nelson net.

Unit exam

Unit 3 Continuity of species

Time permitted: 90 minutes

	Section	Number of questions	Marks available	Marks achieved
A	Multiple choice	15	15	
B	Short answer	5	50	
C	Extended answer	2	20	
	Total		**85**	

Grade: _____

Comments:

Section A Multiple choice (15 marks)

1 DNA is found in cells as two strands that are twisted to form a double helix. The two strands are held together by:

A peptide bonds.

B covalent bonds.

C hydrogen bonds.

D alternating single and double bonds.

2 A sample of DNA was found to have 100 nucleotide pairs. Within the DNA, scientists counted 20 cytosine bases. The number of adenine bases would therefore be:

A 20.

B 40.

C 30.

D 80.

3 Eric was found to have the genotype BB. For this trait, Eric is said to be:

A homozygous dominant.

B homozygous recessive.

C heterozygous.

D hemizygous.

4 During cell division, each chromosome replicates and becomes two sister chromatids in:

A interphase.

B telophase.

C prophase.

D metaphase.

5 In humans, the ability to roll one's tongue is inherited as a dominant trait. If two individuals that are homozygous recessive for tongue rolling have a child, what is the percentage chance that the child will be able to roll their tongue?

A 0%

B 25%

C 50%

D 100%

6 What is the probability of getting a homozygous recessive phenotype when the parents are homozygous recessive and heterozygous?

A 0%

B 25%

C 50%

D 100%

7 In common heath, heterozygotes have pink flowers, but homozygotes have either red or white flowers. If plants with red flowers are crossed with white flowering plants, how many of the offspring will have pink flowers?

A None of them

B 25%

C 50%

D All of them

8 A female with blood type AB and a male with blood type O can produce children with types:

A AB or O.

B A, B or O.

C A or B.

D A, AB, B or O.

9 Apoptosis is:

A important for the recycling of the contents of a cell.

B used when a cell is dividing.

C the regulated destruction of cells.

D only seen in lymphocytes.

10 There are several traits carried on the sex chromosomes. Can a male be a carrier for one of these traits?

A Yes, if the trait is recessive

B Yes, if the mother was a carrier

C It would depend on the trait, but they can be a carrier for some

D No, they only have one copy of the gene

11 Crossing over occurs in the first division of meiosis. What is the importance of crossing over?

A It increases the likelihood that the cells produced contain different genetic material.

B It decreases the number of errors in meiosis.

C It produces extra genetic material, which is needed in the second division.

D It releases proteins that are then used to coil up the DNA after meiosis is complete.

12 Creating a DNA profile can be useful to determine guilt when a crime has been committed. This is based on the fact that an individual has a unique set of:

A non-coding DNA, which is repeated many times at a particular loci.

B coding DNA, which can be repeated many times across different chromosomes.

C serial tandem repeats.

D variant noted tandem repeats.

13 Which of the following is true for gel electrophoresis?

A It sorts fragments of DNA by weight and charge.

B It sorts fragments of DNA by exposing them to ethidium bromide.

C It separates fragments of DNA by varying the size of the holes in the agarose gel.

D It separates fragments of DNA according to the size of the fragment.

14 When a restriction enzyme cuts a DNA molecule and leaves some nucleotides exposed, the ends are called:

A sticky ends.

B staggered ends.

C uneven ends.

D jagged ends.

15 Random changes in small populations can have dramatic results. When a large population is suddenly reduced, it can produce a founder effect or a bottleneck effect. These changes are examples of:

A migration and gene flow.

B speciation.

C extinction.

D genetic drift.

Section B Short answer (50 marks)

1 **a** Complete the table to describe two differences between DNA and RNA. (3 marks)

DNA	RNA

b A DNA sequence, which codes for part of a protein, is shown below. Write the complementary DNA base sequence for the triplets below.

TCC CAA CCC TTC GCC (1 mark)

c Write the base sequence for the codons if this strand went through transcription. (1 mark)

d Describe the role of the ribosome in translation. (3 marks)

e Genomes for different organisms vary in size. For example, the genome for the honey bee, *Apis Mellifera*, is 236 000 000 base pairs long. Using an example, explain what a base pair is. (2 marks)

2 **a** Define the term 'comparative genomics' and state its general purpose. (3 marks)

b State the theory of evolution. (2 marks)

c Describe how comparative genomics is used to provide some evidence for the theory of evolution. (4 marks)

d State the ultimate source of genetic variation that adds new alleles to a population. (1 mark)

3 **a** Name the process that produces gametes in mammals. (1 mark)

b The diploid number of chromosomes in a cat is 38. How many chromosomes are there in the sperm of a cat? (1 mark)

c What is a zygote and how many chromosomes are there in the zygote of a cat? (1 mark)

d In the ABO blood group system in humans, A and B are codominant to blood group O. What happens when two alleles, such as A and B, are codominant? (1 mark)

e A male and a female are planning to have a child together. One of them is blood group B and one is blood group O. Which of these parents will determine the blood group of the child? Explain your answer. (2 marks)

f What are the possible genotypes for the child in part **e**? (1 mark)

g Thalassaemia is an autosomal recessive disorder that affects the life cycle of red blood cells. The blood cells die prematurely and the iron from the haemoglobin builds up in the person's organs. Using a Punnett square, show the possible genotypic and phenotypic outcomes for a child if the mother and the father both have Thalassaemia minor. (In Thalassaemia minor, the person is a carrier of Thalassaemia). (3 marks)

4 Canine Multifocal Retinopathy 1 (CMR1) is an inherited eye disease caused by a mutation in a gene that results in a shortened, dysfunctional protein. Affected dogs can develop orange or pink 'blisters' in the eye. Progression of retinal changes is slow, ceases by 1 year and does not lead to blindness. The disease is inherited in an autosomal recessive pattern.

a Draw a pedigree representing the following:

Two unaffected parents, one homozygous and one heterozygous

Offspring in Generation II, consisting of one affected male and one unaffected carrier female

II1 male mates with an unaffected female and they have one female and one male who are both unaffected (3 marks)

b If the mutation was inherited in a sex-linked recessive pattern, could III1 or III2 be affected? Explain why/why not. (2 marks)

c Explain why most disorders resulting from defective genes on the X chromosome affect more males than females. (2 marks)

d Current diagnostic testing for mutations uses the process of PCR. What do the letters PCR stand for? (1 mark)

e What is the purpose of a PCR? (1 mark)

f List four ingredients that are required to run a PCR. (1 mark)

5 **a** What is a mutation? (1 mark)

b Describe two different causes of mutation. (2 marks)

c Describe the effect of a nonsense mutation. (2 marks)

d A dam is built on a river in the middle of a forest. How might this lead to speciation? (4 marks)

e Fossils are commonly found in sedimentary rocks. Suggest why they are unlikely to be found in igneous or metamorphic rocks. (1 mark)

Section C Extended answer (20 marks)

1 Transgenic crops have been engineered for tolerance to adverse environmental conditions. List three adverse environmental conditions affecting Australian crops. Describe the process required for the production of a transgenic crop with the use of recombined bacterium.

(10 marks)

2 An important role of conservation is the protection of viable gene pools. Conservation planning to maintain viable gene pools should consider:

- biogeography
- reproductive behaviour
- population dynamics.

Discuss how each factor can protect gene pools. (10 marks)

End of examination