VCE BIOLOGY 2009

YEAR 12 TRIAL EXAM UNIT 4

Time allowed: 90 minutes
Total marks: 75

25 Multiple Choice Questions
8 Short Answer Questions

An Answer Sheet is provided for Section A.
Answer all questions in Section B in the space provided.

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Student Name....…….....

VCE Biology 2009 Year 12 Trial Exam Unit 4

Student Answer Sheet

Instructions for completing test. Use only a 2B pencil. If you make a mistake erase and enter the correct answer. Marks will not be deducted for incorrect answers.

Write your answers to the Short Answer Section in the space provided directly below the question. There are 25 Multiple Choice questions to be answered by circling the correct letter in the table below.

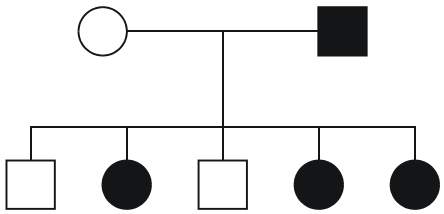
Question 1	A	B	C	D	*Question 2*	A	B	C	D
Question 3	A	B	C	D	*Question 4*	A	B	C	D
Question 5	A	B	C	D	*Question 6*	A	B	C	D
Question 7	A	B	C	D	*Question 8*	A	B	C	D
Question 9	A	B	C	D	*Question 10*	A	B	C	D
Question 11	A	B	C	D	*Question 12*	A	B	C	D
Question 13	A	B	C	D	*Question 14*	A	B	C	D
Question 15	A	B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

VCE Biology 2009 Year 12 Trial Exam Unit 4

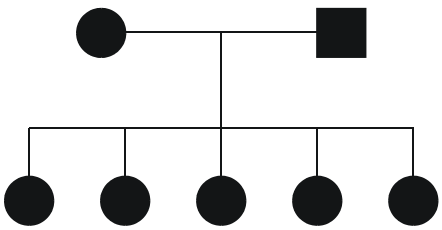
Multiple Choice Questions – Section A

Question 1
Which one of the following pedigrees most likely represents a X-linked dominant pattern of inheritance? Shaded individuals have the trait.

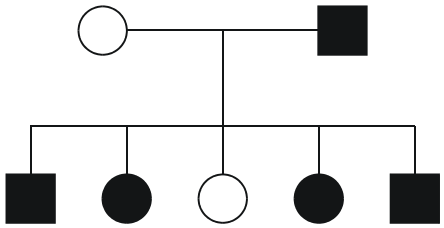
A.



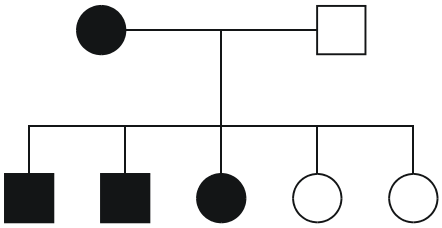
B.



C.



D.



Use the following information to answer Questions 2 and 3.
Assume that in humans a gene on chromosome 7 has the alleles **T** and **t** and another gene on chromosome 9 has the alleles **E** and **e.**

Question 2
From the above information, one can conclude that
A. during prophase I in meiosis, crossing over will occur between chromosomes 7 and 9.
B. during mitosis, the alleles on these chromosomes will undergo independent assortment.
C. at the end of meiosis there will only be two different kinds of gametes formed with these alleles.
D. at the end of mitosis chromosomes 7 and 9 together with the relevant alleles will appear in different cells.

Question 3
A heterozygous male and a heterozygous female for the genes on chromosomes 7 and 9 have offspring. What is the chance that the offspring will be homozygous recessive for both these genes?
A. ¼
B. ½
C. ⅛
D. 1/16

Question 4
The following sequence CACGUGACGUACCAGUCG could represent a
A. strand of DNA which will code for a particular messenger RNA.
B. nucleotide sequence that is present on a DNA molecule.
C. messenger RNA molecule that contains codons for a set number of amino acids.
D. series of stop and start codons that are necessary for transfer RNA synthesis.

Question 5
If a section of DNA that codes for m-RNA contains 40% adenine and thymine as well as 60% cytosine and guanine, then the percentage of uracil in the messenger RNA will be
A. 60%
B. 40%
C. 30%
D. 20%

Question 6
As a result of the process of meiosis, the cells which are present at the completion of this process will have
A. a single copy of each gene.
B. two copies of each gene.
C. four copies of each gene.
D. eight copies of each gene.

Question 7
In a particular species of plant the colour of the flowers is under the control of a gene that has two alleles. When plants that are homozygous for blue flowers are crossed with plants that are homozygous for yellow flowers, the next generation of plants all have blue and yellow flowers in the one specimen. From the information provided one could conclude that for this gene
A. the blue and yellow alleles are part of a multiple allele system for flower colour.
B. the alleles are co-dominant.
C. there are other genes involved in the phenotypic expression of these colours.
D. the gene is showing a pattern of incomplete dominance.

Question 8
If a gene is transferred into a cotton plant which makes the plant more resistant to insect pests, one can conclude that the process of transferring the gene to the plant involved
A. artificial selection.
B. artificial pollination.
C. germ line inheritance of a mutation.
D. genetic engineering.

Use the following information to answer Questions 9 and 10.
Figure 1 below is a pedigree that shows a pattern of inheritance for a particular genetic condition that can be found amongst humans.

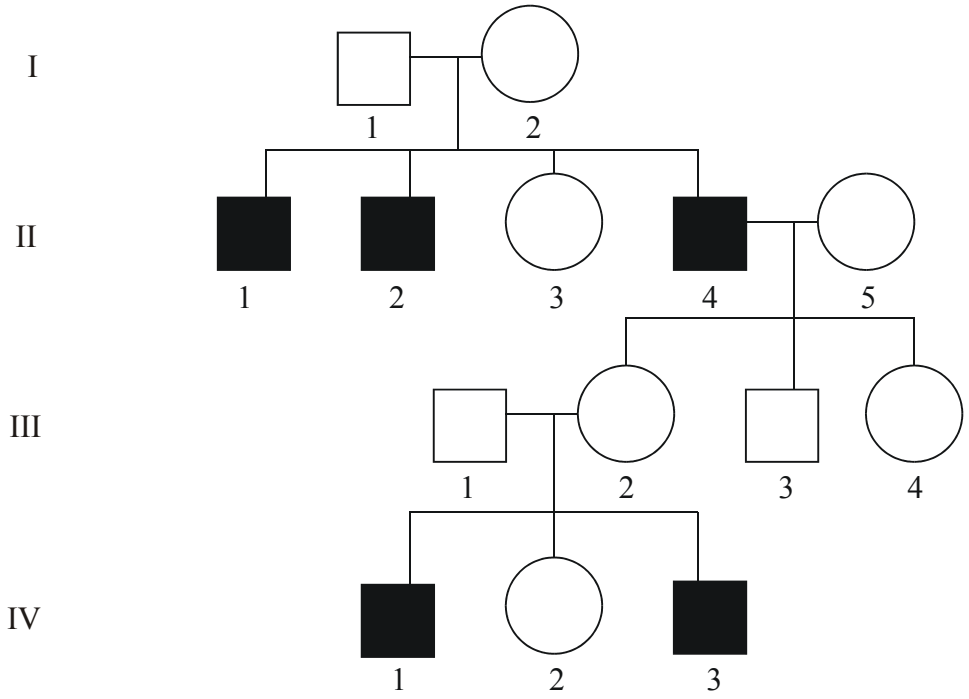


Figure 1

Question 9
Which one of the following best describes the pattern of inheritance in **Figure 1**?
A. X-linked dominant.
B. Autosomal dominant.
C. Autosomal recessive.
D. X- linked recessive.

Question 10
If individual **III-4** who is heterozygous for the genetic condition decides to have children with a male partner whose mother had the genetic disorder, what is the chance that any one of their children could have the genetic condition?
A. ¼
B. ⅓
C. ½
D. ¾

Use the following information to answer Question 11.
Figure 2 below is a diagrammatic representation of a pair of homologous chromosomes during meiosis showing three genes in a particular individual.

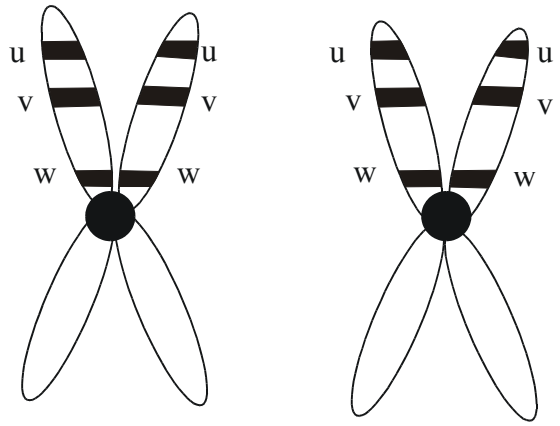


Figure 2

Question 11
From the information provided in **Figure 2** one could conclude that
A. the genes on these chromosomes cannot be involved in crossing over.
B. if crossing over occurs between these three genes, no new combinations arise.
C. crossing over is less likely to occur in individuals that are homozygous recessive.
D. genes on homologous chromosomes are less likely to have crossing over occur than genes on non homologous chromosomes.

Use the following information to answer Questions12 and 13.
Figure 3 below is a family pedigree showing the inheritance of a particular gene which has two allelic forms and is responsible for the production of a specific enzyme needed in cellular metabolism. Individuals that can produce this specific enzyme are shaded.

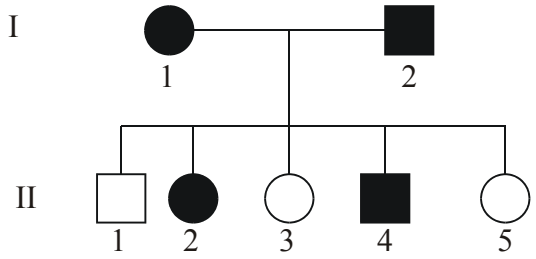


Figure 3

Question 12
If individual **II-2** produces twice as much enzyme as individual **II-4,** one could conclude that for this gene individual **II-2** is
A. heterozygous.
B. homozygous dominant.
C. homozygous recessive.
D. producing twice as much enzyme because being female means she has two X chromosomes, while **II-4** is male and he only has one X chromosome.

Question 13
From the information presented in **Figure 3** and **Question 12** above, one can conclude that individuals
A. **I-1** and **I-2** are both homozygous.
B. **II-1** and **II-5** are both heterozygous.
C. **I-1** and **II-4** are both heterozygous.
D. **I-2** and **II-2** are both heterozygous.

Question 14
A piece of DNA consists of 12.4kbp and a restriction enzyme cuts this piece of DNA into four pieces that are 4.2kbp, 3.7kbp, 2.8kbp and 1.7kbp in size. If these four pieces of DNA are subjected to electrophoresis, which piece of DNA will move the least distance in a given time?
A. 4.2kbp.
B. 3.7kbp.
C. 2.8kbp.
D. 1.7kbp.

Question 15
The position where a restriction enzyme can cut a piece of DNA into smaller fragments is referred to as a
A. receptor site.
B. receptor sequence.
C. recognition sequence.
D. restriction site.

Question 16
Which part of a gene does not code for a protein and is not contained in messenger RNA when it leaves the nucleus and enters the cytoplasm of a cell?
A. Operon.
B. Intron.
C. Exon.
D. Polar body.

Question 17
Which combination of processes would result in providing the most genetic variation?
A. Cell differentiation and polypeptide synthesis.
B. Fertilisation and sex linkage.
C. DNA mutations and mitosis.
D. Crossing over and independent assortment.

Question 18
When a species spreads out and consists of a number of isolated populations living in different habitats, differences will evolve in these populations over a long period of time. This is an example of
A. convergent evolution.
B. adaptive radiation.
C. genetic drift.
D. selection pressure.

Question 19
Uranium-235 is a radioactive isotope which has a half life of 700 million years. Sedimentary rocks that contain fossils are found to have ⅛ of their original amount of uranium-235. From the information provided, how old are the fossils in the sedimentary rocks?
A. 700 million years.
B. 1400 million years.
C. 2100 million years.
D. 2800 million years.

Question 20
The genus *Eucalyptus* consists of around 700 different species of flowering plants and is thought to have evolved into so many different species because of Australia's
A. biogeography.
B. geographic isolation.
C. climatic conditions.
D. lack of flowering plants.

Question 21
Figure 4 below is a cladogram that shows the evolutionary relationship between eight living species of snakes and their ancestral form.

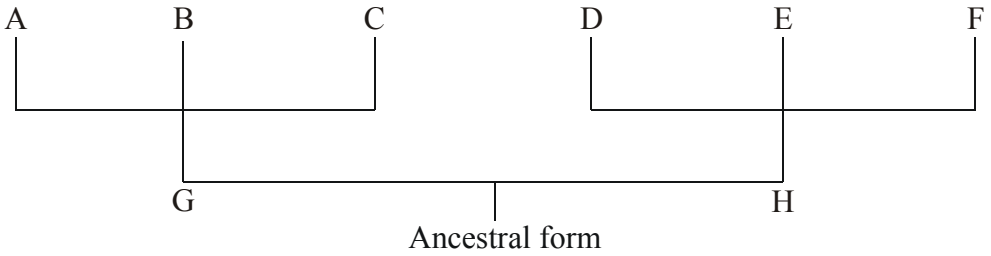


Figure 4

From the cladogram in **Figure 4** one could conclude that
A. species G evolved before species H from their ancestral form.
B. species A, B and C are examples of divergence, while species D, E and F are examples of convergence.
C. hybridisation between species D and E would be greater than hybridization between species D and H.
D. selective breeding could be used to determine the evolutionary relationship between these snakes.

Question 22
The graphs in **Figure 5** show the distribution of two different characteristics, **A** and **B,** found in a large sample of chimpanzees.

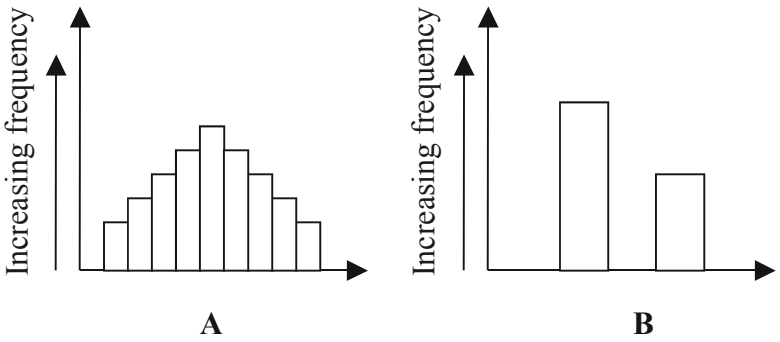


Figure 5

From the graphs **A** and **B,** one can conclude that with regard to these two characteristics graph
A. **A** represents a characteristic that cannot be measured, while graph **B** represents a characteristic that can be measured.
B. **A** represents a characteristic with a continuous variation, while graph **B** represents a characteristic with a discontinuous variation.
C. **A** represents a characteristic that is environmentally determined, while graph **B** represents a characteristic that is genetically determined.
D. **B** represents a characteristic that is under the control of two different genes, while graph **A** represents a characteristic under the control of nine different genes.

Question 23
Which one of the following would provide evidence of cultural evolution in the human fossil record?
A. Size of teeth, indicating dietary habits.
B. Development of an upright stance to detect predators.
C. Presence of burial sites and stone tools.
D. Increase in the size of the brain to develop language skills.

Question 24
Organisms that lack hard parts as well as being soft bodied are rarely fossilised because soft bodied organisms

A. did not evolve body parts that could be fossilised.
B. do not live in environments that are suitable for fossilisation.
C. live in oxygen rich areas which prevents their mineralisation and stops them becoming fossils.
D. decompose readily before they can be covered by sediments and preserved.

Question 25
By looking at the fossil record of sharks and comparing them with today's living specimens, there has been very little change in this group of animals over the last 200 million years. The most likely explanation for this is that sharks

A. are subject to genetic drift and as a result are unlikely to change much in appearance over time.
B. today still live in an environment which is very similar to the one in which they evolved.
C. and dolphins occupy similar niches in the environment and because of the competition between them are unlikely to evolve over time.
D. are a predatory group of animals and as a result do not face the same kind of selection pressures that other groups of animals have to face.

End of Section A

VCE Biology 2009 Year 12 Trial Exam Unit 4

Short Answer Questions – Section B

Question 1
The pedigree below in **Figure 6** shows the inheritance of the trait frizzy fur in mice.
Individual mice that have the characteristic of frizzy fur are shaded.

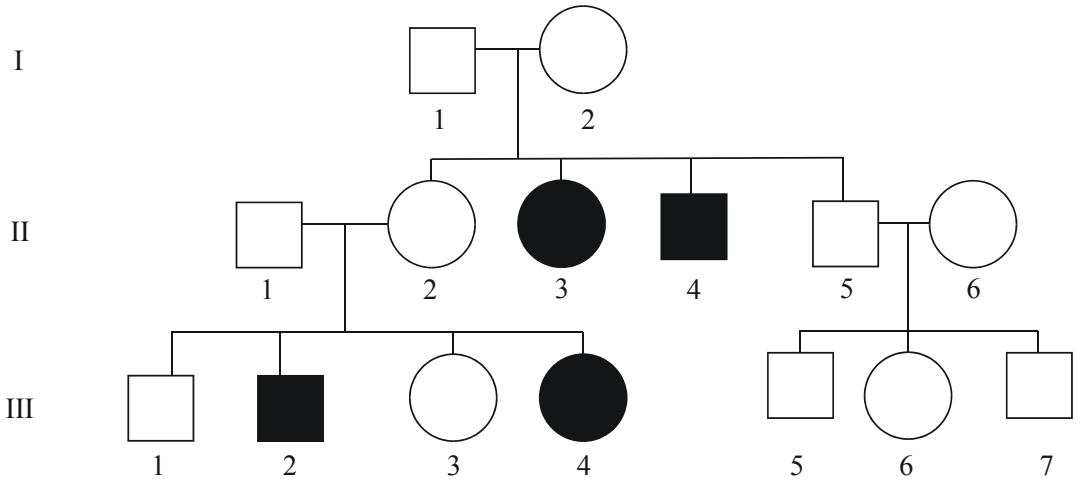


Figure 6

a. What is the chance of individuals **I-1** and **I-2** producing mice with frizzy hair?

_____

(1 mark)

b. Briefly explain your answer to **1a.**

_____

_____

_____

_____

_____

_____

(2 marks)

c. Explain how a scientist could determine whether individuals **III-1** and **III-5** are homozygous dominant or heterozygous.

_____

_____

_____

_____

_____

_____

(2 marks)

d. What proportion of gametes produced by individual **II-2** would have the allele for frizzy fur? Explain.

_____

_____

_____

_____

_____

(1 mark)

e. Using the letters **F** and/or **f** write down the correct genotype/s for individual **II-6.**

_____

(1 mark)

Total = 7 marks

Question 2

The PRNP gene that is found on chromosome 20 in humans sometimes mutates and this results in the production of an abnormal protein. A section of the normal PRNP gene and the mutated form of the same section are shown as follows:

Normal nucleotide sequence of PRNP gene – TGGCTCCAA-
Mutated nucleotide sequence of PRNP gene – TGGTTCCAA-

*Use the table below to answer parts **a** and **b** of **Question 2.***

m-RNA codons that code for particular amino acids							
CUU	Leucine	GUU	Valine	CGU	Arginine	UAU	Tyrosine
CUC	Leucine	GUC	Valine	CGC	Arginine	UAC	Tyrosine
CUA	Leucine	GAA	Glutamic acid	CGA	Arginine	UAA	Stop
CUG	Leucine	GAG	Glutamic acid	CGG	Arginine	UAG	Stop
AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	UGU	Cysteine
AUC	Isoleucine	ACC	Threonine	AAC	Asparagine	UGC	Cysteine
AUA	Isoleucine	ACA	Threonine	AAA	Lysine	UGA	Stop
AUG	Methionine	ACG	Threonine	AAG	Lysine	UGG	Tryptophan

a. Write down the messenger RNA codon that results from the mutated section of the PRNP gene.

_____

(1 mark)

b. Name the three amino acids that result from the presence of the normal PRNP gene and the three amino acids that result from the presence of the mutated PRNP gene.

_____

_____

(1 mark)

c. What type of mutation has happened in the PRNP gene?

_____

(1 mark)

d. What biological term is used to describe the process which results in the production of the polypeptide from the messenger RNA that is made from the mutated form of the PRNP gene?

_____

(1 mark)

e. Outline the sequence of steps that occur in the cytoplasm to synthesise the polypeptide in **Question 2d.**

_____

_____

_____

_____

_____

_____

(2 marks)

Another mutation on a gene, located on a different chromosome in humans, results in the loss of nucleotides from that gene.

f. Using gene probes, how could a scientist distinguish the normal gene from the mutated form of this gene?

_____

_____

_____

_____

_____

(1 mark)

Total = 7 marks

Question 3

Figure 7 below is a diagrammatic representation of a circular piece of DNA called a plasmid, which has had a foreign piece of DNA inserted. Multiple copies of the foreign DNA can then be made if the plasmid is inserted into a bacterium. The size of this plasmid and the foreign piece of DNA together is16.8 kbp and there are two different enzymes, *Hap* II and *Pst* I, that can cut the plasmid at the positions shown. The foreign piece of DNA was inserted into the plasmid between two specific positions where the enzyme *Pst* I can cut the plasmid as shown below.

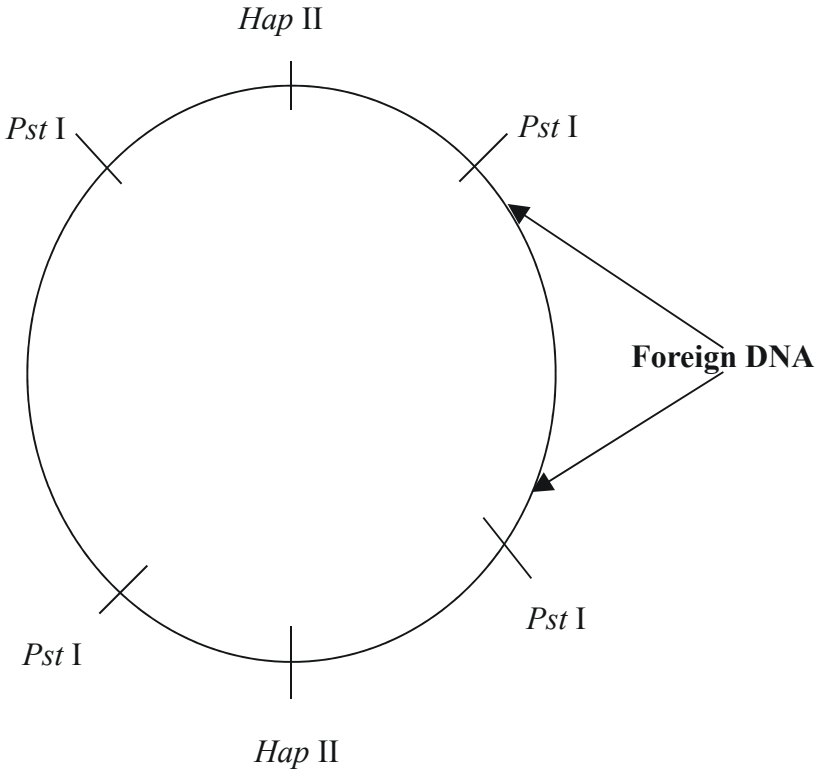


Figure 7

a. What is the biological term given to plasmids that are used to transfer DNA from one organism to another organism?

_____

(1 mark)

b. Briefly explain how the foreign piece of DNA would have been inserted into the plasmid.

_____

_____

_____

_____

_____

(1 mark)

If only the enzyme *Pst* I is used on the plasmid with the foreign piece of DNA, a variety of DNA pieces with varying lengths will be produced.

c. How many pieces of DNA result when only the *Pst* I enzyme is used to cut the plasmid?

_____

(1 mark)

d. Explain how the DNA pieces, produced when the foreign piece of DNA is cut out by the *Pst* I enzyme and the rest of the plasmid is cut by the enzyme *Hap* II, can be separated according to their length.

_____

_____

_____

_____

_____

_____

(2 marks)

e. What other technique could a scientist use if they wanted to make multiple copies of the foreign piece of DNA without using a plasmid and bacteria?

_____

(1 mark)

Total = 6 marks

Question 4

Figure 8 below shows the DNA profiles of five different individuals for a particular gene locus on chromosome 12 in humans.

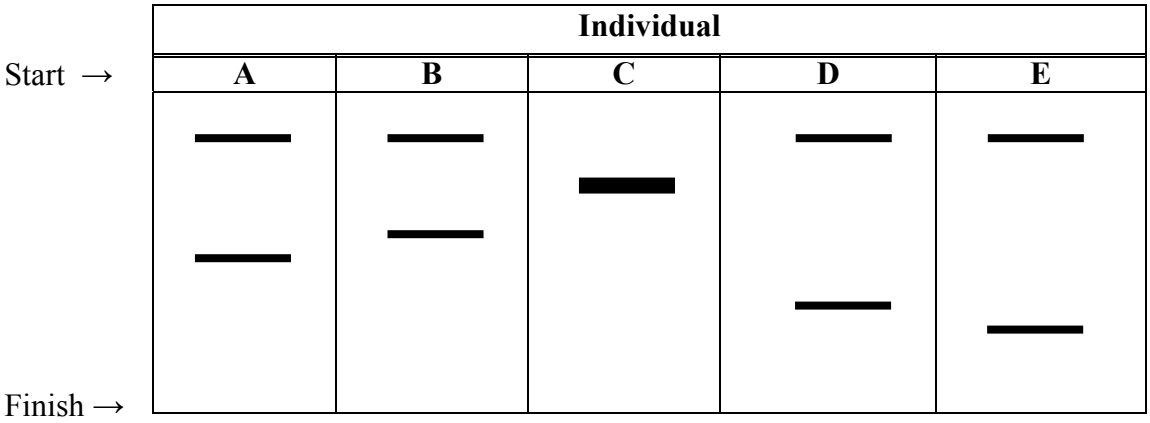


Figure 8

a. What biological term is used when there are more than two alleles for a particular gene locus in the human population?

_____

(1 mark)

b. How many different alleles are there for the particular gene locus on chromosome 12, based on the five individuals in **Figure 8**?

_____

(1 mark)

c. After looking at the DNA profiles of the five individuals in **Figure 8,** a student suggested that all five individuals are heterozygous for this gene locus. Do you agree or disagree with the student? Explain.

_____

_____

_____

_____

_____

_____

(2 marks)

This particular gene locus on chromosome 12 has a specific sequence of bases which are repeated many times, but the number of times the bases are repeated is not the same in individuals **A**, **B**, **C**, **D** and **E.**

d. Which individual **(A**, **B**, **C**, **D** or **E)** has the least number of repeats of a specific sequence of bases at a particular locus on chromosome 12?

_____

(1 mark)

e. Briefly explain your answer to **Question 4d.**

_____

_____

_____

_____

_____

(1 mark)

Total = 6 marks

Question 5
In any given sexually reproducing species there is a large degree of variation between individuals. A large degree of variation is desirable in a species, since it allows the species to evolve when environmental conditions undergo change.

a. Which major type of variation is important in the evolution of a species?

_____

(1 mark)

b. How does the process of meiosis contribute to the variation that is found in sexually reproducing species? Explain.

_____

_____

_____

_____

_____

_____

_____

(2 marks)

c. What biological term is used to describe a trait that shows several distinct variants or forms within a species?

_____

(1 mark)

d. Compare the effects of germline and somatic mutations on the evolution of species.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(2 marks)

Total = 6 marks

Question 6
In order to explain the enormous diversity of life and how life evolved on this planet, Charles Darwin formulated his theory of evolution by natural selection. The concept of natural selection was developed well before our knowledge of genetics and heredity enabled scientists to better understand the process of natural selection.

a. What biological term is used to describe how new species, could develop and evolve?

_____

(1 mark)

b. Using your knowledge of genetics and natural selection, explain how two species could evolve from a common ancestor.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(2 marks)

c. Briefly explain the difference between selection pressure and selective agent.

_____

_____

_____

_____

_____

_____

_____

(2 marks)

d. What biological term is used when there is selection against an organism whose two alleles at a particular gene locus are the same, but selection for an organism whose two alleles at the same gene locus are different?

_____

(1 mark)

Total = 6 marks

Question 7

The two cladograms in **Figure 9** show the possible evolutionary relationship between two unrelated groups of mammals which evolved independently from one another and each group had different ancestral forms.

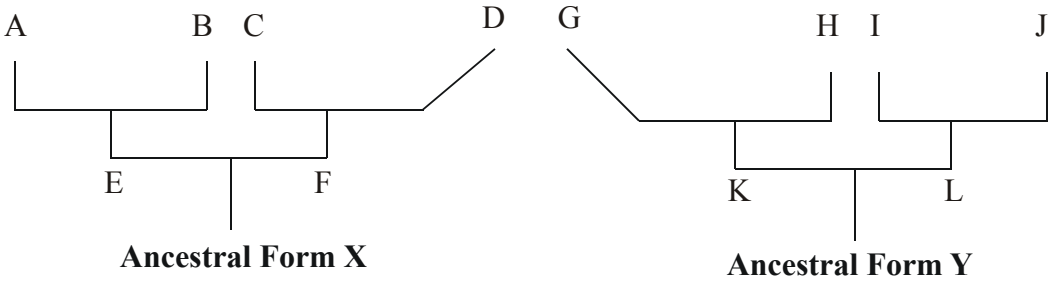


Figure 9

a. What biological term is given to the situation where two unrelated species like **D** and **G** end up having similar structural features?

_____

(1 mark)

b. Explain how two unrelated species like **D** and **G** could end up with both having very similar structural features.

_____

_____

_____

_____

_____

_____

_____

(2 marks)

c. Briefly explain why species **A** and **B** are more closely related than species **A** and **C**.

_____

_____

_____

_____

(1 mark)

d. What significant feature of the skull can be used to determine whether a particular extinct primate walked upright or not?

_____

(1 mark)

e. Name the process in which humans select and develop traits in different species that humans think are important, rather than select traits which might be of survival value to the different species.

_____

(1 mark)

Total = 6 marks

Question 8

Fossils provide palaeontologists with evidence to support the theory of evolution as well as giving them information about past organisms and the environments in which they lived.

a. Define the term fossil.

_____

_____

(1 mark)

b. Briefly explain the meaning of the term half life, when using radioisotopes, to date fossil specimens.

_____

_____

_____

_____

_____

(1 mark)

c. If a radioisotope has a half life of 250 million years, and a rock with a fossil containing this radioisotope is 1,000 million years old, what fraction of this radioisotope would now remain in the rock?

_____

_____

(1 mark)

d. Apart from dating fossils by using radioisotopes, explain what other method could be used to date fossils?

_____

_____

_____

_____

(1 mark)

e. Briefly explain why sedimentation can result in a dead organism becoming a fossil.

_____

_____

_____

_____

(1 mark)

f. What biological term is given to structures on two very similar looking fossils that were the result of divergent evolution?

_____

(1 mark)

Total = 6 marks

End of Section B

End of Trial Exam

Suggested Answers

VCE Biology 2009 Year 12 Trial Exam Unit 4

Multiple Choice Answers – Section A

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

Short Answer (Answers) – Section B

Question 1

a. ¼ or 25% **(1 mark).**

b. Since the trait of frizzy fur is not present in individuals I-1 and I-2 but is present in individuals II-3 and II-4, the allele for this trait must be recessive **(1 mark).** Therefore individuals I-1 and I-2 must be heterozygous and each individual would have one recessive and one dominant allele. As a result there are four possible combinations for crosses involving individuals I-1 and I-2. For both recessive alleles to be present in any individual the chance must be 1/4 or 25% **(1 mark).**

c. The scientist could perform a test cross using a homozygous recessive female mouse with frizzy fur **(1 mark).** If any of the offspring had frizzy fur, then the scientist would conclude that individuals III-1 and III-5 are heterozygous, since they would have received one recessive allele from the male mice. However if no offspring have frizzy fur, then individuals III-1 and III-5 must be homozygous dominant and cannot have the recessive allele in their genotype **(1 mark).**

d. The proportion of gametes having the allele for frizzy fur that individual II-2 would produce is 50% or ½. Since individuals III-2 and III-4 have frizzy fur, they would have received one frizzy fur allele from each parent. Therefore, each gamete that individual II-2 produces will contain either the recessive frizzy fur allele or the dominant non frizzy fur allele **(1 mark).**

e. The genotype of individual II-6 could be either FF or Ff **(1 mark).**

Question 2

a. AAG **(1 mark).**

b. Normal PRNP gene: -threonine-glutamic acid-valine-. Mutated PRNP gene:-threonine-lysine-valine-. All amino acids have to be in correct sequence and normal and mutated versions must be clearly and correctly labelled **(1 mark).**

c. Point mutation or base substitution **(1 mark).**

d. Translation **(1 mark).**

e. The messenger RNA of the mutated PRNP gene attaches to a ribosome and the codons on the m-RNA match up with the anticodons on transfer RNA molecules **(1 mark).** Each transfer RNA molecule, as well as being an anticodon, has a specific amino acid attached. As each anticodon matches up with its codon on the m-RNA formed from the mutated PRNP gene, the amino acids bond with each other in the correct sequence to form the abnormal polypeptide **(1 mark).**

f. The scientist could distinguish between the normal and mutated forms of the gene by using gene probes, since probes are single stranded DNA which is radioactively labelled. After the DNA double strands of the normal and mutated gene have been separated, the gene probes specific for either the normal or mutated single strands of DNA will combine, since they will be complementary strands **(1 mark).**

Question 3

a. Vector **(1 mark).**
b. To begin with the plasmid would have been cut by the restriction enzyme *Pst* I at the specific positions where the foreign piece of DNA is to be inserted. The DNA to be inserted is prepared by using the same *Pst* I enzyme. Then, using ligase enzymes, the foreign piece of DNA would be joined to the plasmid DNA at the same specific positions where the plasmid was cut **(1 mark).**
c. Four **(1 mark).**
d. Since the DNA pieces vary in length they can be separated by using the technique known as gel electrophoresis **(1 mark).** After the pieces of DNA are loaded onto the special gel and subjected to an electric field for a specific length of time, the DNA pieces will move a set distance. The longer the length of the DNA pieces, the shorter the distance the pieces move, and the shorter the DNA pieces, the further they will move in the gel **(1 mark)**.
e. Polymerase Chain Reaction-PCR **(1 mark).**

Question 4

a. Multiple alleles **(1 mark).**
b. Six **(1 mark).**
c. Disagree with the student since individuals A, B, D and E each have two bands on their DNA profile, indicating that they most likely have two different alleles at this gene locus, while individual C has only one band **(1 mark).** Therefore with individual C having only one band on his/her DNA profile, this suggests that the two alleles at this particular gene locus are the same, which means that individual C is most likely homozygous and not heterozygous for this gene locus **(1 mark).**
d. Individual E **(1 mark).**
e. The bands that show each individual's DNA profile indicate the distance the DNA molecule for this particular gene locus has moved in a given time. Since individual E has a band which has moved the furthest, this means that individual E has the smallest number of bases at this gene locus, due to there being the least number of repeating sequences **(1 mark).**

Question 5

a. Genetic variation **(1 mark).**
b. Meiosis contributes to variation in species during the production of gametes. During anaphase I the homologous chromosomes undergo independent assortment in which alleles of genes on a chromosome separate independently of the alleles of genes on other chromosomes **(1 mark).** Crossing over may occur randomly during prophase I in which homologous chromosomes exchange segments of DNA resulting in recombined chromosomes **(1 mark).**
c. Polymorphic or polymorphism **(1 mark).**

d. Germline mutations are those that occur in gametes and can therefore be passed down to succeeding generations. As a result if it is a favourable mutation, it could benefit the species or if the mutation is unfavourable, it could be detrimental to the species **(1 mark).** Somatic mutations occur in cells that are not germline or reproductive and as a result cannot be passed on to succeeding generations. Therefore while they may have consequences for the particular individual, these mutations do not have an impact on the evolution of sexually reproducing species. However in asexually reproducing species, somatic mutations do give rise to genetically new individuals and this could impact on their evolution **(1 mark).**

Question 6

a. Speciation **(1 mark).**

b. At some stage in the distant past, a common ancestor of the species would have separated into two populations by a geographic or some other type of barrier. This barrier would have isolated the two populations from each other, so that there was no gene flow between them **(1 mark).** Over a long period of time, these two isolated populations would have experienced different mutations and been subjected to different selection pressures. As a result, the allele frequencies for different genes within those two populations would have changed. Different characteristics suitable to their particular environment would have developed in the two populations. When gene flow ceased and/or no fertile offspring were produced from matings between members from each population, then these two former populations became two separate species **(1 mark).**

c. Selection pressure is the extent or intensity to which organisms possessing a specific characteristic or trait can either be eliminated or favoured by natural selection, depending on the environment in which the organisms live **(1 mark).** A selective agent refers to the component or factor in the environment that is causing the selection pressure on the organisms. If the factor is favourable, the gene frequency of the trait will increase, however if the factor is unfavourable, then the gene frequency of that trait will decrease **(1 mark).**

d. Heterozygous advantage **(1mark).**

Question 7

a. Convergent evolution **(1 mark).**

b. Unrelated species like D and G could end up with very similar structures because both the selection pressures and the environments in which they evolved would have been very similar **(1 mark).** As a consequence, even though they evolved from different ancestral forms, these very similar selection pressures would act on both these species as they evolved, resulting in them developing very similar structural features **(1 mark).**

c. Species A and B are more closely related than species A and C, since species A and B evolved from species E, while species C evolved from species F. Therefore species A and B have a more recent common ancestor, while species A and C have ancestral form X as their most recent common ancestor and therefore cannot be as closely related **(1 mark).**

d. Foramen magnum **(1 mark).**

e. Artificial selection or selective breeding **(1 mark).**

Question 8

a. A fossil is any thing or object that provides evidence for the prior existence of life on this planet **(1 mark).**

b. The half life of a radioisotope is the time taken for half a sample of a particular radioisotope to breakdown to its stable element. The half life is always the same for a particular radioisotope and is measured in years. Different radioisotopes have different half lives. Depending what fraction of the original radioisotope is left, it is then possible to determine the age of the fossil **(1 mark).**

c. $\frac{1}{16}$ **(1 mark).**

d. The other method that could be used to date fossils is relative dating. This method is based on the principle that older layers of rock form before younger rocks. As a result, older layers of rock are deeper and will have older fossils than more recent rock layers, unless earth movements have occurred **(1 mark).**

e. When an organism dies and is covered with sediments this can result in a fossil, because it reduces the dead organism's chance of being consumed by scavenging animals. Bacterial decomposition would also be reduced by sedimentation and there could be less chance of erosion in the future **(1 mark).**

f. Homologous structures **(1 mark).**

End of Suggested Answers