

Student Name: _____



BIOLOGY 2017

Unit 4

Key Topic Test 6 – Biological knowledge and society

Recommended writing time*: 45 minutes

Total number of marks available: 45 marks

QUESTION BOOK

* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

Conditions and restrictions

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.
- No calculator is permitted in this test.

Materials supplied

- Question and answer book of 12 pages.

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

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

SECTION A – Multiple-choice questions

Instructions for Section A

Select the response that is most correct for the question. A correct answer scores 1, an incorrect answer scores 0. Marks are not deducted for incorrect answers. If more than 1 answer is completed for any question, no mark will be given.

Question 1

It has been determined that an individual has developed Huntington’s disease, an autosomal dominant trait. Each of the children of this individual has a 50% chance of inheriting the condition. These children would be advised to undergo:

- A. Gene therapy
- B. Genetic testing
- C. Genetic screening
- D. Gene modification

Question 2

Genetic screening is a contentious issue because although it will have an impact on the individual, it may also have an impact on the individual’s family and on society as a whole. Which of the following correctly identifies the difference between ethical issues, legal issues and social issues?

| | Legal issues | Ethical issues | Social issues |
|---|--|--|--|
| A | Concern what is moral or right | Concern the protection that laws and regulations provide | Concern how society and individuals will be affected |
| B | Concern the protection that laws and regulations provide | Concern what is moral or right | Concern how society and individuals will be affected |
| C | Concern how society and individuals will be affected | Concern the protection that laws and regulations provide | Concern what is moral or right |
| D | Concern how society and individuals will be affected | Concern what is moral or right | Concern the protection that laws and regulations provide |

Question 3

Rational drug design is a focussed approach to produce new medications. Which of the following does not need to be known in order to produce an effective drug?

- A. If use of the designed drug will have a therapeutic effect.
- B. If the drug is capable of transforming the target structure.
- C. What the three-dimensional shape of the target structure is.
- D. Whether binding is possible between the drug and the target.

Question 4

Which of the following is the target of an antibiotic?

- A. The DNA of a virus.
- B. The plasmid of a bacterium.
- C. The cell wall of a bacterium.
- D. The protein coating of a virus.

Question 5

Which of the following is a method of cloning genes?

- A. Growing transformed bacteria on agar.
- B. Making multiple copies of DNA using PCR.
- C. Transferring the nucleus of one cell into another.
- D. Loading genetic material onto an electrophoresis gel.

Question 6

A couple have two children, one of whom develops an autosomal recessive trait. The other child shows no symptoms associated with the trait, but they decide to have the child tested anyway. Which of the following terms best describes this situation?

- A. DNA testing
- B. Carrier testing
- C. Predictive testing
- D. Prenatal diagnosis

Question 7

Which of the following is a biological issue raised by the use of transgenic crop plants?

- A. Predators may be unable to consume the crop plants.
- B. People will not wish to eat food that contains products from transgenic plants.
- C. The spread of pollen from transgenic plants may lead to the creation of superweeds.
- D. Increasing the yield by using transgenic crops may drive some farmers out of business.

Question 8

Which of the following potential issues relating to genetic testing is least likely to have an impact on society?

- A. The results of all genetic testing are stored on a centralised data base.
- B. A person diagnosed with a genetic condition decides to inform their family.
- C. An employer insists that all potential employees undergo genetic testing prior to employment.
- D. Insurance companies charge higher premiums for people who have a family history of a genetic condition.

Question 9

Under which of the following circumstances should a newborn undergo genetic testing?

- A. They were born prematurely
- B. Other family members have a genetic condition
- C. They have the symptoms of a genetic condition
- D. If early diagnosis and treatment are of strong benefit to the newborn

SECTION B - Short-answer questions

Instructions for Section B
 Answer all questions in the spaces provided.

Question 1 (8 marks)

A number of methods exist for testing for or diagnosing genetic conditions. The technique used depends on the genetic basis of the condition.

These techniques include:

- Karyotyping: developing an image of all of an individual’s chromosomes.
- Fluorescent in situ hybridization: exposing chromosomes to fluorescent molecules to detect small abnormalities.
- Biochemical tests: detecting the presence or absence of a protein or an abnormality in protein structure.
- Molecular testing: detecting any mutations to a DNA sequence.

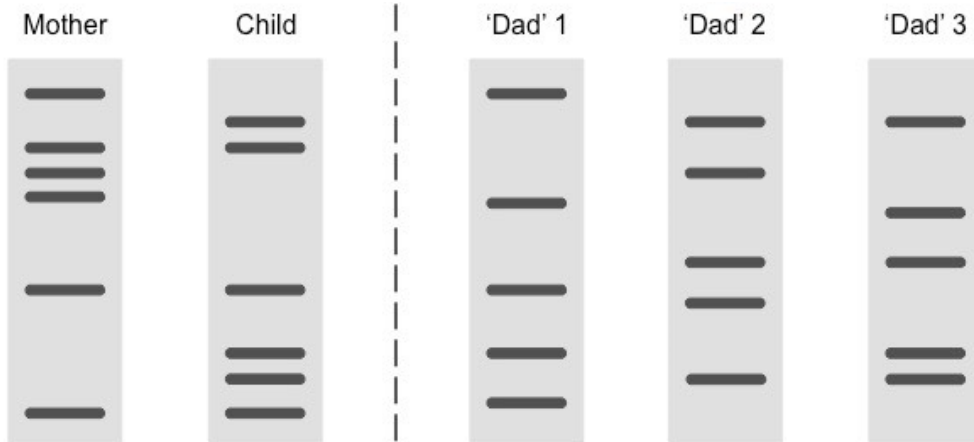
Complete the table below, identifying the type of test that should be used. Provide a reason to support your answer.

| CONDITION AND CAUSE | TYPE OF TEST | EXPLANATION |
|--|--------------|-------------|
| DiGeorge syndrome: caused by a microdeletion on the 22 nd chromosome. | | |
| Klinefelter syndrome: males have an extra X chromosome. | | |
| Tyrosinemia: caused by an absence of the enzyme fumarylacetoacetate hydrolase (FAH) which is essential in the metabolism of tyrosine | | |
| Huntington’s disease: the allele that causes Huntington’s disease has a large number of repeat sequences. | | |

8 marks

Question 2 (5 marks)

Gel electrophoresis is a technique that may be used when carrying out a paternity test. The diagram below compares the DNA of a child with that of the mother and each of three potential fathers.



- a.** Which of the three men is the father of the child? Provide a reason to support your answer.

2 marks

- b.** Explain why the result of the test is also called a DNA fingerprint.

1 mark

- c. The results of carrying out gel electrophoresis may also be used for other purposes. Identify one purpose and explain why the results of gel electrophoresis can be used to accomplish this purpose.

2 marks

Question 3 (8 marks)

Identify whether each of the following organisms is transgenic, genetically modified, both or neither. Provide a reason to support your answer.

- a. Glofish have been produced by inserting coral genes into the genome of a zebra fish.

2 marks

- b. Modern chickens lack teeth, but their ancestors had them. Genetic engineers have been able to identify and unlock the gene that enables chickens to develop teeth. Several chickens with small teeth have been produced.

2 marks

- c. A breeding program was carried out which resulted in the production of large, long lasting roses with a pleasant scent.

2 marks

- d. Organisms referred to as being “knockout” organisms are produced. A specific gene in these organisms is silenced in order to study the effect of the gene being expressed.

2 marks

Question 4 (8 marks)

A strain of corn has been produced which has the ability to secrete Bt toxin, normally naturally produced by the bacterium *Bacillus thuringiensis*. Bt toxin is lethal to many insects and is particularly effective against the corn borer moth.

- a. Identify the effect that incorporating the BT toxin gene would have on the crop yield. Provide a reason to support your answer.

2 marks

- b. Identify an environmental benefit of planting this crop plant.

1 mark

- c. Identify an environmental problem caused as a result of planting this crop plant.

1 mark

- d.** Discuss a social issue that is related to the use of this specific strain of crop plants.

1 mark

- e.** Farmers who wish to grow organic produce have had issues with preventing cross-pollination from occurring between their crops and those of neighbouring farmers who grow GM crops. Why would this cause economic issues for these farmers?

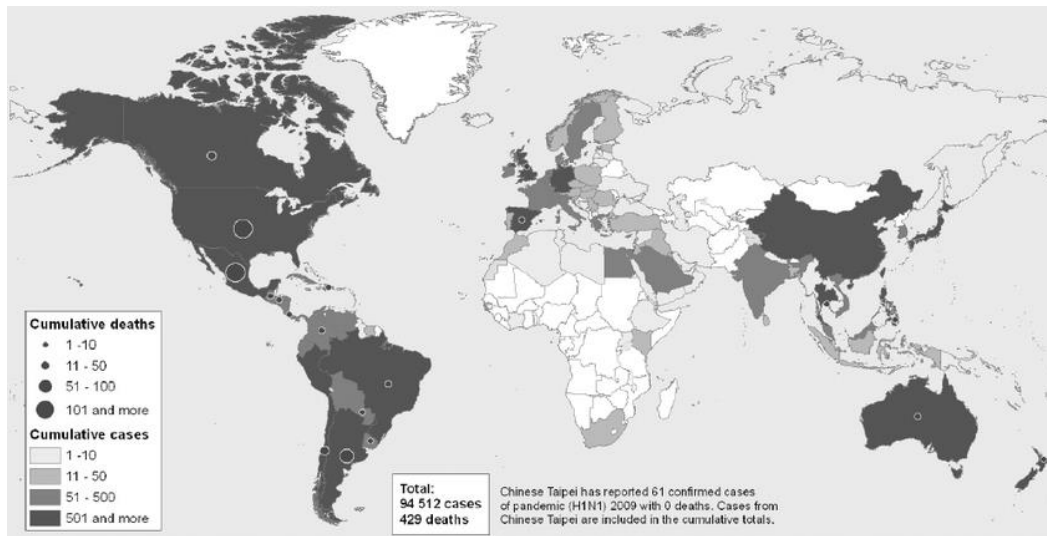
1 mark

- f.** It has been traditional for farmers to save some seeds from one year's crop in order to plant them in the following year. However, anyone who wishes to grow a GM crop is required to sign a contract stating that they will not do so. They are also required to buy new seeds every year. Identify one advantage of the traditional process and an advantage of the newer process of buying seeds for GM crops under contract conditions.

2 marks

Question 5 (7 marks)

The map below shows the distribution of H1N1 influenza in July 2009.



- a. The H1N1 strain of influenza was classified as an emerging disease. What does this term mean? Identify a source of emerging diseases.

2 marks

- b. Would the spread of this disease be more correctly referred to as an epidemic or a pandemic? Provide a reason to support your answer.

2 marks

- c. Explain why it is easier for widespread outbreaks of a disease to occur today than it would have been one hundred years ago.

1 mark

- d. Identify and explain two strategies that could be implemented to deal with the emergence of a new disease.

2 marks

END OF KEY TOPIC TEST