10 EXTENSION SCIENCE 2015

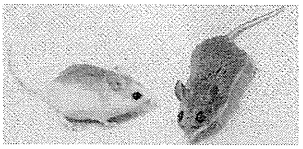
BIOLOGY TEST TWO

Name: _____ **Teacher:** _____ **Mark:** /50

ANSWER KEY **Percentage:** %

SECTION A: **MULTIPLE CHOICE** **(10 marks)**

Select the best answer for each question below.



Answer question 1 and 2 using the information and table below.

A biologist who was studying a population of mice that lived in an area with few trees and scattered low shrubs separated from each other by large areas of bare soil. He found that the mice had two genes that controlled their coat colour. One tended to give the coat a dark-brown colour, while the other produced a lighter yellowish brown colour. The area contained three different soil types: dark red clay, pale yellow sand and light grey sand. Studies of the proportion of mice with the different coat colour were done and are shown in the table. There are was a very dry semi-desert climate. The mice were preyed upon by hawks that hunted mainly in the morning and late afternoon.

Site	Soil colour	Per cent of mice with brown coat	Per cent of mice with yellowish coat
1	Red	82	18
2	Light grey	52	48
3	Pale yellow	41	59

1. Which of the following is a fair interpretation of the data?

(a) There are more brown-coated mice than yellow-coated mice in the population.
(b) Brown coats are more suited to red clay than they are to light-grey sand. (1)
(c) Yellowish coats are more suited to the light-grey sand.
(d) Brown-coated mice are moving from pale-yellow sand and light-grey sand to the red clay.

2. Considering the information in the table, which of the following conclusions is likely?

(a) Hawks always prefer to eat mice with a yellowish coat colour. (1)
(b) The climate is selecting for lighter coloured mice because they will absorb less heat.
(c) The coat colour provides the mice with camouflage protection from the hawk.
(d) Light colour soil selects for the yellowish coat colour.

3. Choose the genotype of a homozygous individual.

(a) r.
(b) RR. (1)
(c) Rr.
(d) R.

4. Choose the scientist who discovered penicillin in 1928.

(a) Bill Nye.
(b) Alexander Fleming. (1)
(c) Charles Darwin.
(d) Thomas Fitzgerald.

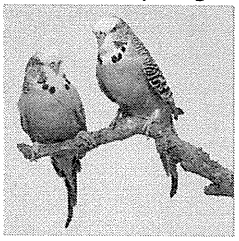
5. The data in the table provides information on the costs to farmers from four different states in India of growing genetically modified cotton.

State in India	Performance advantage of GM cotton over non-GM varieties (percentage)				
	Yield	Income	Cost of chemicals	Total cost	Profit
Maharastra	32	29	–44	15	56
Karnataka	73	67	–49	19	172
Tamil Nadu	43	44	–73	5	229
Andhra Pradesh	–3	–3	–19	13	–40
National average	34	33	–41	17	69

Analyse the data and decide which of the following statements is true.

(a) The state that made the greatest savings on chemicals also had the highest yield and the greatest profit.
(b) The states of Maharastra and Kamataka both saved more than the national average on chemical costs and had a yield and profit above the national average.
(c) The state that had the greatest advantage in terms of total income also had the greatest advantage in terms of total cost and yield.
(d) Andhra Pradesh made a loss because the farmers in that state had to spend more on chemicals.

6. In budgerigars, green feather colour (G) is dominant to blue feather colour (g). A blue male budgerigar mates with a heterozygous female budgerigar. Identify the most probable genotypes of the offspring.



(a) All the offspring will be blue.
(b) All the offspring will be green.
(c) ½ Gg, ½ gg.
(d) ½ GG, ½ gg.

7. Select the chromosomal mutations from the list below.

(a) Deletion, non-disjunction, duplication, diversion.
(b) Inversion, duplication, translocation, deletion.
(c) Non-disjunction, translocation, mutation, inversion.
(d) Duplication, inversion, non-disjunction, donation.

8. Select the incorrect statement regarding sickle cell anaemia.

(a) Sickle cell anaemia results from a change in one nucleotide.
(b) Sickle blood cells have a balloon like shape.
(c) The mutation causes haemoglobin in red blood cells to distort.
(d) Sickle cell anaemia can cause blood cells to clog in capillaries.

9. Trisomy is a form of non-disjunction that involves:

(a) an egg or sperm cell receiving an extra chromosome.
(b) heterozygous chromosomes not separating properly during meiosis.
(c) homologous chromosomes equally dividing chromosomes during meiosis.
(d) an egg or sperm cell missing a chromosome.

10. Select the correct term for the definition 'the effect that natural selection has on the population'.

(a) Selective agent.
(b) Sexual selection.
(c) Selection pressure.
(d) Variation.

SECTION B: **SHORT ANSWER** **(40 marks)**

1. **Name** the Austrian monk who carried out experiments on pea plants in 1856. (1 mark)

Gregor Mendel

2. Write a **definition** for the term 'pure-breeding'. (2 marks)

All individuals have the same genetic information for a characteristic (1) generation after generation. (1)

3. **Explain** how light-coloured peppered moths gradually died out in the cities where pollution had changed the environment (minimum 4 sentences). (4 marks)

The light-coloured moths were being (1) eaten by birds because birds could see them on the black-coloured trees. (1) More dark-coloured moths survived (1) and were able to produce offspring (1) for next generations.

4. **List** two examples of biotic selective factors. (1 mark each) (2 marks)

Predation, competion (or bacterial infection)

5. **List** two examples of physical selective factors. (1 mark each) (2 marks)

Temperature, water, soil nutrients, fire.

6. The process where an environmental factor acts on a population and results in some organisms having more offspring than others is known as: (1 mark)

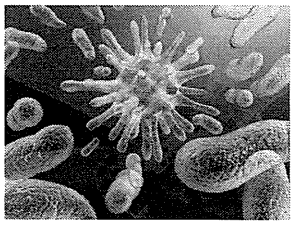
Natural selection

7. Spraying crops with pesticides has caused the development of pesticide-resistant insects. This is given as an example of natural selection even though humans are involved in the spraying.
Identify the selective agent for natural selection in this case. (1 mark)

The pesticide

8. Chemicals made by organisms to defend them against bacteria are known as: (1 mark)

Antibiotics

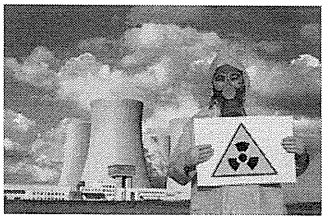


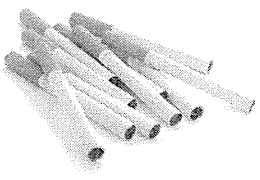
Different types of bacteria

9. **Explain** how the male determines the sex of the child (minimum 3 sentences). (3 marks)

Sperm can have an X or Y chromosome. (1) If a sperm with an X chromosome fertilises an egg then the offspring will be female. (1) If a sperm with a Y chromosome fertilises an egg then the offspring will be male. (1)

10. The images below are both examples of Mutagens (1 mark)





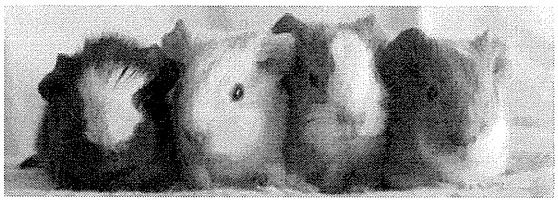
11. The inherited ability of an organism to withstand chemicals is known as (1 mark)

Resistance.

12. Contrast homozygous and heterozygous. (2 marks)

Homozygous means having the same alleles for a gene (1) and heterozygous means having different alleles for a gene. (1)

13. In guinea pigs, black fur is dominant over brown fur. Show the cross of a heterozygous black male with a homozygous brown female. (5 marks)



Parents

Male genotype: Bb

Male phenotype: Black fur (1)

Female genotype: bb

Female phenotype: Brown fur (1)

	B	b
b	Bb	bb
b	Bb	bb

(1)

Offspring

Genotype: Bb 50%, bb 50% (1)

Phenotype: Black fur. 50%, Brown fur 50%. (1)

14. Fill in the missing words below. (4 marks)

ova/

Females have sex cells known as eggs. These sex cells have an X chromosome. Males have sex cells known as sperm. These sex cells can either carry an X chromosome or a Y chromosome. A daughter will always get one X chromosome from her mother and the X chromosome from her father. This would produce X X.

-1 mark for each missing/ incorrect

-1 mark for each incorrect/missing

15. Fill in the missing words below. (2 marks)

One very dangerous type of bacteria is golden staph (Staphylococcus aureus), which is resistant to many antibodies and is very difficult to kill. It became resistant because of the widespread use of antibiotics in hospitals.

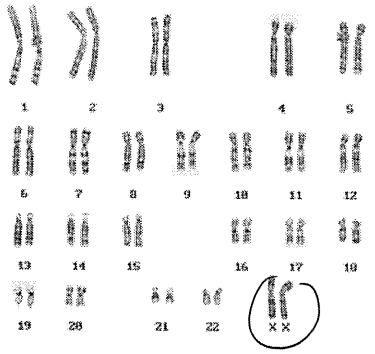
16. Write a definition for the term mutagen. (2 marks)

Something that causes mutations (1) or increases the chance of a mutation occurring. (1)

17. Describe the main difference between gene mutations and chromosomal mutations. (2 marks)

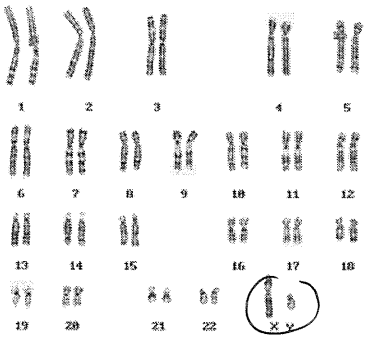
Gene mutations are alterations to DNA sequences that make up a gene (1) whereas chromosomal mutations occur when all or part of a chromosome is altered. (1)

18. Circle the sex chromosomes on each karyotype and **state** whether it is a male or female karyotype. (2 marks)



Is this a male karyotype or a female karyotype? (1)

Female



Is this a male karyotype or a female karyotype? (1)

male

19. Describe the main difference between trisomy and monosomy. (2 marks)

Monosomy occurs when an egg or sperm cell is missing a chromosome (1) whereas trisomy occurs when a sperm or egg cell has an extra chromosome (1).