



Government of **Western Australia**
 School Curriculum and Standards Authority

Western Australian Certificate of Education ATAR course examination, 2016

Question/Answer booklet

HUMAN BIOLOGY

↑
 Place one of your candidate identification labels in this box.
 Ensure the label is straight and within the lines of this box.
 ↓

Student number: In figures

--	--	--	--	--	--	--	--

In words

Time allowed for this paper

Reading time before commencing work: ten minutes
 Working time: three hours

Number of additional
 answer booklets used
 (if applicable):

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer booklet
 Multiple-choice answer sheet

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,
 correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in this examination

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.



Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of examination
Section One Multiple-choice	30	30	40	30	30
Section Two Short answer	9	9	90	105	50
Section Three Extended answer	3	2	50	40	20
Total					100

Instructions to candidates

- The rules for the conduct of the Western Australian Certificate of Education ATAR course examinations are detailed in the *Year 12 Information Handbook 2016*. Sitting this examination implies that you agree to abide by these rules.
- Answer the questions according to the following instructions.

Section One: Answer all questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Section Two: Write your answers in this Question/Answer booklet. Wherever possible, confine your answers to the line spaces provided.

Section Three: Consists of three questions. You must answer two questions. Tick the box next to the question you are answering.
- You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
- Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

See next page

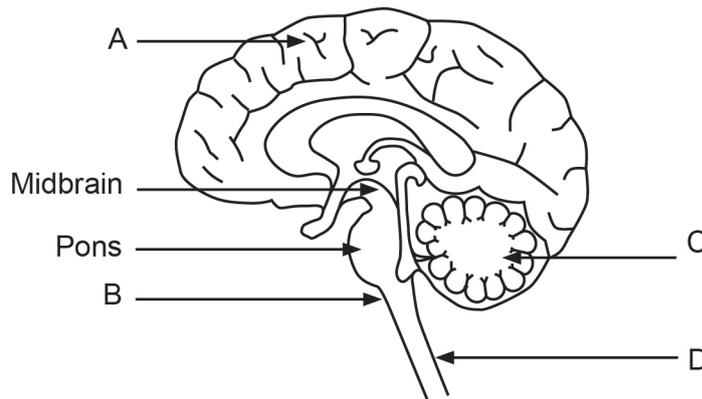
Section One: Multiple-choice

30% (30 Marks)

This section has **30** questions. Answer **all** questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 40 minutes.

Questions 1 and 2 refer to the diagram of the brain shown below.



1. When you sneeze or swallow, which labelled part of the brain is responsible for the control of these actions?
 - (a) A
 - (b) B
 - (c) C
 - (d) D

2. If someone received a severe blow to the part of the brain labelled C, which one of the following would they experience?
 - (a) loss of memory
 - (b) inability to regulate breathing
 - (c) impaired hearing
 - (d) uncoordinated movement

3. Modern great apes and fossils of *Paranthropus robustus* have some features in common and others differ markedly. Which of the following features do they have in common?

They both have

 - (a) large canine teeth in comparison to other teeth.
 - (b) sagittal crests on the surface of the cranium.
 - (c) length of arms greater than length of legs.
 - (d) an elongated and narrow pelvic girdle.

See next page

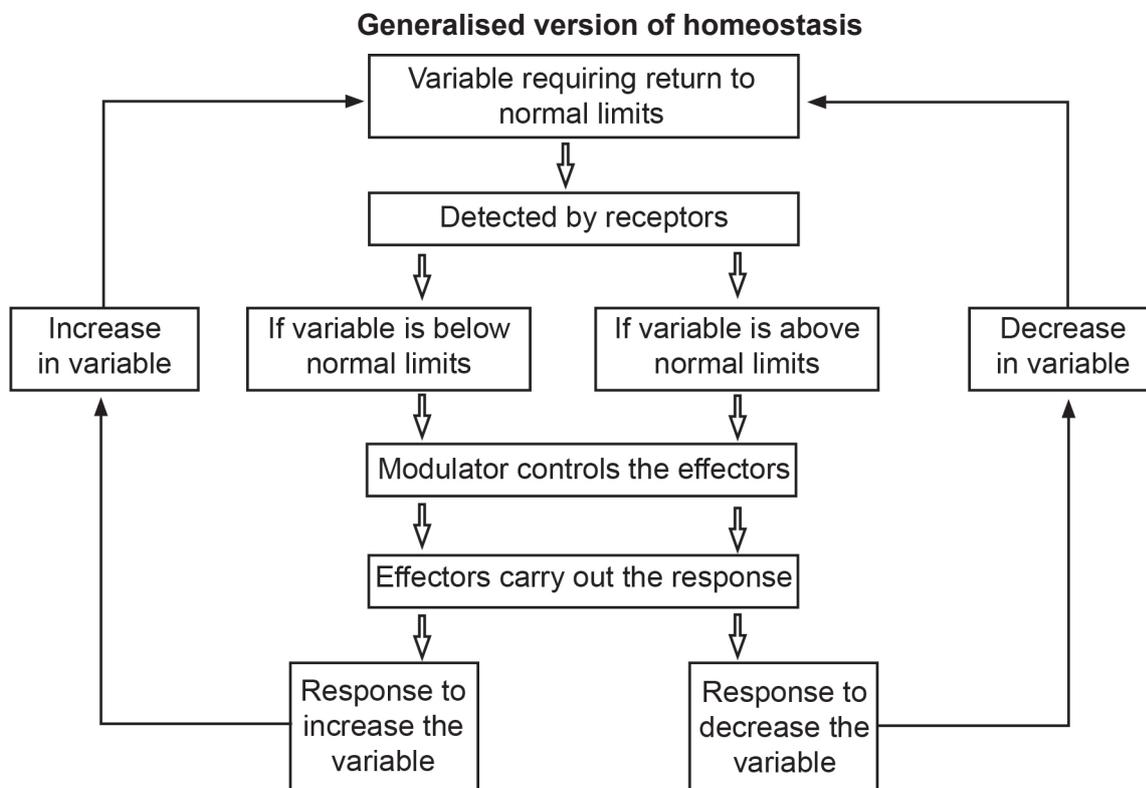
4. Evolution occurs through a process that involves the following events:

- I. changes to gene pool
- II. struggle for existence
- III. survival of the fittest
- IV. variation
- V. sexual reproduction.

The correct order of these events is

- (a) V, IV, II, III and I.
- (b) V, II, III, IV and I.
- (c) I, V, III, II and IV.
- (d) I, V, II, IV and III.

Questions 5 and 6 refer to the information and diagram shown below.

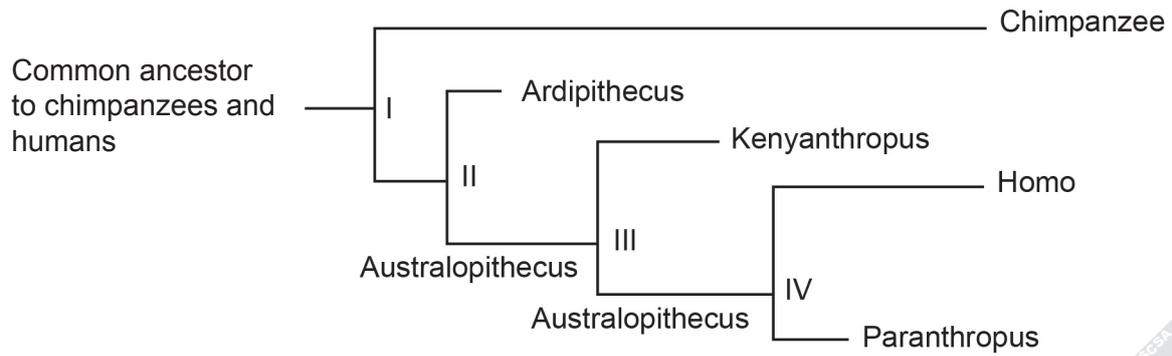


5. If the above diagram represented homeostasis in the control of carbon dioxide levels in the blood, the modulator in the brain controlling the response to increase the variable would be the

- (a) medulla oblongata.
- (b) cerebral cortex.
- (c) hypothalamus.
- (d) corpus callosum.

6. To remove excess carbon dioxide when levels are above normal limits, the effectors would be
- sympathetic nerves, which decrease breathing rate.
 - lung alveoli, which increase breathing rate.
 - the diaphragm, which decreases breathing rate.
 - respiratory muscles, which increase breathing rate.

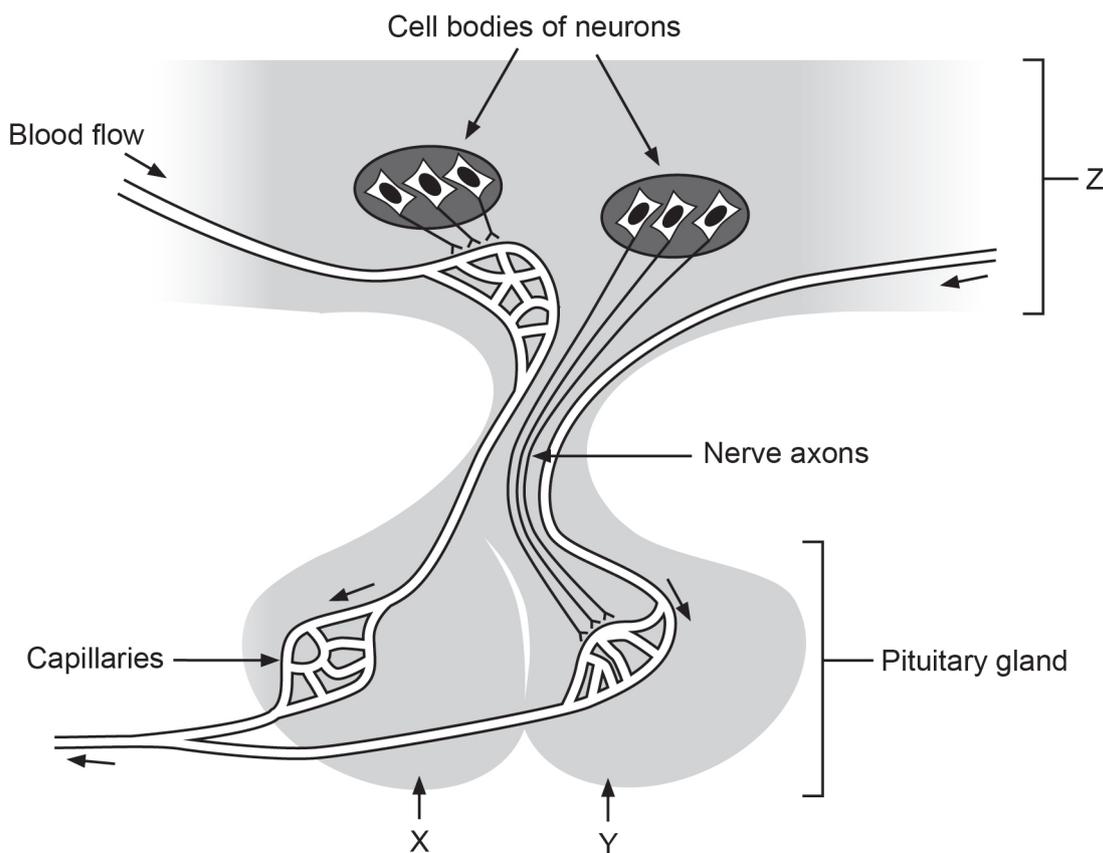
Question 7 refers to the diagram of a hominid phylogenetic tree shown below.



7. Based on the information shown in the phylogenetic tree, the **most** recent common ancestor for *Kenyanthropus* and *Homo* was at point
- I.
 - II.
 - III.
 - IV.
8. In the relatively isolated region of Lake Maracaibo in northwest Venezuela, there is an unusually high incidence of the genetically-inherited nerve disorder known as Huntington's disease. Around the world Huntington's disease is estimated to affect 5–7 people in 100 000. In Lake Maracaibo, it occurs at a rate of 700 people in 100 000. All of the individuals in Lake Maracaibo who carry the allele for Huntington's disease can trace their ancestry to one of the original 19th century inhabitants of the region.
- This example is an illustration of
- natural selection.
 - the founder effect.
 - a high rate of new mutations occurring.
 - a natural disaster causing genetic drift.

9. Which of the following statements describes speciation?
- (a) A mutation occurs in an individual then produces a new species.
 - (b) Two different species interbreed to produce a different species with combined features.
 - (c) A population of one species diverges genetically and produces one or more new species.
 - (d) A small population can no longer interbreed with others in the larger population, producing a new species.

Questions 10 and 11 refer to the diagram shown below.



10. Which part of the brain is shown as Z in the diagram?
- (a) hypothalamus
 - (b) cerebrum
 - (c) brain stem
 - (d) medulla oblongata
11. X and Y represent the two lobes of the pituitary gland. A target organ for hormones released from lobe Y is the
- (a) thymus.
 - (b) thyroid gland.
 - (c) ovaries.
 - (d) uterus.

See next page

Question 12 refers to the information shown below.

GEOLOGICAL TIME SCALE						
Eon	Era	Period	Epoch		Present	
Phanerozoic	Cenozoic	Quaternary	Holocene		0.01	
			Pleistocene		1.6	
		Tertiary	Neogene	Pliocene		5.3
				Miocene		23.7
				Oligocene		36.6
				Eocene		57.8
			Paleogene	Paleocene		66.4
				Cretaceous		144
				Jurassic		208
				Triassic		245
	Paleozoic	Permian		286		
		Pennsylvanian		320		
		Mississippian		360		
		Devonian		408		
		Silurian		438		
		Ordovician		505		
		Cambrian		570		
		Precambrian	Proterozoic		2500	
			Archean		3800	
Hadean			4550			

Age in millions of years before present

12. During which Period would a fossil specimen dated at 700 000 years old have been alive?

(a) Cretaceous
 (b) Proterozoic
 (c) Quaternary
 (d) Pleistocene

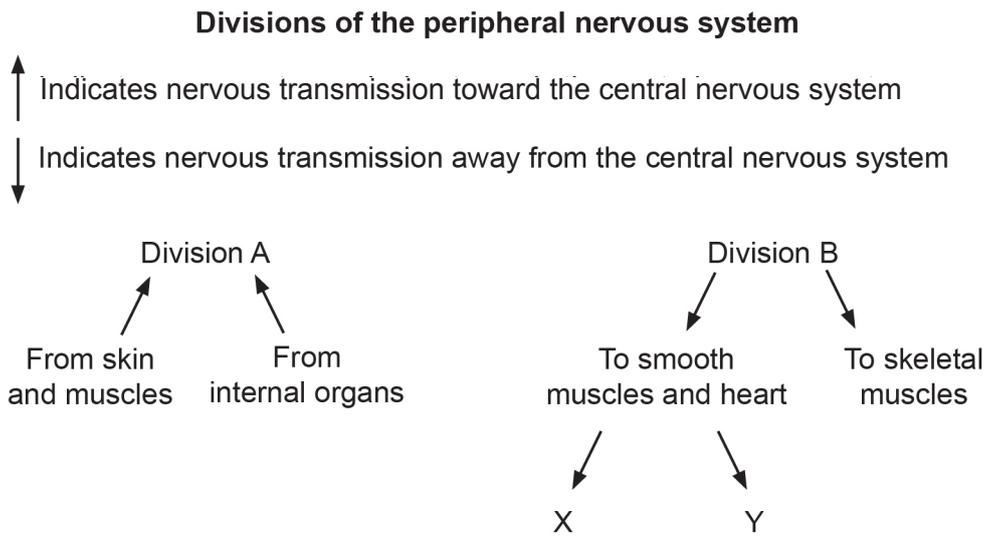
13. The genetic disease known as Tay-Sachs has been the subject of much scientific debate over the evolutionary mechanisms that have produced the patterns of inheritance of the disease. Different theories, all of which have sound scientific reasoning, have linked Tay-Sachs to the founder effect, genetic drift and natural selection.

Which of the following would be the **best** reasoning to link the inheritance of Tay-Sachs to genetic drift?

(a) The original populations carried a high incidence of the allele.
 (b) Affected populations tend to be small and reproductively isolated.
 (c) Sufferers of the disease reproduce at greater rates than non-sufferers.
 (d) Carriers of the allele have a survival advantage over non-carriers.

See next page

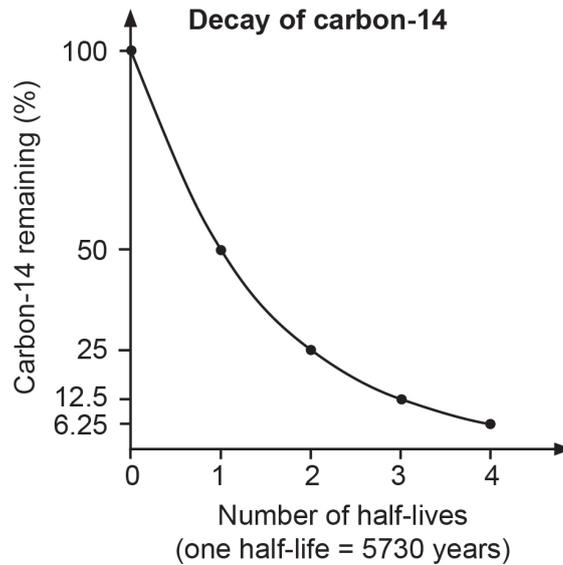
Questions 14 and 15 refer to the information and diagram shown below.



14. Division B is the
- afferent division.
 - efferent division.
 - sympathetic division.
 - parasympathetic division.
15. X and Y represent divisions of the
- autonomic nervous system that usually transmit nerve impulses under involuntary control.
 - somatic nervous system that usually transmit nerve impulses under involuntary control.
 - autonomic nervous system that usually transmit nerve impulses under voluntary control.
 - somatic nervous system that usually transmit nerve impulses under voluntary control.
16. Schwann cells
- speed up nerve impulses.
 - protect the nerve fibres.
 - secrete neurotransmitters.
 - produce the myelin sheath.

17. What ability does the opposable thumb provide to humans that other primates do **not** have?
- grasping hands to effectively grip branches
 - power grip for hammering objects
 - precision grip for fine manipulation of objects
 - weight bearing limbs to assist in large movements

Questions 18 and 19 refer to the graph shown below.

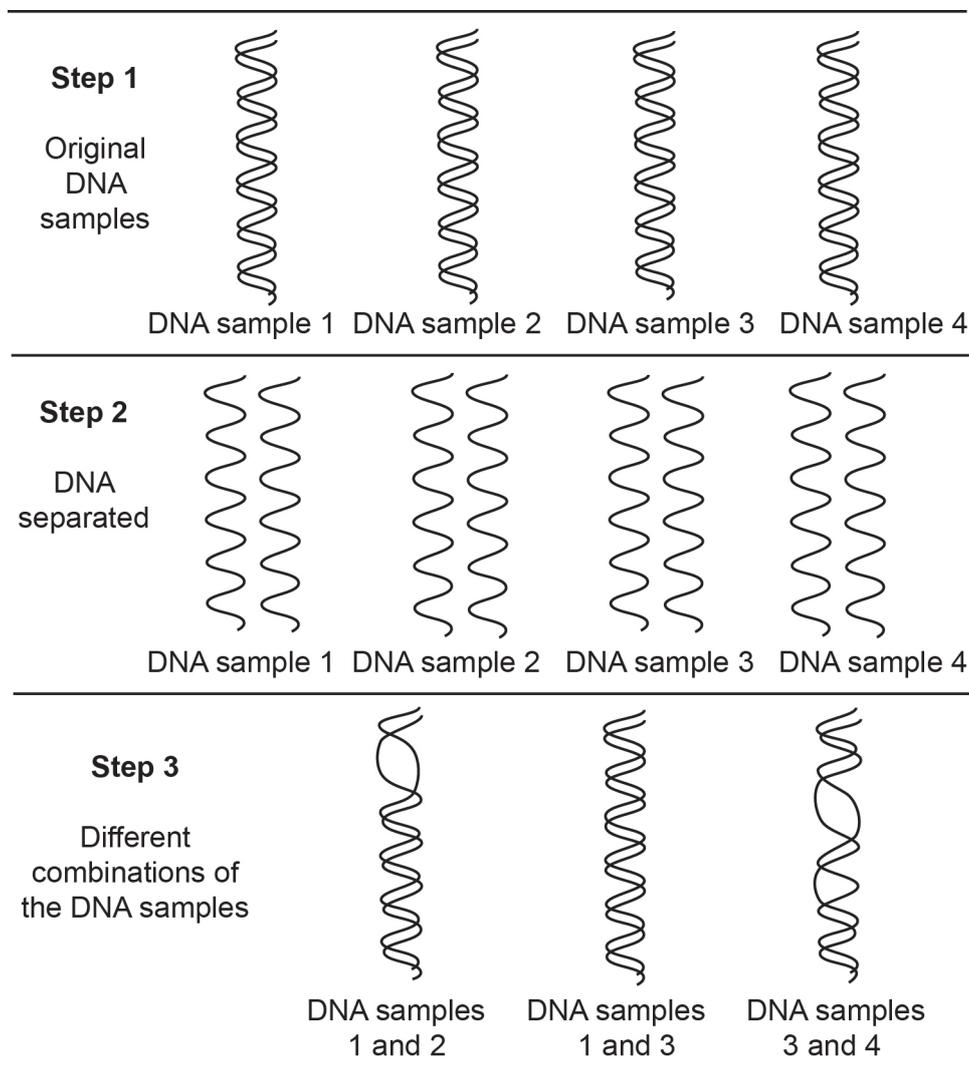


18. Given the information presented in the graph, how many years old is a sample when 12.5% of carbon-14 is remaining?
- 5730
 - 11 460
 - 17 190
 - 22 920
19. The dating technique using the decay of carbon-14 is based on the ratio of carbon-14 remaining compared to
- nitrogen.
 - carbon-12.
 - oxygen.
 - nitrogen-12.
20. Which of the following statements is **correct** about the differences between antibiotics and antiviral drugs?
- Antibiotics
- stimulate B cells and antivirals stimulate T cells.
 - are broad spectrum while antiviral drugs are more specific.
 - stop bacteria from reproducing and antiviral drugs kill bacteria.
 - stop viruses from reproducing and antivirals kill viruses.

See next page

Question 21 refers to the information shown below.

A biochemical study was conducted on several primate DNA samples. The study was aimed at examining the evolutionary relationships between the different primate species. The diagram below depicts the process carried out in the study.



21. Based on the information in the diagram, which of the following is **correct**?

Individuals belonging to DNA samples

- (a) 1 and 2 are more distantly related than samples 3 and 4.
 - (b) 1 and 2 are most likely the same species.
 - (c) 3 and 4 are more closely related than samples 1 and 3.
 - (d) 1 and 3 are most likely the same species.
22. A fossil skull with a cranial capacity of 430cc was found at a site in East Africa and was dated at 3.5 million years old. This fossil would most likely be
- (a) *Homo erectus*.
 - (b) *Paranthropus robustus*.
 - (c) *Australopithecus afarensis*.
 - (d) *Homo habilis*.

See next page

23. Bioinformatics

- (a) provides the database for the information provided by genomics.
- (b) is the study of the comparison of two or more genomes.
- (c) refers to the total genetic biodiversity found in gene pools.
- (d) provides the genetic code of all living things found on Earth.

Questions 24 and 25 refer to the information and diagram shown below.

Down syndrome is an example of a disorder caused by a mutation. This is known as trisomy-21 and is shown below in the karyotype of an affected female.

For copyright reasons this image cannot be reproduced in the online version of this document, but may be viewed at http://anthro.palomar.edu/abnormal/abnormal_4.htm

24. This type of mutation is a

- (a) point mutation.
- (b) somatic mutation.
- (c) chromosomal mutation.
- (d) gene mutation.

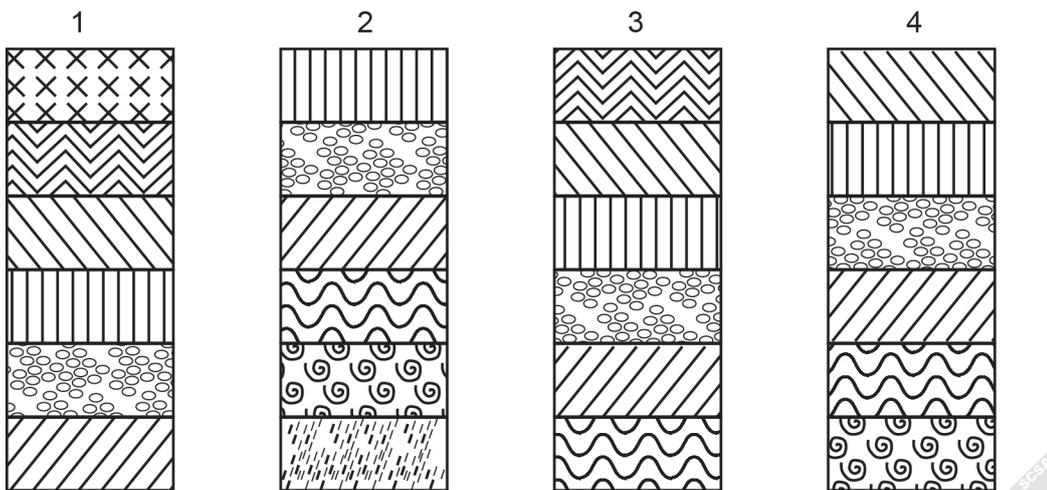
25. The cause of this mutation is

- (a) non-disjunction.
- (b) deletion.
- (c) duplication.
- (d) translocation.

26. Which of the following shows the correct sequence of events from 1 to 4 that occur during the transmission of a nerve impulse along a nerve fibre?

	1	2	3	4
(a)	sodium ions diffuse into the cell	the inside of the cell becomes positive relative to the outside	potassium ions diffuse out of the cell	the inside of the cell becomes negative relative to the outside
(b)	the inside of the cell becomes positive relative to the outside	sodium ions diffuse into the cell	the inside of the cell becomes negative relative to the outside	potassium ions diffuse out of the cell
(c)	potassium ions diffuse out of the cell	the inside of the cell becomes positive relative to the outside	sodium ions diffuse into the cell	the inside of the cell becomes negative relative to the outside
(d)	the inside of the cell becomes negative relative to the outside	sodium ions diffuse into the cell	the inside of the cell becomes positive relative to the outside	potassium ions diffuse out of the cell

Questions 27–29 refer to the diagram shown below, which represents four sets of strata from different archeological dig sites. Different amounts of erosion have occurred at each site.



27. The dating technique used to study and compare these rock layers across the four different archeological sites is a/an

- (a) relative dating technique using the principle of superposition.
- (b) absolute dating technique using the principal of superposition.
- (c) relative dating technique using the study of stratigraphy.
- (d) absolute dating technique using the study of stratigraphy.

28. Which of the archeological dig sites contains the youngest and oldest rock layers?

	Youngest	Oldest
(a)	3	4
(b)	2	1
(c)	1	3
(d)	1	2

29. Which of the sites has suffered the **most** erosion?

- (a) 1
 (b) 2
 (c) 3
 (d) 4

30. Which of the following comparisons is **incorrect** when describing the difference between the control of body functions by the nervous and endocrine systems?

	Nervous	Endocrine
(a)	Rapid transmission	Slow transmission
(b)	Short duration	Long lasting
(c)	Specific, electrochemical signals	Widely dispersed, chemical signals
(d)	A single target organ at one time	Several target organs at the same time

End of Section One

See next page

Section Two: Short answer**50% (105 Marks)**

This section has **nine (9)** questions. Answer **all** questions. Write your answers in the spaces provided.

Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

Suggested working time: 90 minutes.

Question 31**(11 marks)**

- (a) Complete the table below, outlining the anatomical differences between quadrupedal and bipedal primates. (8 marks)

Anatomical characteristic	Quadrupedal primates	Bipedal primates
Curvature of the vertebral column		
Pelvis		
Presence of a carrying angle of the femur		
Arches in the foot		

See next page

Another feature that is often referred to in hominid evolution relates to prognathism.

- (b) (i) What is the meaning of the term prognathism? (1 mark)

- (ii) Prognathism is said to be reduced in higher-order primates. Although not the cause of the change, reduced prognathism does provide an advantage for bipedal primates. State what the advantage is. (1 mark)

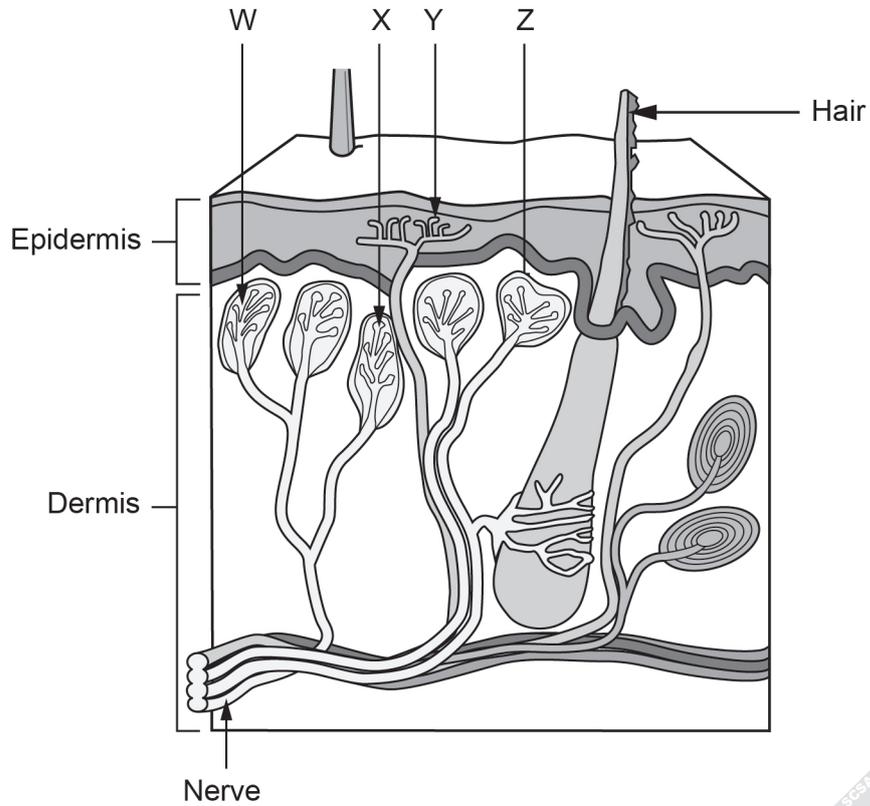
- (iii) Suggest a possible cause for the reduction of prognathism in higher-order primates. (1 mark)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 32

(11 marks)

The following question refers to the diagram of the skin shown below.



(a) Identify the type of receptor labelled Y. (1 mark)

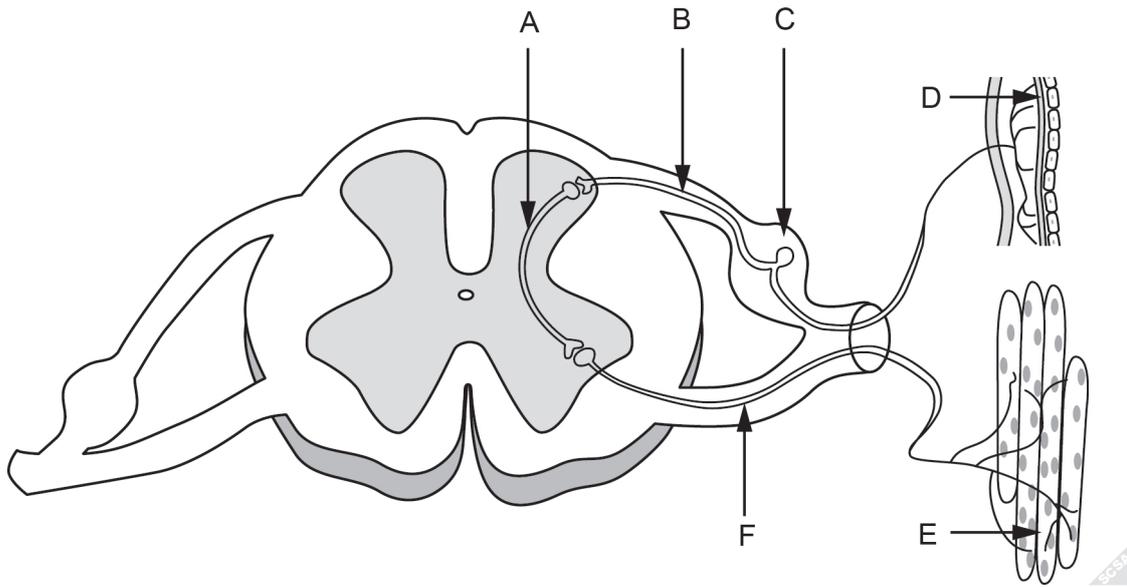
(b) Receptors W, X and Z are all located in the upper region of the dermis, but receptor Y is located in the epidermis. Explain why it is important that receptor Y is located in a different position. (3 marks)

(c) Some of the receptors shown in the diagram are involved in triggering reflexes. Name a type of stimulus that would trigger a reflex. (1 mark)

See next page

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

When a receptor initiates an impulse in a neuron going directly to the spinal cord, it will normally trigger a spinal reflex. The diagram shown below represents a spinal reflex.



- (d) Using the labels in the diagram, identify the following correctly. (2 marks)

Afferent neuron: _____

Interneuron: _____

- (e) State what is found within the structure labelled C. (1 mark)

- (f) Outline **three** important functional properties that are associated with all spinal reflexes. (3 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 33

(14 marks)

A study has recently been carried out to find a way by which Type 1 diabetics may be able to eliminate daily insulin injections. Scientists have investigated the possibility of the use of a particular type of therapy to control blood glucose levels and regulate glucose metabolism.

A small sequence of DNA was injected into the veins of diabetic rats, creating cells that produce insulin. The scientists found that, for up to six weeks, a single injection enabled the diabetic rats to show the same control of glucose levels as that found in healthy rats.

- (a) What type of therapy was used by the scientists in this experiment? (1 mark)

- (b) What is the purpose of injecting the DNA into the rat's body? (1 mark)

- (c) Describe a control group that could be used for this experiment. (2 marks)

- (d) State **one** factor involving blood glucose levels in rats that the scientists would have to determine before they began the experiment. (1 mark)

- (e) If the insulin-producing cells created by this DNA sequence were functioning in the same way as insulin that is normally produced in the body, what is the stimulus being received that ensures optimal levels of glucose are maintained? (1 mark)

- (f) List **two** further steps that scientists would have to take before people with Type 1 diabetes would be able to have access to this therapy. (2 marks)

See next page

(g) Why is insulin **not** produced in people with Type 1 diabetes? (2 marks)

(h) Describe **two** processes controlled by insulin that ensure the maintenance of blood glucose levels. Include the locations in the body where each process occurs. (4 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

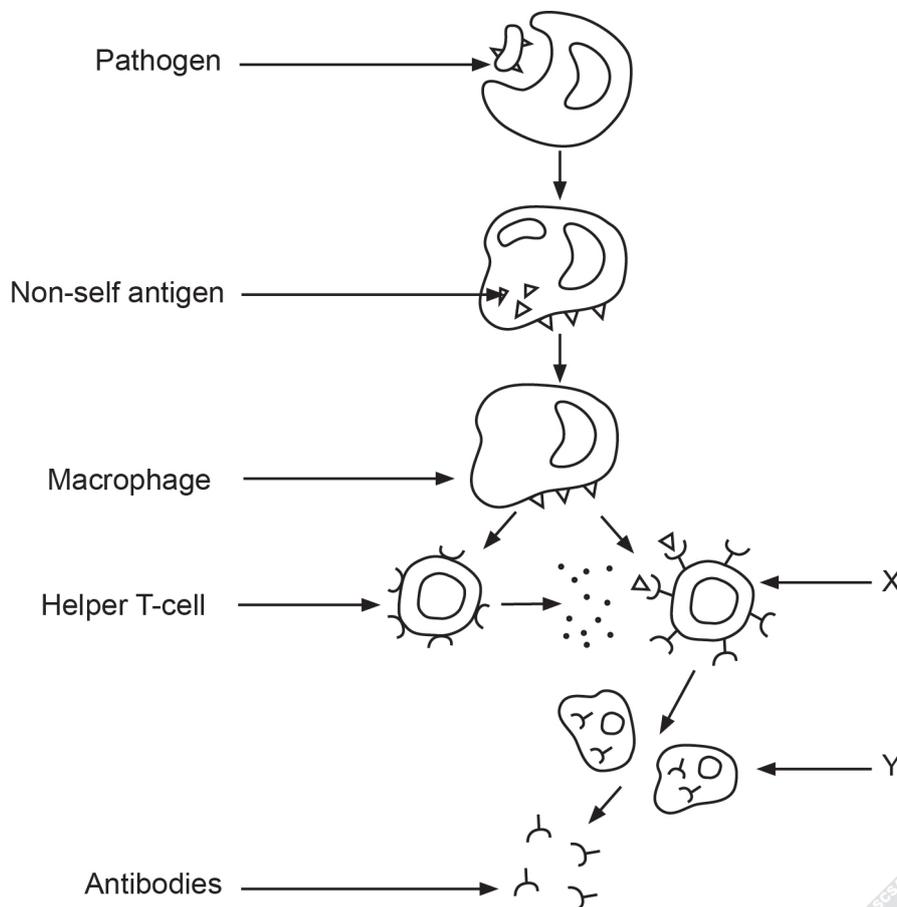
Question 34

(14 marks)

According to the Department of Health of Western Australia, since mid-2011 Western Australia has been experiencing a Pertussis (whooping cough) epidemic. Pertussis is an extremely contagious infection of the respiratory tract that is caused by the bacterium *Bordetella pertussis*. People infected by the bacterium experience uncontrolled coughing and sometimes vomiting, which can last for several months. Protection against Pertussis is well established by the whooping cough vaccine given to infants at eight-weeks of age.

- (a) Identify and describe the type of immunity an infant will gain when injected with the Pertussis vaccine. (4 marks)

The diagram below shows an immune response to a *Bordetella pertussis* infection.



See next page

(b) (i) State the name of the cells identified as X and Y in the diagram. (2 marks)

X _____

Y _____

(ii) Describe the role of a helper T-cell, as shown in the diagram. (3 marks)

(iii) Outline **three** ways in which the antibodies produced by cell Y can fight a bacterial infection. (3 marks)

(c) Whether infants are vaccinated against Pertussis or exposed to the Pertussis bacterium and suffer the effects of the disease, they should be immune to contracting the infection again. Explain why. (2 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 35

(11 marks)

Cortisol is a steroid hormone produced and secreted by the adrenal gland.

- (a) Is cortisol a water-soluble or lipid-soluble hormone? (1 mark)

- (b) Describe the mode of action of a steroid hormone such as cortisol when it reaches a target cell. Include in your answer how the hormone enters the cell and brings about an effect. (4 marks)

Cushing’s syndrome, otherwise known as hypercortisolism, is a disease caused by prolonged exposure to excessive levels of cortisol. It is often caused by a tumour growing on the pituitary gland that alters its normal hormonal secretions. Patients with Cushing’s syndrome can have many different symptoms, including high blood pressure, weight gain, depression, memory dysfunction and bone and muscle weakness.

A patient with Cushing’s syndrome had a large pituitary tumour.

- (c) (i) Which lobe of the pituitary gland would the tumour have affected? (1 mark)

- (ii) Which pituitary hormone would have had its secretion altered by the tumour? (1 mark)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

- (d) Treatment for Cushing's syndrome may require the removal of part of the pituitary gland or adrenal gland. Removing the affected endocrine gland may eliminate the high levels of cortisol; however, it can create other problems. Identify **one** such problem. (1 mark)

Individuals who have an endocrine gland removed will normally need hormone replacement treatment, which often involves the use of synthetic hormones.

- (e) (i) What is a synthetic hormone? (1 mark)

- (ii) Sometimes synthetic hormones produce side-effects that hormones produced normally by the body do not. Explain why. (2 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 36

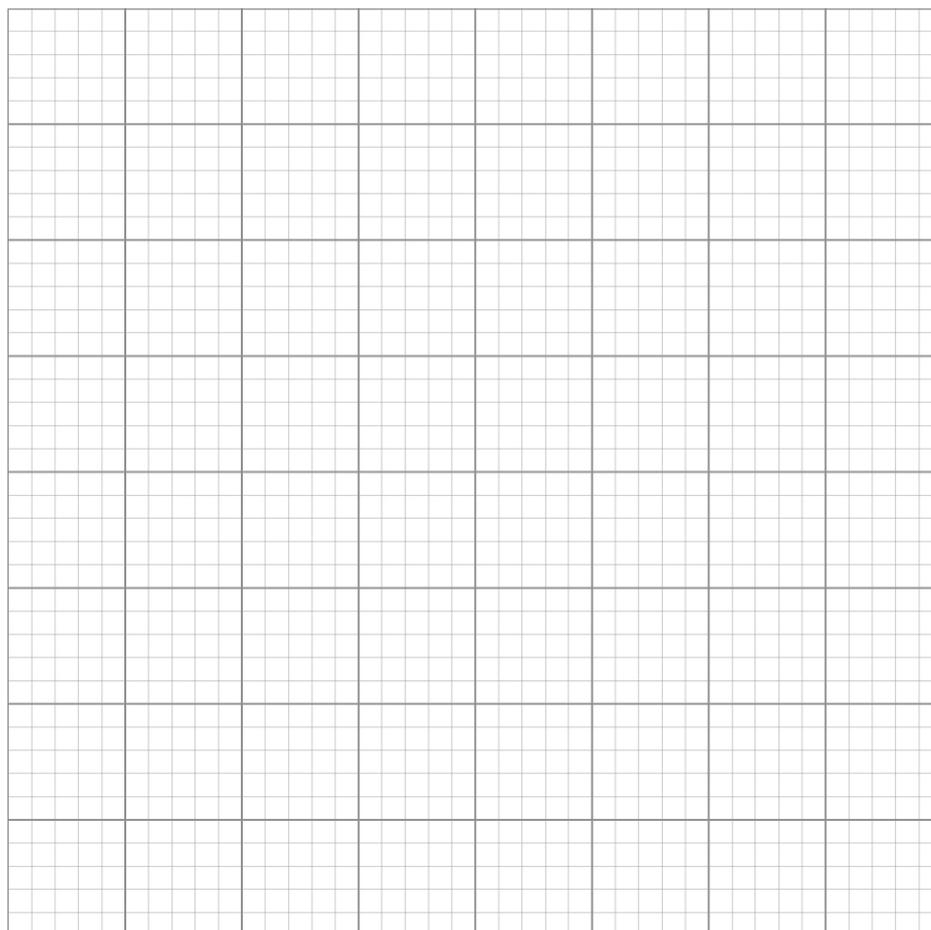
(10 marks)

Use the table below to complete the following questions.

Time (mins)	Level of anti-diuretic hormone (ADH) in the bloodstream (arbitrary units)	Rate of urine production in the kidney (mL/min)
0	7.5	2.1
2	7.5	2.1
4	7.0	2.1
6	17.0	1.5
8	22.0	1.3
10	7.0	1.5
12	7.5	2.1
14	7.5	2.1

- (a) Graph these results on the grid provided below. (5 marks)

A spare grid is provided at the end of this Question/Answer booklet. If you need to use it, cross out this attempt.



See next page

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

- (b) From the graph, determine the level of ADH in the bloodstream after seven minutes. (1 mark)

- (c) (i) Does an increase in ADH levels in the bloodstream increase or decrease the rate of urine production? (1 mark)

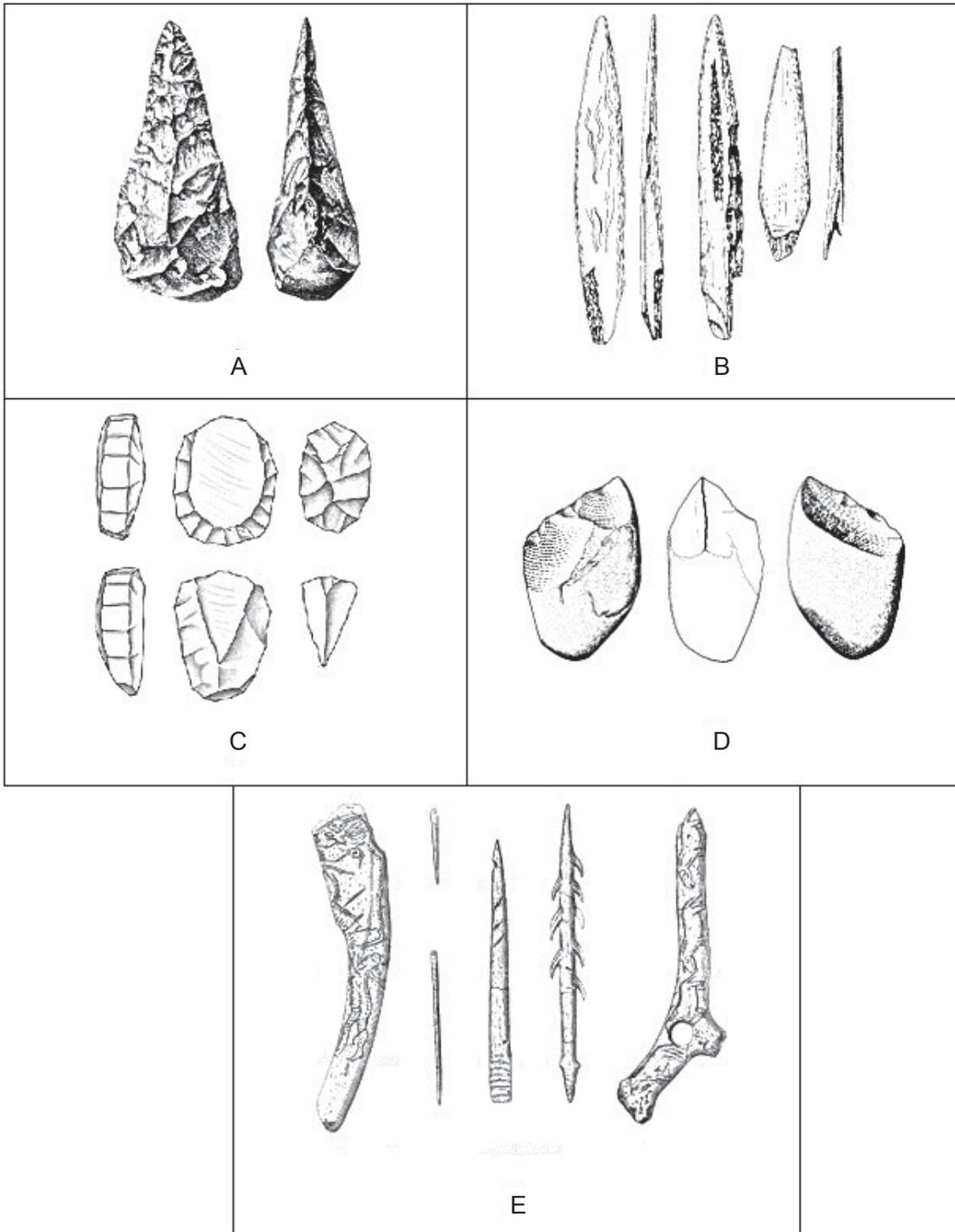
- (ii) Describe the process that causes the change in the rate of urine production you have stated in part (c)(i). (3 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 37

(12 marks)

The following question refers to the tool diagrams below. The tools have not been drawn to scale.



DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

- (a) Complete the table by identifying which labels A, B, C, D and/or E match the statements below. (4 marks)

Statement	Label/s
Oldest group of tools	
Tools made only by <i>Homo sapiens</i>	
Tools made only of stone or rock	
Classified as Mousterian tool culture	

- (b) Name and describe an absolute dating method that could be used to date the tools labelled D. (4 marks)

- (c) The tools labelled E show a great variety in size and shape. Suggest **two** ways in which the hominid who made these tools might have used them and what that tool culture implies about the way they lived. (4 marks)

See next page

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 38

(11 marks)

Anthony Clifford Allison, a South African geneticist, conducted studies on genetic resistance to malaria. This led him to discover the link between malaria and the frequency of the sickle-cell allele in the African population. He found that the majority of Africans with the sickle-cell trait did not develop malaria. The majority without the sickle-cell trait did develop malaria. Malaria can be life threatening so those individuals who had the sickle-cell trait were able to live longer lives than those without the trait.

- (a) People who have both alleles for the sickle-cell have the disease sickle-cell anaemia. What is sickle-cell anaemia? (2 marks)

- (b) People who carry only one sickle-cell allele are said to have the sickle-cell trait. State **one** disadvantage sickle-cell trait has for people with this condition. (1 mark)

- (c) The sickle-cell trait has an advantage for people living in malaria-prone areas due to a selectively advantageous mutation. Explain what is meant by a selectively advantageous mutation. (3 marks)

- (d) (i) Describe how the link between the sickle-cell allele and malaria can lead to changes in the allele frequencies in a population. (4 marks)

- (ii) What term is used to describe the process given in part (d)(i)? (1 mark)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

Question 39

(11 marks)

When scientists find a fossil thought to be an ancestor of modern humans, they firstly extract DNA samples. They then use polymerase chain reaction (PCR) and gel electrophoresis to obtain its DNA sequence before it can be compared to known hominid ancestral DNA.

- (a) Outline the event that occurs in each of the three steps involved in PCR. (3 marks)

Denaturing _____

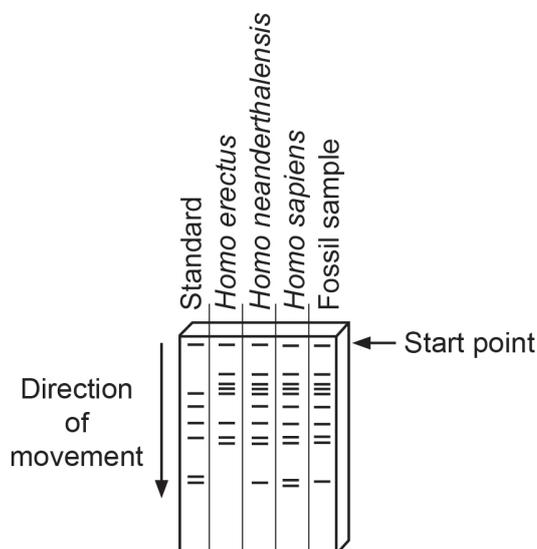
Annealing _____

Extension _____

- (b) Why is conducting PCR a necessary step in analysing fossil samples? (1 mark)

The second stage in the process of obtaining the fossil's DNA sequence involves gel electrophoresis which separates the DNA molecules and enables comparison with known hominid ancestral DNA.

The diagram below shows results after completion of the gel electrophoresis process. It shows the comparison of the gel plate of the fossil bone to other known specimens. The fossil sample analysed was taken from a hominid femur bone.



See next page

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

- (c) (i) What information obtained by gel electrophoresis is shown by a gel plate? (1 mark)

- (ii) By comparing the fossil sample on the gel plate with those of already identified samples the fossil can be classified. What would be the classification of the fossil sample? (1 mark)

As well as DNA sequencing, comparative protein analysis can be carried out to determine evolutionary relationships between organisms.

- (d) Describe how scientists can use comparative protein analysis to discover evolutionary relationships between organisms. (3 marks)

- (e) Could comparative protein analysis be used on the hominid femur bone that was tested by gel electrophoresis? Justify your answer. (2 marks)

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

End of Section Two

See next page

Section Three: Extended answer**20% (40 Marks)**

This section has **three (3)** questions. You must answer **two (2)** questions. Write your answers on the lined pages provided.

Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

Responses could include clearly labelled diagrams with explanatory notes; lists of points with linking sentences; clearly labelled tables and graphs; and annotated flow diagrams with introductory notes.

Suggested working time: 50 minutes.

Answer any **two (2)** questions from Questions 40 to 42.

Indicate the first question you will answer by ticking the box next to the question. Write your answers on pages 34–39. When you have answered your first question, turn to page 40 and indicate the second question you will answer on that page.

Question 40 **(20 marks)**

The nervous and endocrine systems are both involved in the maintenance of the body's internal environment within tolerance limits. One example of this is thermoregulation (that is, the maintenance of internal body temperature).

- (a) Explain how the nervous and endocrine systems maintain the body's internal temperature when it is in danger of falling below the tolerance limits. Ensure your answer includes **two** nervous mechanisms and **one** endocrine mechanism. (14 marks)
- (b) Thermoregulation can also be assisted by behavioural mechanisms. Identify **three** behaviours that lower internal temperature when it is in danger of rising above tolerance limits and outline how each of these assist in maintaining internal temperature. (6 marks)

Question 41 **(20 marks)**

Infectious diseases are caused by pathogens invading the body tissues. Pathogens can be transmitted in various ways. The body's external defence mechanisms are the first to encounter them.

- (a) Outline **four** methods by which pathogens are transmitted. (4 marks)
- (b) Identify features of the skin and the respiratory tract that are external defence mechanisms and outline how they provide defence against pathogens. (8 marks)
- (c) Describe the social, cultural and economic factors that influence whether or not parents choose to have their children immunised. (8 marks)

See next page

**Question 42****(20 marks)**

Archaeologists discovered an almost-complete hominid specimen in Israel. The fossil was dated at approximately 60 000 years old. Initially archaeologists did not know whether the specimen belonged to *Homo neanderthalensis* or modern *Homo sapiens*. With more detailed inspection of the skeletal characteristics it was decided the specimen was *Homo neanderthalensis*.

- (a) Explain why archaeologists initially had difficulty in deciding to which species the hominid specimen belonged. Describe **three** features of the post-cranial skeleton and **five** features of the skull evident in the specimen that allowed them to distinguish it as *Homo neanderthalensis* rather than *Homo sapiens*. (10 marks)

Archaeologists are extremely lucky when they discover complete fossil specimens. They normally find only small fragments of fossils. Much of the fossil record is incomplete due to factors that affect fossil formation and the difficulty in finding fossil specimens.

- (b) Explain why the fossil record is important in providing evidence for evolution. Describe the factors that can affect fossil formation and explain why it is difficult to locate fossil specimens. (10 marks)

Indicate the second question you will answer by ticking the box next to the question. Write your answer on the lined pages provided.

Question 40**(20 marks)**

The nervous and endocrine systems are both involved in the maintenance of the body's internal environment within tolerance limits. One example of this is thermoregulation (that is, the maintenance of internal body temperature).

- (a) Explain how the nervous and endocrine systems maintain the body's internal temperature when it is in danger of falling below the tolerance limits. Ensure your answer includes **two** nervous mechanisms and **one** endocrine mechanism. (14 marks)
- (b) Thermoregulation can also be assisted by behavioural mechanisms. Identify **three** behaviours that lower internal temperature when it is in danger of rising above tolerance limits and outline how each of these assist in maintaining internal temperature. (6 marks)

Question 41**(20 marks)**

Infectious diseases are caused by pathogens invading the body tissues. Pathogens can be transmitted in various ways. The body's external defence mechanisms are the first to encounter them.

- (a) Outline **four** methods by which pathogens are transmitted. (4 marks)
- (b) Identify features of the skin and the respiratory tract that are external defence mechanisms and outline how they provide defence against pathogens. (8 marks)
- (c) Describe the social, cultural and economic factors that influence whether or not parents choose to have their children immunised. (8 marks)

Question 42**(20 marks)**

Archaeologists discovered an almost-complete hominid specimen in Israel. The fossil was dated at approximately 60 000 years old. Initially archaeologists did not know whether the specimen belonged to *Homo neanderthalensis* or modern *Homo sapiens*. With more detailed inspection of the skeletal characteristics it was decided the specimen was *Homo neanderthalensis*.

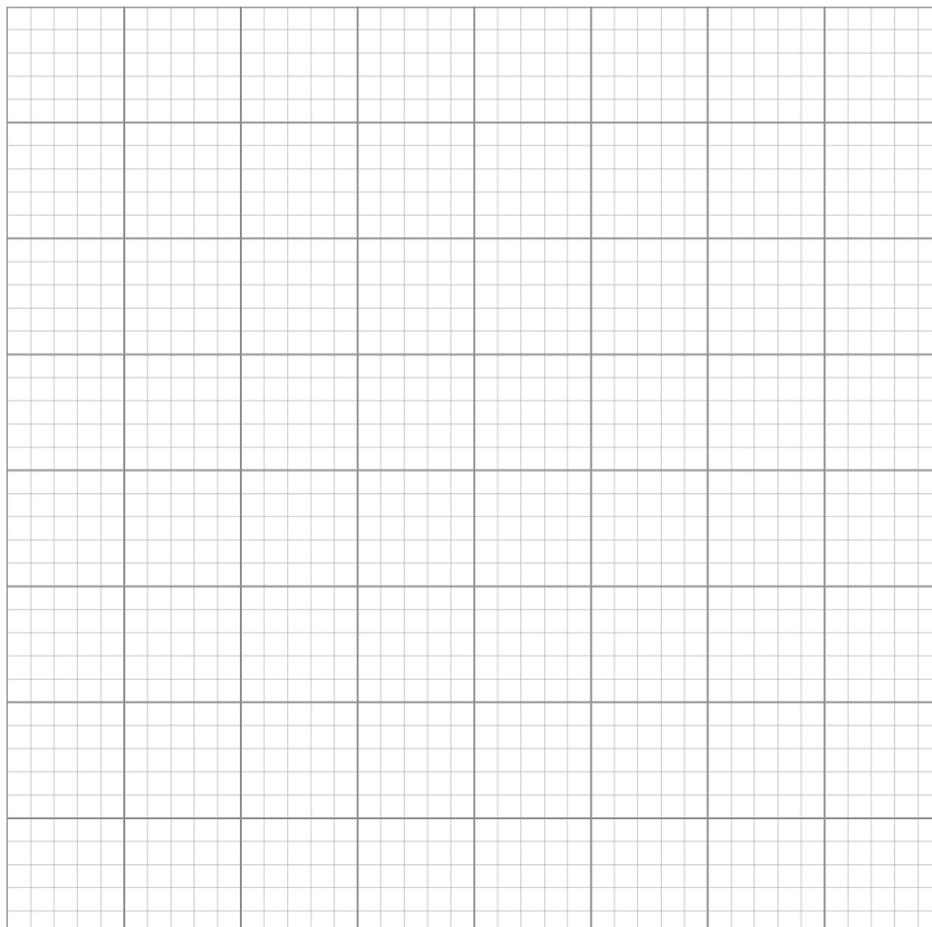
- (a) Explain why archaeologists initially had difficulty in deciding to which species the hominid specimen belonged. Describe **three** features of the post-cranial skeleton and **five** features of the skull evident in the specimen that allowed them to distinguish it as *Homo neanderthalensis* rather than *Homo sapiens*. (10 marks)

Archaeologists are extremely lucky when they discover complete fossil specimens. They normally find only small fragments of fossils. Much of the fossil record is incomplete due to factors that affect fossil formation and the difficulty in finding fossil specimens.

- (b) Explain why the fossil record is important in providing evidence for evolution. Describe the factors that can affect fossil formation and explain why it is difficult to locate fossil specimens. (10 marks)

End of questions

Question 36(a)



DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

ACKNOWLEDGEMENTS

Questions 10–11 Diagram adapted from: OCR. (2008). *Advanced GCE Human Biology exam 2867: Genetics, homeostasis and aging*. (p.12, fig. 4.1). Cambridge UK: OCR.

Question 21 Diagram adapted from: Victorian Curriculum and Assessment Authority (VCAA). (2013). *VCE Biology: Written examination* (p. 15). Retrieved June, 2016, www.vcaa.vic.edu.au/Pages/vce/studies/biology/exams.aspx

Question 24–25 Diagram adapted from: O’Neil, D. (n.d.). [...] *abnormalities: Down syndrome karyotype*. Retrieved June, 2016, from http://anthro.palomar.edu/abnormal/abnormal_4.htm

Question 37 **Diagram A**
Diagram from: De Mortillet, A. (n.d.). [...] discovered in [...]. In J. Norman, [...] *or mode 2 industries*. Retrieved June, 2016, from www.historyofinformation.com/expanded.php?id=2345

Diagram B
Diagram from: Service of Prehistory, University of Liege. (n.d.). [...] *tools from 19th century excavations*. Retrieved June, 2016, from [www.\[...\]com/taw/archaeology-en.html](http://www[...]com/taw/archaeology-en.html)

Diagram C
Diagram from: Boyd, R., & Silk, J.B. (2000). *How humans evolved* (2nd ed.). New York: W.W. Norton, ch.13. Retrieved June, 2016, from www.wwnorton.com/college/anthro/bioanth/ch13/welcome.htm (bottom diagram)

Diagram D
Diagram from: Alvarez, J.M.B. (1987). [...] . Retrieved June, 2016, from [https://commons.wikimedia.org/wiki/File:\[...\]gif](https://commons.wikimedia.org/wiki/File:[...]gif)
Used under Creative Commons Attribution-Share Alike 2.5 Generic licence.

Diagram E
Diagram from: Larive & Fleury. (1884–1889). *Dictionnaire français illustre des mots et des choses*. Paris: (n.p.). Retrieved June, 2016, from [http://depositphotos.com/11007947/stock-illustration-\[...\]html](http://depositphotos.com/11007947/stock-illustration-[...]html)

This document – apart from any third party copyright material contained in it – may be freely copied, or communicated on an intranet, for non-commercial purposes in educational institutions, provided that it is not changed and that the School Curriculum and Standards Authority is acknowledged as the copyright owner, and that the Authority’s moral rights are not infringed.

Copying or communication for any other purpose can be done only within the terms of the *Copyright Act 1968* or with prior written permission of the School Curriculum and Standards Authority. Copying or communication of any third party copyright material can be done only within the terms of the *Copyright Act 1968* or with permission of the copyright owners.

Any content in this document that has been derived from the Australian Curriculum may be used under the terms of the Creative Commons [Attribution 4.0 International \(CC BY\)](https://creativecommons.org/licenses/by/4.0/) licence.