



Student name

BIOLOGY

Unit 3

Trial Examination

QUESTION AND ANSWER BOOK

Total writing time: 1 hour 30 minutes

Structure of book

| Section | Number of questions | Number of marks |
|--------------|---------------------|-----------------|
| A | 25 | 25 |
| B | 6 | 50 |
| Total | | 75 |

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
- No calculator is allowed in this examination.

Materials supplied

- Question and answer book of 21 pages with a detachable answer sheet for multiple-choice questions inside the front cover.

Instructions

- Detach the answer sheet for multiple-choice questions during reading time.
- Write your name in the space provided above on this page and on the answer sheet for multiple-choice questions.
- All written responses should be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

c What term is given to this series of reactions in the cell?

_____ (1 mark)

d Explain how the patient ends up with uncontrollable diarrhoea and dehydration.

Vaccines are available for cholera and are recommended before travel to countries where cholera is present. (2 marks)

e What is a vaccine?

The development of vaccines has focused on oral administering rather than injection. (1 mark)

f Suggest a possible reason for this focus.

g Explain how vaccination would lead to immunity against the disease cholera. (1 mark)

(2 marks)
 Total 10 marks

END OF EXAMINATION

Acknowledgements

Web sites:
 Chylomicron diagram: page 10, sourced from commons.wikimedia.org. Licence terms <http://creativecommons.org/licenses/by-sa/3.0/>
http://courses.washington.edu/psych333handouts/coursepack/ch10-Somatosenory_system.pdf
www.answers.com/topic/infection-potential
www.biology.com/ask/ask.asp?file=lab1_p2.gif
leavingbiology.com/BACTERIA%20Page.htm

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SECTION A - Multiple Choice Questions**Specific instructions for Section A**

This section consists of 25 questions. You should attempt **all** questions.

Each question has four possible correct answers. Only **one** answer for each question is correct. Select the answer that you believe is correct and indicate your choice on the Multiple Choice Answer Sheet by shading the letter that corresponds with your choice of the correct answer.

If you wish to change an answer, erase it and shade your new choice of letter.

Each question is worth **one** mark. **No** mark will be given if more than one answer is completed for any question. Marks will **not** be deducted for incorrect answers.

Question 1

DNA and RNA are both chemicals found in all eukaryotic cells. It is reasonable to state that:

- A. RNA is found exclusively in the cytoplasm whereas DNA is found in both the nucleus and the cytoplasm.
- B. DNA, but not RNA, contains the element phosphorus.
- C. both DNA and RNA are double stranded molecules.
- D. both DNA and RNA contain a five carbon sugar.

Question 2

Mitochondria are organelles found in eukaryotes. The theory of endosymbiosis put forward by biologists is that mitochondria originated from prokaryotes and have come to occupy the eukaryotic or host cells. This theory is supported by the fact that:

- A. mitochondria contain DNA and can reproduce independently by mitosis.
- B. there are many mitochondria in a eukaryotic cell.
- C. the mitochondria have a double membrane in which the inner membrane is similar in structure to prokaryotes and the outer membrane is similar in structure to the host cell membrane.
- D. mitochondria, like bacteria do not contain any ribosomes and make protein using other methods.

Question 3

The percentage of guanine in a molecule of DNA was 20% and the percentage of guanine in a particular molecule of mRNA was 25%. From this information it would be reasonable to conclude that in the same molecules of DNA and RNA:

- A. the percentage of cytosine in the DNA would be 20% and in the RNA would be 25%.
- B. the percentage of thymine in the DNA would be 30% and in the percentage of uracil in the RNA would be 30%.
- C. the percentage of adenine in the DNA would be 30% and in the RNA would be 25%.
- D. the percentage of adenine, uracil and cytosine in the RNA could not be determined from this data.

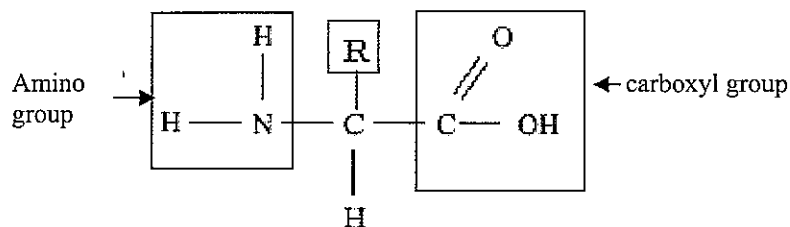
Question 4

The bolas spider, *Mastophora hutchinsonni*, releases a substance that is identical chemically to a pheromone released by a particular species of female moth. It would be reasonable to conclude that:

- A. the bolas spider will attract only male moths.
- B. the bolas spider will attract only female moths.
- C. the bolas spider will attract both male and female moths.
- D. moths of all species will be attracted to the bolas spider.

Question 5

Below is a general structural formula for an amino acid.



Amino acids join to form a polypeptide chain. The chemical groups or groups involved in forming the peptide bond between amino acids is/are:

- A. the carboxyl groups of each amino acid only.
- B. the amino groups of each amino acid only.
- C. the carboxyl group of one amino acid and the amino group of the next amino acid.
- D. the amino group of one amino acid and the R group of the next amino acid.

Question 6

Enzymes function by:

- A. lowering the activation energy in endergonic (anabolic) reactions and raising the activation energy in exergonic (catabolic) reactions.
- B. lowering the activation energy in exergonic (catabolic) reactions and raising the activation energy in endergonic (anabolic) reactions.
- C. lowering the activation energy in both endergonic (anabolic) reactions and exergonic (catabolic) reactions.
- D. raising the activation energy in both endergonic (anabolic) reactions and exergonic (catabolic) reactions.

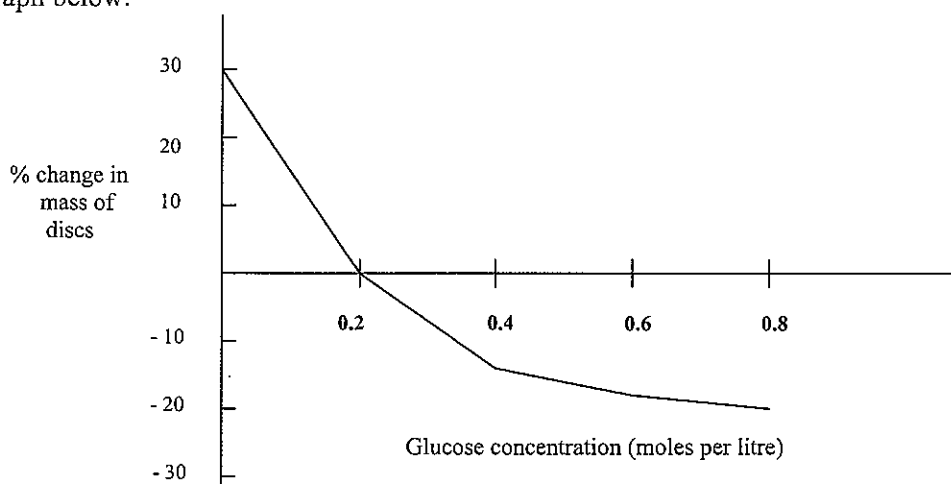
Question 7

Pyruvate, a polar molecule, is a product of glycolysis and must enter the mitochondria to be converted to CO_2 . It is reasonable to state that the pyruvate enters the mitochondria by:

- A. simple diffusion.
- B. the membrane surrounding the molecule and taking it in by endocytosis.
- C. dissolving in the lipid bilayer.
- D. being transported across the membrane by carrier molecules.

Question 8

A carrot was cut into circular discs and each disc was carefully weighed. The discs were then placed in glucose solutions of different concentrations. After an hour the discs from each solution were carefully dried and reweighed and the percentage change in mass was calculated. The results are shown in the graph below.



From these results it would be reasonable to conclude:

- A. there is no movement of water or glucose into or out of the cells of the carrot at 0.2 moles per litre.
- B. the concentration of glucose molecules in the cells of the carrot is 0.2 moles per litre.
- C. the change in mass is due to glucose molecules entering or leaving the cells of the carrot by diffusion.
- D. the change in mass is due to water molecules entering or leaving the cells of the carrot by osmosis.

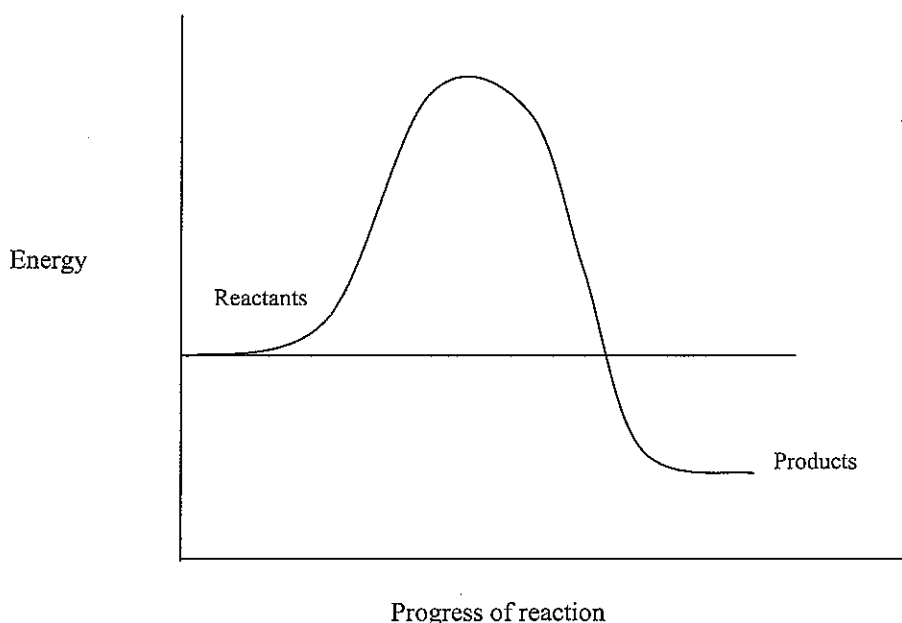
Question 11

Lactate builds up in muscle cells in strenuous activity, causing pain and muscle fatigue. The formation of lactate :

- A. involves the Krebs' cycle in the mitochondria.
- B. occurs in the cytoplasm.
- C. requires oxygen.
- D. requires two ATP molecules per lactate.

Question 12

The following graph represents an enzymatic reaction.



A reaction represented by this graph could be the formation of:

- A. sucrose from glucose and fructose.
- B. a dipeptide from two amino acids.
- C. ATP from ADP and inorganic phosphate.
- D. two amino acids from a dipeptide.

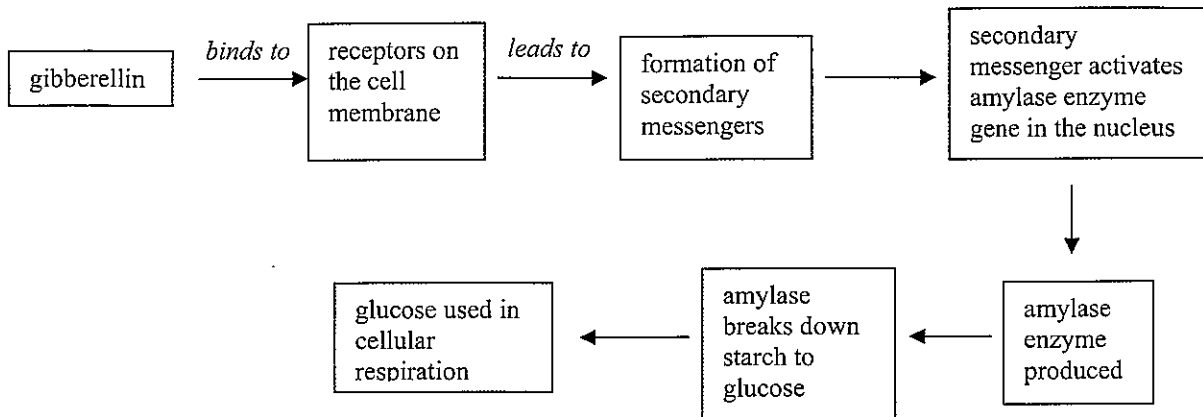
Question 13

When a single ripe banana is placed in a plastic bag containing several unripe bananas, the unripe bananas ripen more quickly than if there was no ripe banana. The ripe banana does not physically touch the unripe bananas. It is reasonable to state that:

- A. the ripe banana uses up the oxygen in the bag giving off carbon dioxide that increased ripening.
- B. the ripe banana gave off ethylene that was contained in the bag and accelerated ripening.
- C. the increased metabolic rate of the ripe banana increased the temperature in the bag that increased ripening.
- D. the ripe banana produced cytokin that was contained in the bag and accelerated ripening.

Question 14

Gibberellin is a plant hormone involved in the germination of wheat seeds. The following flow diagram shows the action of gibberellin.

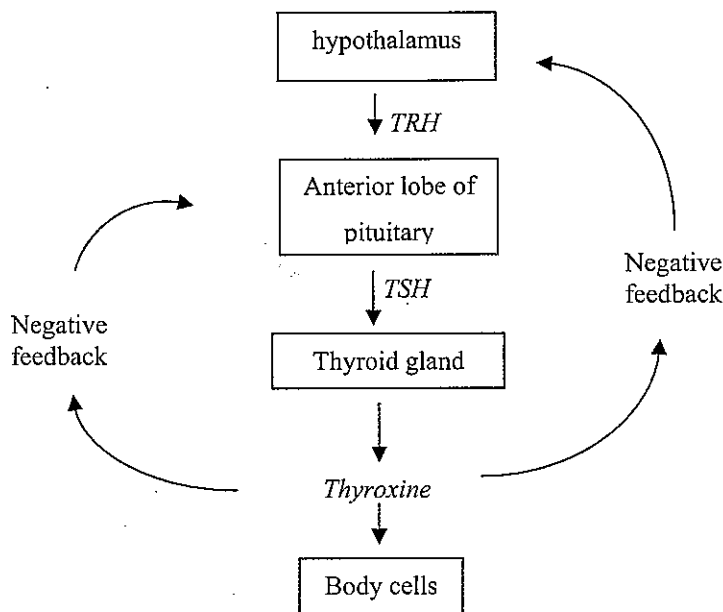


Signal transduction is represented by:

- the activation of the amylose gene.
- the production of the amylose enzyme.
- the formation of the secondary messengers.
- the whole pathway from gibberellin to the production of glucose.

Questions 15, 16 and 17 refer to the following information.

The diagram below shows the production of the hormone thyroxine, an iodine-containing molecule produced by the thyroid gland, that increases the rate of metabolic reactions in cells. The production of thyroxine is under homeostatic control as shown. The hypothalamus produces the hormone *thyrotrophin releasing hormone (TRH)*. *TRH* stimulates the anterior lobe of the pituitary to secrete *thyroid stimulating hormone (TSH)*. *TSH* travels in the bloodstream to the thyroid gland and stimulates it to secrete *thyroxine* that has an effect on the metabolic rate of body cells.



Question 15

If an individual has a diet that is deficient in iodine, it would be reasonable to expect that there would be:

- A. an increase in the levels of *thyroxine* produced in order to compensate.
- B. an increase in both the *TRH* and *TSH* in order to compensate.
- C. decrease in the levels of thyroxin, *TRH* and *TSH*.
- D. a decrease in the level of *thyroxine* only and the levels of *TSH* and *TRH* would remain the same.

Question 16

The sufferer of an autoimmune disease called Graves disease, produces antibodies that bind to the *TSH* receptor site on the thyroid gland and mimics the effect of *TSH*. This individual would:

- A. have an increased production of *thyroxine*.
- B. have a decreased production of *thyroxine*.
- C. have a decreased production of *TSH*.
- D. have an decreased production of *TRH*.

Question 17

In the diagram above it is reasonable to state that:

- A. *thyroxine* is an endocrine signalling molecule, whereas *TRH* and *TSH* are paracrine signalling molecules.
- B. *TRH*, *TSH* and *thyroxin* are all endocrine signalling molecules.
- C. *thyroxine* is a paracrine signalling molecule, whereas *TRH* and *TSH* are neurotransmitters.
- D. *thyroxine* is an endocrine signalling molecule, and *TRH* is a neurohormone.

Question 18

B lymphocytes and red blood cells are both found in the bloodstream. It is reasonable to state that:

- A. B lymphocytes would have more endoplasmic reticulum and golgi bodies than red blood cells.
- B. red blood cells would have more endoplasmic reticulum and golgi bodies than B lymphocytes.
- C. both types of cells would have very little endoplasmic reticulum and golgi bodies.
- D. both types of cells would have large amounts of endoplasmic reticulum and golgi bodies.

Question 19

Proteomics is the large-scale analysis of the proteome of an organism or cell. Proteomics is a useful study because:

- A. all cells of an organism produce the same proteins because they have the same DNA.
- B. proteins, once produced, remain unchanged in a cell.
- C. there are fewer proteins produced than there are genes in a cell, therefore making the study easier.
- D. the proteome of a cell can differ from another cell in the same organism.

Question 20

Di George syndrome is a disease of the immune system. Most individuals with this condition have poorly developed thymus glands. It would be reasonable to expect that these individuals would:

- A. have no antibodies in their tissue fluids.
- B. have no plasma cells.
- C. have reduced numbers of T cells.
- D. reject tissue transplants more readily.

Question 21

A disease in which the immune system fails to recognise “self” antigens is:

- A. acquired immune deficiency syndrome.
- B. an allergic response
- C. an immune deficiency disease.
- D. an auto-immune disease.

Question 22

One line of body defence is the production of interferons. Interferons are:

- A. produced by viral infected cells in order to protect nearby cells from invasion by viruses.
- B. proteins that assist cytotoxic T cells to ingest invading bacteria.
- C. produced by B cells as a response to the presence of a pathogen.
- D. chemicals produced by phagocytes to attract more phagocytes to the site of infection.

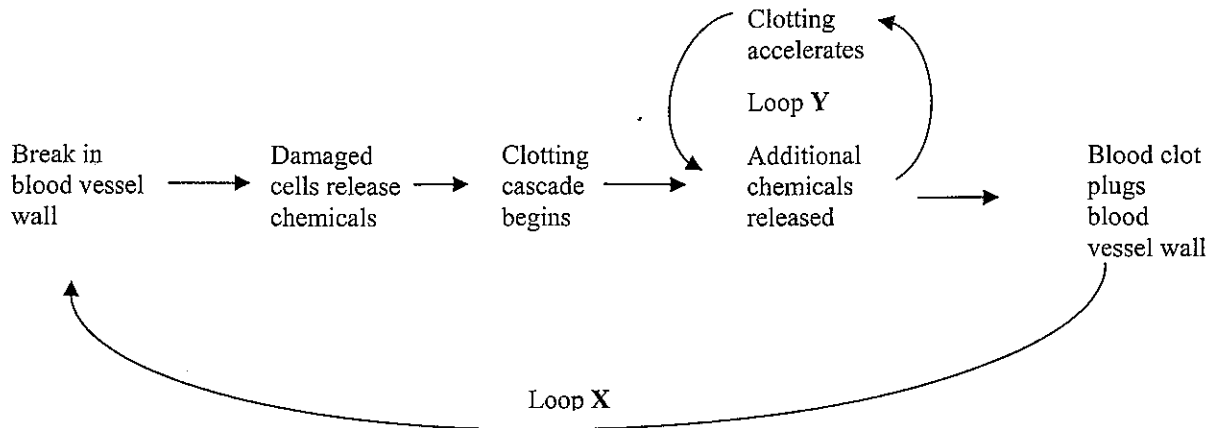
Question 23

In late 2009, the Australian government organised a mass immunization programme for Australians against the disease swine flu. The rationale was to limit the spread of this disease because immunization:

- A. kills the swine flu virus and therefore prevents its spread.
- B. reduces the immune response in those vaccinated.
- C. prevents the virus from entering the body by boosting the first line of defence.
- D. prevents the multiplication of the virus in the immunised individual.

Question 24

The following flow diagram represents the steps in blood clotting.



It is reasonable to state that:

- A. feedback loop X is a positive feedback that lowers the original stimulus.
- B. feedback loop Y is a positive feedback that hastens the formation of the blood clot.
- C. feedback loop Y is a negative feedback that increases the production of chemicals.
- D. feedback loops X and Y are both examples of homeostasis.

Question 25

Allergic reactions are caused by allergens interacting with the immune system. The allergens cause:

- A. mast cells to produce histamine that brings about the allergic response.
- B. B lymphocytes to produce histamine that brings about the allergic response.
- C. plasma cells to produce an allergenic protein that brings about the allergic response.
- D. mast cells to produce IgE antibodies that brings about the allergic response.

END OF SECTION A

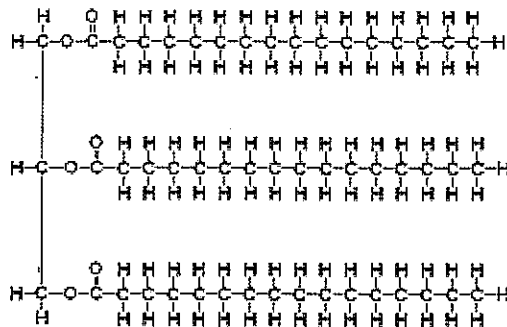
SECTION B - Short Answer Questions

Specific instructions for Section B

This section consists of 6 questions. There are 50 marks in total for this section.

Write your responses in the spaces provided. You should attempt all questions. Please write your responses in **blue** or **black ink**.

Question 1



Molecule A

The molecule depicted (molecule A) is a bio-molecule found in living organisms.

a Name the molecule depicted above.

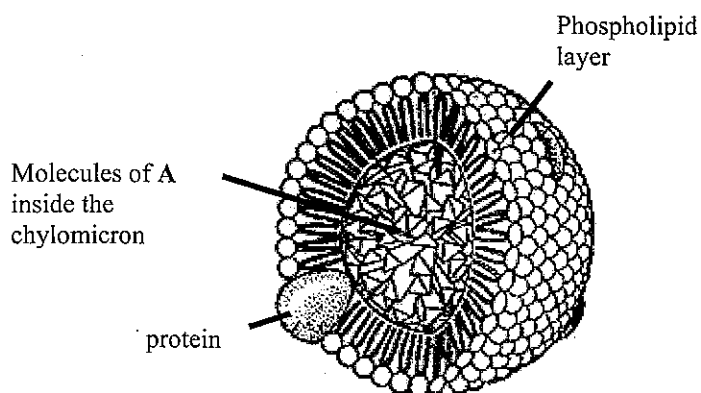
(1 mark)

Hydrolysis breaks this molecule into **two** distinct molecules during digestion in the small intestine.

b Name these **two** molecules.

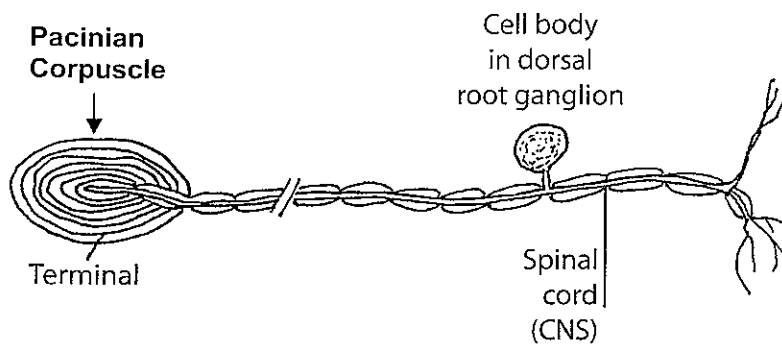
(2 marks)

After absorption from the small intestine the two molecules rejoin and are transported to the liver. The structure below, called a chylomicron is used to transport these molecules into the lymph stream and then into the bloodstream to the liver.



Question 2

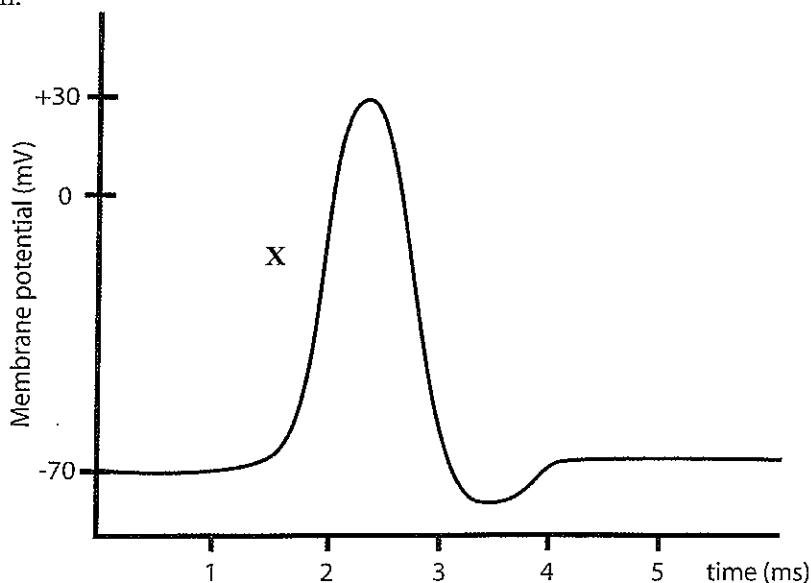
Pacini corpuscles are structures found deep in the skin. They consist of a nerve ending surrounded by a capsule of layered connective tissue. When pressure is applied to the pacinian corpuscle, the plasma membrane of the nerve cell deforms resulting in depolarisation of the nerve until a threshold is reached and the nerve fires off. The diagram below shows the pacinian corpuscle and its neuron.



a What type of neuron is associated with the Pacinian corpuscle? Explain your answer.

(1 mark)

The diagram below shows the pattern of voltage changes associated with movement of the nerve impulse along the axon.



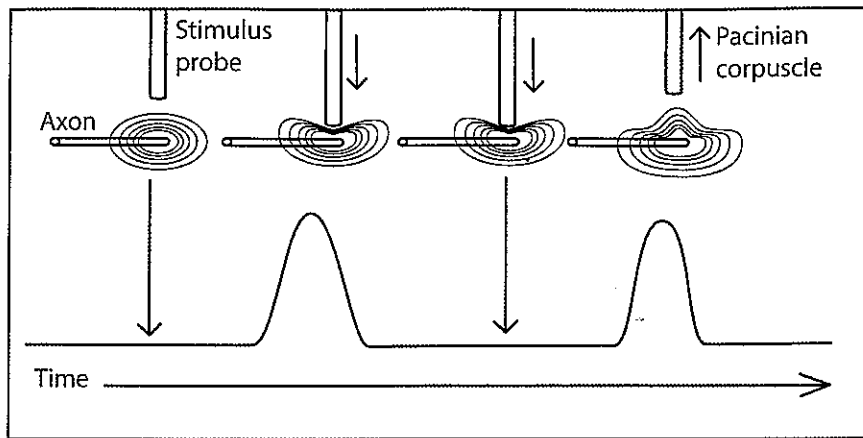
b What term is given to the peak of this graph?

(1 mark)

c What causes the rise in the graph at X?

(1 mark)

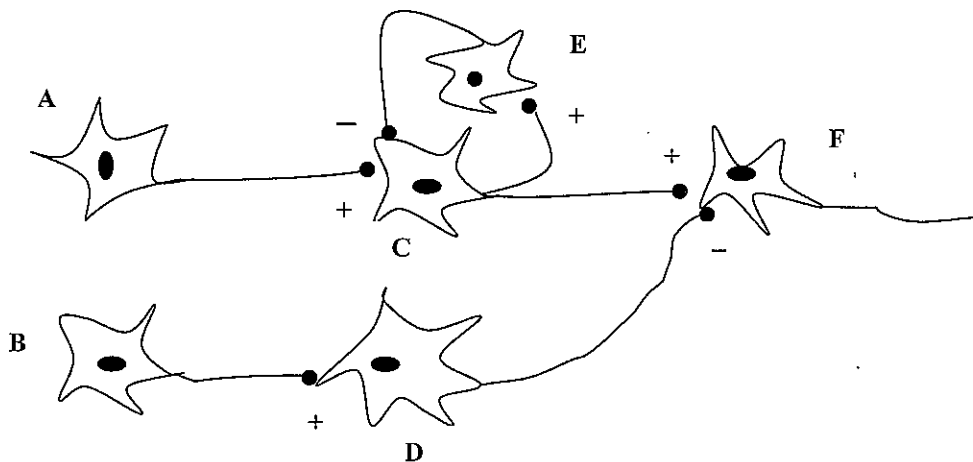
The Pacinian corpuscles are called rapidly adapting receptors as they fire off when there are changes in pressure but not if the pressure is sustained. The diagram below shows the stimulation of the nerve.



d Use this data to explain how someone with a firm fitting belt or ring will not notice the sensation after a short time.

(2 marks)

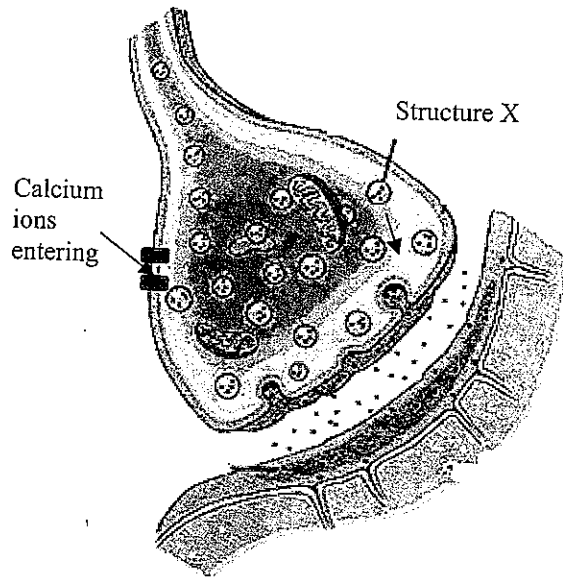
Nervous pathways consist of neurons that are excitatory and inhibitory. Consider the following neuron circuit diagram. The + sign indicates an excitatory synapse and a - sign indicates an inhibitory synapse.



e What will happen at neuron F if neurons A and B are fired off simultaneously?

(1 mark)

The following diagram shows the involvement of calcium ions (Ca^{2+}) in nervous pathways. When calcium ions enter they cause the structures labelled X to move towards the membrane. It is possible to block calcium channels using particular drugs called calcium channel blockers.



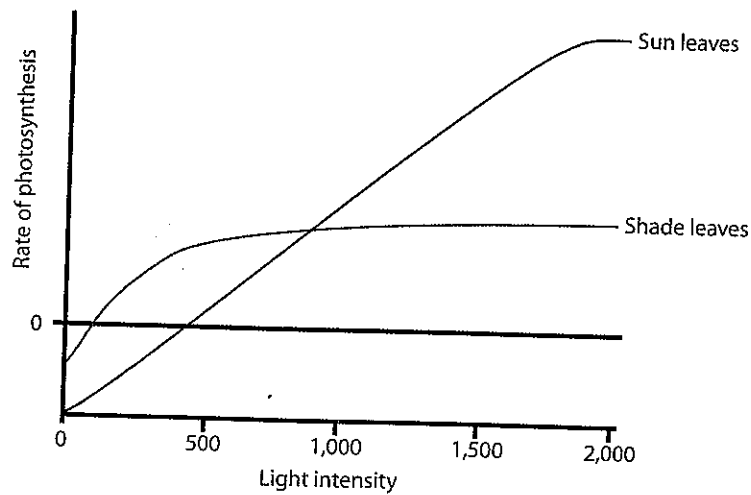
f Explain how such a drug would affect this nervous pathway.

(2 marks)

Total 8 marks

Question 3

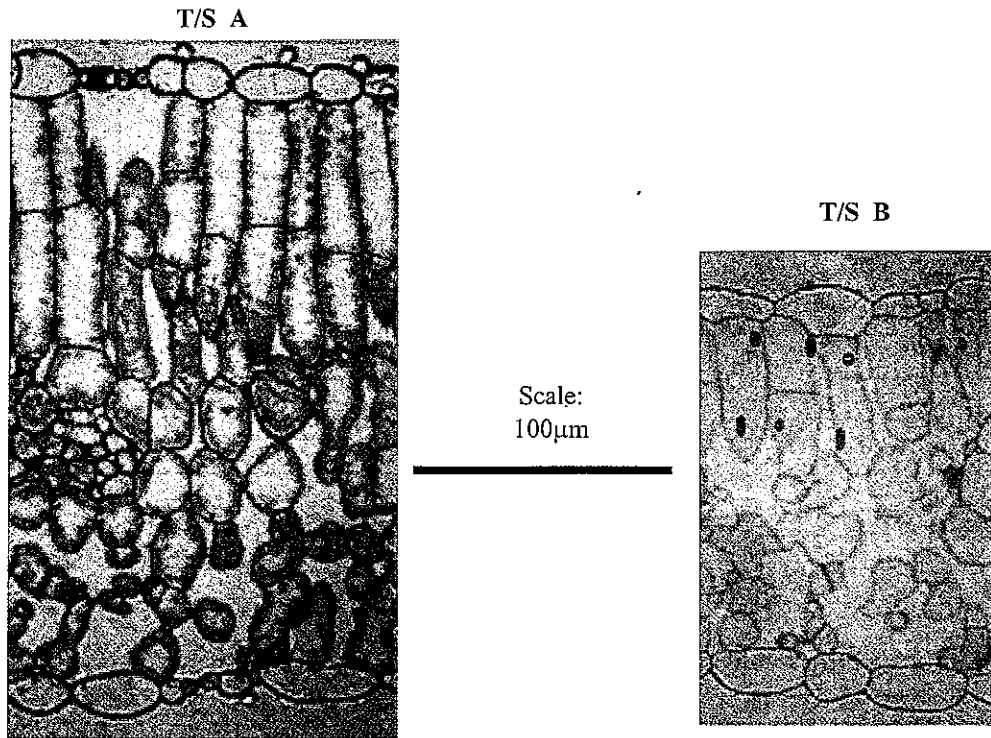
Changes in leaf anatomy and shape and the arrangement of leaves with respect to each other affect rates of photosynthesis. Plants that are exposed to intense light in their natural environment have 'sun leaves' while those that are exposed to shade have 'shade leaves'. Some species of plants have both sun leaves and shade leaves on the same plant. The graph below shows the rate of photosynthesis in shade leaves and sun leaves in two plants.



a Which plant has the greater rate of photosynthesis between 0 and 500 light intensity?

(1 mark)

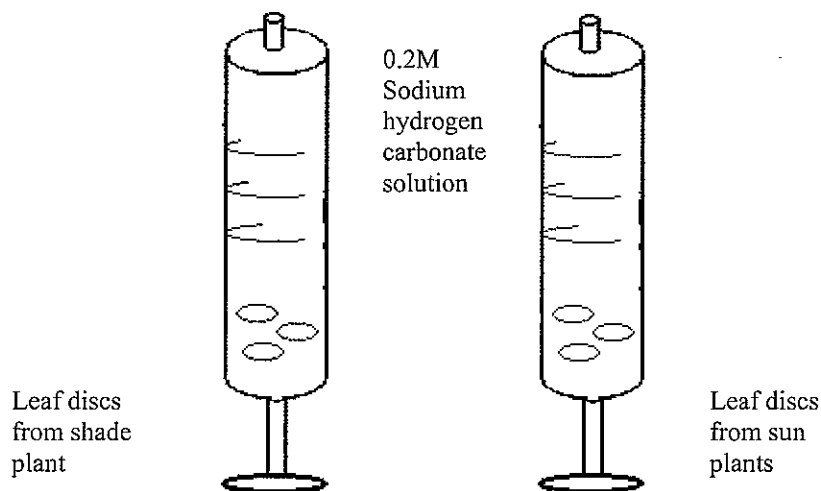
The transverse sections A and B below are of these two types of leaves.



b Suggest which T/S belongs to which leaf. Give reasons for your answer.

(2 marks)

Students wished to investigate the response of sun and shade plants to white light. They cut 3 leaf discs from a sun plant and 3 leaf discs from a shade plant and placed them in two different syringes filled with 0.2M sodium hydrogen carbonate solution. The air was removed from the syringe, a finger was placed over the nozzle and the plunger was gently pulled down. This caused bubbles of air to be drawn out of the leaf discs and as a result the discs fell to the bottom of the syringe. The syringes with the leaf discs were then exposed to white light. The production of oxygen causes the leaf discs to float to the surface.



c Suggest an hypothesis for this experiment.

(1 mark)

d Name one factor that must be kept constant in this experiment and explain why.

(2 marks)

The results for the experiment are shown below

| Type of leaf | Average time taken to float (min) |
|------------------|-----------------------------------|
| Sun plant leaf | 2 |
| Shade plant leaf | 5 |

e Using the information above, explain the results observed.

(2 marks)

The experiment was then repeated using a green filter covering both the syringes. The results are shown below.

| Type of leaf | Average time taken to float using a green filter (min) |
|------------------|--|
| Sun plant leaf | 10 |
| Shade plant leaf | 5 |

f What do these results suggest about the absorption of light by shade plants?

(1 mark)

- g Suggest how these results mimic the response of shade leaves and sun leaves in their natural environment.

(2 marks)

Total 11 marks

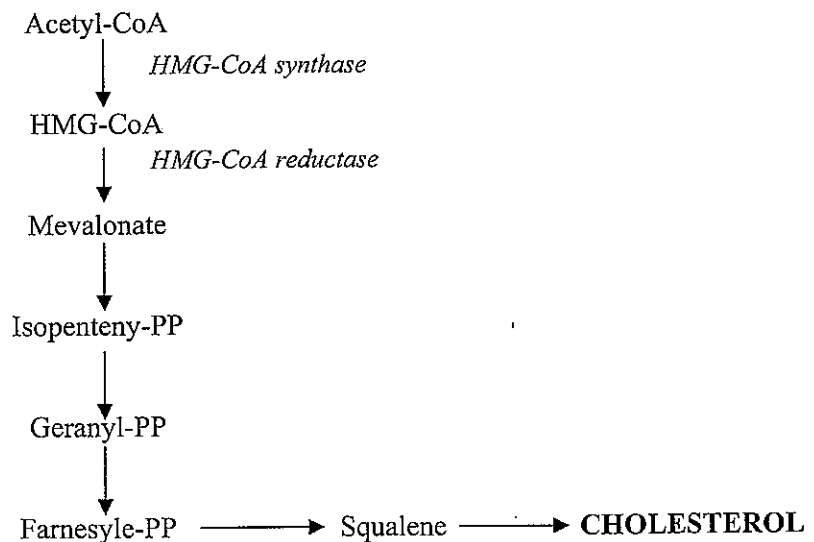
Question 4

High levels of cholesterol in blood plasma have been implicated in heart disease especially in Western society. Cholesterol is manufactured in the liver and is an important component of cell membranes.

- a What is the function of cholesterol in cell membranes?

(1 mark)

A simplified pathway for the cholesterol production is shown below.



One group of medications given to reduce cholesterol production is the *statins*. These affect the substance *HMG-CoA reductase* by competitive inhibition. Statins can have serious side effects and must be taken in strict accordance with the dosage recommended.

- b What type of substance is *HMG-CoA reductase*?

(1 mark)

- c Referring to the above pathway, what conclusion can you draw about the shape of the statin molecule?

(2 marks)

- d How might rational drug design lead to the development of drugs like the statins?

(1 mark)

Patients taking statins are advised not to eat grapefruit as grapefruit contain substances that inhibit the breakdown of statins in the body.

- E What could be a possible outcome for patients that do not heed this advice and eat grapefruit when on this statin medication.

(1 mark)

Total 6 marks

Question 5

Baby mammals obtain antibodies that have crossed the placenta from the mother and also from their mother's milk. These antibodies then act to give the young mammal protection while their own immune system is developing.

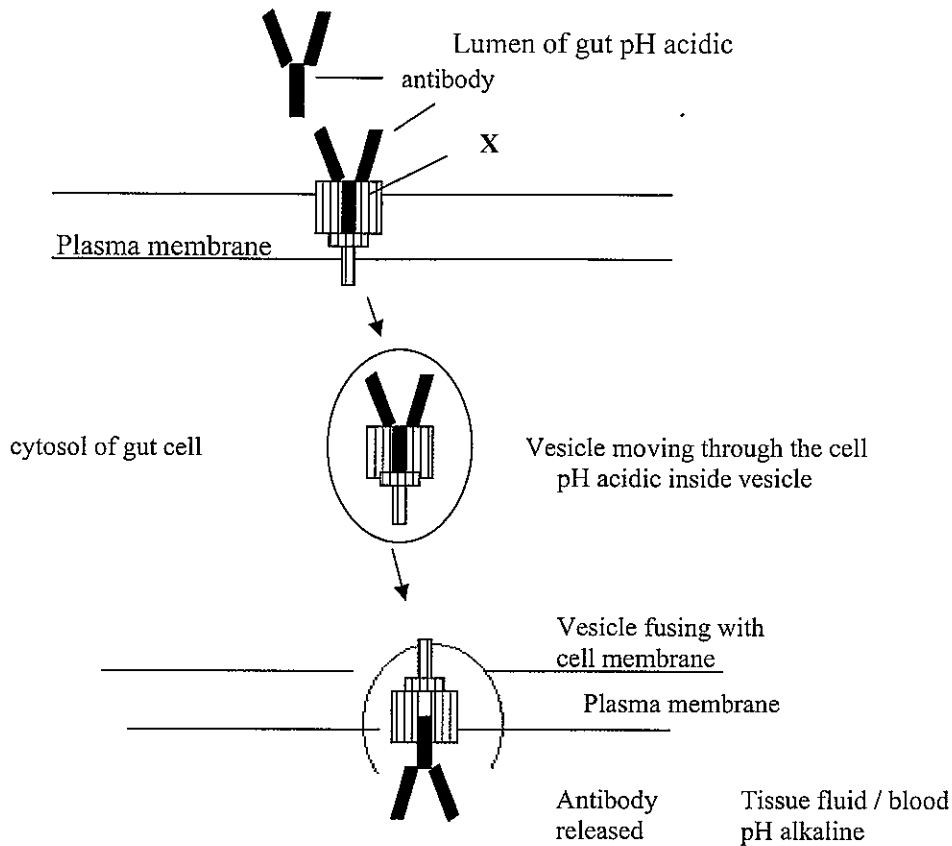
- a What type of chemical compound is an antibody?

(1 mark)

- b Name the type of immunity described above and justify your answer.

(2 marks)

Research has been carried out in order to investigate how antibodies ingested by young mammals in breast milk are able to pass across the gut into the bloodstream. In this research, antibodies were tagged with gold nanoparticles and their path across the cells of the gut could be visualised. The diagram below shows the pathway.



c In the diagram above what is the structure labelled X ?

_____ (1 mark)

d Name the process by which the antibody enters the cell.

_____ (1 mark)

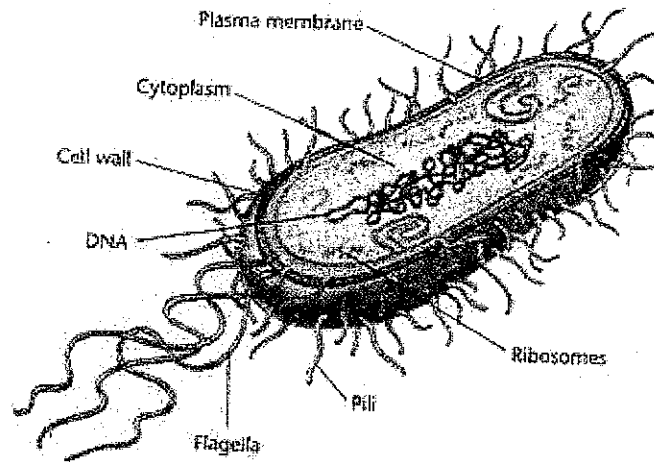
e Using the information in the diagram above, suggest how the antibody becomes attached and then released on the other side of the cell.

(2 marks)

Total 7 marks

Question 6

Vibrio cholera is an enteric bacterium that causes the disease cholera. The bacteria are taken into the gut by drinking contaminated water and colonise the small intestine. They produce a powerful toxin that results in severe diarrhoea.



These bacteria need to be able to penetrate the thick mucus coating of the small intestine in order to colonise the wall of the intestine.

- a Suggest how these bacteria could penetrate the thick mucus lining.

(1 mark)

- b i Suggest **another** difficulty that these bacteria need to overcome in order to colonise the small intestine.

(1 mark)

- ii Suggest a feature of the bacteria that would enable them to overcome the difficulty you have suggested in the answer above.

(1 mark)

The cholera toxin binds to a membrane receptor and the active part of the toxin enters the cell and activates a G protein by a non-reversible enzymatic reaction. The G protein initiates a series of chemical reactions that are unable to be stopped and this results in large amounts of chloride ions (Cl^-) moving into the lumen of the intestine. Sodium ions (Na^+) follow due to the electrical force. The result is uncontrollable diarrhoea and dehydration of the patient.

...continued next page

c What term is given to this series of reactions in the cell?

(1 mark)

d Explain how the patient ends up with uncontrollable diarrhoea and dehydration.

(2 marks)

Vaccines are available for cholera and are recommended before travel to countries where cholera is present.

e What is a vaccine?

(1 mark)

The development of vaccines has focused on oral administering rather than injection.

f Suggest a possible reason for this focus.

(1 mark)

g Explain how vaccination would lead to immunity against the disease cholera.

(2 marks)

Total 10 marks

END OF EXAMINATION

Acknowledgements

Websites:

- Chylomicron diagram page 10, sourced from commons.wikimedia.org. Licence terms <http://creativecommons.org/licenses/by-sa/3.0/>
- http://courses.washington.edu/psych333/handouts/coursepack/ch10-Somatosensory_system.pdf
- www.answers.com/topic/action-potential
- shp.by.ru/spravka/neurosci/
- www.biology.lsu.edu/.../plphys/lab1_p2.gif
- leavingbio.net/BACTERIA%20Page.htm

TEACHERS, PLEASE NOTE:

In marking the Exam, teachers should keep in mind that the language used in the suggested answers is sometimes more sophisticated than a student would offer since these answers are written for teachers' information in their correction of the Exam.

The answers suggested here might not be the only correct responses possible. Teachers must use their professional judgement in awarding marks for other answers offered. However, in accordance with the VCAA practice, students who give a correct response, and then offer a contradictory incorrect response within the same part of the question, should not be awarded any marks for the correct part of the response. Also in accordance with the VCAA practice, no half marks should be given.

SECTION A - MULTIPLE CHOICE QUESTIONS (1 mark each: 25 marks)

| | | | |
|----|---|----|---|
| 1 | D | 16 | A |
| 2 | C | 17 | D |
| 3 | D | 18 | A |
| 4 | A | 19 | D |
| 5 | C | 20 | C |
| 6 | C | 21 | D |
| 7 | D | 22 | A |
| 8 | D | 23 | D |
| 9 | D | 24 | B |
| 10 | A | 25 | A |
| 11 | B | | |
| 12 | D | | |
| 13 | B | | |
| 14 | C | | |
| 15 | B | | |

SECTION B - WRITTEN RESPONSES

Question 1

- a Triglyceride 1 mark
- b Fatty acids (1) and glycerol (1) 2 marks
- c The chylomicron is surrounded by phospholipid molecules and is therefore hydrophilic on the outside and hydrophobic on the inside (1). The triglycerides are hydrophobic and will dissolve in the hydrophobic interior of the chylomicron (1) and can be transported as the hydrophilic part of the chylomicron will enable it to be transported in the blood which is a polar liquid. 2 marks
- d Primary structure. 1 mark
- e X is an alpha helix (1) and Y is a beta pleated sheet (1). 2 marks

Total Question 1: 8 marks

Question 2

- a This is a sensory or afferent neuron, as it brings information into the spinal cord. 1 mark
- b Action potential. 1 mark
- c Influx of sodium ions. 1 mark
- d The pacinian corpuscle only fires off when there is a change in stimulus (1). A firm fitting ring or belt will only fire off at the start, and, as there is no change there will be no excitation of the pacinian corpuscle after that, hence the person doesn't feel the sensation (1). 2 marks
- e There will be no response as they will cancel each other out as A is excitatory and B is inhibitory. 1 mark

- f The Ca^{2+} ions would not be able to enter the neuron as the drug blocks the calcium channels (1). As Ca^{2+} ions are needed for the membrane of the vesicle containing the neurotransmitter to fuse to the presynaptic membrane to release the neurotransmitter there will be no passage of impulse across the synapse (1) and therefore no further relay of the message. 2 marks

Total Question 2: 8 marks

Question 3

- a The shade leaves as the value of the graph is higher than for the sun leaves. 1 mark
- b The shade leaf is T/S B and the sun leaf is T/S A (1). The sun leaf will have a thicker palisade layer to maximize photosynthesis when light is abundant as light can penetrate the leaf (1). 2 marks
- c In full white light sun plants will have a greater rate of photosynthesis. 1 mark
- d The temperature must be kept constant (1) as an increase in temperature will increase the rate of photosynthesis (1). 2 marks
- e As the sun plant leaves took a shorter time to float (1) their rate of photosynthesis in full light is faster than shade leaves (1). 2 marks
- f As the shade plant leaves took a shorter time to float they were able to photosynthesise faster in green light than the sun plant leaves. (1) 1 mark
- g In its natural environment the sun plant has full light and can readily absorb blue and red light for photosynthesis, the shade leaves will receive the light that has passed through the canopy with little blue and red light (1) so it needs to be able to utilize other wavelengths (1) such as green light in order to photosynthesise. 2 marks

Total Question 3: 11 marks

Question 4

- a Cholesterol is needed to maintain fluidity and flexibility in the cell membrane. 1 mark
- b An enzyme. 1 mark
- c Competitive inhibition means that the substrate and the inhibitor must both compete for the active site of the enzyme (1). In order to do this, the inhibitor and the substrate must have a similar shape to attach to the active site, therefore statin has a similar shape to HMG-CoA (1). 2 marks
- d Rational drug design involves the research into the construction of a drug that fits a biological target and interferes with its action. Rational drug design would have involved finding a compound that inactivates an enzyme in the pathway to form cholesterol. 1 mark
- e Patients would experience a build-up of statins in the body as they are prevented from being broken down and this would be toxic to the patient. 1 mark

Total Question 4: 6 marks

Question 5

- a A protein 1 mark
- b Passive immunity (1). The antibodies have been made in another individual and passed on, in this case, in the breast milk (1). 2 marks
- c A receptor protein 1 mark
- d Receptor mediated endocytosis or endocytosis. 1 mark
- e In an acidic pH the antibody is able to bind to the receptor and is held in this acidic environment as the vesicle moves through the cell (1). On the other blood side of the cell, the pH is alkaline and the antibody, due to change in shape at a different pH, does not bind as well in an alkaline environment and so is released (1). 2 marks
- Total Question 5: 7 marks**

Question 6

- a The flagella allow them to propel themselves through the thick mucus. Or Production of protease enzymes that digest the mucus would enable the bacteria to reach the intestine cells. 1 mark
- b i Any of: The acidity of the stomach Or Digestive enzymes in the intestine Or Natural flora of the intestine 1 mark
- ii The cell wall would be resistant to acid or enzyme attack Or they undergo rapid reproduction. 1 mark
- c Signal Transduction. 1 mark
- d As chloride and sodium ions move into the lumen of the small intestine, the concentration of solutes becomes higher in the lumen of the intestine (1), water will move by osmosis from the area of low concentration of solutes (the cells) into areas of high concentrations of solutes (1) (the lumen of the intestine) resulting in diarrhoea and dehydration. 2 marks
- e A vaccine is a suspension of attenuated living or dead microorganisms that when introduced into an individual results in the production of specific antibodies. 1 mark
- f As cholera is caused by enteric bacteria, by taking an oral vaccine antibodies are more likely to be found close to the intestine where the bacteria are. 1 mark
- g After vaccination the antigens in the vaccination combine with some B cells, causing them to reproduce to form cloned cells (1). These cloned cells then form plasma cells that produce antibodies against the cholera bacteria. Some B cells form B memory cells that survive and react immediately to produce antibodies should a person become infected with the cholera bacteria (1). 2 marks
- Total Question 6: 10 marks**

Total Section B: 50 marks
Total examination: 75 marks

END OF SUGGESTED SOLUTIONS