

Student Number: 166



Shore

Sydney Church of England Grammar School

**2008**  
**HIGHER SCHOOL CERTIFICATE**  
**TRIAL EXAMINATION**

# 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 Student Number where required
- **Note:** Any time you have remaining should be spent revising your answers.

**Total marks - 100**

**Section I**

**Part A – 15 marks**

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

**Part B – 60 marks**

- Attempt Questions 16-29
- Allow about 1 hour and 45 minutes for this part.

**Section II**

**25 Marks**

Attempt ONE question from Questions 30 or 32

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.

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

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

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

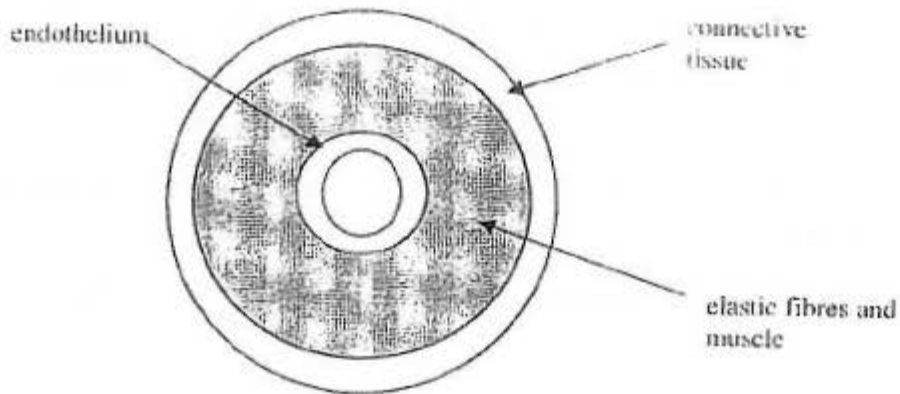
A  B  C  D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

A  B  C  D   
correct

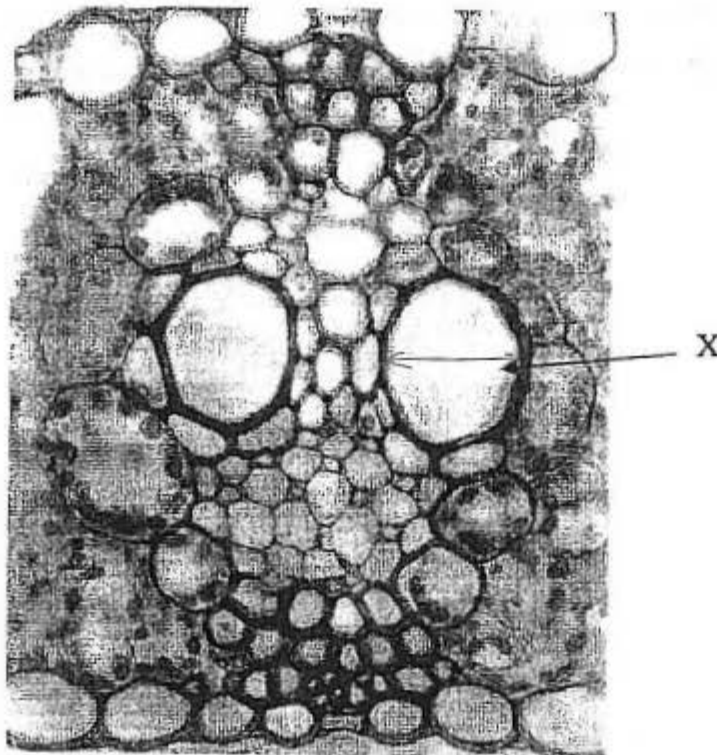
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1. The drawing below represents a cross section through a type of blood vessel.



The type of blood vessel represented by the diagram is

- A) lymph
  - B) vein
  - C) capillary
  - D) artery
2. The photomicrograph below shows a transverse section through a vascular bundle.

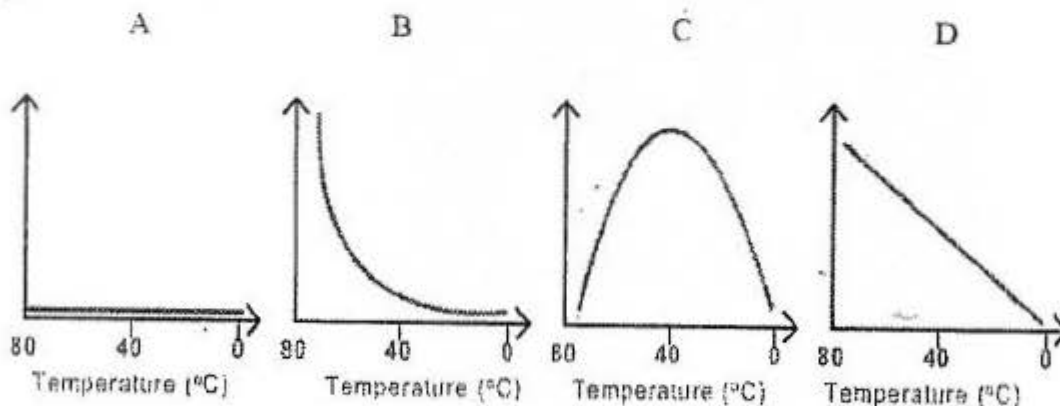


The area of the photomicrograph is  $1.00 \text{ mm} \times 0.80 \text{ mm}$ .

Use this information to determine the diameter of the large xylem vessel indicated.

- A)  $0.15 \mu\text{m}$
- B)  $1.5 \mu\text{m}$
- C)  $15 \mu\text{m}$
- D)  $150 \mu\text{m}$

3. Active transport is different to passive transport in that
- Active transport occurs in the kidney: passive transport does not.
  - Diffusion is an example of passive transport, osmosis is an example of active transport.
  - Passive transport involves the movement of water, active transport involves only the movement of glucose.
  - Active transport uses energy to move substances against a concentration gradient: passive transport does not.
4. The form in which salts are transported around the human body is
- As dissolved ions in the blood plasma.
  - In a protein coated package called a chylomicron.
  - As bicarbonate ion in red blood cells
  - As crystals floating in lymph nodes.
5. The graph which best shows the changes in reaction rate when a mammalian enzyme is added to a very hot substrate solution and the solution is then cooled down from 80°C to 0°C is:



6. In pea plants the red (R) colour is dominant over white (r) colour. The expected phenotypic ratio from a cross between two heterozygous red pea plants would be:
- all red
  - all white
  - 3 red: 1 white
  - 1 red: 1 white

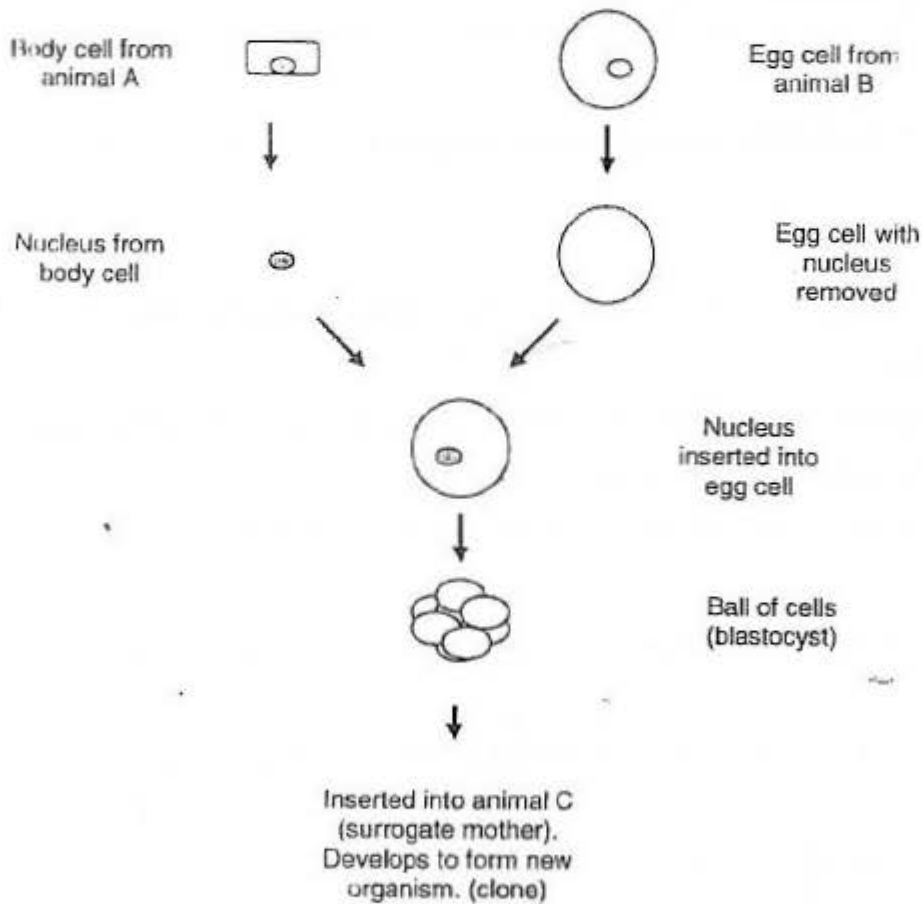
7.

Choose the option which best describes the contribution of mutation, crossing over and segregation of chromosomes to producing variation within a population.

	<b>Mutation</b>	<b>Crossing Over</b>	<b>Random Segregation</b>
A)	Produces <u>new alleles</u>	Gives new combinations of alleles	Gives new combinations of chromosomes
B)	Gives new combinations of alleles	Gives new combinations of chromosomes	Produces new alleles
C)	Gives new combinations of chromosomes	Produces new alleles	Gives new combinations of alleles
D)	Gives new combinations of chromosomes	Gives new combinations of alleles	Produces new alleles

8.

The drawing below represents the steps followed in the **cloning process**.



The animal the clone will be identical to is

- A) A
- B) B
- C) C
- D) None. It will be genetically unique

9. The table below shows the main steps in DNA replication.

Step 1	DNA replication begins with a parent DNA molecule unwinding and unzipping between the nitrogen bases of the two strands.
Step 2	
Step 3	An enzyme, DNA polymerase, aids in the formation of sugar-phosphate bonds attaching one nucleotide to the next and forming the backbone of the new daughter strands.

The best statement for the missing step, step 2 is:

- A) The exposed nitrogen bases move into the cytoplasm and join with their complementary nucleotides.
- B) The two new DNA molecules produced have one original parent strand and a newly formed daughter strand.
- C) Free-floating nucleotides attach themselves to their complementary exposed nitrogen bases.
- D) Each unzipped strand of DNA moves into the cytoplasm and attaches itself to a ribosome.
10. Over time, the most likely effect that cloning will have on the genetic variability of a population would be:
- A) Increasing the genetic variability since cloning can produce many thousands more individuals than would occur naturally.
- B) Reducing the genetic variability since offspring come from just a few selected individuals.
- C) Increasing the genetic variability since humans use cloning to select for favourable alleles.
- D) No effect since sexual reproduction will always result in variation in offspring.
11. Koch's Postulates are used to identify:
- A) the vector carrying a disease.
- B) causative mutations and viruses.
- C) causes of non-infectious disease.
- D) the causative organism of an infectious disease.

12. Second line of defence mechanisms include:
- A) skin, cilia and chemical barriers.
  - B) inflammation and macrophages.
  - C) mucous membranes and inflammation.
  - D) Chemical barriers and mucous membranes.
13. A patient was prescribed a course of antibiotics for an infection of a cut. The instruction on the packet included the statement: "All tablets in the course must be taken as directed."
- It is necessary to follow these instructions so that:
- A) the cut heals.
  - B) there is no risk of infection by another pathogen.
  - C) resistance to the drug does not develop in the pathogen.
  - D) Scar tissue does not build up over the wound.

14. The best description of prions, viruses and bacteria is:

	Prions	Viruses	Bacteria
A)	Reproduce without nucleic acid	Do not contain nucleic acid	Possess membrane bound organelles
B)	Possess chitin cell wall	Colonise a host cell to reproduce	Have no distinct nucleus
C)	Possess chitin cell wall	Do not contain nucleic acid	Possess membrane bound organelles
D)	Reproduce without nucleic acid	Colonise a host cell to reproduce	Have no distinct nucleus

15. Organ transplant recipients need to receive medication for the rest of their lives to:
- A) prevent the organ mounting an immune response against the recipient.
  - B) protect against infection of the new organ.
  - C) prevent the recipient from rejecting the organ.
  - D) boost the recipient's damaged immune system.



**Section I (continued)****Part B – 60 marks****Attempt Questions 16 – 29****Allow about 1 hour and 45 minutes for this part**

Answer the questions in the spaces provided.

## Question 16 (3 marks)

a) Define the term ectothermic organism.

1

b) For a named Australian ectothermic organism outline a response to assist it to regulate body temperature if there is a drop in daily ambient temperature.

2

## Question 17 (5 marks)

Carbons dioxide is transported in the blood in three different forms:

- Hydrogen carbonate ions ( $\text{HCO}_3^-$ )
- Dissolved carbon dioxide ( $\text{CO}_2$ )
- Bound to protein as carbaminohaemoglobin

The table below shows the relative amounts of these substances in the blood of a man who is monitored while at rest and during exercise.

	Concentration of $\text{CO}_2$ in the blood ( $\text{mmol L}^{-1}$ )			
	Arterial blood	Venous blood (at rest)	Venous blood (after light exercise)	Venous blood (after heavy exercise)
$\text{CO}_2$ in hydrogen carbonate ions	13.52	14.51	14.6	14.66
Dissolved $\text{CO}_2$	0.68	0.78	1.02	1.32
$\text{CO}_2$ bound to protein	0.3	0.3	0.28	0.24
Total $\text{CO}_2$ in plasma	14.50	15.59	15.90	16.22
pH of blood	7.4	7.37	7.26	7.14



- a) Identify the form of CO<sub>2</sub> transport which shows the greatest increase due to exercise. 1
- b) Describe the effect of exercise on the levels of CO<sub>2</sub> bound to protein. 1
- c) Explain the differences in pH between arterial and venous blood. 3

Question 18 (5 marks)

Homeostasis is the maintenance of a stable internal environment.

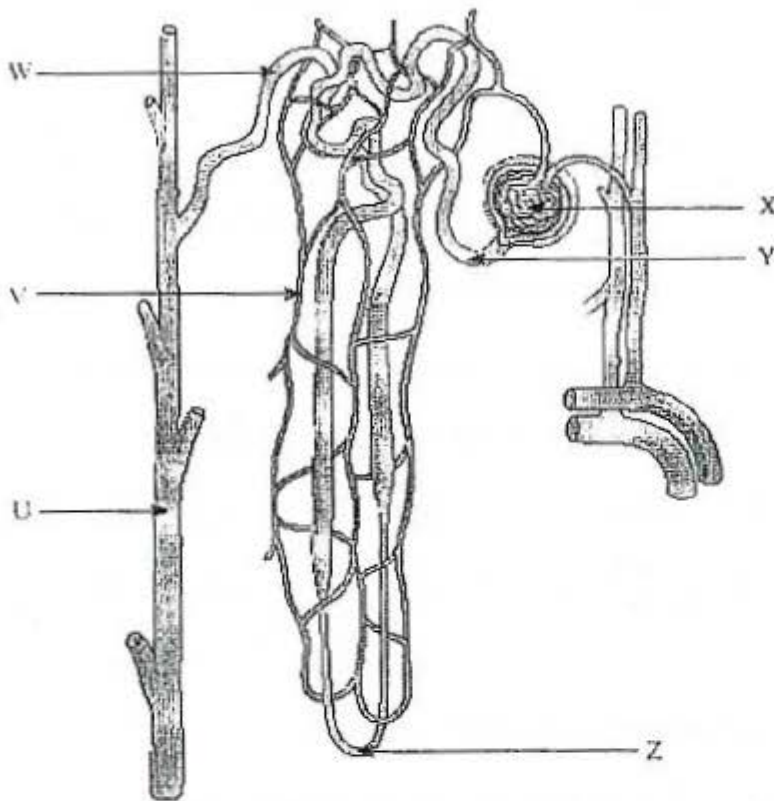
- a) Using an example of homeostasis that you have studied, complete the table below. 3

Example of homeostasis:	
One way in which changes from the stable state are detected:	One way in which changes from the stable state are counteracted:

- b) Explain why it is important to maintain homeostasis 2

## Question 19 (5 marks)

The diagram below shows a nephron from a human kidney.



- a) Identify where in the nephron:
- filtration occurs 1
  - reabsorption occurs 1
- b) Outline how the process of filtration and reabsorption, in the nephron of the kidney, regulate body fluid concentration. 3

Question 20 (2 marks)

Outline TWO different processes present in plants to regulate salt concentration in a saline environment. 2

Question 21 (8 marks)

*Varroa destructor* is an external parasitic mite that attacks honeybees *Apis cerana* and *Apis mellifera*. The disease caused by the mite is called varroaosis. *Varroa destructor* can only replicate in a honeybee colony. It attaches at the body of the bee and weakens the bee by sucking haemolymph. In this process the mite spreads viruses like Deformed Wing Virus to the bee. A significant mite infestation will lead to the death of the whole bee colony, usually in the late autumn through early spring. The Varroa mite is the parasite with the most pronounced economic impact on the beekeeping industry. Its treatment has been of limited success. Initially the bees were medicated with an arachnicide called fluviolate which caused about 95% of mites to die. The mites are now unaffected by fluviolate. *Varroa destructor* are found on all continents except Australia.

a) Outline why fluviolate is no longer effective in killing *Varroa destructor*. 3

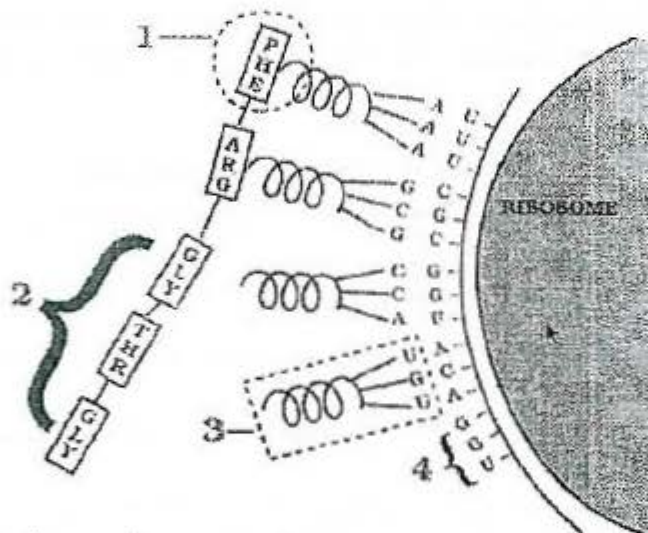
b) Outline the quarantine measures which are likely to be in use to prevent the entry of *Varroa destructor* into Australia and evaluate their effectiveness. 5

## Question 22 (3 marks)

With reference to at least two scientists in genetics outline the importance of collaboration and communication on their scientific findings.

3

## Question 23 (6 marks)



- a) Name the process above and identify what is produced as a result of this process. 2
- b) Outline the steps involved in the process above. 4

Question 24 (5 marks)

The weaver ants of tropical Australia construct their homes from leaves and silk. Scientists have identified the silk producing genes in the weaver ants and, by placing these genes into bacteria or plants, it should be possible to create large amounts of insect silk, which is light, but tough enough to make a bullet-proof vest.

- a) State the name given to a species that has had genes of a different organism added to their genetic make up. 1
- b) Outline the process which could be used to create this silk. 4

Question 25 (3 marks)

Red-green colour-blindness is a recessive sex-linked condition.

A girl who is red-green colour-blind surveys her parents and grandparents. Only one of these six people is colour-blind.

In the space below construct a pedigree diagram, showing her, her parents and grandparents, to help you explain how she inherited the condition.

Make sure you identify the relative who is colour-blind and any "carriers" of the condition.

## Question 26 (3 marks)

Using an example of a non-infectious disease that you have studied, explain how a knowledge of its causes is important in its treatment or management.

3

## Question 27(4 marks)

Complete the table below to outline the roles of some components of the immune response.

4

Component of the immune response	Role in the immune response
Antibodies	
B cells (B lymphocytes)	
Helper T cells (helper T lymphocytes or T4 lymphocytes)	
Killer T cells (Cytotoxic T lymphocytes)	



Question 28 (4 marks)

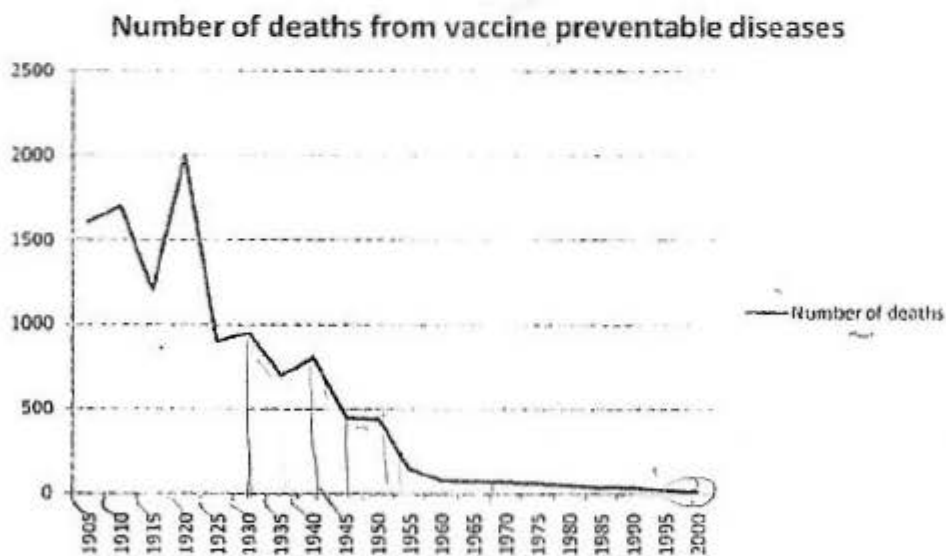
Our bodies are home to a vast number of bacteria. This is a healthy arrangement as long as these "microflora" remain in balance.

Using a named example of a condition, explain how an imbalance in this microflora can come about and cause disease.

4

Question 29 (4 marks)

Diphtheria vaccine introduced to schools 1932; Tetanus vaccine introduced 1939; Pertussis (whooping cough) vaccines introduced 1942; Polio vaccine introduced 1955; measles vaccine widely used 1970.



- a) Use the information in the graph to evaluate the effectiveness of vaccination programs in preventing death in children from vaccine preventable diseases.

2

b) Outline the way in which vaccines may prevent disease.

2

# Biology HSC Trial 2008 Answers

Q	1	2	3	4	5	6	7	8	9
A	D	D	D	A	A	C	A	A	C

Q	10	11	12	13	14	15
A	B	D	B	C	D	C

16a)

Answer	Mark
Correct definition	1

An organism which relies on external heat sources to regulate its body temperature

Not accepted: cold blooded or variable body temperature.

16b)

Answer	Mark
A named Australian ectotherm + A response to decreased ambient temperature outlined	2
Australian ectotherm species not fully named + A response to decreased ambient temperature outlined OR A named Australian ectotherm + A response to decreased ambient temperature stated but not outlined	1
Australian ectotherm species not fully named + A response to decreased ambient temperature stated but not outlined	0
Australian ectotherm species not fully named OR A response to decreased ambient temperature stated but not outlined	0

Diamond python

Basking by moving into the sun for longer

Not accepted: just "basking" is not enough for outline.

17a)

Answer	Mark
The correct form identified	1

Dissolved CO<sub>2</sub>

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17b)

Answer	Mark
Effect described correctly	1

Levels of CO<sub>2</sub> bound to protein decrease as exercise increases.

17c)

Answer	Mark
CO <sub>2</sub> makes the blood more acidic ( or CO <sub>2</sub> forms carbonic acid)+ CO <sub>2</sub> is being produced (or added) + Due to respiration in muscles (or just respiration or just by muscles) (order not important, can pay if implied)	3
Any 2 of the above	2
Any 1 of the above	1
pH is lower in veins (too obvious since clear from the table and doesn't tell us that they know the link between CO <sub>2</sub> and pH)	0

18

Answer	Mark
Example + Detection + Counteraction	3
Example + either Detection or Counteraction correct	2
The example is something that is maintained at a constant level in the body but neither the detection or counteraction match.	1
Example is not maintained at a constant level in the body.	0

Temperature regulation

Hypothalamus detects a decrease in blood temperature

Nerve signal to skeletal muscles to shiver.

18b)

Answer	Mark
The reason given must match the example given in a) OR a new example must be referred to. If referring to Temperature or pH, enzymes have an <u>optimum temperature/pH</u> at which they operate + enzymes need to function correctly to maintain <u>metabolism</u> .	2
If temperature or pH is not referred to in a) or is not mentioned as the basis of the answer to b) then the answer above is only worth 1	1
If referring to Temperature or pH: enzymes have an <u>optimum</u> at which they operate OR enzymes need to function correctly to maintain <u>metabolism</u> .	1
If no reference to Temperature or pH: enzymes have an <u>optimum</u> at which they operate OR enzymes need to function correctly to maintain <u>metabolism</u> .	0

Enzymes work best at their optimum temperature (or have an optimum temperature)

The body's metabolism depends on enzymes.

19a)

Answer	Mark
i) X OR $X \rightarrow Y$	1
ii) V OR Y,Z,W,U $\rightarrow$ V OR everywhere else (Note, if U is not included in the second option its OK because the diagram doesn't show this capillary network surrounding that part)	1
Either i) or ii) correct	1

19b)

Answer	Mark
Molecules removed from blood are listed/noted + Molecules taken back into the blood are listed/noted	2
Only one of the above lists is correct	1
Molecules are removed and then taken back but wrong molecules listed	1
If the words "filtered" and "reabsorbed" are used in the answer they cannot be paid since they are given in the question	0

Filtration removes most particles small enough to fit through the wall of the glomerulus and the bowman's capsule from the blood and into the kidney tubule (including urea, salts, amino acids, sugars, water) but not the blood cells and large blood proteins.

Reabsorption is where the molecules needed by the body (including amino acids, sugars and some salt and water) are taken back into the blood.

20

Answer	Mark
Two processes + the site where they occur	2
Just two processes OR	1
One process and the site where it occurs	1
Just two sites where processes occur without mentioning the processes	0

Any two of:

Exclusion at the endodermis in roots.

Salt glands in leaves to excrete excess salt.

Accumulation of salt in old tissues, such as leaves, which are later shed.

21a)

Answer	Mark
<u>Resistance</u> to fluviate has developed in the mites + Genetic differences (or a <u>mutation</u> ) was <u>already present</u> in some of the original population of mites (for resistance to fluviate) when fluviate was first used + The survivors bred/passed on resistant gene OR formed a <u>new population</u> of resistant mites	3
Any two of the above	2
Any one of the above	1

Answer	Mark
<p>Evaluation: <i>Varroa</i> has successfully been excluded from entering Australia + Quarantine measures which have resulted in this success (any 4):</p> <ul style="list-style-type: none"> <li>Any imported bees are <u>isolated</u> in quarantine stations</li> <li>Quarantined bees are kept until it is clear they are not infected or <u>destroyed</u> if infected.</li> <li>Imported goods are <u>inspected</u> to see if they contain bees or hives</li> <li>People entering Australia are asked to <u>declare</u> if they are bringing bees into the country</li> <li>Australia only permits <u>import</u> of bees <u>from areas</u> known to be <u>free of</u> <i>Varroa</i> infection.</li> <li>There is no need to worry about inspecting honey or wax since it doesn't support the mites without live bees to live on.</li> </ul>	5
Evaluation + any 3 measures	4
Evaluation + any 2 measures OR no evaluation + 4 measures	3
Evaluation + any 1 measure OR no evaluation + 3 measures	2
Evaluation OR no evaluation + 2 measures	1
No evaluation OR 1 measure	0

Answer	Mark
<p>At least 2 scientists who worked in the field of genetics are named + The findings of each is mentioned + A link between their collaboration and their findings is made + A link between their communication and their findings is made.</p>	3
2 scientists + findings of both + link between collaboration OR communication and their findings	2
2 scientists + findings of ONE + link between collaboration OR communication and their findings OR 1 scientist + his/her findings + link between collaboration AND communication with other unnamed scientists and their findings	1
1 scientist + his/her findings + link between collaboration OR communication with other unnamed scientists and their findings	0

Watson and Crick (2 geneticists) worked together (collaboration) to discover the structure of DNA (their findings) they needed extra understanding about DNA structure from Franklin which she shared at open forums and her x-ray photos, supplied to them by Wilkins (communication), to complete their model.

23a)

Answer	Mark
Protein/polypeptide synthesis (OR translation) + Proteins/polypeptides (not just enzymes)	2
Either protein synthesis OR proteins	1

23b)

Answer	Mark
Any 4 of the following steps in the correct order: <ul style="list-style-type: none"> <li>DNA unzips</li> <li>A mRNA copy is made from one DNA strand</li> <li>The mRNA moves to the ribosome</li> <li>tRNAs bring in corresponding amino acids to match the mRNA</li> <li>peptide bonds form between the amino acids</li> <li>amino acid chain breaks free and leaves ribosome to be modified</li> </ul>	4
Any 3 of the above steps in the correct order	3
Any 2 of the above steps in the correct order	2
Any one of the above steps OR any 3 but out of order	1
1 or 2 steps out of order	0

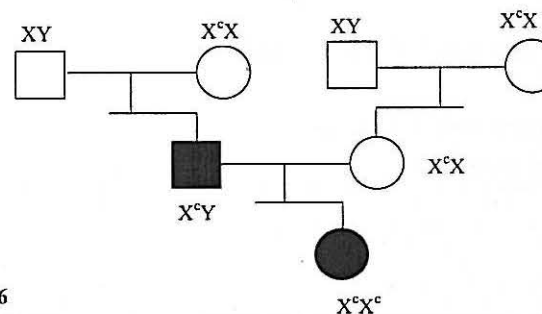
24a) Transgenic [1]

24b)

Answer	Mark
Any 4 of the following steps in the correct order: <ul style="list-style-type: none"> <li>The amino acid sequence of the silk protein is found</li> <li>An artificial DNA strand is made by working backwards from the amino acid sequence to make a base sequence.</li> <li>The actual gene is located on the chromosomes of the ant using the artificial gene with radioactive or fluorescent tag as a marker.</li> <li>The silk gene is cut from the ant chromosome using a restriction enzyme</li> <li>The same restriction enzyme is used to cut a bacterial plasmid</li> <li>The silk gene is mixed with the cut plasmid and DNA ligase enzyme</li> <li>Recombined plasmid is reinserted into the bacterium (by heating and cooling)</li> <li>Transgenic bacteria reproduce in culture with correct substrate to produce ant silk</li> <li>Ant silk purified</li> </ul>	4
Any 3 of the above in correct order	3
Any 2 of the above in correct order	2
Any 1 of the above OR any 3 or 4 in wrong order.	1

25

Answer	Mark
(Note: pedigree diagram is enough) Normal conventions used for pedigree AND three generations shown Girl and father indicated as colour-blind (shaded) + Carrier genotypes for all female relatives + normal genotypes for both grandfathers	3
Any 2 of above	2
Any one of above	1
None of above	0



26

Answer	Mark
Non-infectious disease example+ Cause + How knowing the cause is important for treatment/management (Note: there is no need to specify if referring to treatment or management for the last mark)	3
Non-infectious disease example+ Cause	2
Non-infectious disease example OR Infectious disease example+ Cause + How knowing the cause is important for treatment/management	1
Infectious disease example+ Cause	0

Down's Syndrome [1]

Non-disjunction during meiosis to form one gamete → trisomy of the 21st chromosome pair [1]

Chance of non-disjunction increases with age therefore avoid having children late in life. [1]



### Communication option

30a)i) Receptors detect stimuli [1]

30a)ii)

Answer	Mark
Stimulus → receptor → transmission → response	1
other	0

Stimulus → receptor → transmission → response

30b)

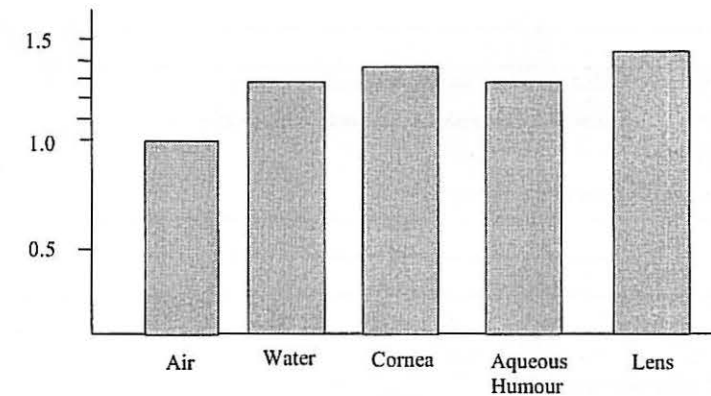
Answer	Mark
4 functions correct	4
3 functions correct	3
2 functions correct	2
1 functions correct	1

Eye structure	Function
Conjunctiva	<u>Protects</u> eye surface
Choroid	<u>Reduces reflection</u> of light inside eye
Lens	<u>Focuses</u> light onto retina
Optic nerve	Sends nerve (electrochemical) <u>signals to the brain</u>

30c)i)

Answer	Mark
Complete title ( includes both refractive index and eye structures)+ Even scale on vertical axis + correctly labelled axes (refractive index and eye structure) + correct units for refractive index (N) + column or bar graph (not line)	4
One of the above missing	3
Two of the above missing	2
Three of the above missing	1

Refractive index of structures associated with the eye



30c)ii) Refraction is the bending of light as it passes from one medium to another [1]

30c)iii)

Answer	Mark
light <u>changes speed</u> + <u>bends towards the normal</u> since the <u>cornea is more dense</u> <u>OR</u> Light <u>slows down</u> + <u>bends</u> since the <u>cornea is more dense</u>	2
Changes speed + bends Since cornea is more dense	1
Changes speed + bends Since cornea has a different density	0

The light slows down and bends towards the normal [1] since the cornea is more dense [1]

27

Answer	Mark
Antibodies <u>inactivate</u> pathogens B cells produce <u>antibodies</u> Helper T cells <u>present</u> antigens to B and T cells Killer T cells <u>destroy</u> infected cells	4
Any 3	3
Any 2	2
Any 1	1

28

Answer	Mark
Named example of a disease resulting from an imbalance in microflora + Microbes involved in the imbalance and which part of the body is involved+ How the imbalance arises + Results of the imbalance/symptoms of the disease	4
Any 3 of above	
Any 2	
Any 1	

Vaginal Thrush/yeast infection/Candidiasis

*Candida albicans* yeast/fungus and *Lactobacillus* bacteria

A course of antibiotics kills the lactobacilli and not the yeast so the yeast become a problem

White pungent discharge, itchiness

29a)

Answer	Mark
Describes the trend (decrease to none) AND Evaluation of effectiveness (completely gone) + Reason for effect i.e.further evaluation (herd immunity/or new vaccines used or discovered)	2
One of the above	1

With each new vaccine the death rate decreased until they were no more deaths. [1]

There were still some people who remained unvaccinated in the population [1]

OR

Herd immunity (with most people vaccinated the diseases cannot spread to enough unvaccinated people for an outbreak and so eventually disappears)

OR

Some diseases for which a vaccine exists, for example meningococcal or Hep C, were not given to the whole population until much later since those diseases were rare and the cost of vaccinating the whole community was not considered with the worth the benefit to society

OR

A vaccine for some rarer diseases (meningococcal or Hep C) only became available much later.

29b)

Answer	Mark
Any 2 of: Injection of part of, or attenuated form of, pathogen + Production of <u>memory cells</u> + <u>Immediate</u> response ( <u>antibody</u> production) to later infection of disease pathogen.	2
Any 1 of the above	1

A vaccine is an injection of a part of a pathogen or a weakened/attenuated form of a pathogen which cannot cause the disease but which induces the production of memory cells. [1]

If the actual pathogen invades later the memory cells induce the immediate production of antibodies which destroy the pathogen before symptoms appear. [1]

Answer	Mark
Accommodation is focussing light + from objects at different distances Achieved: lens changes shape + Lens thicker for closer objects + Lens thinner for distant objects.	5
Any 4 of above	4
Any 3 of above	3
Any 2 of above	2
Any 1 of above	1

**Accommodation:**

the focussing [1] of light from objects  
at different distances [1] from the eye

**How it is achieved:**

The lens changes shape [1].

For closer objects the ciliary muscles relax to allow the lens to become thicker in the middle so bending/refracting the light more. [1]

For distant objects the ciliary muscles contract to flatten the lens (making it thinner in the middle) so bending/refracting light less.[1]

Answer	Mark
At least 4 correct steps (including at least one safety or disposal of waste step) + 2 pieces of equipment	3
At least 4 correct steps (including at least one safety or disposal of waste step) + None or one piece of equipment named OR At least 4 correct steps (not including at least one safety or disposal of waste step) + 2 pieces of equipment OR Only two or three correct steps (including at least one safety or disposal of waste step) + 2 pieces of equipment	2
Only two or three correct steps (including at least one safety or disposal of waste step) + None or one piece of equipment named	1
Only two or three correct steps (not including at least one safety or disposal of waste step) + None or one piece of equipment named	0

Method: (any 4 of the following steps [2] with the mention of two pieces of equipment [1])

- Disposable plastic gloves were put on.
- A cow's eye was obtained from the container and placed on a sheet of newspaper.
- A dissection guide was used.
- Fat around the eye was removed using scissors.
- The sclera was pinched/gripped with the forceps and the scissors were used to make a knick in the sclera.
- The pointed end of the scissors was inserted into the knick and the sclera was cut all the way around the circumference of the eye
- The front half of the eye was removed and the lens pulled free.
- The vitreous humour was squeezed out and the back half of the eye was inverted.
- The blind spot/optic nerve was located and the retina was peeled off the choroid using the forceps.
- A drawing of the parts of the dissected eye was made and the text used to label the parts.
- The remains of the eye were disposed of in the plastic container provided and the equipment placed into the sterile solution.
- Hands were washed.

30f)

Answer	Mark
Two images + Two forward pointing eyes + Different objects at different distances from the eye	3
Any 2 of the above	2
Any 1 of the above	1

Two views/images [1]

of different objects at different distances from the eye [1]from two forward pointing eyes. [1]

## Genetics the Code Broken

- 32a)i) Male with B type blood could be the father  
OR Male with AB type blood could not be the father [1]

32a)ii)

Answer	Mark
It is possible to <u>eliminate</u> the male with blood <u>type B, but not the type A male</u> + The student shows they know there are <u>two B type genotypes</u> of the B male ( $I^B i$ or $I^B I^B$ ) + <u>Three correct punnet squares.</u> OR, since the mother is ii and can't supply an $I^A$ allele to the child, the <u>B male can't supply an <math>I^A</math> allele</u> either (OR the AB male could supply an $I^A$ allele) to the child.	3
It is possible to eliminate the male with blood type B + The student shows they know there are two B type genotypes of the B male ( $I^B i$ or $I^B I^B$ )	2
It is possible to eliminate the male with blood type B OR The student shows they know there are two B type genotypes of the B male ( $I^B i$ or $I^B I^B$ )	1

	$I^B$	i
i	$I^B i$	ii
i	$I^B i$	ii

	$I^B$	$I^B$
i	$I^B i$	$I^B i$
i	$I^B i$	$I^B i$

	$I^A$	$I^B$
i	$I^A i$	$I^B i$
i	$I^A i$	$I^B i$

(Note: it is not necessary to state that the punnet squares show that an A type child is not possible if the father is type B since the question is only out of 3)

- 32b) i) 26-29%  
ii) more in the mid range, less tall and short (OR Normal distribution with a skew to the tall end) OR Bell Curve  
iii) One feature determined by more than one pair of alleles  
(OR One feature determined by alleles at 2 or more loci)  
(OR one feature determined by more than two genes in an individual)  
(NOT One feature determined by more than two genes – this could be multiple alleles since the term gene can mean allele)

32b) iv)

Answer	Mark
<b>One use</b> , (eg forensics, paternity, pedigrees)+ which have <u>many different versions</u> (not just 2) OR the name of same variable genes (eg STRs or microsatellites) + variable genes at <u>many different loci/positions</u> on various chromosomes are looked at/analysed + form a <u>unique pattern/fingerprint</u> for each person.	4
Any 3 of above	3
Any 2 of above	2
Any 1 of above	1

Non-coding alleles called Short Tandem Repeats, which have many different versions [1] (not just 2), at many different loci/positions on various chromosomes [1] are looked at/analysed and form a unique pattern/fingerprint [1] for each person to help in forensics [1], paternity or pedigreeing

32c)i)

Answer	Mark
Correct gametes for both parents + Correct punnet square + Correct phenotypic ratio given	3
Correct genotypes for ONE parent + Correct gametes for each parent, even if one is incorrect from the info in the question+ Correct punnet square, even though the original genotypes were wrong OR Correct genotypes for both parents + Correct gametes for ONE parent + Correct punnet square, even if the gametes for one parent were wrong for one parent OR Correct genotypes for both parents + Correct gametes for both parents + Incorrect punnet square [Ignore the phenotypic ratio here]	2

<p>Incorrect genotypes for both parents + Correct gametes for each parent, even if both are incorrect from the info in the question+ Correct punnet square, even though the original genotypes were wrong for both parents. OR Correct genotypes for both parents + Correct gametes for ONE parent + Incorrect punnet square OR Correct genotypes for ONE parent + Correct gametes for each parent, even if one is incorrect from the info in the question+ Incorrect punnet square [Ignore the phenotypic ratio here]</p>	1
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[Note: the critical skill for answering this kind of question is the ability to work out the gametes:

RrTt gametes are RT, Rt, rT and rt

rrTt gametes are rT and rt ]

Punnett square for RrTt x rrTt:

		RrTt (heterozygous for shape and height)			
		RT	Rt	rT	rt
rrTt (heterozygous for height but homozygous wrinkled)	rT	RrTT	RrTt	rrTT	rrTt
	rt	RrTt	Rrtt	rrTt	rrtt

Phenotypic ratio: 3 round, tall: 1 round, short: 3 wrinkled, tall: 1 wrinkled, short

32c)ii)

Answer	Mark
Ratio would be different (even though it is possible it could be the same if crossing over occurred to a large enough extent) Linked alleles are (usually) <u>inherited together</u> [Unless crossing over occurs (with crossing over there will still usually be a different ratio to unlinked alleles)]	2
If two alleles are linked they are (usually) <u>inherited together</u> OR Yes, unless crossing over occurs	1
Yes OR The ratio would be different	0

The ratio would be different [1] since, if two alleles are linked (inherited on the same chromosome), they are (usually) inherited together [1] (unless crossing over occurs.)

32d)i)

Answer	Mark
Three reasons given and assessed	3
Three reasons given but only one or two assessed	2
Two reasons given but not assessed OR One reason given and assessed	1

Any 3 of the following:

Linkage maps only include the relative positions  
of expressed genes

and can only be produced using large scale breeding experiments  
which are not possible/unethical for humans.

32d)ii)

Answer	Mark
3 benefits discussed	3
3 mentioned but not discussed 2 benefits discussed	2
1 benefits discussed OR 2 mentioned	1

Any three of the following:

Disease causing genes have been identified and can now be screened for

Or gene therapy can now be attempted

The proteins coded for by the newly discovered genes can be studied and used to develop treatments.

Genetic profiles in people can be used to tailor medical treatments to individuals,

Human evolution can be studied in more depth

32 e) i)

Answer	Mark
Diploid + Chromosomes in pairs	1
Diploid OR Chromosomes in pairs	0

32 e)ii)

Answer	Mark
An extra 21 <sup>st</sup> chromosome/ Down Syndrome	1
Only 22 pairs (the sex pair are located top right of diagram)	0

32 f)

Answer	Mark
Two features, and part affected, for two species other than human (or two features in one species)	1
Part affected only, or feature only, or species not named	0

Sample answer:

White Clover, Pattern on leaf

Fruit Fly, colour of eye.