

INNOVA JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION
in preparation for General Certificate of Education Advanced Level
Higher 1

CANDIDATE
NAME

CLASS

INDEX NUMBER

BIOLOGY

8875/01

Paper 1 Multiple Choice

30 August 2016

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

There are **thirty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

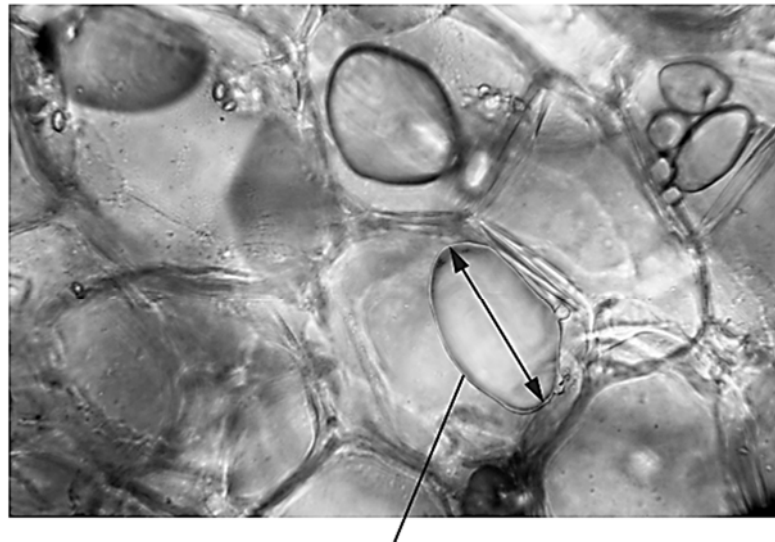
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

This document consists of **14** printed pages.



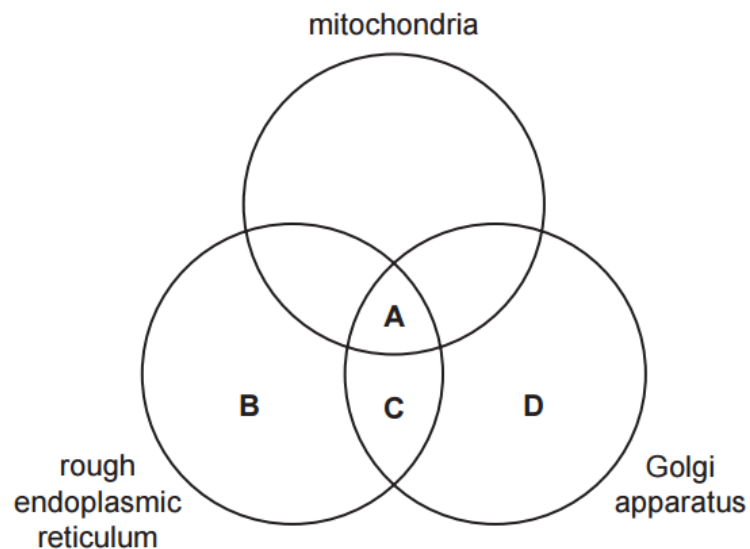
- 1 The picture shows starch grains as seen with an optical microscope. The actual length of the starch grain A is $50\text{ }\mu\text{m}$.



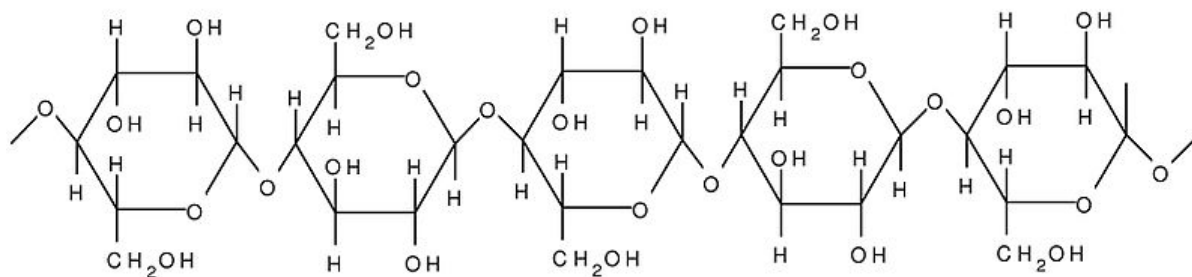
Starch grain A

Calculate the magnification.

- A x 5
 B x 50
 C x 500
 D x 5000
- 2 Which of the following organelle(s) is/are directly required for the formation of the hydrolytic enzymes found in lysosomes?

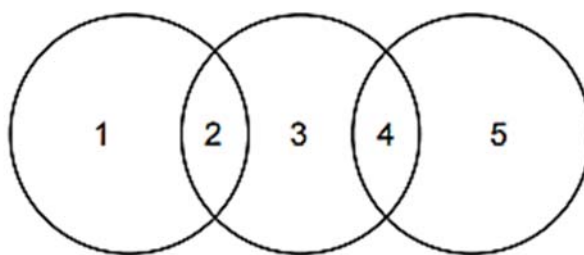


- 3 The figure shows a portion of a polymer.



Which statement is **true** about the polymer?

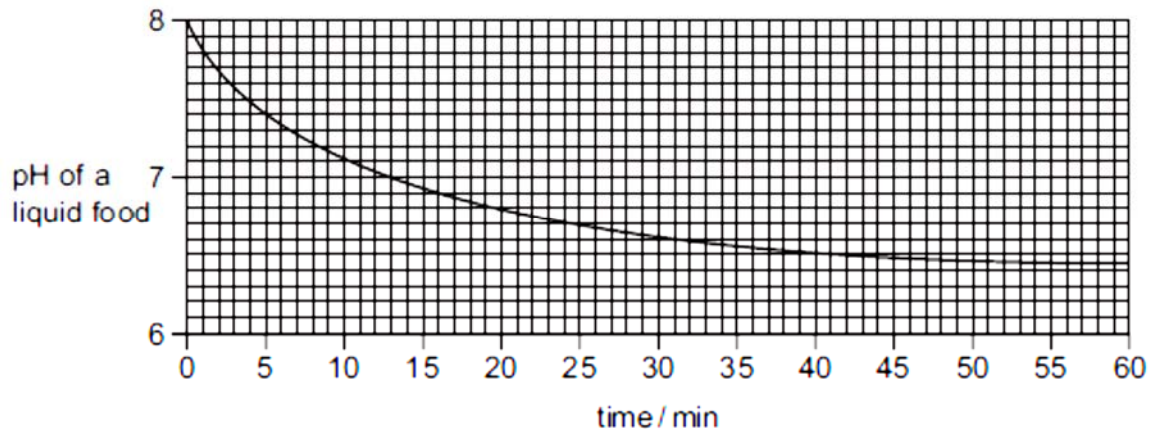
- A The polymer will assume a helical structure.
 - B The polymer can exist in both branched and unbranched forms.
 - C The orientation of the monomer will result in a straight chain polymer.
 - D The monomers are able to form α (1-6) glycosidic bonds with one another.
- 4 The diagram shows the relationship between the levels of protein structure and bonds.



Which row is **correct**?

	1	2	3	4	5
A	primary	peptide	secondary	ionic	tertiary
B	secondary	hydrogen	tertiary	peptide	primary
C	tertiary	ionic	primary	peptide	quaternary
D	quaternary	ionic	tertiary	ionic	secondary

- 5 Lipase is a digestive enzyme produced by the pancreas that catalyses the hydrolysis of dietary lipids. The table shows how the pH of a liquid food containing a high proportion of lipids decreases over time.



Which of the following statements are possible explanations of the results of the experiment between 50 and 60 minutes?

- 1 Enzyme concentration becomes the limiting factor.
 - 2 Substrate concentration becomes the limiting factor.
 - 3 All the enzyme active sites are saturated.
 - 4 Denaturation of the enzyme by the products.
 - 5 Products are acting as inhibitors.
- A** 1, 2 and 3
B 1, 4 and 5
C 2, 3 and 4
D 2, 4 and 5

6 Specific enzyme inhibitors inhibit only one enzyme.

The drug disulfiram, which is used as a treatment for alcoholism, is a specific inhibitor of acetaldehyde dehydrogenase. Acetaldehyde dehydrogenase is involved in the detoxification of ethanol. As a result of inhibition by disulfiram, any ethanol that is present in the system can only be partly broken down, resulting in nausea and vomiting.

Why is it important that the enzyme inhibitor disulfiram is specific?

- 1 It cannot disrupt other metabolic pathways.
- 2 It prevents ethanol from binding to the active site.
- 3 It is unlikely to cause unwanted side effects.
- 4 It inhibits aldehyde oxidase.

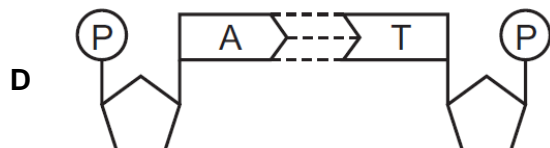
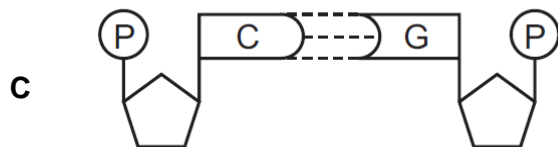
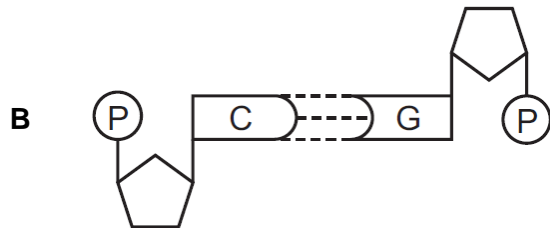
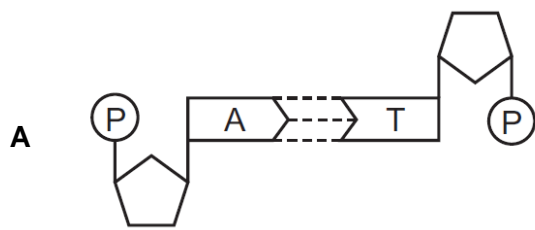
- A** 1, 2, 3 and 4
B 1, 2 and 3 only
C 1 and 3 only
D 2 and 4 only

7 In a multicellular organism, which of these statements about mitosis can help to explain the control of the mitotic cell cycle?

- 1 In most cells the genes initiating mitosis are not switched on.
- 2 Mitosis produces cells to replace damaged cells that cannot be repaired.
- 3 Mitosis transmits a complete copy of all the alleles in a cell to new cells.
- 4 Daughter cells formed by asexual reproduction develop from unspecialised cells.

- A** 1 only
B 3 only
C 1 and 4
D 2 and 4

8 Which diagram represents a correct base pair of DNA?



9 How many of these statements about DNA polymerases are **correct**?

- 1 They transcribe DNA.
- 2 They synthesise DNA in the 3' to 5' direction.
- 3 They require a primer to function.
- 4 They require activated nucleotides.

- A 1
B 2
C 3
D 4

- 10** The following sequence of bases shows a short section of linear DNA from which mRNA is transcribed.

TACTCACATTAG...

The table shows a number of mRNA codons and their corresponding amino acids.

codon	AGU	AUC	AUG	CAU	GUA	UAC	UAG	UCA
amino acid	serine	iso-leucine	methionine	histidine	valine	tyrosine	'stop'	serine

Which row shows how this short section of linear DNA would be translated into part of a polypeptide chain?

	tRNA anti-codon order	amino acid sequence
A	AUGAGUGUAAUC	methionine, serine, valine, iso-leucine
B	AUGAGUGUAAUC	tyrosine, serine, histidine, stop
C	UACUCACAUUAG	methionine, serine, valine, iso-leucine
D	UACUCACAUUAG	tyrosine, serine, histidine, stop

- 11** The coding region of a gene is 102 nucleotides long, including both the start and stop codons.

Which of the following would be the most likely effect of a single nucleotide deletion at position 76 in the coding region?

- A** Only the active site would be affected.
- B** The entire amino acid sequence of the polypeptide would change.
- C** There would be changes in only the first 25 amino acids.
- D** There would be changes in only the last 8 amino acids.

- 12** The locus of the gene refers to the

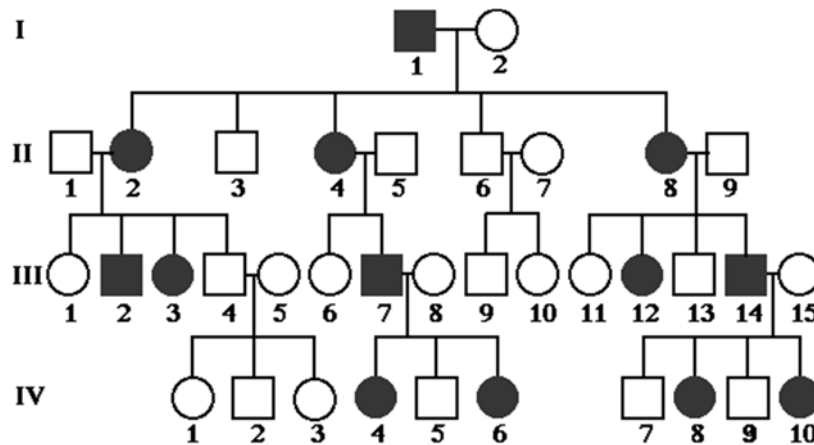
- A** chromosome where the gene is found.
- B** position of the gene on a specific chromosome.
- C** position of the gene on the X chromosome.
- D** type of allele present on the chromosome.

- 13** In the breeding season, male Anole lizards court females by bobbing their heads up and down while displaying a colourful throat patch. Both characteristics are controlled by genes found on separate chromosomes. Anoles prefer to mate with lizards, which bob their heads fast and have red throat patches. These two alleles are dominant over their counterparts, slow bobbing and yellow throats.

A male lizard heterozygous for head bobbing and homozygous dominant for the red throat patch mates with a female that is also heterozygous for head bobbing but has yellow throat patch.

What percentage of the offspring has fast bobbing and red throat phenotype?

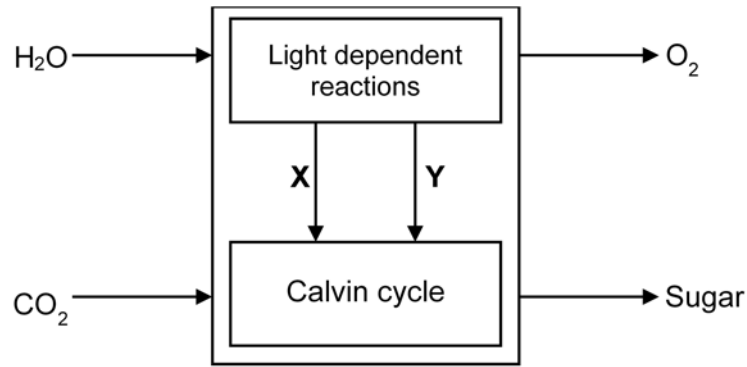
- A** 25%
B 50%
C 75%
D 100%
- 14** The inheritance of a genetic disease in a family is presented in a pedigree tree below.



What is the most likely type of inheritance shown?

- A** autosomal dominant
B autosomal recessive
C sex-linked dominant
D sex-linked recessive
- 15** Codominance is
- A** the distinct expression of both alleles in a heterozygote.
B the incomplete expression of both alleles.
C when an intermediate phenotype results.
D when neither of the alleles are dominant over the other.

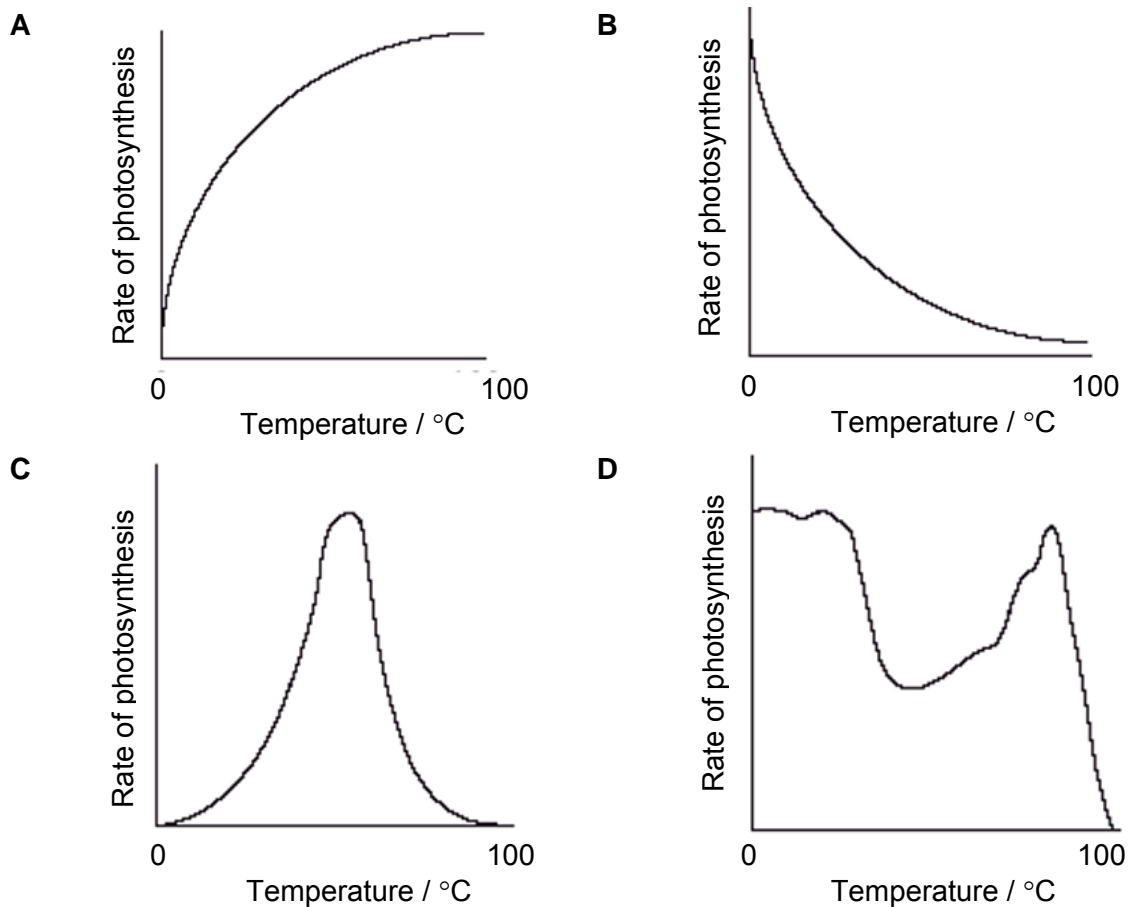
- 16 The diagram below shows the processes that occur in the chloroplast during photosynthesis.



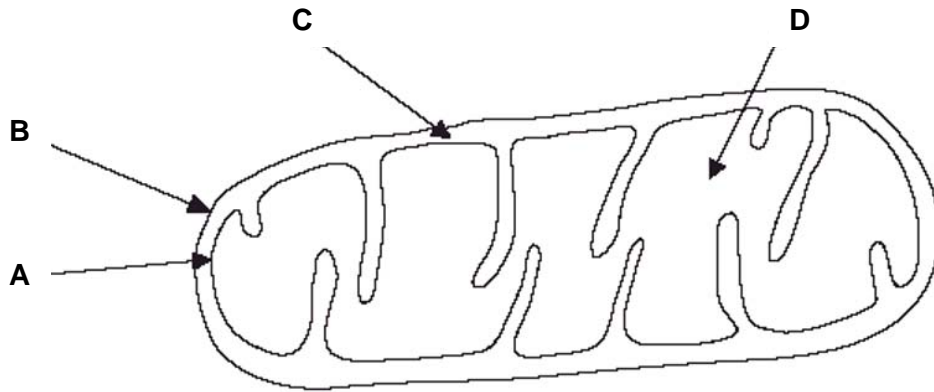
What are **X** and **Y**?

	X	Y
A	ATP	NADH
B	ATP	NADPH
C	H ⁺	Electrons
D	FADH ₂	NADH

- 17 Which graph best represents the effect of temperature on the rate of photosynthesis of a plant?



18 Where is carbon dioxide produced in the mitochondrion?



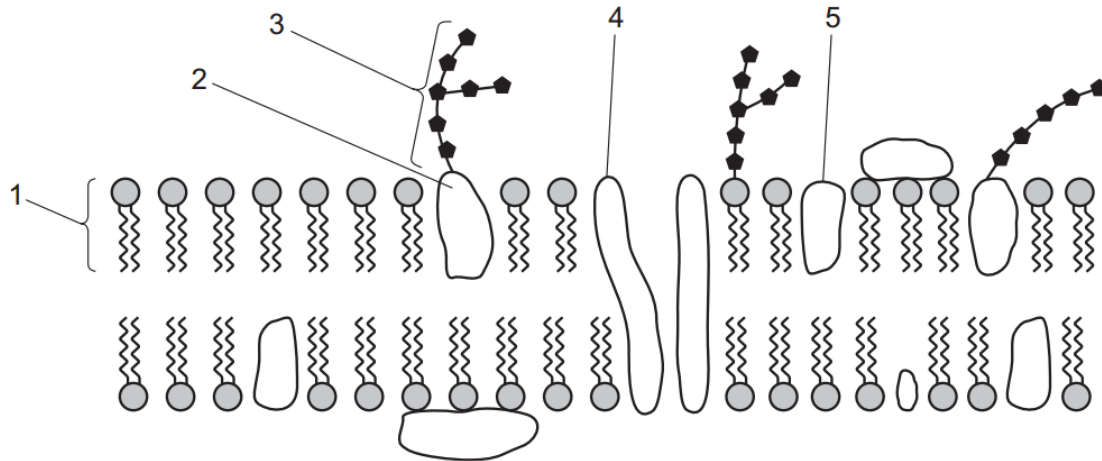
19 The formation of ethanol from pyruvate is an example of

- A aerobic respiration.
- B alcoholic fermentation.
- C carbon dioxide production.
- D lactate fermentation.

20 Which of the following descriptors is a function of cholesterol in the cell membrane?

- A It allows hydrophilic molecules to pass through the membrane.
- B It allows lipid soluble molecules to pass through the membrane.
- C It helps to attract water to maintain the fluidity of the membrane.
- D It prevents the phospholipids from moving apart from each other at high temperatures.

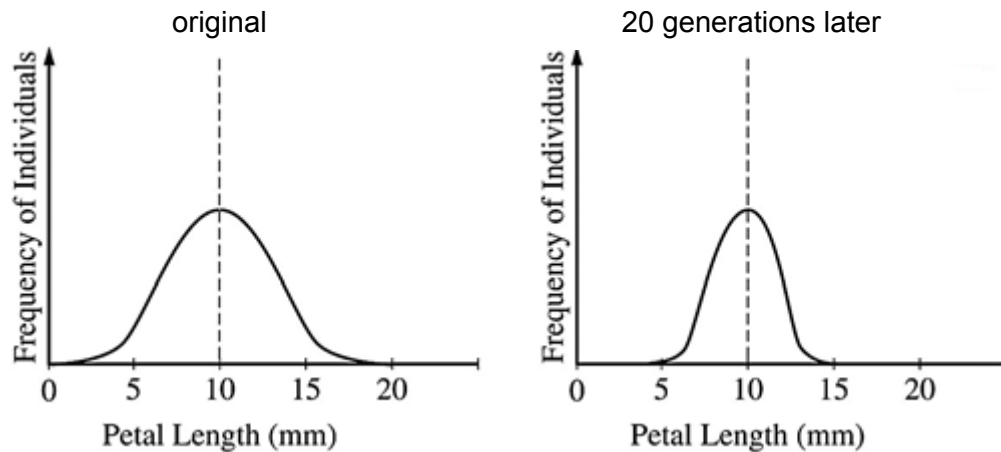
- 21 The diagram shows part of a cell surface membrane.



Which molecule(s) allow(s) the movement of hydrophilic substances across the membrane?

- A 1 only
 - B 4 only
 - C 2 and 5
 - D 4 and 5
- 22 A plant species arrives at a new island and are exposed to a new set of pollinators.

The diagram below shows the frequency distribution of petal length in the original colonising population and 20 generations later.



Which type of selection is shown in this example?

- A directional selection
- B disruptive selection
- C neutral selection
- D stabilising selection

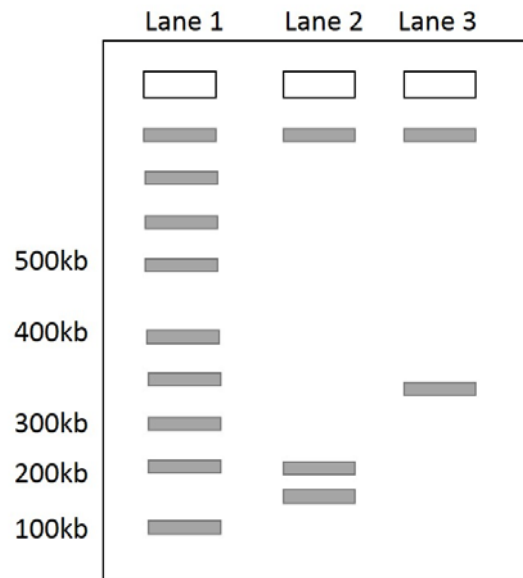
- 23** In one of the scientific journals that Charles Darwin published in 1839, he wrote:

"I have stated, that in the thirteen species of ground-finches [in the Galapagos Islands], a nearly perfect gradation may be traced, from a beak extraordinarily thick, to one so fine, that it may be compared to that of a warbler. I very much suspect that certain members of the series are confined to different islands; therefore, if the collection had been made on any one island, it would not have presented so perfect a gradation. It is clear, that if several islands have each their peculiar species of the same genera, when these are placed together, they will have a wide range of character."

What does the quote above illustrate?

- A** convergent evolution, homologous structures
 - B** convergent evolution, analogous structures
 - C** divergent evolution, analogous structures
 - D** divergent evolution, homologous structures
- 24** What would be the best technique for determining the evolutionary relationship among closely related organisms?
- A** compare their anatomical structures
 - B** compare their embryological structures
 - C** compare the genetic information contained in the liver cells of the organisms
 - D** compare the genetic information contained in the red blood cells of the organisms
- 25** If the first three nucleotides in a six-nucleotide restriction site are ATC, what would the next three nucleotides most likely be?
- A** ATC
 - B** CTG
 - C** GTG
 - D** GAT
- 26** A polymerase chain reaction (PCR) amplification was performed on human genomic DNA. Multiple products of varying sizes were obtained, including one of the expected size. Which of the following modifications to the protocol is the most likely to eliminate the extra PCR products?
- A** increasing length of the primer
 - B** increasing the denaturation temperature from 94°C to 96°C
 - C** decreasing the annealing temperature from 56°C to 52°C
 - D** increasing the elongation temperature from 70°C to 74°C

- 27 The diagram below shows the results from a restriction digestion of a normal β -globin allele (lane 2) and a mutant β -globin allele (lane 3). Lane 1 contains the DNA ladder.



Based on the results shown, which of the following statements best describes the mutation that resulted in the mutant CFTR allele?

- A An additional restriction site was generated.
 B One restriction site was lost.
 C Two restriction sites were lost.
 D The number of restriction sites remained unchanged.
- 28 Which pair of statements are ethical concerns arising from the Human Genome Project?
- 1 scientists tracing migration of different population groups based on maternal inheritance
 - 2 genetic counsellors giving advice to people who are genetically pre-disposed to risks
 - 3 parents choosing to abort fetuses with minor disorders based on genetic testing results
 - 4 scientists developing tests for only some disease-causing genes
 - 5 insurance company charging lower rates to people with genetic disposition to fewer diseases
- A 1 and 4
 B 2 and 5
 C 3 and 4
 D 3 and 5

- 29** Within its own environment, a particular cell line cannot be induced to produce a cell from a different cell line.

Which statement explains this?

- A** Genes not required for a particular cell line are not expressed.
 - B** Genes not required for a particular cell line are removed by enzymes.
 - C** Only pre-mRNA that is required for a particular cell line is processed.
 - D** Stem cells have only the genes required for their particular cell line.
- 30** Which statement supports the view that genetically engineered animals could help to solve the demand for food in the world?
- A** Transgenic pigs and sheep are produced to express higher levels of growth hormone.
 - B** Biomedical applications of genetically engineered animals have also become routine within the pharmaceutical industry, for drug discovery, drug development and risk assessment.
 - C** Cloning of either extinct or endangered species such as woolly mammoth helps to retain genetic diversity in small populations.
 - D** By inserting genes from sea anemone and jellyfish, zebrafish have been genetically engineered to express fluorescent proteins.