ARMADALE SENIOR HIGH SCHOOL

ATAR Human Biological Science Unit 3

Test 4 Evolutionary Mechanisms: Mutations and Gene Pools

Name _____

Date _____

Structure of the paper

Section	Number of questions available	Marks allocated	Your Marks
Multiple Choice	16	16	
Short Answer	6	29	
Extended Answer	2	10	
Total		55	

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Multiple choice Answer Sheet

Place a **X** through the best answer.

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)

SECTION B: Short Answer (29 marks)

Question 11

a) The major sources of new variations in a gene pool are mutations. Although they can occur in any cell of the body, mutations occurring in only one type of cell result in changes to allele frequencies in a gene pool. Name the type of cell and describe how mutations in these types of cells can cause changes in allele frequencies in a gene pool. (2 marks)

b) Members of a single gene pool become isolated from each other preventing gene flow between the two groups. Eventually the frequencies of two alleles of a particular gene in the two separate gene pools become significantly different from one another.

Explain how natural selection contributes to this difference in allele frequency.

(4 marks)

c) Name two types of barriers to gene flow that may have caused human populations to become isolated from each other in the past. Provide an example of each type.

(4 marks)

	Barrier to gene flow	**Example**
1.		
2.		

d) The change in allele frequencies in gene pools is also affected by another evolutionary mechanisms called random genetic drift.

Describe two ways in which random genetic drift differs from natural selection in its effect on changes in allele frequencies.

(2 marks)

Question 12

a) If a person had a karyotype that included the sex chromosomes XXY, what syndrome would they have? (1 mark)

b) Would this person be a male or a female? (1 mark)

c) How many chromosomes would this person have in a somatic (body) cell? (1 mark)

Question 13

Tay-Sachs disease is an autosomal recessive disease that usually kills those who inherit it before they reach 4 years of age. In descendants of central and eastern European Jews known as the Ashkenazim, Tay-Sachs has a higher incidence than in the rest of the population.

a) Explain how Tay-Sachs could be an example of the Founder effect.

(3 marks)

b) Explain how natural selection could reduce the frequency of Tay-Sachs in the Ashkenazim people.

(3 marks)

c) Explain why Tay-Sachs has continued to exist in the Ashkenazim people.

(2 marks)

Question 14

Sickle cell anaemia is a condition found in people throughout the world. Homozygous recessive individuals often die young due to organ failure and infection, yet in the United States there are believed to be over 2 million people who carry the sickle cell condition. Why do so many people carry the sickle cell condition?

(2 marks)

Question 15

Why is a short stocky build, such as in the Inuit of North America, an advantage in a cold climate?

(2 marks)

Question 16

Indicate on the table below how each event alters gene frequencies. (2 marks)

Event	Increase or decrease gene frequency
Mutation	
Migration	
Random genetic drift	
Isolation	

See next page.

SECTION C: Extended Answer **(10 marks)**

This section has two questions. You must answer **ONE** question. Write your answers in the lined pages provided.

Question 22

Genetic testing of natives of Iceland have indicated major differences in allele frequency to Scandinavians and the Celts of Ireland and Scotland from where they are believed to have originated. Describe the ways in which changes in allele frequency can come about in populations such as those found in Iceland.

(10 marks)

OR

Question 23

a) Explain the difference between genetic drift and natural selection as processes that result in evolution. Explain carefully how you might determine whether observations of evolution were due to selection or genetic drift. (7 marks)

b) Discuss two circumstances where genetic drift is likely to occur. Explain why.

(3 marks)

End.