# *INSIGHT*

***Trial Exam Paper***

# 2011

# YEAR 11 BIOLOGY

## Written examination 1

**STUDENT NAME:**

## QUESTION AND ANSWER BOOK

***Reading time: 15 minutes***
***Writing time: 1 hour 30 minutes***

**Structure of book**

| *Section* | *Number of questions* | *Number of questions to be answered* | *Number of marks* | *Suggested times (minutes)* |
|---|---|---|---|---|
| **A** | 25 | 25 | 25 | 30 |
| **B** | 8 | 8 | 50 | 60 |
| | | | Total 75 | 90 |

- Students are permitted to bring the following items into the examination: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring sheets of paper or white out liquid/tape into the examination.
- Calculators are not permitted in this examination.

**Materials provided**

- The question and answer book of 23 pages.
- An answer sheet for multiple-choice questions.

**Instructions**

- Write your **name** in the box provided and on the answer sheet for multiple-choice questions.
- You must answer the questions in English.

**At the end of the examination**

- Place the answer sheet for multiple-choice questions in the front cover of the question and answer book.

**Students are NOT permitted to bring mobile phones or any other electronic devices into the examination.**

**SECTION A – Multiple-choice questions**

**Question 1**
A feature NOT found on a compound light microscope is
**A.** a condenser
**B.** an eyepiece lens
**C.** electromagnetic lenses
**D.** a fine focus knob

**Question 2**
Four structures were viewed under a microscope and measured. Which of the following series of measurements occurs in descending order?
**A.** 0.1 nm, 0.85 nm, 0.1 µm, 0.85 µm
**B.** 0.1 µm, 0.85 µm, 0.1nm, 0.85 nm
**C.** 0.85 nm, 0.1 nm, 0.85 µm, 0.1 µm
**D.** 0.85 µm, 0.1 µm, 0.85 nm, 0.1 nm

**Question 3**
Cells vary widely in terms of their size and function. Three features they share in common are
**A.** metabolism, chloroplasts and a plasma membrane
**B.** flagella, a plasma membrane and mitochondria
**C.** chloroplasts, ribosomes and a nucleus
**D.** a plasma membrane, cytoplasm and metabolism

**Question 4**
Prokaryote cells
**A.** divide by binary fission.
**B.** include yeasts, bacteria and protists.
**C.** have a single-stranded DNA molecule.
**D.** show a defined internal structure.

**Question 5**
The majority of cells carry out cytosis which involves the infolding or outfolding of the plasma membrane. Cytosis can occur because of the fluid nature of the plasma membrane. Cytosis is a form of
**A.** passive transport
**B**. active transport
**C.** diffusion
**D.** facilitated diffusion

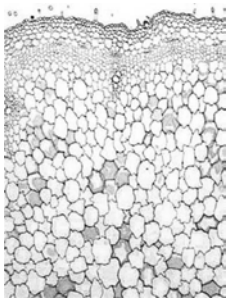
**Question 6**

A plasma membrane has the ability to allow the passage of some substances through it. The membrane is said to be

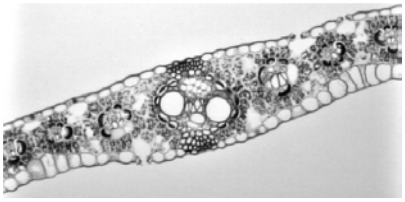
**A.** partially impermeable
**B.** impermeable
**C.** partially permeable
**D.** permeable

**Question 7**

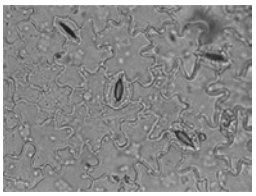
The images show some sections of cells taken from the leaves of plants.



parenchyma cells



vascular cells



epidermal cells

*Images reproduced with kind permission of Charles Good and the Ohio State University, Lima Campus*

Groups of cells with a shared specialisation are called

**A.** organs
**B.** tissues
**C.** systems
**D.** organisms

*The following information relates to Questions 8 and 9.*

A student was examining a series of images from an electron microscope. An image from that series is shown below.

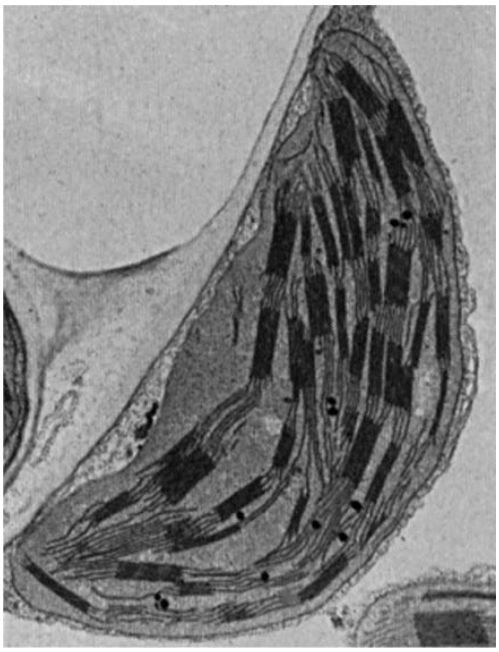


*Image reproduced with kind permission of Ryan Griffin at www.sciencegateway.org*

**Question 8**

Which organism would NOT contain this kind of structure?

**A.** animal
**B.** plant
**C.** algae
**D.** protest

**Question 9**

These structures are the site of an energy transformation process essential to living organisms. The process which occurs can be summarised as

**A.** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

**B.** $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O$

**C.** $6CO_2 + 6H_2O \xrightarrow[\text{light}]{} C_6H_{12}O_6 + 6O_2$

**D.** $6CO_2 + 6O_2 \xrightarrow[\text{light}]{} C_6H_{12}O_6 + 6\,H_2O$

**Question 10**

Fresh produce, which includes fruits and vegetables, are often cooled and then transported in refrigerated vehicles from growers to consumers. Some produce is kept in a confined space with controlled oxygen and carbon dioxide levels and in some instances, to lengthen shelf life, the surface of produce is coated with wax. These three strategies are designed to prevent deterioration of produce which will occur due to continued

**A.** photosynthesis
**B.** metabolism
**C.** respiration
**D.** cellular respiration

**Question 11**

In cell division, replication of the entire cell is only complete after the cytosol and organelles contained within the cytosol form separately around the new nuclei that have formed. This process is known as

**A.** parthenogenesis
**B.** cytokinesis
**C.** mitosis
**D.** meiosis

**Question 12**

The image shows a set of double-stranded chromosomes.

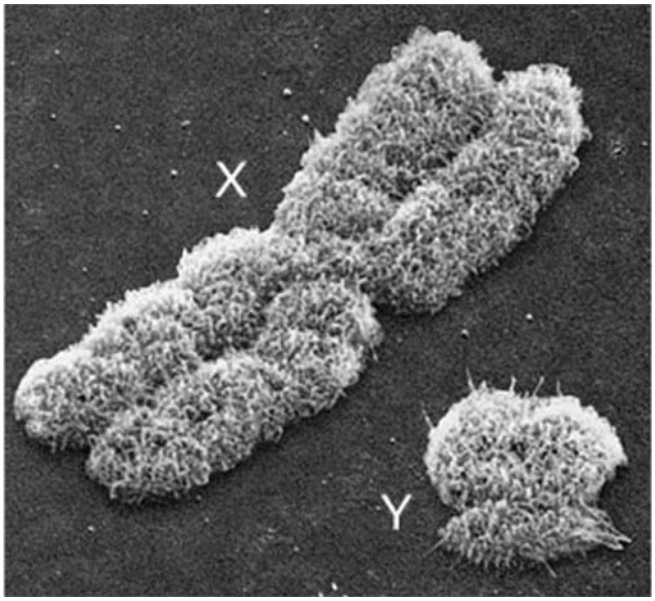



*Image reproduced with kind permission of Mary Greene at http://rst.gsfc.nasa.gov*

Chromosomes first appear as double-stranded chromosomes during

**A.** interphase
**B.** telophase
**C.** prophase
**D.** metaphase

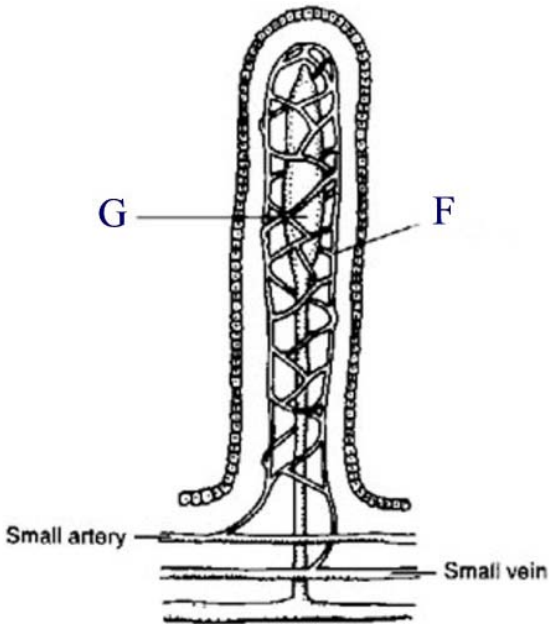
**Question 13**

Athlete's foot is a fungal infection of the feet in humans. It is caused by the fungus *Trichophyton rubrum* which thrives in warm, moist conditions and causes dry skin and itching. *T. rubrum* feeds by secreting enzymes, which partially digest food extracellularly. The partially digested food is then absorbed to complete digestion internally. The mode of nutrition of the fungus is best described as

**A.** heterotrophic
**B.** autotrophic
**C.** omnivorous
**D.** herbivorous

*The following information relates to Questions 14 and 15.*

The diagram shows a cross section of tissue taken from the lining of the digestive system of a human.




**Question 14**

Structure F is a

**A.** capillary
**B.** lacteal
**C.** villus
**D.** microvillus

**Question 15**

Following digestion, material is absorbed into Structure G and transported away from the small intestine. Which of the following is correct?

| | Absorbed Into | Digested Material | Transported In |
|---|---|---|---|
| **A.** | G | amino acids, monosaccharides | blood |
| **B.** | G | glycerol, fatty acids | blood |
| **C.** | G | amino acids, monosaccharides | lymph |
| **D.** | G | glycerol, fatty acids | lymph |

**Question 16**

Blood is composed of plasma and cells. The diagram shows the appearance of a test tube after blood has been allowed to settle. Two fractions have separated forming a clear fluid above and an opaque region below.

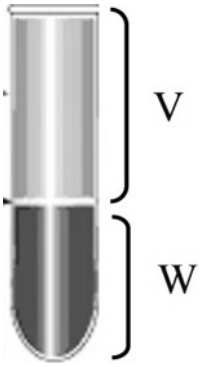



*Image reproduced with kind permission of Cathi Galati at www.sigmaaldrich.com*

In fraction W, it would be reasonable to expect to find

**A**. platelets and water
**B.** erythrocytes and leucocytes
**C.** erythrocytes and globulins
**D.** fibrinogen and hormones

**Question 17**

Organisms must exchange oxygen and carbon dioxide with the environment in which they live. These gases diffuse in and out of cells along a concentration gradient. Which of the following is NOT required in an efficient gas exchange surface?

**A.** a large, moist surface area for exchange
**B.** a source of energy to facilitate gas exchange
**C.** a thin permeable surface
**D.** efficient blood supply

**Question 18**

Insects have a system of trachea that supply living cells with oxygen. The trachea have a cuticular lining which is made from chitin and protein. In humans, the respiratory tract is supported by rings of

**A.** cartilage
**B.** chitin
**C.** bone
**D.** vascular tissue

*The following information relates to Questions 19, 20 and 21.*

Metabolism of protein results in the production of nitrogenous waste which can be harmful to body tissue. Fish avoid damage to their body tissues by excreting their nitrogenous waste into a ready supply of water. The diagram summarises the water balance strategies shown by marine and freshwater fish.

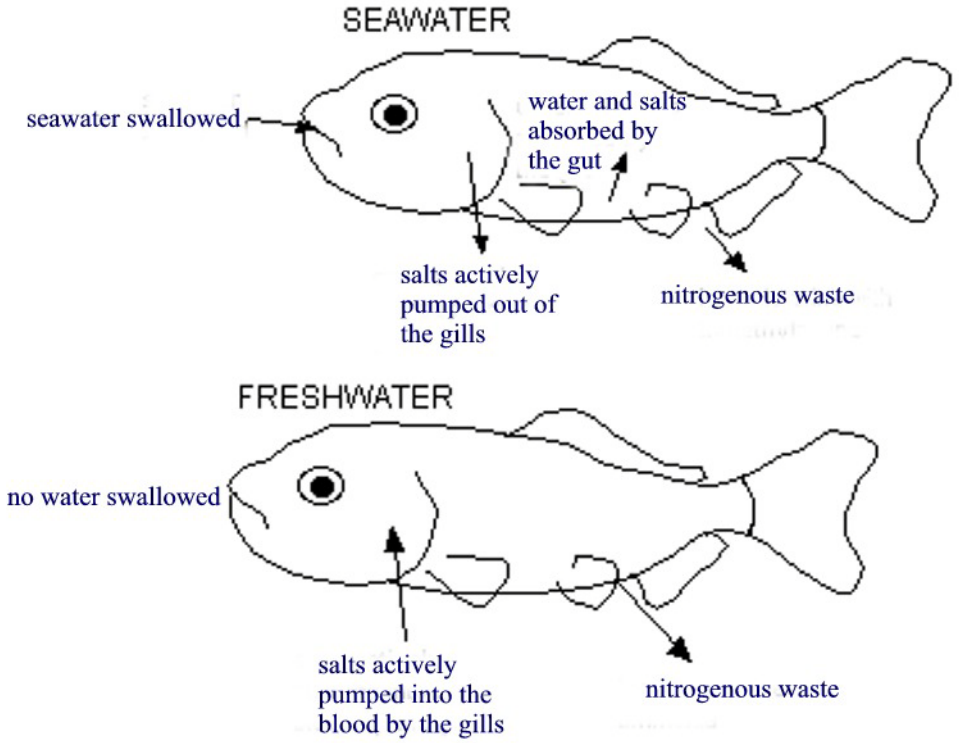



*Image adapted from www.ahobart.net*

**Question 19**

Which term best describes the tissues of a marine fish in relation to its environment?

**A.** isotonic
**B.** hypertonic
**C.** hypotonic
**D.** phytoplanktonic

**Question 20**

The form of nitrogenous waste produced by freshwater fish is

**A.** ammonia
**B.** urea
**C.** uric acid
**D.** creatinine

**Question 21**

Diadromous fish, such as salmon, migrate from marine to freshwater as part of their breeding cycle. In doing so, they encounter salt and water balance (osmoregulatory) challenges. These are overcome through physiological and behavioural adaptations which enable them to osmoregulate like marine fish in the ocean and freshwater fish when migrating inland.

Switching between osmoregulatory modes in migrating fish

**A.** is controlled by diet.
**B.** is triggered by water temperature.
**C.** occurs immediately and the fish do not need to stop during their migration.
**D.** takes time and the fish must spend a few days acclimatising to the new environment.

**Question 22**

The diagram shows a nephron from a mammalian kidney. Which is the correct sequence of labels for the diagram?

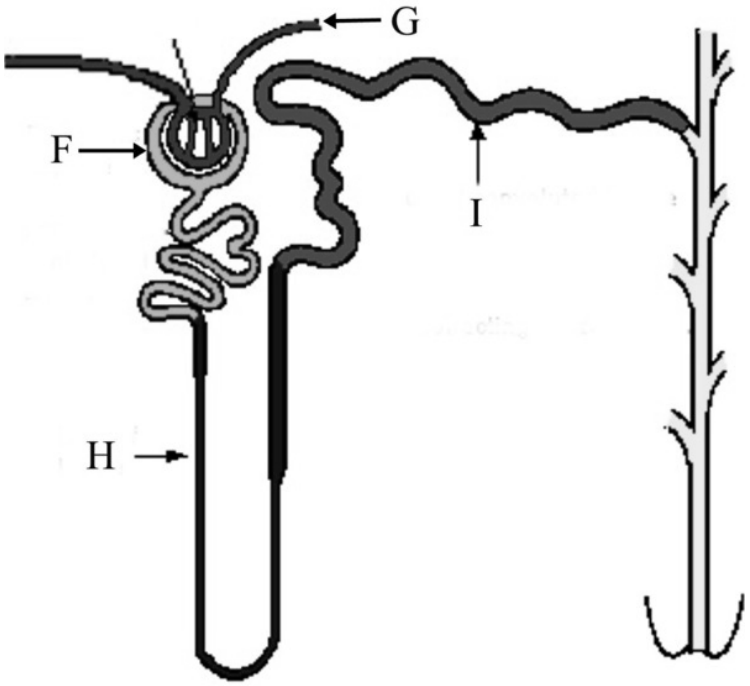



*Image adapted from www.ahobart.net*

| | F | G | H | I |
|---|---|---|---|---|
| **A** | distal tubule | afferent arteriole | collecting tubule | glomerulus |
| **B** | glomerulus | afferent arteriole | collecting tubule | distal tubule |
| **C** | Bowman's capsule | efferent arteriole | loop of Henle | distal tubule |
| **D** | efferent arteriole | loop of Henle | distal tubule | collecting tubule |

**Question 23**
Asexual reproduction occurs when offspring are produced from a single parent. All offspring are identical with each other and their parent. Which of the following is an example of asexual reproduction?

**A.** spawning in corals
**B.** alternation of generation in mosses
**C.** simultaneous hermaphrodism in earthworms
**D.** spore formation in fungi

**Question 24**
Flowers are the reproductive organs in angiosperms. Most angiosperms are monoecious and carry both the male and female parts on the same plant. The correct male and female reproductive structures for angiosperms are

| | Male Reproductive Structures | Female Reproductive Structures |
|---|---|---|
| **A.** | stamen, stigma, style | carpel, anther, filament |
| **B.** | stamen, anther, filament | carpel, stigma, style, ovary |
| **C.** | carpel, stigma, anther | stamen, filament, style, ovary |
| **D.** | carpel, stigma, style, ovary | stamen, anther, filament |

**Question 25**
The classification of living organisms has changed significantly over time. Beginning with Linnaeus's two-kingdom system, the biodiversity of Earth was grouped into a three-kingdom system (Haeckel), then a five-kingdom system (Whittaker) and most recently, a three domain system proposed by Woese. The domains found in Woese's system include

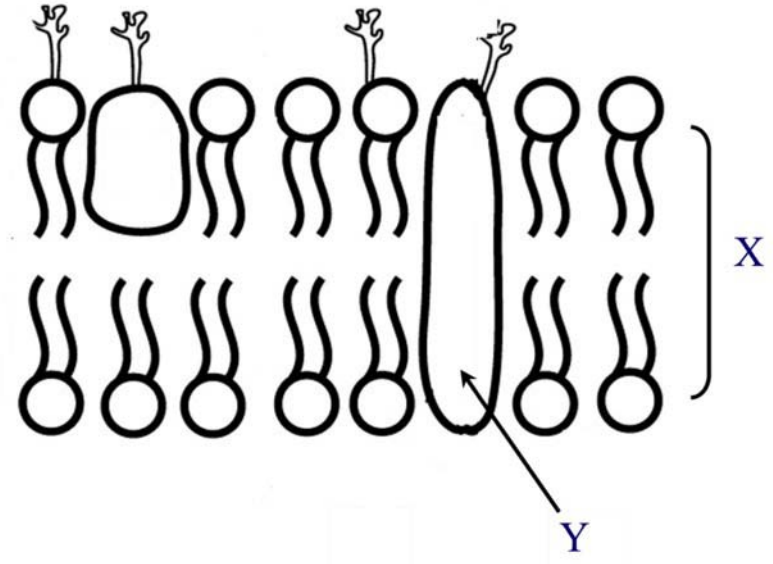
**A.** Eubacteria, Archaea, Eukarya
**B.** Eukarya, Plantae, Animalia
**C.** Fungi, Eubacteria, Animalia
**D.** Animalia, Vegetabile, Archaea.



**END OF SECTION A**

**SECTION B – Short-answer questions**

**Question 1**
The diagram shows a cross section of a portion of plasma membrane.




**1a.** Identify the structures X and Y.

X _____

Y _____

2 marks

A student places a quantity of plant cells into a beaker of distilled water.

**1b. i.** What is the name of the process that occurs over the next few hours?

_____

1 mark

**1b. ii.** Use a diagram to show how one of the plant cells is likely to appear after 8 hours.

1 mark

The student then places an equivalent quantity of red blood cells into a new beaker of distilled water.

**1c.** Explain what happens to the red blood cells.

_____

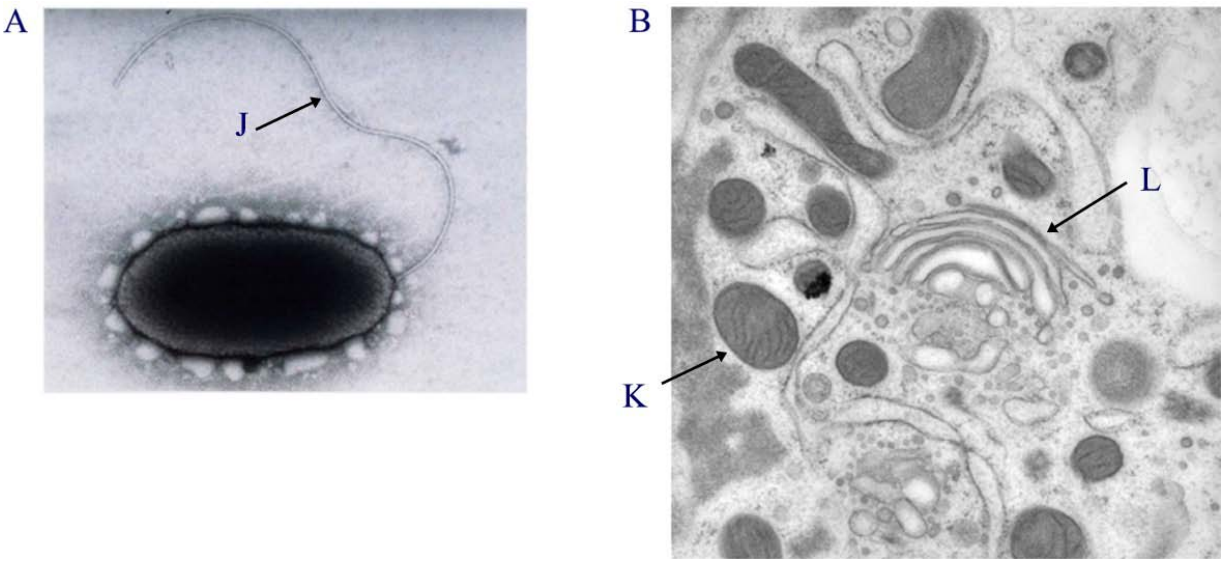
_____

_____

1 mark
[Total 2 + 1 + 1 +1 = 5]

**Question 2**

Two cells, A and B, are shown in the following diagram.




*Images reproduced with kind permission of Kathryn Applegate at www.biologos.org and Simon Crawford at the University of Melbourne*

**2a. i.** Which is the eukaryote cell? Circle your answer.

Cell A Cell B

1 mark

**2a. ii.** Give a reason to support your answer in **2a.i.**

_____

_____

_____

1 mark

**2b.** Identify the structures **J**, **K**, **L** and their associated function by completing the following table.

| | **Structure** | **Function** |
|---|---|---|
| **J** | | |
| **K** | | |
| **L** | | |

3 marks

**2c.** Consider the structures **J**, **K**, **L**. Identify, by name, the structures that are not visible with a light microscope.

_____

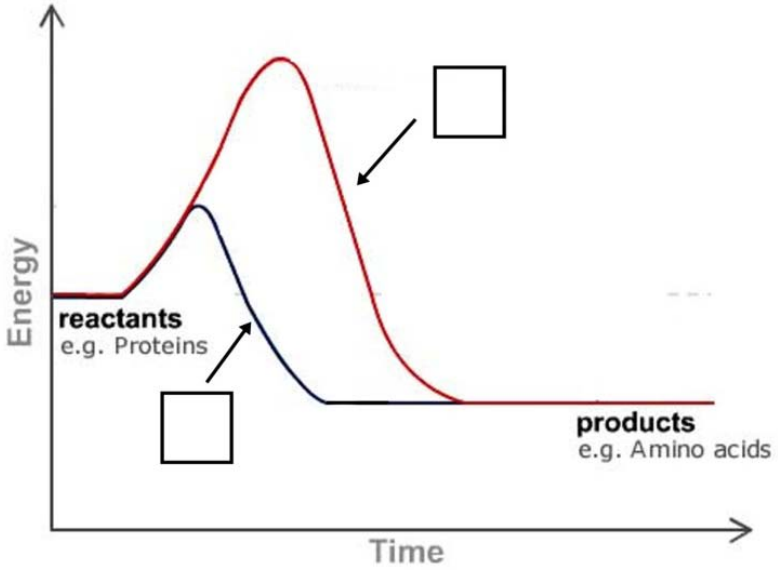
1 mark
[Total 1 + 1 + 3 + 1 = 6]

**Question 3**
The organic compounds that are found in an organism are grouped into four main classes. The table identifies certain properties of these compounds.
**3a.** Complete the information by filling in the table.

| **Monomer/Subunit** | **Polymer** | **Constituent Elements** | **Example** |
|---|---|---|---|
| amino acid | | C, H, O, N, S | |
| | carbohydrate | | maltose |
| nucleotide | | C, H, O, N, P | |
| | lipid | | oils in seeds |

4 marks

**3b.** Enzymes are biological catalysts and control the rate of reactions in living organisms by influencing the stability of chemical bonds. The diagram shows a generalised chemical reaction.




**3b. i.** Identify one way in which an enzyme differs from a non-biological catalyst.

_____

_____

_____

1 mark

**3b. ii.** By placing the correct letters in the boxes on the graph above, assign the appropriate labels to the diagram.
**M –** reaction with enzyme
**N –** reaction without enzyme

1 mark

**3b. iii.** Why do enzyme-catalysed reactions in humans slow down at temperatures lower than 37°C?

_____

_____

_____

2 marks
[Total 4 + 1 + 1 + 2 = 8]

**Question 4**

All animals require energy to survive. Energy requirements vary for different animals with some eating a wide variety of foods, while others may eat just one specific type. Animals can be divided into three main groups according to the types of food they eat. The image shows the skulls of three animals, each with a different diet.


*Image reproduced with kind permission of Joey Williams at [www.skullsunlimited.com](http://www.skullsunlimited.com)*

**4a. i.** What is the term used to describe the diet of animal B?

_____

1 mark

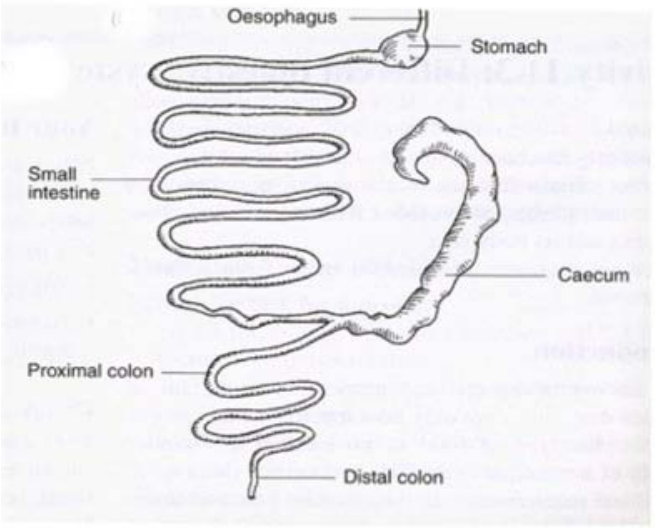
**4a. ii.** There are four types of teeth present in the dentition of animal B. Identify the tooth with its function by matching the number to the correct letter in the table below.
**Tooth:** A – incisor; B – canine; C – premolar; D – molar
**Function:** 1 – crushing; 2 – tearing; 3 – grinding; 4 – cutting

| Tooth | Function |
|---|---|
| A – incisor | |
| B – canine | |
| C – premolar | |
| D – molar | |

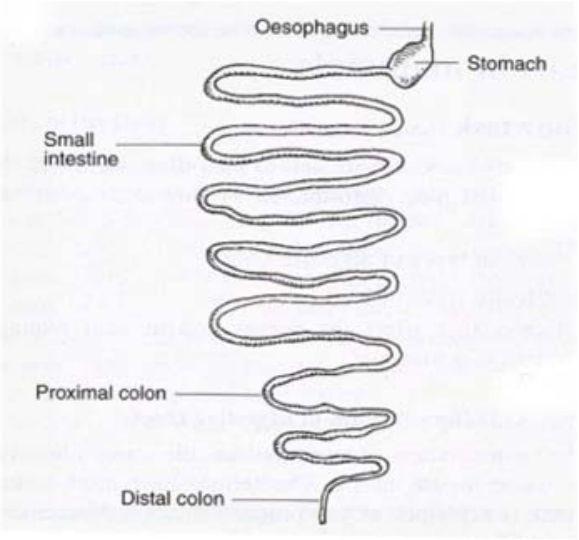
2 marks

Animal A and animal C have approximately the same body mass of around 90 kilograms in a full-grown adult male. A comparison of the type of alimentary canal found in these animals is shown below.

Animal A




Animal C




*Images adapted from* Biology Book 1, Activity Manual, 3e *Leslie et al (Wiley, 1998)*

**4b.** What would be the most likely diet of animal C? Explain your answer.

_____

_____

_____

_____

2 marks

The following image shows the skulls of two herbivorous animals, a rhinoceros and a hippopotamus.

**Rhinoceros** **Hippopotamous**

*Images reproduced with kind permission of Joey Williams at [www.skullsunlimited.com](http://www.skullsunlimited.com)*

| **Rhinoceros** | **Hippopotamus** |
|---|---|
| large jaw | small jaw |
| small stomach | large stomach |

**4c.** Which of the two is more likely to be a foregut fermenter? Explain your answer.

_____

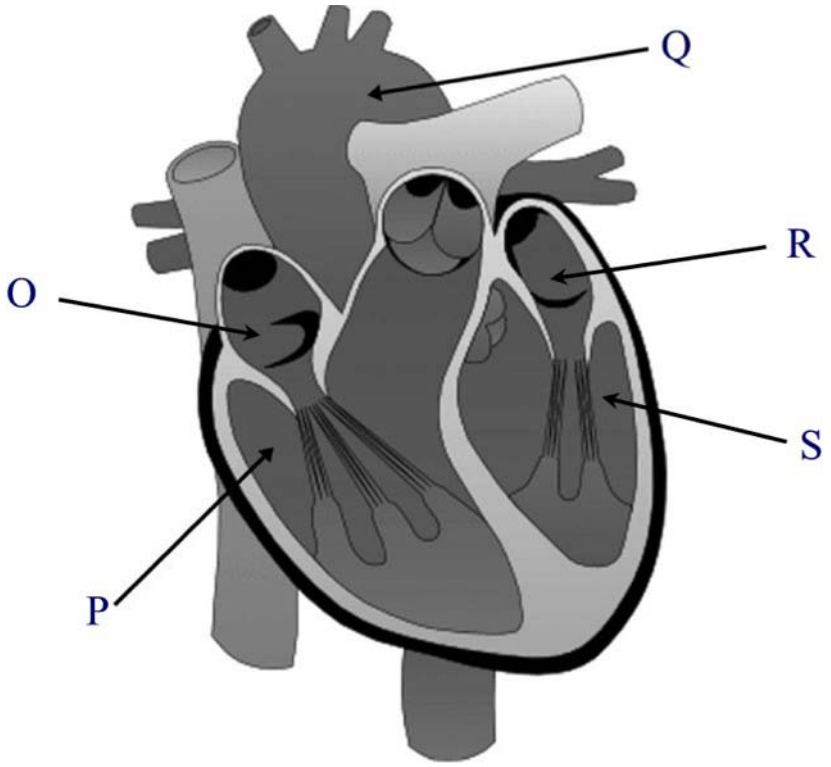
_____

_____

2 marks
[Total 1 + 2 + 2+ 2 = 7]

**Question 5**

The diagram shows some of the internal features of a human heart.




**5a.** Identify structures **O** and **Q**.

Structure **O** _____

Structure **Q** _____

2 marks

**5b.** Which part of the body is not supplied with blood from structure Q?

_____

1 mark

**5c.** Choose letters from the diagram above to indicate the chambers of the heart in which blood would have a higher concentration of oxygen.

_____

_____

1 mark

**5d.** Suggest why a blockage to the left descending artery could lead to the death of the cardiac muscle.

_____

_____

_____

_____

_____

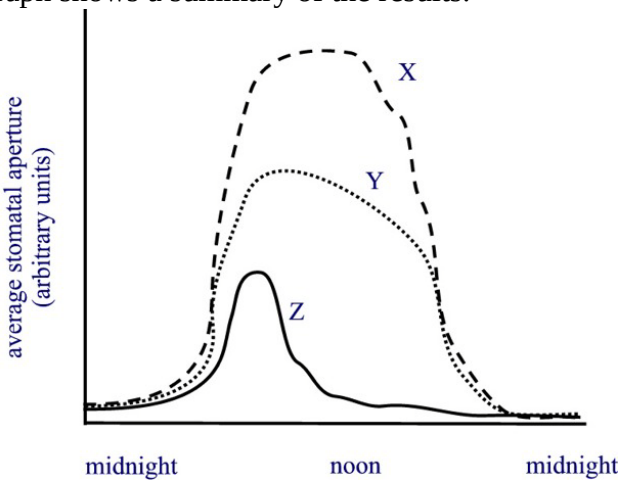
3 marks
[Total 2 + 1 + 1 +3 = 7]

**Question 6**

A group of university students carried out an investigation into the loss of water from leaves. They recorded measurements of stomatal openings in a range of different conditions, each over 24-hour periods. The different conditions were

- **i.** cloudy
- **ii.** sunny and humid
- **iii.** sunny and dry

The graph shows a summary of the results.




**KEY:**

**X –** ____

**Y –** ____

**Z –** ____

**6a.** Match the line on the graph (**X**, **Y** or **Z**) with the condition (**i**, **ii**, **iii**) by completing the key to the figure. Write the description of the condition in the appropriate box.

2 marks

A stomatal opening (stoma) is a pore, the size of which is determined by the movement of water in and out of cells which surround it. Stomata are usually open during daylight hours and closed in periods of darkness.

**6b. i.** What is the name given to the cells that surround a stoma?

_____

1 mark

**6b. ii.** Explain the benefit, to a plant, of stomata that open during the day and close at night.

_____

_____

_____

2 marks

In August 2010, Victoria's historic Separation Tree was vandalised. The tree, which commemorates the separation of Victoria from New South Wales in 1851, was ringbarked in the Royal Botanic Gardens overnight. Botanists are uncertain whether the tree will survive the attack.

**6c.** Explain how ringbarking is likely to cause a tree to die.

_____

_____

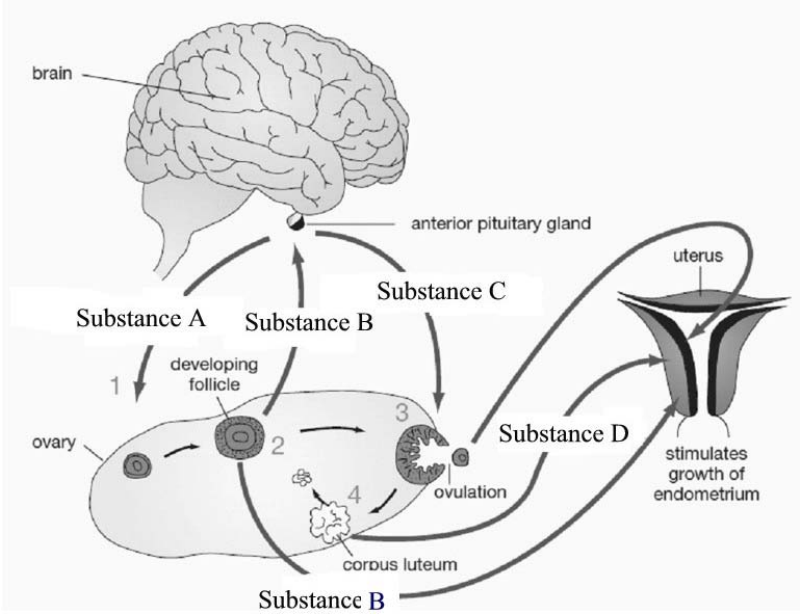
_____

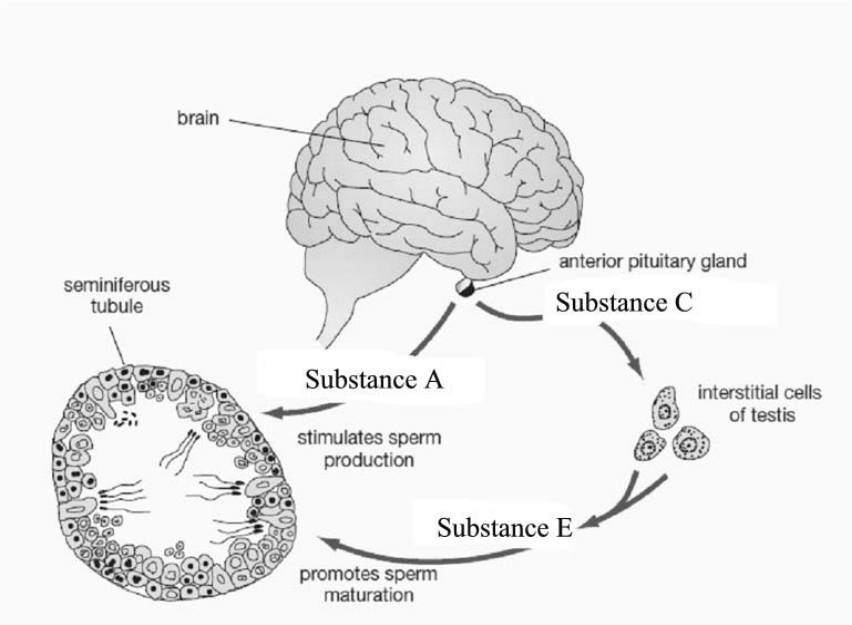
_____

2 marks
[Total 2 + 1 + 2 + 2 = 7]

**Question 7**

The diagrams show a representation of the female ovarian cycle and gamete production in males.




*Images adapted from* Heinemann Biology 1, 4e *Evans et al (Heinemann, 2005)*

**7a.** Complete the table and identify the listed substances.

| | |
|---|---|
| Substance A | |
| Substance B | |
| Substance D | |
| Substance E | |

3 marks

Ovulation is triggered by the production of a specific substance.

**7b.** What is the name of the substance that triggers ovulation?

_____

1 mark

The length of the ovarian cycles of three women were compared and the results are shown in the table.

| **Woman 1** | **Woman 2** | **Woman 3** |
|---|---|---|
| 35 days | 24 days | 31 days |

**7c.** On what day of the ovarian cycle is woman 3 most likely to ovulate?

_____

1 mark

[Total 3 + 1 + 1 = 5]

**Question 8**

The table shows the classification of four different species.

| | **Species 1** | **Species 2** | **Species 3** | **Species 4** |
|---|---|---|---|---|
| ***Phylum*** | Chordata | | | |
| **Class** | Mammalia | | | |
| **Order** | Diprododontia | Diprododontia | | |
| **Family** | Potoroidae | Macropodidae | | Macropodidae |
| **Genus** | *Bettongia* | *Petrogale* | *Lagorchestes* | *Lagorchestes* |
| **Species** | *penicillata* | *penicillata* | *leporides* | *hirsutus* |

**8a.** Complete the classification table by filling in the spaces.

2 marks

**8b.** In which kingdom are these organisms classified?

_____

1 mark

A biologist examined the relationship between three species of kangaroo, *Macropus fuliginosus, Macropus giganteus* and *Macropus rufus*. Her observations were recorded in the following table.

| **Characteristic** | ***M. fuliginosus*** | ***M. giganteus*** | ***M. rufus*** |
|---|---|---|---|
| tail length (male) | 425–1000 mm | 430–1090 mm | 710–1000 mm |
| mass (male) | 54 kg | 55 kg | 60 kg |
| hairs on the muzzle | present | present | present |
| pouch life of offspring | ~298 days | ~300 days | ~235 days |
| embryo development delayed if older offspring in pouch (diapause) | no diapause | diapause | diapause |

**8c.** Explain which two species are most closely related and state which combination of characteristics supports your answer.

_____

_____

_____

2 marks
[Total 2 + 1 + 2 = 5]



**END OF SECTION B**