	Marks
Appropriate scale provided (5-8 μm) (S) Correctly drawn diagrams of RBCs (circular, no nucleus) and WBC (nucleus and slightly larger (x 1.5-2) than RBCs) (D)	1
• Only one of the above points given.	0

Question 23 (4 marks)

Enzymes are considered to be essential components of metabolic functioning in all cells.

- (a) With respect to enzyme activity, compare the effect of increasing temperature with the effect of changing the substrate concentration (2 marks)

Increasing temperature results in an increase in the activity of the enzyme until the optimal temperature is reached for the enzyme. After this temperature the enzyme activity decreases (inverted U shape graph). Increasing concentrations of substrate would result in an increase in the enzyme activity until a certain level is reached from which thereafter there would no increase in enzyme activity with increasing substrate concentration (hyperbolic-shape graph).

Outcome criteria	Marks
Description of the hyperbolic behaviour for substrate concentration (S) with enzyme activity + description of the inverted U shape graph behaviour for increasing temperature (T)	2
Description of the hyperbolic behaviour for substrate concentration with enzyme activity OR description of the inverted U shape graph behaviour for increasing temperature	1

- (b) Describe the features of an enzyme activity experiment that you performed in the school laboratory that enabled you to collect valid data. (2 marks)

Same total volume of solution should be used. E.g., use total of 10 mL in each test tube.

Diluted the milk to different concentrations e.g., 10 ml milk in one test tube, 8 mL milk + 2 mL water in test tube 2, 6 mL milk + 4 mL water in test tube 3, 3 mL milk + 7 mL water in test tube 4.

Control condition: each milk concentration experimental condition had the same set up except water was substituted for the rennin (to same volume).

Same volume of enzyme (rennin) was used for each experimental condition. E.g., put 5 drops in each test tube.

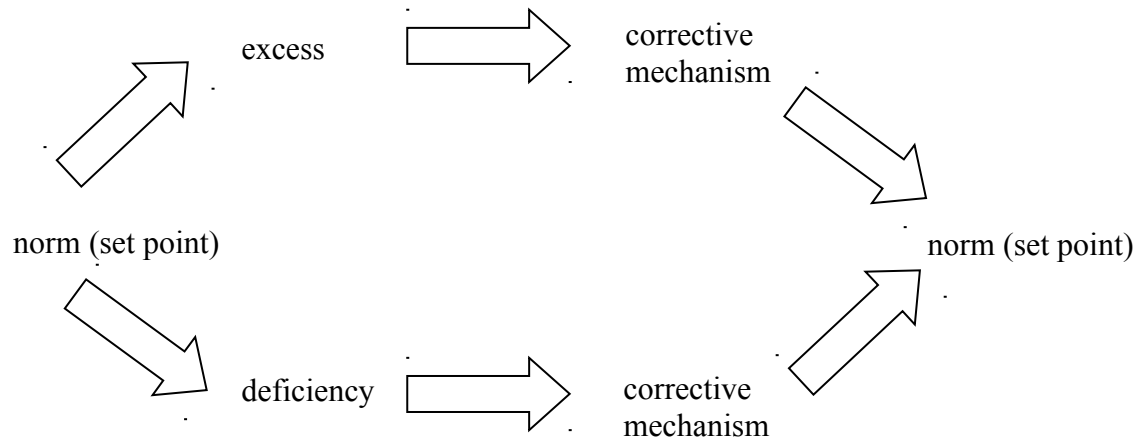
Consistent method employed to record the time taken for the milk to clump (test tube tilted, observing for no liquid motion) as a measure of enzyme activity.

Temperature/lighting must be kept constant and the same mixing procedure was applied to all the solutions.

Outcome criteria	Marks
Descriptions of how the student implemented a control condition and controlled at least two experimental variables for their investigation. Also acceptable is an outline of the methodological aspects that represented a valid approach to testing the hypothesis (e.g., changing substrate concentration and how to measure the rate of enzyme activity).	2
One of the above given	1

Question 24 (3 marks)

The diagram represents a general scheme for homeostasis.



Using an example, explain how this scheme represents the process of homeostasis.

Homeostasis refers to the maintenance of a relatively stable internal environment. The scheme represents homeostasis by including two processes that are in the main responsible for homeostasis.

Stage 1: detection of changes from the stable state. The scheme facilitates this stage of homeostasis by detecting if a substance or condition is in excess or under the normal value. E.g., thermoreceptors in human skin are used to detect deviations in temperature of the blood from the normal blood temperature of 37°C. E.g., the hypothalamus in the brain detects a change in blood temperature.

Stage 2: counteracting changes from the stable state. The scheme caters for this stage by having corrective mechanisms to return the substance or condition to the normal value. E.g., muscles or glands receive impulses from the brain which instruct effectors to bring about a response such as sweating when too hot or shivering when too cold. E.g., the thyroid gland produces less thyroxine so metabolism is decreased and less heat is produced. E.g., blood vessels vasodilate so more heat is lost when too hot.

Outcome criteria	Marks
Description of homeostasis with reference to how the scheme contains the two stages of homeostasis and examples given for each stage	3
Description of homeostasis with reference to how the scheme contains one stage of homeostasis and one example given	2
Description of homeostasis	1

Question 25 (3 marks)

Discuss the use of antibiotics in the management of diseases.

Discuss: identify issues and provide points for and/or against.

Antibiotics are very effective in targeting specific bacteria that cause disease. E.g., penicillin has been used successfully to treat numerous diseases caused by bacteria over many years. Many lives have been saved by the use of antibiotics. Thus humans can use antibiotics to treat a disease without harm to their own cells. There are a range of antibiotics developed and can therefore be used for a range of bacteria infections. Hence diseases caused by bacteria can be managed quickly and effectively using antibiotics. Antibiotics may also be given to prevent infections in people that are suffering from other diseases which result in the lowering of the immune system response.

However, there are several issues associated with using antibiotics for managing disease. Antibiotics are only useful for bacterial diseases. Some bacteria have developed a resistance to antibiotics and thus are immune to the use of antibiotics. Antibiotic resistance can accumulate via inappropriate administration of antibiotics by doctors and patients. E.g., if the patient fails to complete the course of antibiotics bacteria may survive and if any bacteria have a resistance to the antibiotic they could replicate, infect the person and develop populations that have resistance to antibiotics. Doctors may oversubscribe antibiotics to patients.

“The excessive use of antibiotics allows the proliferation of antibiotic-resistant bacteria.”

Outcome criteria	Marks
Two points provided regarding the effectiveness of antibiotics in treating/managing disease and two points provided regarding the negatives of antibiotic use in treating/managing disease	3
One point provided regarding the effectiveness of antibiotics in treating/managing disease and one point provided regarding the negatives of antibiotic use in treating/managing disease	2
One point provided regarding the effectiveness of antibiotics in treating/managing disease OR one point provided regarding the negatives of antibiotic use in treating/managing disease	1

Question 26 (3 marks)

Diseases may be caused by a variety of organisms.

- (a) Explain how an identified disease may be caused by an imbalance of human microflora. (2 marks)

Candidiasis (thrush) is caused by a fungus, *Candida albicans*. *C. albicans* and other microbes exist in humans but when an imbalance occurs, such as when using an antibiotic to treat some other disease, *C. albicans* can increase in number. (Other reasons for imbalance: diabetes, immune suppression, steroids, oral contraceptives, and pregnancy.

Outcome criteria	Marks
Identifies a disease caused by an imbalance in human microflora and explains how the disease arises	2
Identifies a disease caused by an imbalance in human microflora	1

- (b) Identify a disease caused by a macro-parasite. (1 mark)

Tapeworm (taeniasis), liver fluke disease, scabies, elephantitis

Question 27 (2 marks)

A person falls to the ground, grazing her skin. She notices that, shortly after falling, her skin is swollen and starts to bleed.

Compare the roles of inflammation and the lymph system as non-specific body defence adaptations in dealing with this injury.

Inflammation: blood vessels dilate thus increasing the blood flow to the injured site and bringing more white blood cells such as phagocytes to conduct phagocytosis.

Lymph system: tissue fluid flows into the lymph system which contains lymph nodes that filter and destroy foreign particles (such as bacteria, viruses, dirt) via phagocytosis (by phagocytes in the lymph node).

Outcome criteria	Marks
Describes the role of inflammation (I) and lymph system in dealing with the injury (L)	2
Describes the role of inflammation OR the lymph system in dealing with the injury	1

Question 28 (4 marks)

Malaria has caused more deaths to humans than any other disease.

- (a) Identify the cause of malaria. (1 mark)

Plasmodium genus (a protozoan). (1)

- (b) Describe the major symptoms of malaria. (1 mark)

Periodic fever (every 48-72 hours, depending on the type of malaria), headaches, anaemia (1)

- (c) Outline one important historical development in malaria research that has assisted in controlling malaria. (2 marks)

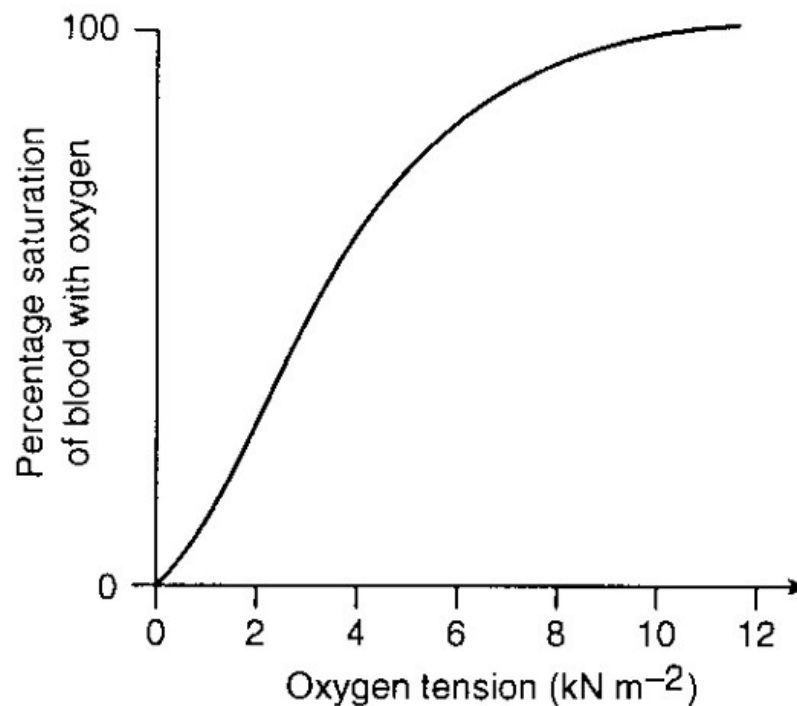
Controlling a disease refers to reducing the spread of the disease through a population. That is, keeping the incidence of the disease to a minimum. It may involve eradicating the source of infection, preventing the transmission and protecting people susceptible to the disease.

In the 1890s, Ronald Ross analysed the *Anopheles* species of mosquito via dissection and discovered that *Plasmodium* is taken into the mosquito when it sucks the blood of people containing *Plasmodium*, that is, malaria sufferers. Eradicate mosquito larvae in water bodies via the introduction of fish that feed on mosquito larvae; Use of insecticides; Use of drugs to destroy certain forms of Plasmodium; Use of protective nets and clothing. The strategy of eradicating mosquito larvae via the introduction of fish that feed on mosquito larvae is aimed at destroying the vector, the *Anopheles* species of mosquito thus preventing the vector from passing on the protozoan to humans.

Outcome criteria	Marks
Identifies and outlines one historical development of the understanding of malaria (H) with respect to any aspect of controlling the disease (C)	2
Identifies one historical development of the understanding of malaria with respect to any aspect of controlling the disease	1

Question 29 (2 marks)

The graph below shows the relationship between the percentage oxygen saturation of haemoglobin in the blood and the partial pressure (or tension) of oxygen in the blood.



Explain the effect of a decrease in oxygen tension in the blood on the functioning of muscle tissue.

The drop in oxygen tension enables haemoglobin to release/download oxygen quickly/ %age saturation of haemoglobin with oxygen decreases; (1) mark
so that muscles could use oxygen to produce energy from glucose/food stored inside. (1) mark

Question 30 (2 marks)

Outline why a transplanted kidney from the genetically identical twin of a kidney transplant patient is more likely to survive than a kidney from an unrelated individual.

In identical twins the genetic makeup of all cells is identical. The recipient twin's immune system will identify the cells in transplanted organ as its own. This will not trigger/stimulate immune response.

The cells in transplanted kidney from an unrelated individual may be recognised as foreign (antigens) as such immune response will trigger and destroy cells.

Criteria	marks
States that cells in kidney of identical twins are alike as such will not trigger immune response States that cells in kidney of unrelated individual may not be alike as such will trigger immune response that will destroy cells	2
States that cells in kidney of identical twins are alike as such will not trigger immune response OR States that cells in kidney of unrelated individual may not be alike as such will trigger immune response that will destroy cells	1

Question 31 (3 marks)

Outline the impact of changes in the physical conditions in the environment on the evolution of an identified Australian plant or an animal species.

Australian climate changed from cooler and wetter to drier and hotter. (1)

Some species like Antarctic beech and Wollemi pine (1) could only survive in limited areas as small pockets due to adaptations that only suit to limited range of conditions. (1)

Eucalyptus trees/ bottle brush/ tea trees/ lilly pillies have deep root system to obtain water from deeper ground. It also has narrow thick leathery leaves with waxy cuticle to prevent water loss.

Underground lignotubers and epicorm buds below the bark respond quickly after fire to regenerate plant. Thick woody fruits. Bilby with large ears to lose heat quickly.

Kangaroos have bipedal hopping that helps them to be energy efficient. They have flat teeth for grinding tougher vegetation and have multi-chambered stomach for digestion.

Spinifex grass is able to roll leaves to decrease transpiration.

criteria	marks
- States that climate changed to hot and drier - Identifies a species - Describe one adaptation	3
- States that climate changed to hot and drier AND/OR - Identifies a species AND - Describe one adaptation	2
- States that climate changed to hot and drier OR - Identifies a species	1

Question 32 (5 marks)

- (a) Explain how an understanding of the source of variation in sexually reproducing organisms has provided support for Darwin's theory of evolution by natural selection. (2 marks)

To compete for limited amount of resources the species develop a wide range of adaptations to succeed and survive. These cause variations among individuals.

Current knowledge about the source of variations due to independent assortment of chromosomes, random fusion of gametes, crossing over and mutations has produced strong evidence in favour of what causes variations.

Due to genetic differences, better adapted variations among individuals allow better chance for some to survive through the process of natural selection which lead to the formation of new species.

criteria	marks
• States that variations among individuals provided better chance to survive for some individuals. • States that these variations occur due to (random fusion of gametes/random segregation of chromosomes/crossing over/mutations provide strong support for what causes variations hence provide (at least two sources) • evidence for Darwin's theory.	2
Any one of the above	1

- (b) Describe a method for cloning an organism and explain the potential impact of this reproductive technology on the evolution of the species involved. (3 marks)

Whole organism cloning involves the nucleus of a donor cell being placed, via a micropipette, into an enucleated egg cell. This cell is placed into a surrogate mother who produces an organism that is a replica of the donor. This process yields an organism that has the same genome as the donor cell provider.

- The theory of organic *evolution* (biological evolution) contends that all living organisms arose in the course of history from earlier forms. Usually, many groups of organisms have a common ancestor. As the earth's environments altered over a long period of time, organisms gradually change, or evolved, into other types of organisms.

A modern reproductive technology such as whole organism cloning may have a detrimental effect on the evolution of a species. This selective breeding process may reduce the genetic diversity of a species and thus reduce the potential of the species to evolve.

Criteria	Marks	Mark code
Adequate demonstration of the concept of evolution: gradual change and common ancestry and describes the reduction of genetic diversity for a species as a result of cloning. Outlines a method of whole organism cloning.	3	
Adequate demonstration of the concept of evolution: gradual change and common ancestry and describes the reduction of genetic diversity for a species as a result of cloning. Outlines a method of whole organism cloning with one important feature missing. OR Outlines a method of whole organism cloning	2	
Adequate demonstration of the concept of evolution OR Outlines a method of whole organism cloning	1	

Question 33 (6 marks)

Vaccination programs have been commonly used in countries around the world for several years.

(a) Assess the effectiveness of vaccination programs. (3 marks)

Vaccination involves the injecting or oral intake of antigens from dead or weakened or non virulent strains of pathogens for a particular disease. These antigens trigger an immune response which lead to the production of large number of antibodies without or mild disease symptoms.

These antibodies are ready in the immune system to fight pathogen if it invades the body, thus prevent the contraction of disease.

Vaccines are cheap and safest methods of preventing disease.

Vaccines saves lives and sufferings due to disease as such help save huge treatment cost and produce quality of life.

Vaccination may antagonise some beliefs of people and at times may cause some side effects.

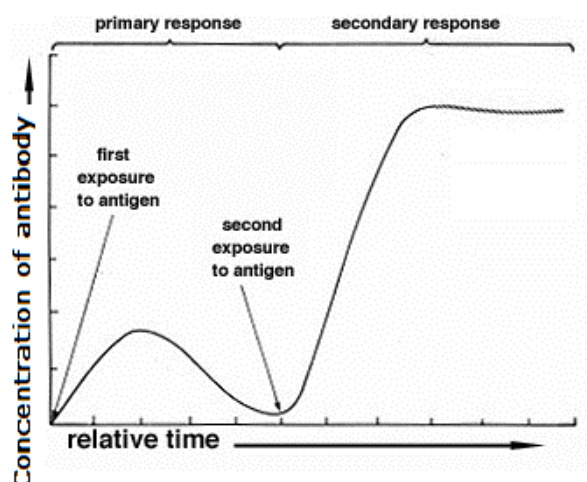
Overall vaccination against whooping cough has helped save lives, cost as well as spread diseases.

criteria	marks
• States what a vaccine is • States two positives or • one positive and one negative • makes a judgement	3
Any one or two of above	1-2

Question 33 *Continued*

- (b) X and Y are the two children that belong to families X and Y respectively. Family X takes part in an immunisation program and consequently child X is immunised against all target diseases. Family Y does not take part in the immunisation program and as a result child Y is not immunised.

When an outbreak of whooping cough occurred at school, child X did not contract whooping cough while child Y contracted whooping cough and was hospitalised with serious complications, but eventually recovered.



Use the information provided in the graph above to explain how the immunisation program has worked to provide long term immunity to whooping cough in child X. (3 marks)

The vaccine against whooping cough consists of dead or weakened form of bacteria *Bordetella pertussis*.

On administration the antigen in the vaccine trigger an immune response. This initiates B lymphocytes to produce antibodies. This is shown as primary response on the graph.

An unimmunised child will have no antibodies in his/her body.

If bacteria (*B. pertussis*) attacks the individual, the immune response will again be triggered and a very large number of antibodies will be produced. These antibodies along with previous antibodies will fight off the pathogen. This is shown as secondary response on the graph. This will prevent the occurrence of disease.

criteria	marks
- States that a vaccine produce antibodies against a pathogen and refer this as primary response (must refer to the graph) - States that secondary response is produced when pathogen actually attacks the body. (refer to the graph) - States that the antibodies present due to primary response as well as during secondary response prevent the occurrence of disease.	3
Any one or two of above (do not refer to the graph)	1-2

Question 34 (4 marks)

The following table shows the concentrations of various substances in blood plasma, the glomerular filtrate in the kidney nephrons and in urine.

Substance	% concentration in blood plasma	% concentration in glomerular filtrate	% concentration in urine
glucose	0.10	0.10	nil
Urea	0.03	0.03	2.0
water	99	99	96
salts	0.72	0.72	1.5

Identify and explain the processes involved in the transport of each of the above substances in order to produce these results.

Glucose, urea, water and salts diffuse from the blood plasma into Bowman's capsule since they are small enough to diffuse into the Bowman's capsule, moving from high to low concentration areas. Also, the pressure of the blood plasma is high enough in the glomerulus to force the small substances into the Bowman's capsule.

Glucose is moved from filtrate into blood by active transport process because it moves from low to high concentration. Hence the % concentration of glucose in the urine is nil.

Urea is moved from blood into filtrate by simple diffusion process because it moves from high to low concentration

Water is moved from the filtrate into the blood by osmosis because it moves from high to low concentration. The reabsorption of water into the blood results in the higher concentration of urea and salts in the urine.

Salt is moved from filtrate into blood by active transport process because it moves from low to high concentration. Salt may also diffuse back into the blood in the ascending limb of the loop of Henle.

Outcome criteria	Marks
Identifies and explains the transport of all substances into the Bowman's capsule to form the glomerular filtrate and identifies and explains the transport of all substances to form the urine values	4
One missing from above	3
Two missing from above	2
Describes the transport of one substance	1

Question 35 (1 mark)

Mangroves are one type of plant that can survive saline (salt) environments.

Identify another saline environment plant and describe an adaptation of this plant that enables it to survive its saline environment.

Atriplex (salt bush) has bladder-like trichomes (hairs). Each trichome has a stalk and a balloon-like tip, the bladder cell. The leaves sequester excess electrolytes in the bladder cells, which release the salt back into the environment when they are ruptured. (1)

Question 36 (2 marks)

The *Proteaceae* are a diverse plant family, including rainforest species such as the Tree Waratah (*Alloxylon*), as well as species like the Waratah (*Telopea*) and *Banksia*, which are adapted to dry sandstone ridges around Sydney.

Describe how technology could be used to demonstrate the evolutionary relationship between *Alloxylon*, *Telopea* and *Banksia*.

Nucleotide sequencing in DNA of different species/amino acid sequence in specific proteins such as haemoglobin or cytochrome C.

Nucleotide sequencing/DNA hybridisation involves unzipping of strands of DNA of two different species and then two strands from two different species will join when complementary nitrogen bases match.

The degree of close matching is used to determine how close the two species relate to each other. Greater the degree of matching closer are the two species related.

Amino acid sequence in specific protein of two different species is studied. Closer are the two proteins in amino acid sequence, more closely related are the two species.

Criteria	marks
- Identified the correct technique - Describes how is analysis carried out. - Describes how the results from the analysis are used to determine the evolutionary relationship.	2
- Identifies the technique AND - Describes how is analysis carried out. OR - Describes how the results from the analysis are used to determine the evolutionary relationship.	1

Question 37 (3 marks)

Explain the immune response in the human body in terms of the mechanisms that allow interaction between B and T lymphocytes.

Macrophage holding antigen on its (MHCII molecules) activates helper T cells.

Helper T cells then activate appropriate B and T cells.

T cells clone to produce millions of cytotoxic killer T cells and memory T cells.

(Cytotoxic killer cells destroy antigen by releasing chemicals)

B cells clone to produce millions of memory B cells and plasma cells. Plasma cells produce specific antibodies that help cytotoxic killer T cells to destroy the antigen.

criteria	marks
• States that helper T cells are activated by markers/antigens/MHCII molecules on the surface of macrophage. • States that helper T cells activate T and B cells which clone to produce cytotoxic killer T cells and plasma cells respectively. • States clearly the functions carried by cytotoxic killer T cells as well as plasma cells. (in sequential order)	3
Any one or two of above	1-2

Write your Name and Class at the top of the Section II Answer Booklet.

Section II

25 marks

Attempt ALL parts of Question 38 Biotechnology - Parts (a) – (i)

Allow about 45 minutes for this part

Answer the question parts in a writing booklet. Extra writing booklets are available.

Question 38 Biotechnology

Question parts (a) to (e) are based on the article below.

New breakthrough gives hope to cancer sufferers

By [Rachel Carbonell](#)



Researchers are trialling a breakthrough treatment aimed at killing cancerous blood cells while leaving healthy cells largely unharmed.

"The trial will be open for both lymphomas and leukaemias that have not responded optimally to other treatments," Professor McArthur said. Professor McArthur says the treatment is unique because it is able to target cancerous cells and have minimal effect on healthy ones. "All cells in our body need to make proteins to be able to grow," he said. "You can actually turn off protein synthesis and selectively treat the cancer cells without killing the normal cells. (This is) a new approach to treating cancer," he said. "It's not damaging DNA, it's not directly destroying the enzymes that are called protein kinases# that are now very commonly targets in cancer cells; it's an entirely new process to target for drug treatment in cancer."

Updated July 10, 2012 13:10:12

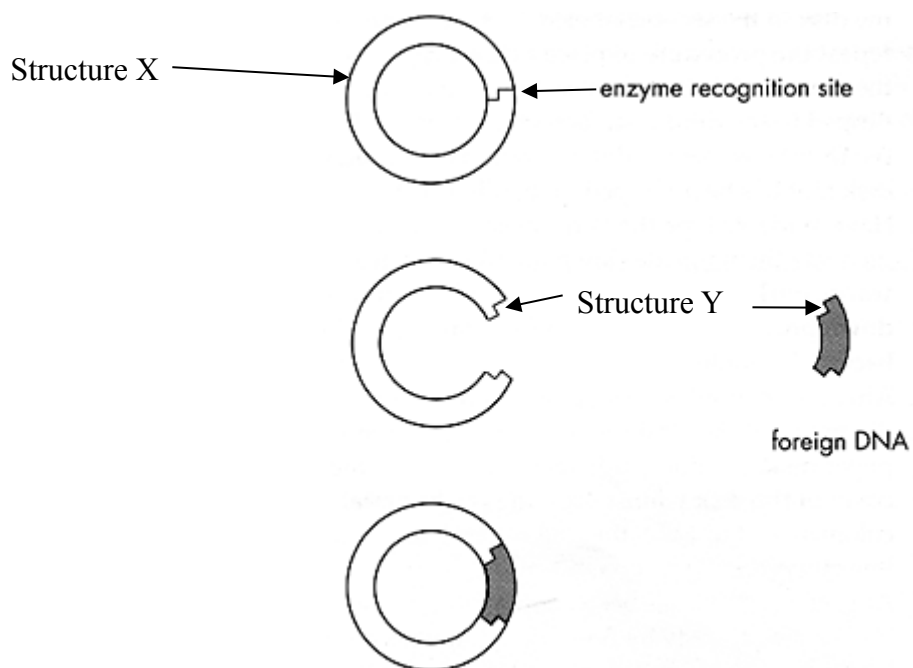
<http://www.abc.net.au/news/2012-07-10/newbreakthrough-gives-hope-to-cancer-sufferers/4120714>

protein kinases play an important role in cell division and an instrumental role in processes such as cancerous growths.

- (a) Outline the steps of protein synthesis required for the formation of proteins such as the protein kinases in cancer cells. (3 marks)
- (b) Explain how "turning off protein synthesis" can stop cancer growth. (2 marks)
- (c) Outline how changing the pH of blood will influence the activity of protein kinase enzymes if they are found in blood which has a pH range of 7.35 – 7.45. (3 marks)
- (d) Assess the validity and reliability of the information provided by the article. (3 marks)

Questions continue on next page →

- (e) The diagram below outlines the cutting and inserting steps used to form recombinant DNA.

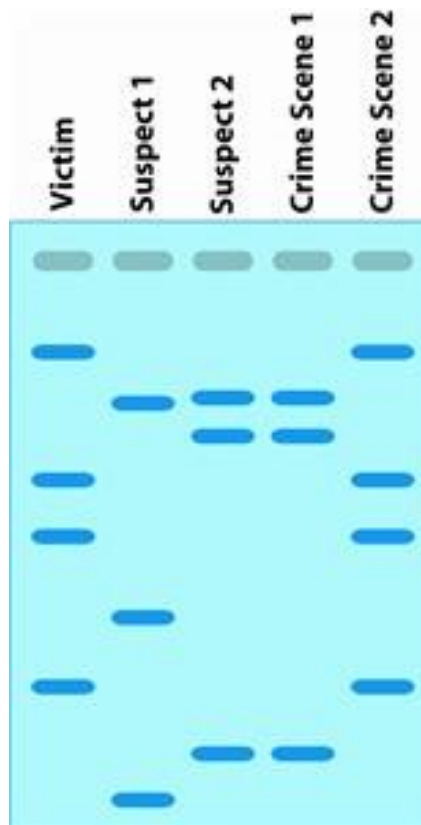


Identify the structures labelled X and Y. (1 mark)

- (f) Compare the use of DNA vectors with microinjection for inserting DNA to form transgenic organisms. (3 marks)
- (g) Outline the process of polymerase chain reactions. (3 marks)

Questions continue on next page

- (h) The diagram represents the DNA profiles from a murder case.



Justify which one of the suspects could have been the murderer. (2 marks)

- (i) In your course you have prepared case studies on applications of biotechnology for human purposes. Describe two named applications and evaluate the efficiency of each of the processes for BOTH applications. (7 marks)

End of Trial paper

(a) Outline the steps of protein synthesis in cancer cells.

Marking Guidelines	Marks
• Correctly outlines transcription • Correctly outlines translation • Polypeptide manufacture • Reference to stimulus material	3
• Outlines transcription or outlines translation • Polypeptide manufacture • Reference to stimulus material OR • Outlines transcription and translation • Reference to stimulus material OR • Outlines transcription and translation • Polypeptide manufacture	2
• Some reference to transcription and/ or translation or Polypeptide manufacture or reference to stimulus material	1

DNA unravels – the gene that codes for protein kinase is transcribed by complimentary mRNA where Thymine base is replaced with Uracil. The mRNA strand moves out of the nucleus to the ribosome. There the complimentary tRNA attaches to the mRNA three bases at a time. Attached to each tRNA is a specific amino acid for that sequence. The amino acids bond and the tRNA molecule moves off one at a time. At the end of the mRNA is a codon that stops the mRNA being copied and the ribosomal unit disperses and the specific polypeptide that forms the protein Kinase is complete.

MARKERS FEEDBACK

Many responses needed more stepping out – transcription then translation then polypeptide formation (many weakened at the last two steps). ALWAYS REFERS TO THE STIMULUS MATERIAL IN YOUR ANSWERS. Those that used diagrams tended to get the better marks.

(b) Explain how “turning off protein synthesis” can stop cancer growth

Marking Guidelines	Marks
• Cause • Effect	2
• Cause OR • Effect	1

Turning off protein synthesis stops the production of protein kinases. If there is no protein kinase then malignant tumours not produced therefore no cancer.

MARKERS FEEDBACK

Either done well or not. Many got confused between protein synthesis and mitosis. Protein Kinases involved in instigating cell division but not the process by which the cancer cells divide.

- (c) Outline how the pH will influence the activity of enzyme protein kinase if they are found in blood which has a pH range of 7.35 – 7.45.

Marking Guidelines	Marks
• Outlines the influence of pH on enzyme activity	1

Activity the optimum at pH 7.35 – 7.45. If above 7.45 then the activity will start to decline rapidly until there is no activity because the enzyme has become denatured and ceases working. Likewise enzyme activity will decrease pH below 7.35.

MARKERS FEEDBACK

Looking for the word denaturing and influence on activity. Mostly done well.

(d) Assess the validity and reliability of this information.

Marking Guidelines	Marks
• Validity – Against and For • Reliability – only one source • Judgement eg unreliable and invalid	3
• Against or for - validity • Against - reliability • Some judgement OR • Against or for validity and reliability and some judgement	2
• Some reference to validity or reliability	1

ABC news – not a well known scientist journal, educational institute but the source was updated very recently and is quoted by a professor but does not say from which institute. Only one source – no others to compare the information back to. Therefore the information is invalid and unreliable.

MARKERS FEEDBACK

Not done so well. Still need to refine terms and know the difference between reliability and validity For first hand sources and second hand sources. Reliability is finding the same information in several sources. Validity – up to date and from reputable sources eg universities, medical journals etc.

(e) Identify the structures labelled X as plasmid and Y as sticky end for one mark

MARKERS FEEDBACK

Done well but needed to get both correct to get full marks.

(f) Compare the method of DNA vectors and microinjection in the production of transgenic organisms.

Marking Guidelines	Marks
• Outlines DNA vectors	3

• Outlines Microinjections • At least one similarity and one difference	
• Outlines DNA vectors or Microinjections • At least one similarity and one difference OR • Outlines DNA vectors • Outlines Microinjections • similarity or one difference OR • Outlines DNA vectors • Outlines Microinjections • two differences or two similarities	2
• Outlines DNA vectors or Microinjections • At least one similarity and/or one differences	1

Microinjection a fine glass needle is used to insert the recombinant DNA into the nucleus of the host cell.

DNA Vectors are viruses that are used to insert the recombinant DNA into the host

Both are used to inject manipulated DNA into a host cell whereas, DNA vectors are naturally occurring and microinjections are manipulated by man. DNA vectors can insert many host cells at one time however, microinjection is done one host cell at a time.

MARKERS FEEDBACK

Not done so well. Many responses did not display a thorough understanding of microinjection and DNA vectors. Compare should include similarities and difference. This question lends itself to outlining each process to be able to compare effectively. Those who outlined the process seemed to be able to get the 2's or the 3's due to stronger comparisons.

(g) Outline the process of polymerase chain reactions

Marking Guidelines	Marks
- Correctly outlines the following steps - Heat - Primers, Polymerase and Nucleotides added - Cycled through - Particular DNA sequences amplified	3
Any of the three	2
Any of the two	1

DNA is heated and the strands separate. Primers, Polymerase and Nucleotides added. The primers initiate the sites that the duplication will occur from. This is carried out over and over again. Each time producing a double the amount of the original DNA. After many cycles – amplification of a particular DNA sequence.

MARKERS FEEDBACK

For those who knew the process it was done well. Quite a few left out the polymerase enzyme!

(h) Justify which one of the suspects could have been the murderer

Marking Guidelines	Marks
Correctly identifies suspect 2 and justifies	2
- Correctly identifies suspect 2 - or - justifies	1

Suspect 2 blood matches the pattern at Crime scene one, therefore, Suspect 2 must be the murderer.

MARKERS FEEDBACK

Done well

(j) In your course you have prepared case studies on applications of biotechnology for human purposes. Describe two named applications and evaluate the efficiency of each of the processes for BOTH applications

Marking Guidelines	Marks
Identifies all of the following: - Names TWO applications - Identifies and in detail describes the process used including the organism or tissue used and the outcome for <u>both</u> applications. - Describes at least a for AND against for each process or product - Provides a judgement based on criteria	7
- As for 7 but only outlines OR - Names ONE applications and in detail describes the process or processes used including the organism or tissue used - for AND against for the process or product - Provides a judgement based on criteria relating correctly to efficiency	6
- Names and outlines two applications, adv and disadv for both and some judgement relating to efficiency OR - Names and describes two methods adv or disadv but with judgement relating to efficiency	5
- Describe two applications and judgement OR - Outlines one application with adv and disadv and some judgement	4
Outline, adv or disadv some judgement OR Outline both, adv or disadv and no judgement	3
- Identifies the application and <u>outlines</u> some parts of the process - Identifies at least one point for OR one point against the process or product	2
Identifies the application OR Identifies the organism or tissue used OR Identifies the outcome of the biotechnological process identified OR Identifies one point for the process OR Identifies one point against the process	1

Aquaculture

Aquaculture is the farming of aquatic life. It is used to farm Atlantic Salmon in Tasmania. Salmon are kept in netted pools in the rivers. This biological process provides a way to reduce overfishing in our already exhausted waters, jobs and income to the state as well as a good and plentiful source of salmon for consumers. However, there is a risk that some of these salmon could escape into the waters and create competition for the native fish or prey upon the native fish. There is also the concern of the pollution that the farms themselves may cause. But by having strict guidelines to check nets regularly and formation of oyster farms under the salmon farms. Fish farms take a lot of bait fish to feed the salmon and therefore can be quite expensive to feed the fish up to a point that they are of a substantial weight for consumption. Therefore, the process of salmon farming is not very efficient.

Insulin

Gene for insulin production has been inserted into the plasmid of e coli bacteria. The bacteria is then fermented and produces large amounts of insulin that is extracted from the cultivation beds. This is then processed into a readily available form of insulin for human use. Advantages – completely compatible with humans. Large set up fees for equipment and gene manipulation.

However, once set very large amounts can be produced quickly and cheaply. Therefore the process for insulin production is efficient.

MARKERS FEEDBACK

Either done well or not done well. Many students still not following the evaluate scaffold and or not familiar with the content being tested. Those that tended to set their answers out under headings tended to gain the higher marks. The question was about efficiency – that is the energy output into the process/product vs the output. Many students interpreted that as the advantage vs the disadvantages.