

**Student Number:**

SYDNEY BOYS HIGH SCHOOL



## HSC TRIAL EXAMINATION

**2008**

# BIOLOGY

### **General Instructions**

Reading time - 5 minutes  
Working time - 3 hours  
Board approved calculators may be used  
Write using black or blue pen  
Draw diagrams using pencil  
Write your Number on all pages

This examination is a school based assessment task and cannot in any way guarantee the content or the format of the 2008 Biology Higher School Certificate Examination

**Total marks- 100**

### **Section I - Pages 2 - 19**

Total marks (75)  
This section has two parts,  
Part A and Part B

#### **Part A**

Total marks 15  
• Attempt Questions 1-15  
• Allow about 30 minutes for this part

#### **Part B**

Total marks 60  
• Attempt Questions 16-27  
• Allow about 1 hour 45 minutes  
for this part

### **Section II - Pages 20-22**

Total marks 25  
• Attempt Question 28 ONLY  
• Allow about 45 minutes for  
this section

**Section I**

75 marks

**Part A – 15 marks**

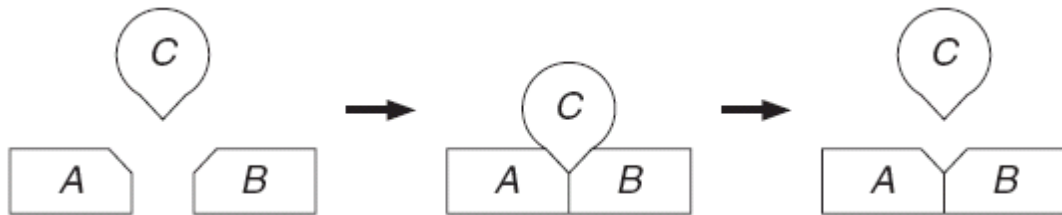
**Attempt Questions 1–15**

**Allow about 30 minutes for this part**


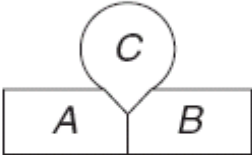


Use the multiple-choice answer sheet for Questions 1–15.

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1 The diagram shows one example of enzyme action as demonstrated by the ‘Lock and Key’ model.

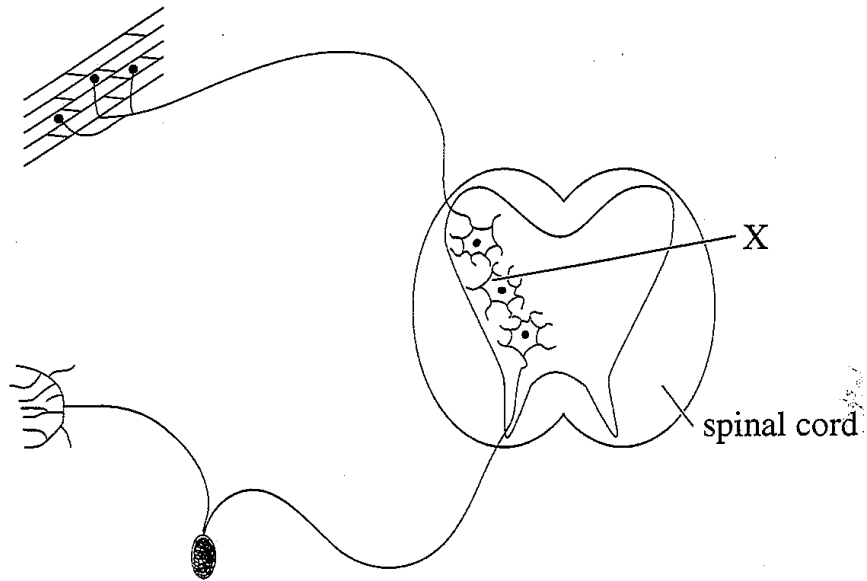


Which part of the diagram represents the substrate?

- (A) 
- (B) 
- (C) 
- (D) 

2

A portion of a nervous system is illustrated in the diagram below.



Which structure is represented by 'X' in the diagram?

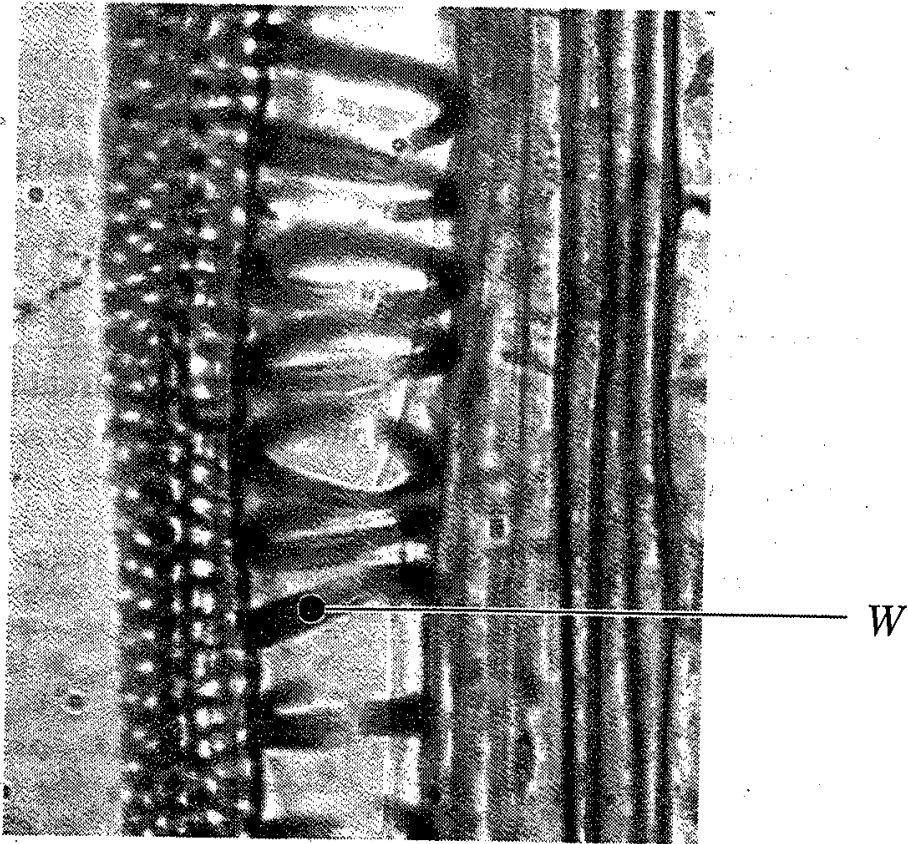
- (A) an effector
- (B) a neuron
- (C) a red blood cell
- (D) a receptor

3 The Wollemi Pine (*Wollemia nobilis*) is easily killed by the fungus *Phytophthora* which lives in the soil. The last small population of Wollemi Pines grows in a remote part of a national park in NSW. Scientists studying this natural population use strategies to prevent the trees becoming infected with *Phytophthora*. Which procedure would be most effective in preventing the spread of this fungus to the Wollemi Pines?

- (A) Preventing the importation of infected Wollemi Pines into Australia
- (B) Washing soil from scientists' shoes before they walk in the area
- (C) Inspecting soil samples in the area
- (D) Commercially producing and distributing the Wollemi Pine

Student Number:

4 This is a longitudinal section of plant stem ( $\times 200$ ).



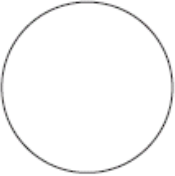
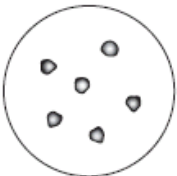
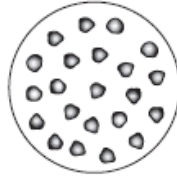
What is the name and function of the tissue labelled *W*?

	<i>Name</i>	<i>Function</i>
(A)	Xylem	Transports water and mineral ions
(B)	Phloem	Transports water and mineral ions
(C)	Xylem	Transports simple sugars
(D)	Phloem	Transports simple sugars

**Student Number:**

**5** Students performed an investigation to compare the effectiveness of two water treatments for purifying pond water.

Three samples of pond water, *A*, *B* and *C*, were collected and each used to inoculate an agar plate. The plates were incubated at 25°C and examined three days later. The number of visible bacterial colonies on each plate was counted and the results tabulated.

<i>Sample</i>	<i>A</i>	<i>B</i>	<i>C</i>
<i>Treatment</i>	5 grams of pool chlorine per litre of water	Boiling for one minute	No treatment
<i>Number of visible bacterial colonies</i>	0 	6 	22 

What is the dependent variable in this investigation?

- (A) Treating the water by boiling or adding pool chlorine
- (B) The use of a control sample
- (C) The number of visible bacterial colonies
- (D) The use of sterile agar plates for each sample

**6** Which leaf structures are adaptations to assist in the conservation of water?

- (A) Large air spaces, pointed leaf tip
- (B) Central vein, irregular leaf shape
- (C) Sunken stomates, thick waxy cuticle
- (D) Spongy mesophyll, vascular bundle

**Student Number:**

7 Quarantine plays an important role in the prevention of disease. It is best described as:

- (A) Preventing flu outbreaks by studying new virus outbreaks in communities.
- (B) Using Koch's postulates to determine the causative pathogen.
- (C) Preventing the spread of disease into Australia or between the states.
- (D) collecting cultures from infected organisms to establish causes of diseases.

8 Which observations can be used to demonstrate Koch's contribution to understanding the cause of disease?

- (A) The bacteria, *Helicobacter pylori*, are present in the stomach of all people diagnosed with stomach ulcers.
- (B) Some mosquitoes carry a pathogen that is often fatal to people.
- (C) A lack of vitamin C is found in all people suffering the nutritional disease scurvy.
- (D) Polio vaccinations trigger an immune response.

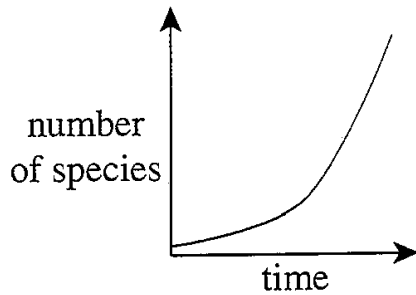
9 Current reproductive techniques can be used to alter the genetic composition of a population. Some of these methods were also used in the nineteenth century by Gregor Mendel.

How did Mendel use reproductive techniques in his experiments?

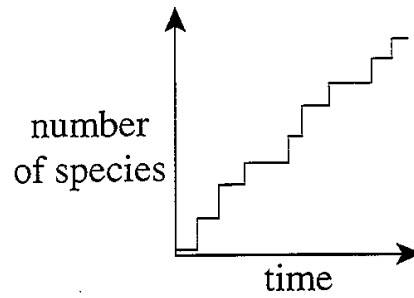
- (A) He cloned the pea plants with round seeds to increase their food supply.
- (B) He created a transgenic species by mixing tall pea plants and short pea plants.
- (C) He artificially inseminated the pea plants to achieve wrinkled seeds.
- (D) He artificially pollinated the pea plants to test for different genotypes in the offspring.

10 Which Diagram below best illustrates the concept of punctuated equilibrium?

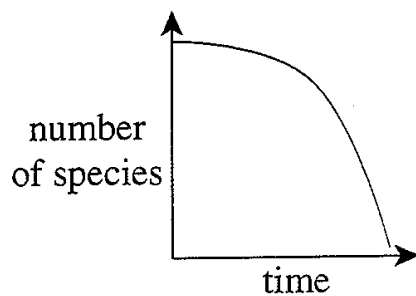
(A)



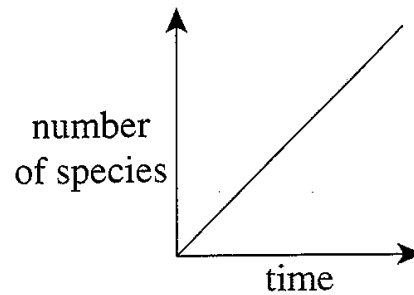
(B)



(C)



(D)

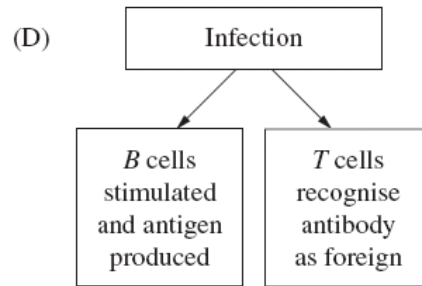
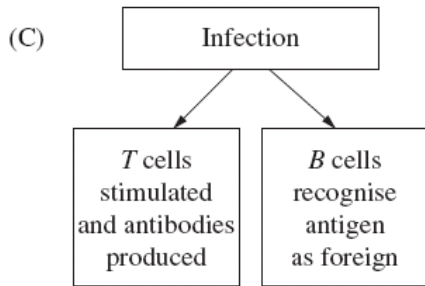
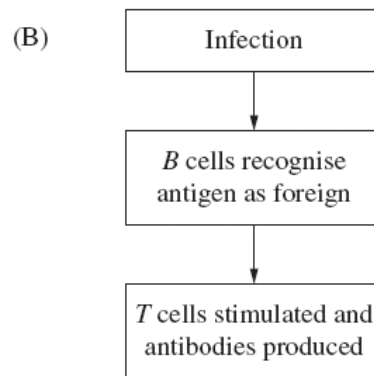
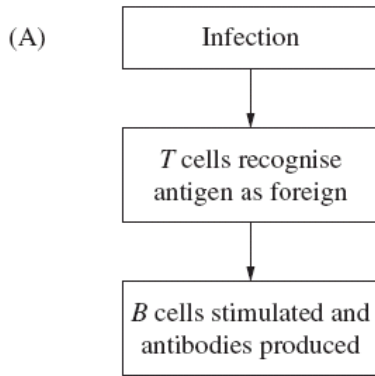


11 The effectiveness of a new insecticide was tested on a large population of mosquitoes over a number of breeding cycles. At first the population of mosquitoes was reduced dramatically by the use of the insecticide. After a number of breeding cycles the population then began to increase until the insecticide appeared to have little effect.

How would the Darwin/Wallace theory of evolution by natural selection explain these observations?

- (A) Some of the original population adapted to the insecticide and survived to produce offspring.
- (B) Some of the original population were resistant to the insecticide and passed this on to their offspring.
- (C) Some of the original population had already reproduced before the insecticide was used.
- (D) Some of the original population were isolated from the insecticide as a control group.

12 Which flowchart correctly shows an interaction between *B* and *T* lymphocytes during an immune response?



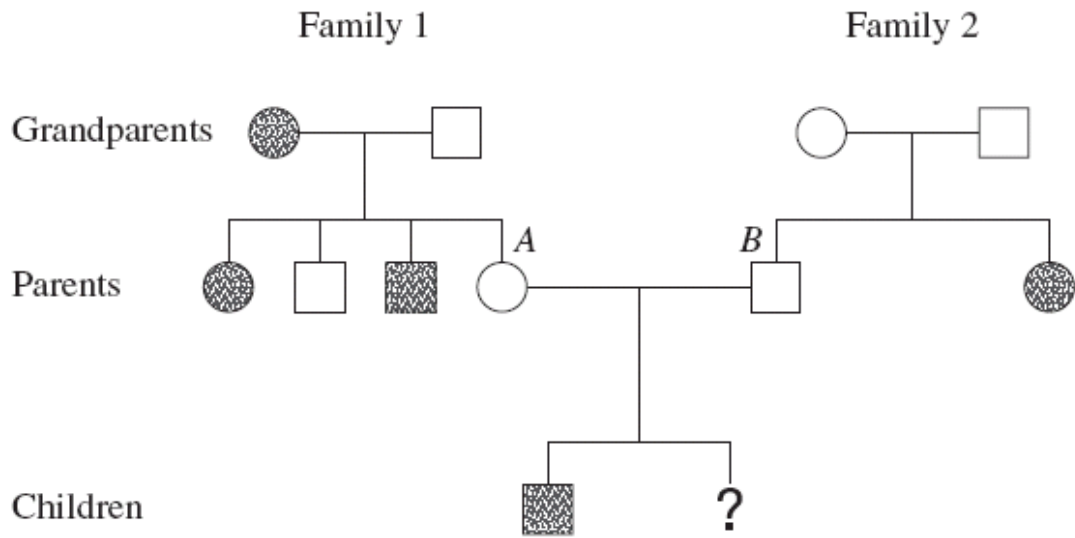
13 At the end of a marathon race a runner's body is dehydrated.

How does the body control the two hormones, ADH and aldosterone, to help to re-establish normal water balance?

- (A) ADH is inhibited and aldosterone is released.
- (B) ADH is released and aldosterone is inhibited.
- (C) Both ADH and aldosterone are released.
- (D) Both ADH and aldosterone are inhibited.



14 The family tree shows the inheritance of a genetic characteristic.



What is the probability that a daughter of parents *A* and *B* would be affected?

- (A) 100%
- (B) 50%
- (C) 25%
- (D) 0%

**Student Number:**

**15** The movement of materials through a plant occurs by translocation and the transpiration stream.

What is the main difference between these mechanisms?

- (A) Translocation occurs in endotherms, while the transpiration stream occurs in ectotherms.
- (B) Translocation occurs in xylem tissue, while the transpiration stream occurs in phloem tissue.
- (C) Translocation involves active transport, while the transpiration stream involves passive transport.
- (D) Translocation transports respiration products, while the transpiration stream transports photosynthetic products.

**Part B – 60 marks**

**Attempt Questions 16–27**

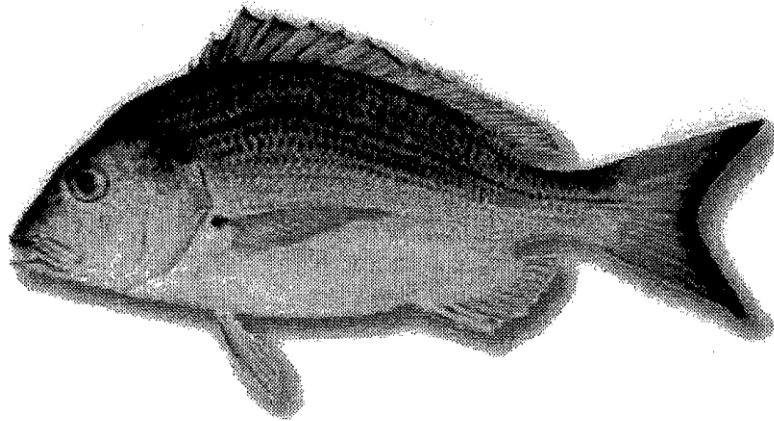
**Allow about 1 hour and 45 minutes for this part**

**Answer the questions in the spaces provided.**

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**Question 16**

**(3 marks)**



Source. [www.conran.net.au](http://www.conran.net.au)

Some salt water fish such as bream (above) live in estuaries. At times of heavy rainfall the salinity (salt concentration) of the water decreases significantly.

- (a) Outline the main problem that this would cause for the fish. (1 mark)

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- (b) Explain how the fish could survive this reduced salinity. (2 marks)

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**Student Number:**

**Question 17** (4 marks)

(a) Name a blood product extracted from donated blood and outline how it could be used to restore normal body function. (2 marks)

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(b) Propose TWO reasons why research is needed to develop alternatives to donated blood. (2 marks)

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**Question 18** (3 marks)

A student working in a restaurant kitchen is required to wear disposable gloves and hat when preparing food.

(a) Explain how this practice assists in the control of disease. (2 marks)

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(b) Identify another hygiene practice that reduces the risk of infection. (1 mark)

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**Student Number:**

**Question 19** (6 marks)

(a) Name ONE example of a disease caused by a macro-parasite. (1 mark)

.....

(b) List TWO features of prions that distinguish them from protozoans. (2 marks)

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(c) Most pathogens must first be transmitted to and enter the human body before they trigger an immune response. Relate this statement to a named infectious disease you have studied. (3 marks)

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**Question 20** (4 marks)

Assume that a gene controlling fur colour has recently been identified in mice. One allele for this gene produces a brown fur colour. A second allele produces a black fur colour.

Suppose you are asked to determine the dominance relationship between these two alleles, including whether it is a case of co-dominance or simple dominance.

(a) Summarise the crosses you would make to determine the dominance relationship. (2 marks)

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(b) Explain the types of observations upon which you could base your conclusions. (2 marks)

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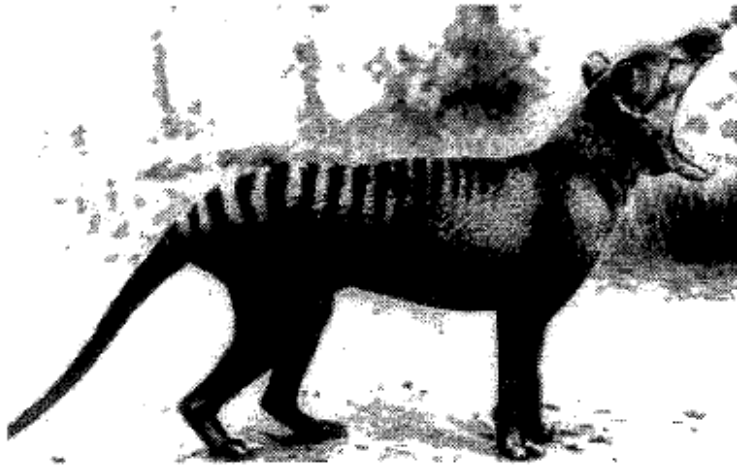
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**Question 21**

(6 marks)

The Thylacine or Tasmanian Tiger is thought to have been extinct since the 1930's.



In recent years some scientists have suggested that the Thylacine could be 'brought back to life' through cloning. Thylacine DNA could be extracted from a museum specimen of a Thylacine foetus dating from 1866 and preserved in alcohol. This DNA could be used to clone a new Thylacine.

Other scientists consider the project to be impossible and have pointed out the following:

- There is only one Thylacine specimen suitable for extraction of DNA.
- The nuclear membranes in the specimen have broken down and the DNA is no longer enclosed in a nucleus.
- There are no living Thylacines and its nearest living relatives are the much smaller Tasmanian Devils.

(a) Using your knowledge of cloning techniques and the implications of cloning for genetic diversity, explain why EACH of the three points above make it very unlikely for a viable population of Thylacines to be produced from cloning.

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(b) Discuss the ethical issues raised by the Thylacine cloning project. (3 marks)

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Student Number:

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**Question 22**

(6 marks)

**Dangerous diseases in humans**

<i>Disease</i>	<i>Deaths per 10 000 people infected</i>	<i>Pathogen survival time outside the human host (days)</i>
Chickenpox	3	1
Diphtheria	200	370
Influenza	10	14
Mumps	5	1
Smallpox	9 998	885
Whooping cough	100	12

Copyright New Scientist 2006.

(a) Which disease in the table is the most dangerous? Give TWO reasons for your Answer. (2 marks)

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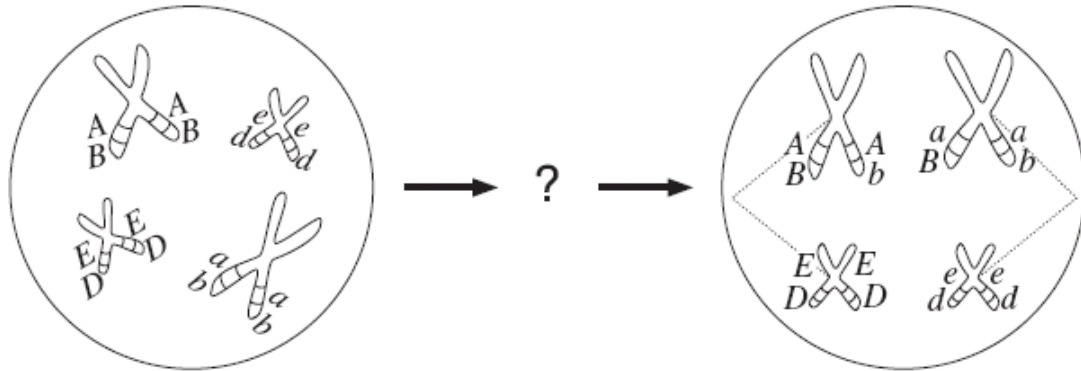
(b) Evaluate the effectiveness of a vaccination program for ONE named disease from the table. (4 marks)

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Question 23

(8 marks)

The diagram shows two steps of the process of meiosis occurring in a cell with four chromosomes.



(a) Describe the behaviour of the chromosomes between the steps shown. (2 marks)

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(b) List FOUR possible combinations of alleles that would be found in the gametes resulting from this process. (2 marks)

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(c) Explain ONE advantage of the process of meiosis to the species. (2 marks)

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(d) Distinguish between the terms allele and gene. (2 marks)

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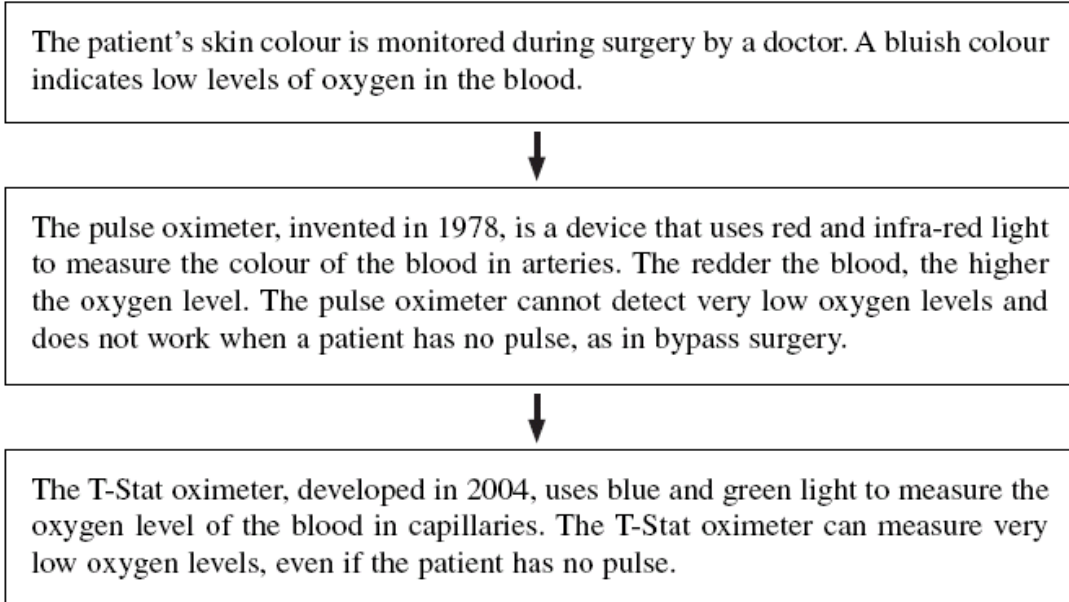
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**Question 24**

(6 marks)

The flowchart shows the development of technology used to measure oxygen concentration in blood during surgery.



(a) Why is it important to monitor oxygen levels in blood during surgery? (1 mark)

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(b) Explain ONE advantage of the T-Stat oximeter over the pulse oximeter. (2 marks)

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(c) Explain TWO changes in the chemical composition of blood as it moves along a capillary. (3 marks)

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**Student Number:**

**Question 25**

(3 marks)

Epidemiological studies indicate that there is a relationship between smoking and the incidence of lung cancer.

What information would have been gathered to establish this relationship?

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**Question 26**

(3 marks)

Describe how genes assist in the maintenance of health.

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**Student Number:**

**2008 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION**

**Biology**

**Section II**

**25 marks**

**Attempt ONE question from Questions 28–32**

**SBHS Attempt Q28 ONLY!**

**Allow about 45 minutes for this section**

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

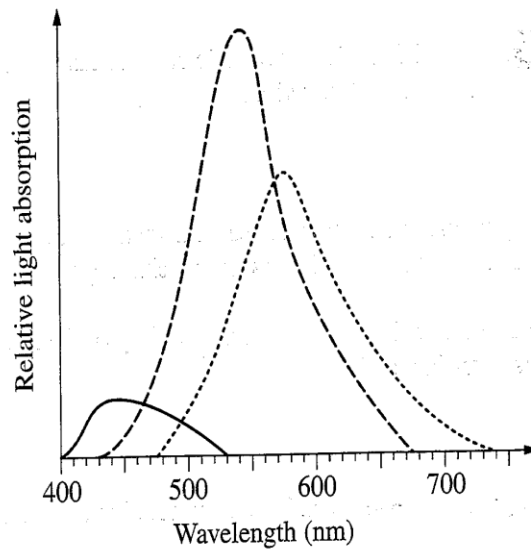
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	<b>Pages</b>
<b>Question 28</b>	
<b>Communication</b> .....	<b>21–22</b>
Question 29	
Biotechnology .....	23–24
Question 30	
Genetics: The Code Broken? .....	25–26
Question 31	
The Human Story.....	27–28
Question 32	
Biochemistry .....	29–30

**Question 28 — Communication**

(25 marks)

- (a) Compare the range of the electromagnetic spectrum detected by humans with that of other animals and discuss these differences. (5 marks)
- (b) (i) Describe an investigation you conducted to investigate a mammalian eye to relate structures to functions. (3 marks)  
(ii) How would you evaluate the relevance and reliability of the information gathered in this investigation? (3 marks)
- (c) Describe cataracts and the technology that can be used to prevent blindness from cataracts and evaluate the implications of this technology for society. (7 marks)
- (d) The graph shows the relative light absorption by cones in the human eye.



**KEY**

- Blue pigment cone
- - - Green pigment cone
- ..... Red pigment cone

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Nelson Thornes Ltd from Biology,  
Martin Rowland, 978-0-17-438425-0,  
first published in 1992.*

**Student Number:**

- (i) Estimate the wavelength at which the green pigment cone absorbs most light.  
(1 mark)
- (ii) Describe the pattern of light absorption by the red pigment cone, and suggest why all three pigment cones are necessary for colour vision. (2 marks)
- (iii) Explain the relationship between the occurrence of colour vision in animals and their use of colour for communication. Include examples in your answer.  
(4 marks)

**End of Question 28**



# SYDNEY BOYS HIGH SCHOOL

## TRIAL HSC BIOLOGY EXAM

### 2008

#### MARKING CRITERIA AND SAMPLE ANSWERS

##### Section 1 – Part A – 15 Multiple Choice Questions – 1 mark each

Q	Answer	Comments
1	D	The substrate is the material that is acted upon by the enzyme as the diagram represents an anabolic enzyme reaction where enzymes draw materials together. D represents the substrate, C the product, B the enzyme acting on the substrate-active site, and A the enzyme
2	B	Structure X is a neuron. Muscles and glands are effectors. Receptors are structures that detect changes (usually found in tissues like the skin). Red blood cells are found in the blood.
3	B	This would prevent the transport of the fungus into the area from surround soils.
4	A	The label is showing the spiral lignin within the xylem. The xylem is responsible for transporting water and dissolved mineral ions.
5	C	The number of visible bacterial colonies is the dependent variable as this is what is physically being measured in the experiment.
6	C	Sunken stomates and thick waxy cuticle are adaptations that resist water loss. All other features listed will not assist the leaf in conserving water.
7	C	The primary purpose of Quarantine procedures is to prevent the entry of disease into Australia and between states and regions within Australia.
8	A	One of Koch's postulates stipulates that the specific micro-organism must be present in every host with the disease, correlating with answer A.
9	D	Mendel artificially pollinated pea plants to test for different genotypes in the offspring by controlling the type of pollen that was transferred between the pea plants.
10	B	According to the theory of punctuated equilibrium, there are short bursts of rapid increase in the diversity of organisms interspersed by longer periods in which little or not increase in diversity is observed.
11	B	This is a classic example of natural selection in action. Variety exists in the gene pool, as some of the mosquitoes are genetically different and hence able to resist the pesticide. These then breed and manifest this characteristic to produce a resistant population.
12	A	In the interaction of B and T cells, the macrophage displays fragments of the antigens that are recognised by the B cells, which transform into plasma cells and produce antibodies.
13	C	Both ADH and aldosterone are released, as the body needs to retain as much water as possible as well as to replace the salts lost through perspiration.
14	C	The characteristic is recessive. Both parents A and B are heterozygous, so the chance of an affected female (homozygous recessive) is 3:1.
15	C	Translocation involves the movements of photosynthesis products (ie sugars), necessitating active transport. Transpiration is the result of physical forces' moving water up through the plant from the roots to the leaves where it is lost through evaporation, so involves passive transport.

**Section 1 – Part B – 12 Questions on Core Topics - 60 marks**

16 (a)

Marking Guidelines	Marks
Osmotic problem outlined	1 mark

It would face an inflow of water by osmosis.

16 (b)

Marking Guidelines	Marks
Two mechanisms described and their effect on water balance explained	2
One mechanism described or two done less well (outlined)	1
One mechanism outlined ONLY.	0

The fish's kidneys would need to start producing copious dilute urine by reabsorbing salts. At the same time it could actively take up salts through its gills. These two measures would remove the excess water entering by osmosis while minimising loss of salts in the urine. Salts lost would be replaced via the gills.

17 (a)

Marking Guidelines	Marks
Names a blood product AND outlines how it could be used	2
Names a blood product OR outlines how donated blood can restore normal body function	1

- (a) Blood products extracted from donated blood include: whole blood, plasma, red blood cells, platelets, granulocytes, clotting factors viii or xi.

*Factor viii (example):* Factor viii is administered to haemophiliacs to assist clotting and reduce bruising.

17 (b)

Marking Guidelines	Marks
Proposes TWO reasons why research is needed	2
Proposes ONE reason why research is needed.	1

- (b) Research is needed to develop alternatives to donated blood because currently there is a consistently high demand for donated blood, which is never in surplus. Donated blood can carry diseases, it needs to be cross-matched with recipients to avoid rejection, and it cannot be stored indefinitely. An alternative to donated blood would hopefully eliminate some or all of these problems in the future.



18 (a)

Marking Guidelines	Marks
Explains how gloves and hat prevent transmission of pathogen from infected person to healthy person	2
Identifies gloves and hat are a barrier to transmission of pathogens	1

- (a) A student working in a restaurant kitchen is required to wear disposable gloves and hat when preparing food so that disease transmission is reduced. Hands can transmit many pathogens if they have not been washed thoroughly. Hair can transmit pathogens from the hair or scalp as well as various parasites that can fall onto the food.

18 (b)

Marking Guidelines	Marks
Identifies a hygiene practice other than wearing gloves and hat that can reduce infection	1 mark

- (b) Another hygiene practice that reduces risk of infection can be any of the following:
- Hand washing
  - Refrigeration of perishable foods rather than leaving them at room temperature
  - Use of clean utensils and plates
  - Wearing a face mask to prevent fine droplets produced by sneezing/coughing from transmitting disease
  - Covering any open wounds

19 (a)

Marking Guidelines	Marks
Correctly names ONE disease caused by a macroscopic parasite	1 mark

- (a) Diseases caused by a macro-parasite include: fascioliasis (liver fluke disease), bilharzia (parasitic worms spread by snails), schistosomiasis (blood fluke disease), taeniasis (tapeworm disease), lice infestation (lice), and scabies (itch mites)

19 (b)

Marking Guidelines	Marks
Lists TWO distinguishing features	2
Lists ONE distinguishing features	1

- (b) Prions are proteins that have been altered from the normal shape while remaining chemically the same, and they cannot exist independently outside of a living organism, while protozoans are free living and single-celled eukaryotic organisms. Prions are extremely resistant to heat and chemical agents, unlike protozoans.

19 (c)

Marking Guidelines	Marks
Names infectious disease AND its causative pathogen; Describes transmission AND describes immune response	3
Names infectious disease AND its causative pathogen AND describes transmission	2
Names infectious disease AND its causative pathogen	1

(c) Many infectious disease may be discussed, eg malaria.

Malaria is transmitted by the female *Anopheles* mosquito. The causative agent is any one of four different microscopic sporozoan protozoans from the genus *Plasmodium* that can cause malaria via the mosquito vector. The infective *Plasmodium* sp. must first enter the body and get past the first line of defence. This is done by a mosquito vector that injects an anticoagulant containing saliva into the animal host through the skin while sucking the host's blood. Transmission occurs when the saliva containing the *Plasmodium* sp. is injected into the bloodstream. It then invades the liver cells, where asexual reproduction occurs. Consequently, red blood cells are affected, causing them to burst, releasing toxins into the body of the host. Once the parasite enters the red blood cells, antibodies are produced, but surface antigens on the cell membrane of the *Plasmodium* sp. are varied and hence the host immune response is useless as the antibodies do not recognise the antigens.

20 (a)

Marking Guidelines	Marks
Identifies cross between true-bred brown with true-bred black AND explains (i) how the true-bred strains are obtained OR (ii) how this is used to determine dominance	2
Identifies the cross between true-bred brown with true-bred black	1

(a) The most direct way to accomplish this would be to mate a true-bred (homozygous) brown mouse with a true-bred (homozygous) black mouse. Such true-bred mice could be obtained by repeated inbreeding of brown and black strains.

20 (b)

Marking Guidelines	Marks
Explains TWO observations upon which conclusions could be based	2
Describes TWO observations OR Explains ONE observation	1

(b) When true-bred brown and black mice are crossed, the offspring should all be heterozygous. If the offspring are either all brown or black, then it is a case of simple dominance. The phenotype of the offspring is the dominant allele and the colour absent from the offspring is the recessive allele. However, if the phenotype shows both brown and black colour within single individuals of the offspring, there is co-dominance.

21 (a)

Marking Guidelines	Marks
The problem raised by each of the three points is explained	3
2 points explained	2
1 point explained	1

- Only one specimen – any future cloned population would all be genetically identical – too little genetic diversity to be viable
- Nuclear membranes broken down – present whole animal cloning technique involves placing a nucleus from the animal to be cloned into an enucleated egg cell – not possible if no distinct nuclei are available
- No Thylacines only close relative Tasmanian Devil – what will be surrogate mother? Tasmanian Devil may be too small and unsuitable for development of young thylacine.

21 (b)

Marking Guidelines	Marks
2 ethical issues described and related to this case	3
1 ethical issue described or two named	2
1 ethical issue named	1

Humans are responsible for the extinction of the thylacine; therefore we have an obligation to try to bring it back if possible. We have abused the 'rights' of this species and ethically we should make amends. Any loss of biodiversity through species extinction disturbs the food web in an ecosystem having further impact on other species. Preventing or reversing extinction may restore balance to an ecosystem.

22 (a)

Marking Guidelines	Marks
Gives TWO reasons to justify the choice of most dangerous disease with comparison to other disease	2
Gives ONE reason to justify the choice of most dangerous disease with comparison to other disease <b>OR</b> gives TWO reasons to justify choice of most dangerous disease without comparison to other diseases.	1

- (a) Of the listed diseases the most dangerous is smallpox. This is because it has the highest number of deaths per 10,000 infected people listed and can survive outside of the human host for 885 days, which is the longest period of all the diseases listed.

22 (b)

Marking Guidelines	Marks
Evaluates the effectiveness of the vaccination program	4
Explains the effects of the vaccination program on individuals and the population	3
Explains the effects of the vaccination program for a named disease on individuals	2
Outlines the vaccination program undertaken for a named disease	1

- (b) *Smallpox (example)*: The vaccination program against smallpox has been very successful, to the point of eradication of the disease. The mass immunisation program undertaken with all people susceptible to the disease has resulted in providing protection for those in the community who are not resistant, as the disease is not now transferred readily within that community, thereby protecting the population. This means that the need for vaccination has been diminished, and people no longer have to have vaccinations against the disease.

23 (a)

Marking Guidelines	Marks
States that process of crossing over has occurred AND describe what happens to the chromosomes	2
States that the process of crossing over has occurred OR describe what happens to the chromosomes	1

(a) Two visible behaviours of the chromosomes are:

- The chromosomes line up along the equator and the centromeres are visible
- The chromosomes undergo crossing over (B and b)

23 (b)

Marking Guidelines	Marks
Correctly lists four possible gamete genotypes and no incorrect gamete genotypes	2
Lists at least two correct possible gamete genotypes and lists not more than two incorrect gamete genotypes	1
Lists more incorrect gamete genotypes than correct gamete genotypes	0

(b) Possible combinations of the alleles that would be found in the gametes are:

*AE, BD, bD, ae, Bd, bd.* (Correct these!!)

23 (c)

Marking Guidelines	Marks
Explains ONE advantage of meiosis to species	2
States ONE advantage of meiosis to species	1

(c) The advantage of the process of meiosis to a species is that it enables variation to occur. Variation enables species to change over time, which is particularly advantageous to a species in a changing environment.

23 (d)

Marking Guidelines	Marks
Defines the terms allele and gene AND clearly distinguishes between them	2
Defines the terms allele and gene	1

(d) A gene is the part of the DNA molecule that contains the instructions to make proteins and have specific locations on chromosomes. These determine particular characteristics, eg height or eye colour. An allele is the variation or alternative form of this characteristic or gene eg tall/short or brown/blue.

24 (a)

Marking Guidelines	Marks
Outlines importance of monitoring oxygen level in blood during surgery	1 mark

- (a) It is important to monitor oxygen levels in the blood throughout surgery to ensure that enough oxygen is being circulated around the patient's body, particularly to the vital organs, and to ensure that the body is still functioning correctly, even though sedated.

24 (b)

Marking Guidelines	Marks
Explains ONE advantage (of T-Stat oximeter over pulse oximeter)	2
Identifies ONE advantage (of T-Stat oximeter over pulse oximeter)	1

- (b) The T-Stat oximeter can be used for patients who are undergoing major surgery where there is no pulse and the pulse oximeter cannot be used, such as by-pass surgery. The pulse oximeter uses red/infra-red light to measure oxygen levels in arteries only, but the T-Stat oximeter uses blue/green light to measure oxygen levels in capillaries, which can be much lower.

24 (c)

Marking Guidelines	Marks
Explains TWO changes	3
Identifies TWO changes <b>OR</b> Explains ONE change	2
Identifies ONE change	1

- (c) Changes in chemical composition that occur as blood moves along a capillary include:
- Decrease in oxygen concentration as carbon dioxide enters the capillary from the body cells, eg where respiration has taken place
  - Increase in the amount of metabolic wastes as wastes produced in the body cells, eg urea, enter the capillary.

Marking Guidelines	Marks
THREE appropriate types of information	3
TWO appropriate types of information	2
ONE appropriate type of information	1

Information that would have been gathered to establish a relationship between smoking and the incidence of lung cancer includes:

- Age of individuals
- Gender of individuals
- Possible cause of the disease
- Risk factors such as:
  - Number of cigarettes smoked by individuals daily
  - General health status of individuals
  - Lifestyle practices, eg exercise/diet
  - Strength of cigarettes smoked
  - Age of smoking commencement
  - Co-habitation/working with smokers
  -

Marking Guidelines	Marks
<b>THREE</b> of the following points: <ul style="list-style-type: none"> <li>• Genes control production of polypeptides/proteins which act as structural proteins for growth and repair.</li> <li>• Genes control production of polypeptides/proteins which act as enzymes for metabolic function.</li> <li>• Genes control production of polypeptides/proteins which act as immunological proteins for immune system functioning.</li> <li>• Genes direct cell division (mitosis) for growth and repair.</li> </ul>	3
<b>TWO</b> of these points	2
<b>ONE</b> of these points	1

Genes assist in the maintenance of health by enabling exact functioning copies of cells to be made via mitosis. This is essential for growth and repair. The function of genes is also to ensure that correct proteins are produced in a cell to allow growth and repair, to enable all cellular processes to continue by acting as metabolic enzymes and by acting as immunological proteins enabling various immune system functions.

Marking Guidelines	Marks
<ul style="list-style-type: none"> <li>• Hypothesis correctly stated</li> <li>• Reasonable equipment list</li> <li>• Step by step method including method of measuring independent and dependent variable given</li> <li>• Other variables controlled</li> <li>• Experimental control described</li> <li>• A number of tests done or experiment repeated</li> <li>• One safety measure outlined</li> <li>• Result given</li> </ul>	8
<ul style="list-style-type: none"> <li>• 1-7 of the above</li> </ul>	1-7

**Hypothesis:** Microorganisms present in the air will cause spoilage and decay and show significant microbial growth in the flask which is open to the air.

**Variables:** The independent variable is exposure to air; the dependent variable is mould growth; the experimental control is the sealed flask; controlled variables include: temperature, amount and type of broth, sterility of flasks, time of observations.

**Equipment:** Two conical flasks; two stoppers with one hole through them; one glass tube with an s-bend; one straight glass tube; a beef stock cube; water; Bunsen burner; matches;

**Method:** (Type method here)

**Safety measure:** Wear glasses to protect eyes from possible splashes or breaking glass; be careful handling hot equipment including flasks and tripod and Bunsen burner; keep flasks in fume cupboard to prevent exposure to mould; dispose of mould carefully.

**Result:** Mould grew in the flask which was open allowing air to enter. No mould grew in the flask which was sealed from the external air by the s-bend trap.



## MARKING CRITERIA AND SAMPLE ANSWERS

### Section II –Question 28 on the Option 9.5 Communication – 25 marks

28 (a)

Marking Guidelines	Marks
Correctly states range of EMS detected by Humans and TWO other animals AND discusses similarities AND differences	5
Correctly states range of EMS detected by Humans and TWO other animals AND discusses differences ONLY	4
Correctly states range of EMS detected by Humans and ONE other animal AND discusses similarities AND differences	3
Correctly states range of EMS detected by Humans and ONE other animal AND discusses differences ONLY	2
Correctly states range of EMS detected by Humans or other animals without discussing similarities and differences	1

“This was done well however boys need to learn their nanometres! There were two marks for each animal and the commonest mark to be lost was a non specific statement about humans. Also don’t use negative statements eg humans don’t need to see ultra-violet light as we don’t eat nectar, or they don’t need infra-red as they don’t live at night. It is biological rubbish.” (from SGS Biology Exam Crib 2007)  
(Type sample answer here)

28 (b) (i)

Marking Guidelines	Marks
Detailed description of method including Aim, Hypothesis OR Risk assessment	3
Detailed description of experimental method	2
Basic description of experimental method	1

(Type sample answer here)

28 (b) (ii)

Marking Guidelines	Marks
Explains how Relevance <b>AND</b> Reliability of information can be evaluated	3
Explains how Relevance <b>OR</b> Reliability of information could be evaluated	2
Shows understanding of Relevance <b>OR</b> Reliability without explain how these could be evaluated	1

(b) (ii) The relevance and reliability of the information gathered in this investigation could be evaluated by looking at the currency of the reference material used in the investigation, and by comparing the diagrams produced in the investigation to published brain diagrams and possibly to dissection photos, if available on the internet or other sources.

28 (c)

<b>Marking Guidelines</b>	<b>Marks</b>
Describes cataracts AND describes in thorough detail the surgical removal of the lens and its replacement with a synthetic lens AND makes a clear judgement about the significance of this technology for society including clear criteria for judgement	7
Describes cataracts AND describes in thorough detail the surgical removal of the lens and its replacement with a synthetic lens AND makes a general evaluative statement about the significance of this technology for society	6
Describes cataracts AND describes in thorough detail the surgical removal of the lens and its replacement with a synthetic lens without an evaluative statement	5
Describes cataracts AND describes with sound detail the surgical removal of the lens and its replacement with a synthetic lens without an evaluative statement	4
Describes cataracts AND describes with basic detail the surgical removal of the lens and its replacement with a synthetic lens	3
Describes cataracts AND states that blindness due to cataracts can be corrected by removal of the lens and replacement with a synthetic lens	2
Describes what a cataract is	1

(Type sample answer here)

28 (d) (i)

Marking Guidelines	Marks
About 540 nm	1 mark

28 (d) (ii)

Marking Guidelines	Marks
Describes light absorption by red pigment <b>AND</b> suggests why three types of cones are needed for colour vision	2
Describes light absorption by red pigment <b>OR</b> suggests why three types of cones are needed for colour vision	1

- (d) (ii) The red pigment has the broadest range of wavelength, even though the relative amount of light absorbed is not as great as for the green pigment but much larger than for the blue pigment.

All three colour pigments are necessary for colour vision because each responds to only a set wavelength range. The overlap of the activity between the cone pigments results in the ability to detect the broad spectrum of visible light. For example, if yellow light hits the retina, then the blue and green cones respond and the brain will interpret this as yellow.

28 (d) (iii)

Marking Guidelines	Marks
Explains relationship between colour vision and use of colour for communication including <b>TWO</b> examples	4
Explains relationship between colour vision and use of colour for communication including <b>ONE</b> example	3
Explains relationship between colour vision and use of colour for communication <b>without</b> examples <b>OR</b> Describes occurrence of colour vision and use of colour for communication <b>with</b> examples	2
Describes occurrence of colour vision and use of colour for communication <b>without</b> examples	1

- (d) (iii) Colour vision occurs in many animal groups, including insects, bony fish, reptiles, birds and frogs. Among mammals, primates are one of the few groups that have colour vision. Most of these species are brightly coloured themselves, so it follows that they can detect colour. Animals use colour for many different functions, all of which in the long run enable the survival of the species, such as:
- Warning predators with bright colour displays to prevent themselves from being eaten, eg brightly coloured poisonous frogs
  - Identifying ripe fruit when feeding/avoiding poisonous species/locating nectar in bright flowers, eg primates, birds and insects
  - Enabling them to be camouflaged in their surroundings, eg chameleons, tigers
  - Breeding purposes, such as colour displays in order to attract a mate, eg bird feathers (tails of peacocks), red belly in stickleback fish