1.6 Inheritance, Variation and Evolution: 30-minute Pack

Total Marks

AQA 8461 · Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State what is meant by the term 'gene'.

(Total for Question 1 is 1 mark)

2 Define the terms 'dominant allele' and 'recessive allele'.

(Total for Question 2 is 2 marks)

© Revision Library | revisionlibrary.co.uk

3 Charles Darwin proposed the theory of evolution by natural selection. Describe the process of natural selection, using the example of a population of animals in which some individuals are, by chance, better camouflaged than others.

(Total for Question 3 is 4 marks)

---

4 Fossils provide evidence for how life on Earth has changed over time.

(a) Describe two ways in which fossils can form. **(2)**

(b) Explain why the fossil record is incomplete. **(2)**

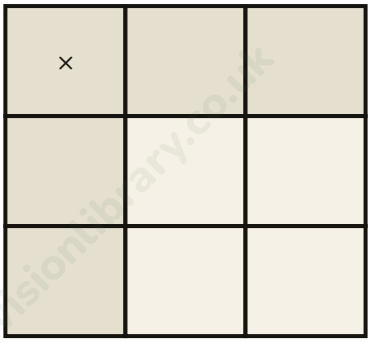
(Total for Question 4 is 4 marks)

© Revision Library | revisionlibrary.co.uk

5 In pea plants, the allele for tall stems (T) is dominant to the allele for short stems (t). A gardener in Kent crosses two pea plants that are both heterozygous (Tt) for stem height.

(a) Complete a genetic cross diagram to show the possible gametes and offspring genotypes from this cross. **(2)**

Cross: Tt × Tt



(b) Using your diagram, state the genotype ratio of the offspring. **(1)**

(c) State the phenotype ratio of the offspring, and calculate the percentage of offspring expected to be tall. **(2)**

.....

(Total for Question 5 is 5 marks)

© Revision Library | revisionlibrary.co.uk

6 A microbiologist in a hospital laboratory grew a culture of 5,000,000 bacteria. Before any antibiotic was added, 250 of these bacteria already carried a mutation that gave them resistance to the antibiotic meticillin.

(a) Calculate the percentage of the original bacterial population that was resistant to meticillin. **(2)**

.....

(b) The bacterial culture was then treated with meticillin. Explain why, after treatment, nearly all of the surviving bacteria were resistant to the antibiotic, even though resistant bacteria made up such a small percentage of the population before treatment. **(3)**

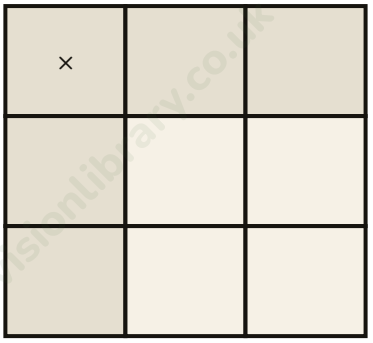
(Total for Question 6 is 5 marks)

© Revision Library | revisionlibrary.co.uk

7 Polydactyly is a condition in which a person is born with extra fingers or toes. It is caused by a dominant allele, D. One parent has polydactyly and is heterozygous (Dd); the other parent does not have polydactyly (dd).

(a) Complete a genetic cross diagram and use it to calculate the probability, as a percentage, that a child of these parents will have polydactyly. **(2)**

Cross: Dd × dd



(b) Polydactyly does not usually reduce a person's chance of surviving or having children. Explain why this means the allele for polydactyly is not removed from the population by natural selection, even though it is not the most common form of the gene. **(2)**

(Total for Question 7 is 4 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 1.6 Inheritance, Variation and Evolution: 30-minute Pack

Question 1

a small section of DNA (found on a chromosome) that codes for (controls) a particular characteristic or protein, oe **B1**

Answer: A small section of DNA that codes for a particular characteristic or protein.

Question 2

dominant allele: an allele whose characteristic appears in the phenotype even if only one copy is present (e.g. present in a heterozygote), oe **B1**

recessive allele: an allele whose characteristic only appears in the phenotype if two copies are present (homozygous recessive), oe **B1**

Answer: Dominant allele: its characteristic shows even with only one copy present. Recessive allele: its characteristic only shows if two copies are present.

Question 3

individuals in a population show variation, e.g. some are better camouflaged than others, due to differences in their alleles **B1**

organisms compete for limited resources (e.g. food, space, mates); better camouflaged individuals are less likely to be caught by predators **B1**

individuals with characteristics best suited to the environment are more likely to survive and reproduce (survival of the fittest) **B1**

the alleles for the advantageous characteristic are passed on to offspring, so over many generations the proportion of the population with that characteristic increases **B1**

Answer: Indicative content - award any 4 of the marking points listed, max 4 marks.

Question 4

(a) from the hard parts of an organism (e.g. bones, shells, teeth) that do not decay easily, and which may be gradually replaced by minerals as they are buried **B1**

(a) from organisms preserved in places where decay is prevented, e.g. in amber, tar pits, peat bogs, or ice (any one suitable example) **B1**

(a) Answer: Fossils can form from hard body parts replaced by minerals over time, or from whole organisms preserved in places where decay is prevented, such as amber or ice.

(b) many early forms of life were soft-bodied, which decayed completely and left few traces/fossils **B1**

(b) many fossils that did form have since been destroyed by geological activity (e.g. rock movement, erosion) before they could be discovered **B1**

(b) Answer: Soft-bodied organisms rarely fossilise, and many fossils that did form have since been destroyed by geological processes, so the record is incomplete.

Question 5

(a) correct gametes shown for each parent: T and t **M1**

(a) correct offspring genotypes shown: TT, Tt, Tt, tt **A1**

(a) Answer: Gametes T and t from each parent; offspring genotypes TT, Tt, Tt, tt.

(b) 1 TT : 2 Tt : 1 tt (accept 1:2:1) ft from (a) **B1**

(b) Answer: 1 TT : 2 Tt : 1 tt

(c) 3 tall : 1 short ft from (a) **B1**

(c) 75% cao **B1**

(c) Answer: Phenotype ratio 3 tall : 1 short; 75% of offspring expected to be tall.

Question 6

(a) (250 / 5 000 000) x 100 **M1**

(a) 0.005% cao **A1**

(a) Answer: 0.005%

(b) the antibiotic killed the non-resistant bacteria, as they had no mutation giving resistance **B1**

(b) the resistant bacteria survived the antibiotic treatment because their mutation protected them from its effects **B1**

(b) the surviving resistant bacteria then reproduced (without competition from the non-resistant bacteria), so nearly all of the remaining/new population was descended from resistant bacteria **B1**

(b) Answer: The antibiotic killed the non-resistant bacteria; the resistant bacteria survived and then reproduced, so almost all of the surviving population came from resistant ancestors.

Question 7

(a) correct offspring genotypes shown: Dd, Dd, dd, dd **M1**

(a) 50% cao **A1**

(a) Answer: 50%

(b) natural selection removes alleles that reduce an organism's chance of survival or reproduction (i.e. that are selected against) **B1**

(b) because polydactyly does not significantly affect survival or reproduction, people with the allele are just as likely to reproduce and pass it on, so it is not selected against/eliminated from the population **B1**

(b) Answer: Natural selection only removes alleles that reduce survival or reproductive success; as polydactyly does not do this, carriers reproduce as successfully as anyone else, so the allele is not eliminated from the population.

© Revision Library | revisionlibrary.co.uk