

Student Name: _____



BIOLOGY 2020

Unit 2

Key Topic Test 4 – Genotypes and phenotypes

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.
- A calculator is NOT 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 correct for the question. A correct answer scores 1 mark, and an incorrect answer scores 0. Marks are not deducted for incorrect answers. If more than one answer is selected for any question, no mark will be given for that question.

Question 1

Much of what we know about genetics was first observed and postulated by,

- A. Mendel
- B. Darwin
- C. Crick and Watson
- D. Ian Fraser

Question 2

Andrew notices that his pet mice either have a black or a brown coat and he knows that this is due to their genetics. He could confidently tell his friend that:

- A. some of his mice have a black genotype
- B. some of his mice have a black phenotype
- C. some of his mice have a brown genotype
- D. some of his mice have a brown genome

Question 3

Which of the following is not a correct statement?

- A. an allele that is masked by another is called recessive
- B. a dominant allele will always show in the phenotype
- C. a recessive allele can show in the genotype and phenotype
- D. a dominant allele will always be present in the genotype

Information for questions 4, 5 and 6.

When an organism is produced by sexual reproduction, it will receive an allele for a characteristic from each parent.

Question 4

Which is an incorrect statement regarding these two alleles?

- A. the alleles are located on homologous chromosomes
- B. the alleles are at the same loci on each homologous chromosome
- C. the alleles will always show in the phenotype
- D. the alleles are different forms of the same gene.

Question 5

If these two alleles are not the same, for this characteristic, the organism can be described as:

- A. homozygous
- B. heterozygous
- C. monozygous
- D. pure bred

Question 6

When the two alleles are not the same, usually only one characteristic will show in the organism. This is because,

- A. there is only room for one allele to show
- B. one allele will be better than the other
- C. only the allele from the female parent shows
- D. one allele is dominant and the other is recessive

Question 7

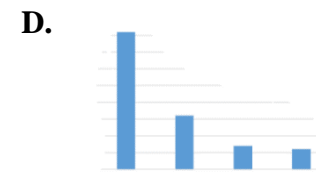
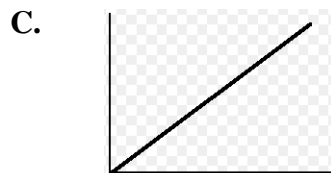
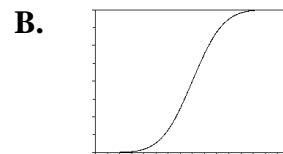
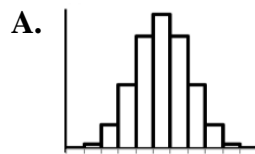
An easily recognisable genetic trait is the ability to tongue roll. Jon cannot tongue roll, but all his children can. The mother of his children must therefore be:

- A. homozygous recessive
- B. homozygous dominant
- C. heterozygous
- D. not able to be determined

Information for questions 8 and 9.

Question 8

Some biology students surveyed their class for height in cm and also for left or right handedness. They graphed their class results. Which of the graphs below could represent the results for height?



Question 9

The correct type of graph from Q8 is typical of characteristics controlled by:

- A. one gene and creates continuous variation within a population
- B. one gene and creates discontinuous variation within a population
- C. many genes and creates continuous variation within a population
- D. many genes and creates discontinuous variation within a population

Question 10

Which of the following determines an individual's phenotype?

- A. genotype
- B. environment
- C. epigenetic factors
- D. all the above

SECTION B- Short-answer questions

Instructions for Section B

Answer all parts of the question in the space provided. Write using black or blue pen.

Question 1

Thomas is trying to breed some curly haired guinea pigs. He has a female called Curly but when he mated her with a straight-haired guinea pig called Herbert, all the offspring were straight haired.

a. What characteristic is dominant, and which is recessive?

1 mark

b. What symbols could be used to represent the allele curly hair and straight hair?

1 mark

c. Draw a punnet square to show the cross between Curly and Herbert.

2 marks

Thomas is very disappointed but the next time he tried mating Curly with another straight-haired guinea pig called Harry. This time he had some success.

d. What must be the genotype of Harry? _____

1 mark

e. Draw a punnet square to show the cross between Curly and Harry.

2 marks

f. The genotype of Curly can be described as _____

1 mark

g. The genotype of Herbert can be described as _____

1 mark

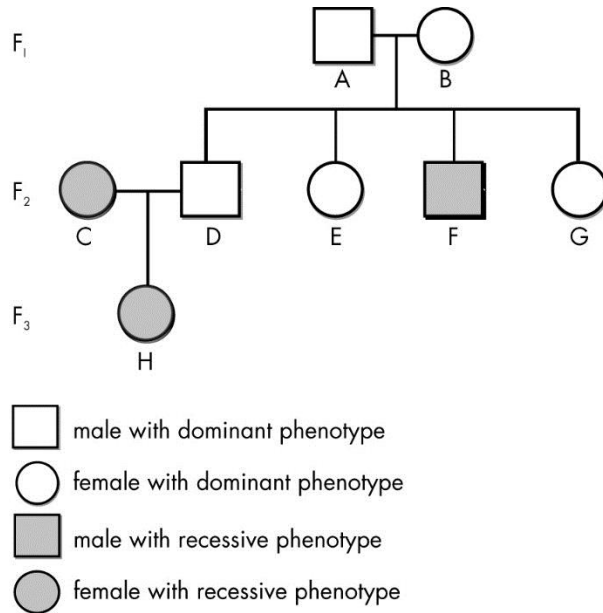
h. The genotype of Harry can be described as _____

1 mark

Total 10 marks

Question 2

Examine the family pedigree below. It illustrates the pattern of inheritance of tongue rolling ability and non-tongue rolling ability in a family. Individual C cannot tongue roll.



- a. Which characteristic, tongue roller or non-tongue roller is dominant in humans and which is recessive?

1 mark

- b. Using the convention for ascribing symbols, what would you use for each of these characteristics?

1 mark

c. Write down the phenotypes and genotypes for each of the following individuals.

Individual	Phenotype	Genotype
A		
B		
C		
D		
F		
H		

6 marks

d. Write down the phenotype for individuals E and G.

1 mark

e. List the possible genotypes for the individuals E and G.

2 marks

Total 11 marks

Question 3

Matilda noticed some pretty pink snapdragon flowers growing in a neighbour's garden. When they produced seeds, she collected some and planted some in her garden. She was delighted when she saw that some of the flowers were pink but wondered why there were also white and red ones growing.

- a. Assign appropriate symbols and draw a punnet square to show how she could get this result.

3 marks

- b. What proportions would be expected for each phenotype?

1 mark

- c. What is the name given to this type of inheritance?

1 mark

Total 5 marks

Question 4

Siamese cats demonstrate how the environment can affect phenotype. At birth the kittens are all white. Later they begin to develop a darker pigmentation along the edges of their ears, tip of their tail and their feet. This is due to a critical enzyme in the production of pigment, which operates more effectively when the temperature is below the cat's core temperature.



a. Explain why the pigment is not seen at all at birth.

2 marks

b. Explain why the pigment develops on the edges of their ears, tip of their tail and their feet.

2 marks

c. Theoretically, how could the pigmentation be encouraged to develop?

1 mark

Total 5 marks

Question 5

Identical twins have the same genotype and yet they can show differences in their phenotype. This indicates that environment may influence the gene expression of an individual so that the genotype is moderated in some way. Some of the differences may be due to epigenetic factors.

- a. Define “epigenetics”.

1 mark

- b. How is epigenetics thought to act?

2 marks

- c. Give an example of a possible epigenetic factor in a person’s life.

1 mark

Total 4 marks

END OF KEY TOPIC TEST