



Quality Assessment Tasks

NAME: _____

VCE[®] Biology

Unit 2 Examination

Reading time: 10 minutes

Writing time: 90 minutes

QUESTION AND ANSWER BOOK

Section	Number of questions	Number of questions to be answered	Number of marks
A	25	25	25
B	7	7	50
		Total	75

This exam will be marked out of 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.

Materials supplied

- Question and answer book of 25 pages.
- Answer sheet for multiple-choice questions.

Instructions

- Write your **student name** in the space provided above on this page.
- Check that your **student name** is printed on your answer sheet for multiple-choice.
- All written responses must be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.
- Your teacher will advise you of the contribution of this exam to your School-Assessed Coursework.*

Students are NOT permitted to bring into the examination room mobile phones and/or any other unauthorised electronic devices.

Section A: Multiple Choice

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Instructions for Section A

Answer all questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is correct or that best answers the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will not be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this section are not drawn to scale.

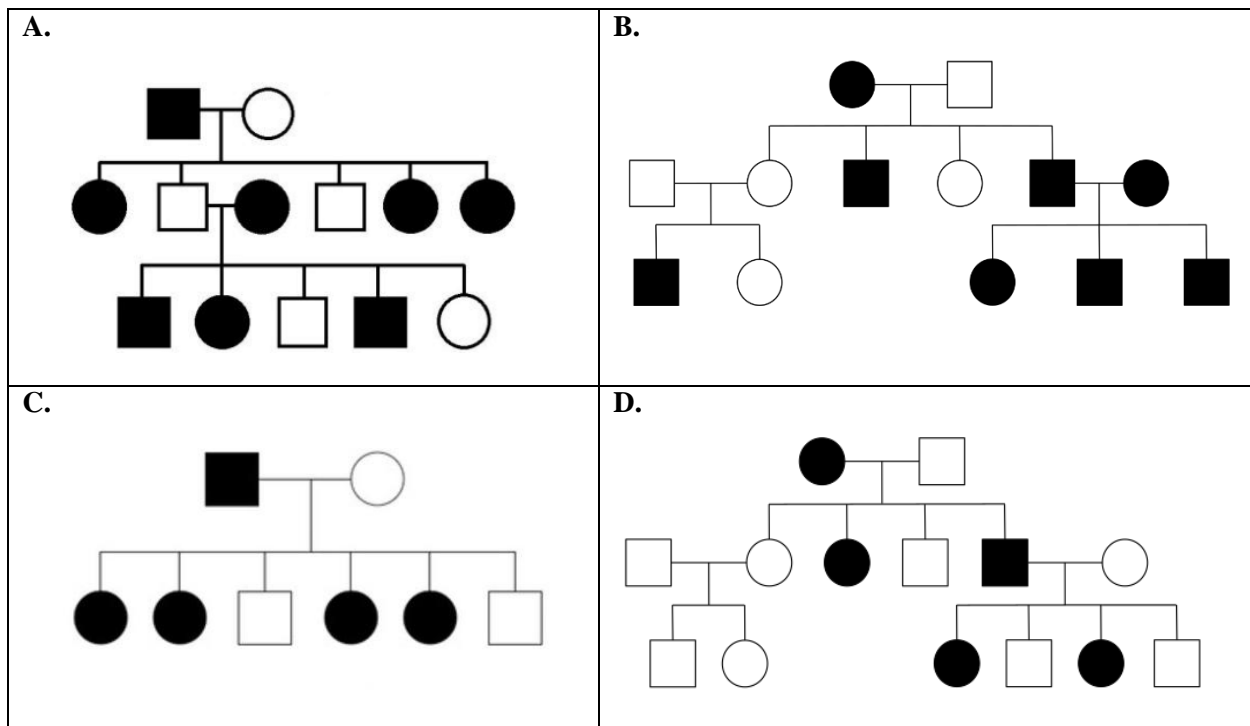
Question 1

A Punnett square is used to

- A. determine gene linkage.
- B. predict the gender of future offspring.
- C. calculate the ratio of genotypes and phenotypes in the F_2 generation.
- D. calculate the number of heterozygous and homozygous offspring in the F_2 generation.

Question 2

Colour blindness is a sex linked recessive trait. The pedigree chart that represents colour blindness is

**Question 3**

Which of the following is an example of primary data?

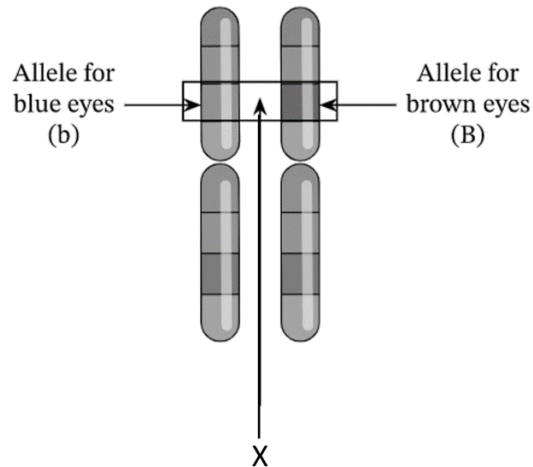
- A. A telephone interview conducted with 150 Year 11 students investigating their favourite band
- B. An analysis of the diaries of 30 car accident survivors
- C. Generating a graph to represent the speed of every 100 m sprint winner in the last 12 Olympics
- D. A collation of ABS data showing trends in household energy use over the past 50 years

Question 4

Which of the following is a benefit of sexual reproduction?

- A. An individual can reproduce without a mate.
- B. Disease is less likely to affect all members of a population.
- C. The population can increase rapidly when the conditions are favourable.
- D. The individuals in a population can increase in density across a number of seasons.

Use the following information to answer Questions 5 & 6.

**Figure 1****Question 5**

In Figure 1, the label 'X' indicates

- A. the gene for eye colour.
- B. the chromosome for eye colour.
- C. that eye colour is a linked gene.
- D. the variation of eye colour across a population.

Question 6

If two individuals with the same genetic information as that represented in Figure 1 mate, they are most likely to have

- A. brown eyes and only produce brown-eyed offspring.
- B. blue eyes and only produce blue-eyed offspring.
- C. brown eyes and produce offspring with both blue and brown eyes.
- D. blue eyes and produce offspring with both blue and brown eyes.

Question 7

An example of discontinuous variation in a population is the

- A. number of left handed members of a family.
- B. difference in height of the members of a Year 11 class.
- C. change in a person's hair colour over their lifetime.
- D. the difference in people's eye colour in a school yard.

Use the following information to answer Questions 8 & 9.

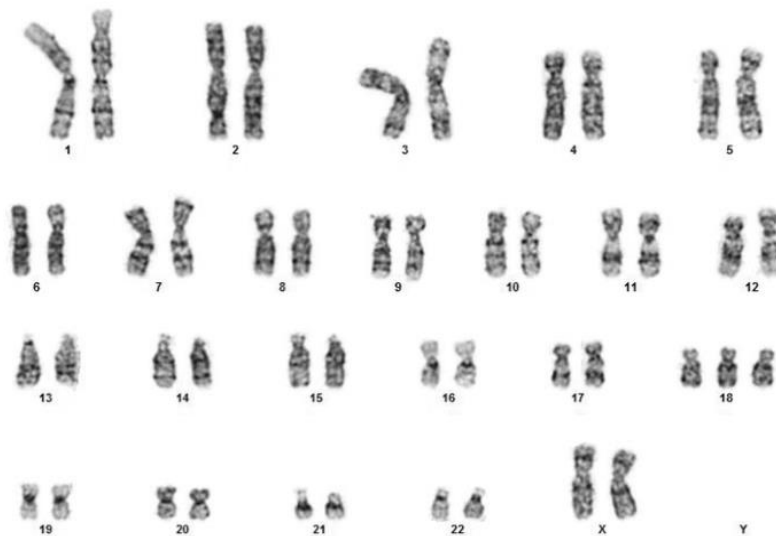


Figure 2

Question 8

From this karyotype we can conclude that this individual

- A. is male.
- B. is able to reproduce.
- C. has a chromosomal abnormality.
- D. has contracted a disease that is attacking their nuclei.

Question 9

The total number of chromosomes belonging to this individual is

- A. 22.
- B. 23.
- C. 46.
- D. 47.

Question 10

People with blonde hair often have blue eyes. These observable traits are known as an individual's

- A. genotype.
- B. phenotype.
- C. chromosomes.
- D. autosomes.

Question 11


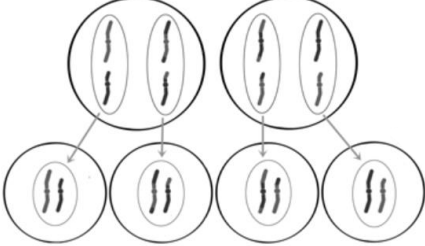
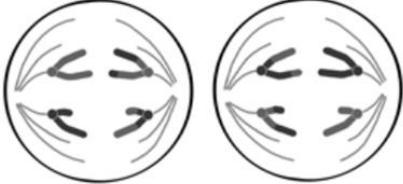
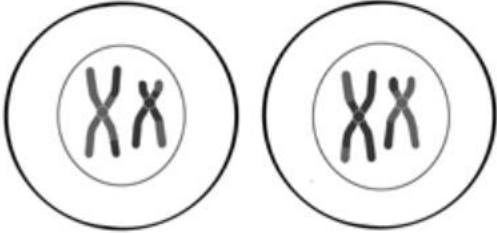
The murrnong or Yam daisy, grows from seeds. This reproductive strategy

- A. leads to genetically identical offspring.
- B. can increase the plant's susceptibility to disease.
- C. will increase genetic diversity across the population.
- D. only occurs in warm temperate regions.

Use the following information to answer Questions 12 – 14.

The following diagram shows stages of cell division. The stages are presented out of order.

Table 1: Stages of cell division

Stage number	Image of stage
1.	
2.	
3.	
4.	





Question 12

The correct order of the stages shown is

- A. 1, 2, 3, 4
- B. 2, 4, 3, 1
- C. 4, 1, 3, 2
- D. 4, 3, 2, 1

Question 13

The image that would precede the four images shown above, in sequence is

A.	
B.	
C.	
D.	

Question 14

The process represented in Table 1

- A. occurs in the cytosol.
- B. results in diploidy.
- C. results in recombination.
- D. results in cells used for growth.

Question 15

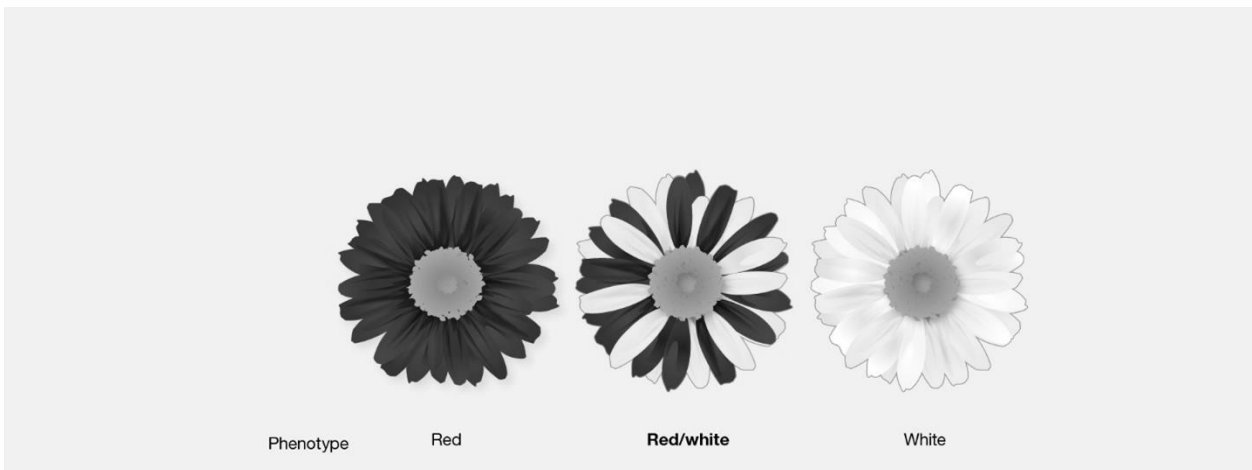


Figure 3

A flower grower was crossing some red and white flowers together and found three variations in the offspring. These three variations are shown in Figure 3

The variation in the offspring show that

- A. there are three alleles for colour phenotype.
- B. the red is the dominant allele.
- C. both the red and the white alleles are expressed at the same time.
- D. the red/white flower shows incomplete dominance of the white allele.

Use the following information to answer Questions 16 & 17.

A farmer was breeding guinea pigs and obtained a black-furred and a white-furred guinea pig. He bred those two guinea pigs together and found that a large number of offspring over many litters were black.

Question 16

It can be determined that

- A. the white guinea pig carries two different alleles for fur colour.
- B. the black guinea pig is homozygous for fur colour.
- C. black is a stronger colour than white.
- D. if the farmer had bred two white-furred guinea pigs together, the offspring would have been half black furred and half white furred.

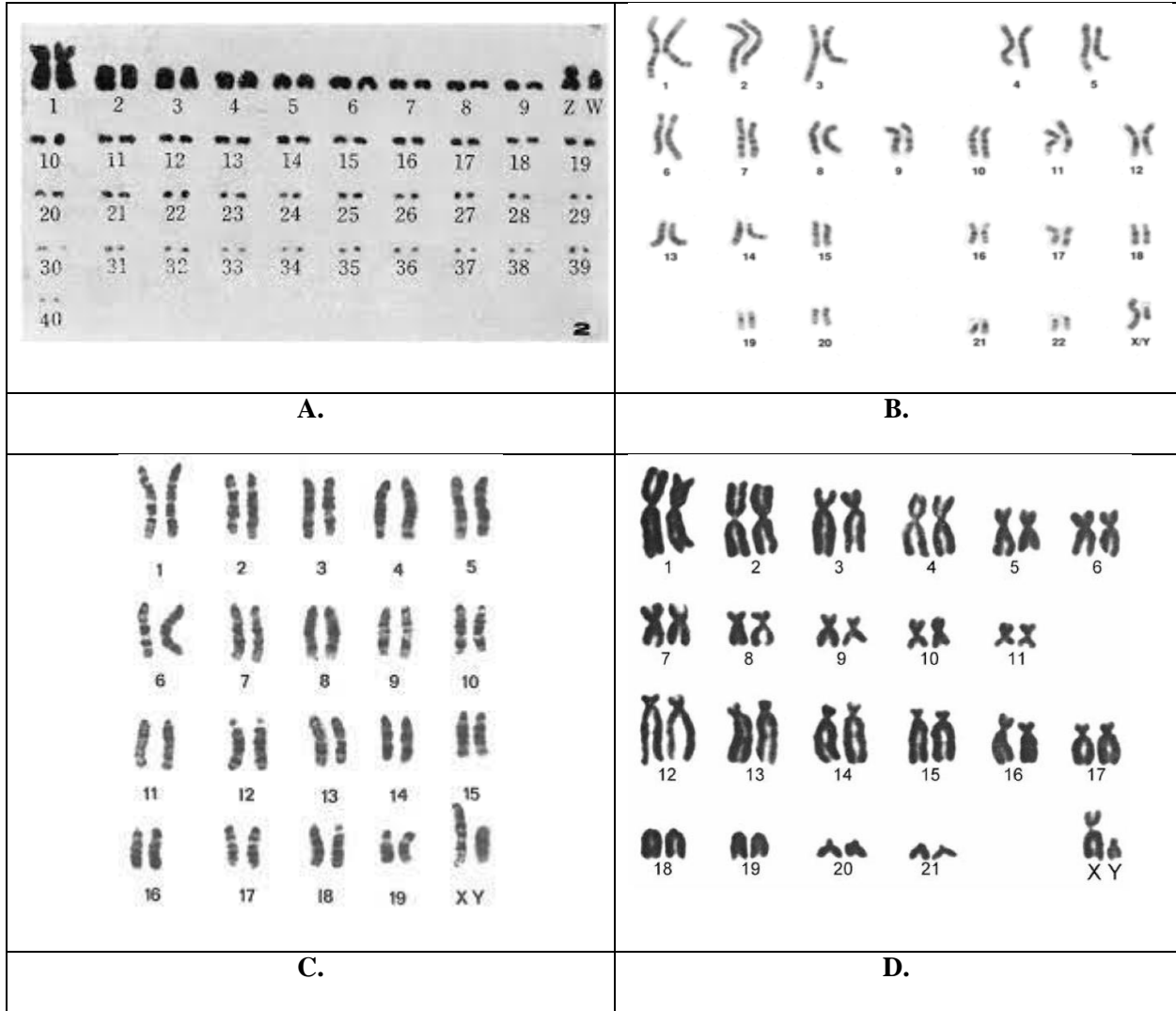
Question 17

If the symbols for fur colour were R and r, the F1 offspring genotypes would be

- A. 100% Rr.
- B. 50% RR and 50% rr.
- C. 25% RR, 50% Rr and 25%rr.
- D. 75% Rr and 25%RR.

Question 18

The pigeon has $2n=80$ chromosomes. The karyotype that most likely belongs to a pigeon is



Use the following information to answer Questions 19 & 20.

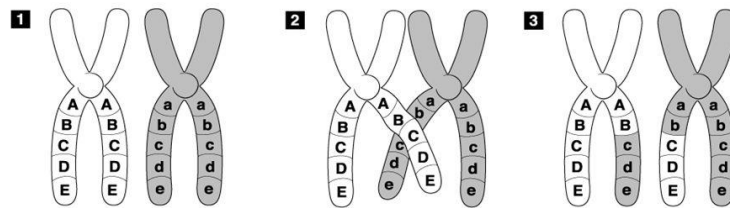


Figure 4

Question 19

Diagram 2 in Figure 4 shows

- A. the exchange of genetic material between sister chromatids.
- B. the exchange of chromosomal segments between non-homologous chromosomes.
- C. the mutation of a gene.
- D. the overlap and fusing of two chromatid arms.

Question 20

Genetic analysis found that the genes 'C' and 'E' were often inherited together. This is evidence that

- A. the genes assort independently.
- B. No individual displays the observable traits associated with gene 'c' and 'd'.
- C. Recombination is not occurring.
- D. Crossing over is not occurring between these two genes.

Question 21

Diastema, or tooth gaps, are a common genetically inherited trait. The application of braces to reduce the size of the gap is an example of

- A. the interplay between a phenotype and the environment.
- B. genetic engineering.
- C. reducing the number of future offspring who will experience diastema.
- D. the impact of the environment on a genotype.

Question 22

An example of a structural adaptation is

- A. a pencil tree plant's shallow roots that spread like a wide net around the plant.
- B. a skunk protecting itself from a bear with its sulfur containing chemical spray.
- C. a black bear spending the long winter months in a den in a state of hibernation.
- D. a young copperhead wiggling its tail to attract prey.

Question 23

A student's Aunty, who is a scientist, believes that mobile phone use is linked to adolescent obesity.

This is

- A. an opinion.
- B. a scientific idea supported by evidence.
- C. an example of primary data collection.
- D. based in secondary data.

Question 24

Honey bees are described as mutualists. This is because

- A. they live in hives.
- B. as bees take nectar and pollen, their primary food source, from flowers they spread pollen from flower to flower.
- C. a queen bee can lay twice its body weight in eggs each day.
- D. worker bees communicate with a dance.

Question 25

An example of a systematic error is

- A. a researcher finding a positive correlation between dog ownership and aerobic exercise in their survey results.
- B. an electronic scale that is calibrated to add 0.02gms to every measurement.
- C. a student pouring 9mL and 11ml of a solution into two separate test tubes, when the method requires two 10 mL solutions.
- D. in an experiment about memory capacity, participants are scheduled to undergo memory tests at different times of the day from one another.

Section B: Short Answer

Instructions for Section B

Answer all questions in the spaces provided. Write using blue or black pen.
Show all working in your answers to numerical questions. No marks will be given for an incorrect answer unless it is accompanied by details of the working.
Unless otherwise indicated, the diagrams in this section are **not** drawn to scale.

Question 1 (9 marks)

The following excerpt is adapted from an article published in Newsweek

The world's bananas are clones – and they are in imminent danger

Virtually all the bananas sold across the Western world belong to the so-called Cavendish subgroup of the species and are genetically nearly identical. These bananas are sterile and dependent on propagation via cloning, either by using suckers and cuttings taken from the underground stem or through modern tissue culture.

Cavendish accounts for 47 percent of the bananas grown worldwide and 99 percent of all bananas sold commercially for export to developed countries.

But the Cavendish unfortunately has its own weaknesses—most prominently susceptibility to a disease called Black Sigatoka. The fungus *Pseudocercospora fijiensis* attacks the plants' leaves, causing cell death that affects photosynthesis and leads to a reduction in fruit production and quality. If Black Sigatoka is left uncontrolled, banana yields can decline by 35 to 50 percent.

Source <https://www.newsweek.com/worlds-bananas-are-clones-and-they-are-imminent-danger-publish-monday-5am-1321787>

- a) Identify the means via which the Cavendish banana reproduces. (1 mark)

- b) Identify one advantage and one disadvantage of the reproduction method identified in part a). (2 marks)







c) What is meant by the term 'cloning'? (1mark)

d) Describe some of the bioethical considerations that should be taken into account when applying reproductive cloning technology. (2 marks)

e) Why may the cloning of bananas pose less of an ethical challenge than the cloning of animals? (3 marks)

Question 2 (8 marks)

First Nations Elders from the Gunditjmara, Winda Mara (Kerrup Jamara), Goolum Gollum, Kirrae Whorrong and Framlingham peoples have helped to create a seasonal calendar for Gariwerd – also known as the Grampians - in Victoria. There are six distinct weather periods recognised in the Gariwerd seasonal cycle.

<p>Kooyang Late summer January-March</p> <p>Eel season Hottest and driest time Scarce surface water High bushfire risk Night sky is bright with stars</p> 	<p>Gwangel moronn Autumn March-May</p> <p>Honey bee season Warm, still days Country starts to cool Cooler mornings Red sunrises and golden evenings</p> 	<p>Chunnup Winter May-July</p> <p>Cockatoo season Freezing winds Coldest time of year Bleak mists Rain</p> 	<p>Larneuk Pre-spring July-August</p> <p>Nesting bird season Dramatic weather changes Wettest time of year Rivers run high</p> 	<p>Petyan Spring September-November</p> <p>Wildflower season Tempestuous weather Warmer days Bush bursts into life Emu constellation appears</p> 	<p>Ballambar Early summer November-January</p> <p>Butterfly season Summer heat starts Hot, dry days Stable weather</p> 
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a) Explain the importance of including First Nations voices and knowledge in scientific research. (2 marks)

b) How can this calendar build our understanding of interdependencies between different species at Gariwerd? (2 marks)

c) Following the Gariwerd seasonal calendar, identify two keystone species. (2 marks)

A student made the claim that a keystone species is always a predator.

- d)** Explain if the student's claim is correct or not. (2 marks)

Question 3 (8 marks)

Once considered extinct in the wild, Gilbert's potoroo is now listed as Critically Endangered by the Australian federal government and on the international IUCN Red List after being found on Mt Gardner, near Albany, in 1994. This species is endemic to this south-western point of Western Australia where an estimation of 35 individuals lives. This potoroo is a fragile species because of its delicate diet that depends almost entirely on 40 different kinds of fungi. Gilbert's potoroo has evolved to create a symbiotic relationship with the fungi, which needs the potoroo to disperse its spores, while providing the potoroo with unique nutritional benefits.

Source: <https://www.australiangeographic.com.au/topics/wildlife/2014/09/australias-keystone-endangered-species/>

- a)** Describe how the clearing of Mt Gardner may impact on Gilbert's potoroo. (2 marks)

- b)** Describe how a decline in the number of potoroos impact on the diversity of fungi species found at Mt Gardner. (2 marks)

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-
- c) What is the difference between the distribution and the density of the potoroo population? (2 marks)

Gilbert's potoroo is known to be predated upon by introduced species such as foxes and feral cats. It is known that these predators kill native Australian wildlife in disproportionately high numbers compared to the number of animals foxes and cats kill on the European and Asian continents.

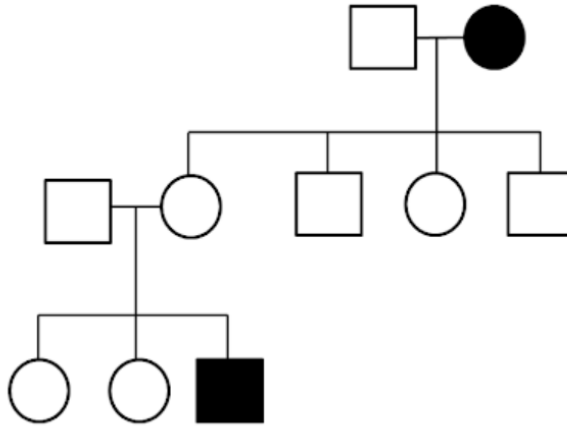
- d) Explain why Gilbert's potoroo, like other Australian native animals, is particularly vulnerable to predation from Foxes and Feral Cats. (2 marks)

Question 4 (7 marks)

Muscular dystrophy (MD) is a disorder that causes muscle weakness and deterioration, or atrophy. There are a number of different types of the disorder, the most common of which is Duchenne MD. Duchenne MD becomes apparent during the toddler years as children begin to walk.

A couple have recently had their son, a toddler, diagnosed with Duchenne MD. This has come as a shock as neither parent experiences any MD related symptoms.

The male parent, the son's father, had been adopted as a baby so did not ever know his biological parents. He did some research into the disorder and was able to find a pedigree chart that showed the inheritance of Duchenne's MD. The pedigree chart is shown below.



The couple are now worried, as they have also have a baby boy, that their baby will experience the same symptoms when he starts to walk in about a year's time.

- a) Demonstrate the percentage chance that their baby will also have Duchenne MD?

(3 marks)

- b) Duchennes MD is passed to the next generation by which pattern of inheritance?

(1 mark)

- c) Explain the effect that Duchennes MD would have on the couple's children if both were girls rather than boys.

(3 marks)

Question 5 (7 marks)

Genomic is the study of genes and other information coded into an individual's DNA. Genomic technologies help researchers investigate the relationships between many sections of the genome and to build our understanding of the combined influence on health and disease.

Genomic research is an area of ongoing ethical debate.

- a) Explain what is meant by the term 'ethical consideration' (2 marks)

- b) Outline one ethical consideration that needs to be taken into account when conducting genomic research. (1 mark)

- c) Outline one source of primary data and one source of secondary data that a researcher could collect when investigating the ethical implications of genomic research. (2 marks)

A group of researchers were interested in the ownership of genomic research information. Studies that they had read indicated that the biotech companies that conducted the research, rather than the individuals who provided samples, ultimately end up owning the genomic information.

- d)** Develop a research question that could guide the researchers' investigation. (2 marks)

Question 6 (5 marks)



Koala

Read the following excerpt from a transcript taken from the television program ‘Nature’

Season 30/Episode 13: Cracking the Koala Code

The koala’s body is lean with long, muscular front and hind limbs and large, sharp claws to help with gripping tree trunks. The skin on the bottom of its feet is rough to provide friction good for climbing.

Koalas are folivores (leaf eaters) and subsist primarily on eucalyptus leaves, though they will occasionally eat non-eucalypt plant species. They eat approximately a pound of leaves daily and rarely drink, obtaining water from its leafy diet. Though there are well over 600 species of eucalypt, Koalas will often eat from only a handful of eucalypt species, often specific to the region. Eucalyptus leaves are highly toxic to most mammals, but koalas have digestive systems specially adapted to detoxify the poisonous chemicals in the leaves. They are the only known mammals other than the greater glider and ringtail possum that live on a eucalypt diet. Due to the high energy expenditure required to digest their food, which is high in fiber, low in nutrition, and also toxic to most animals and the species low metabolic rate, koalas spend anywhere from 18 to 20 hours of their day sleeping. Koalas are nocturnal and do the vast majority of their eating at night.

Source: [https://www.pbs.org/wnet/nature/cracking-the-koala-code-koala-fact-sheet/7681/#:~:text=Koalas%20are%20arboreal%20\(tree%20dwelling,provide%20friction%20good%20for%20climbing](https://www.pbs.org/wnet/nature/cracking-the-koala-code-koala-fact-sheet/7681/#:~:text=Koalas%20are%20arboreal%20(tree%20dwelling,provide%20friction%20good%20for%20climbing).

- a) Identify one of each of the types of adaptations possessed by the koala. (3 marks)

Type of adaptation	Example of adaptation for survival
Structural	
Behavioural	
Physiological	

- b) Distinguish between a structural and a physiological adaptation (2 marks)

Question 7 (6 marks)

- a) Draw and label the first two phases of the cell division process that results in haploid gametes. (2 marks)

- b) Describe the events that occur during the first phase of the same cell division process represented in part a). (2 marks)

c) Explain what is meant by the term 'homologous chromosome'. (2 marks)

END OF EXAMINATION BOOKLET

MULTIPLE CHOICE ANSWER SHEET

Name.....

Instructions: Circle the letter corresponding to the correct response for each question.

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