Inheritance and probability

Biology calculations | AQA Combined Science 8464 and AQA GCSE Biology 8461 | 12 questions, 31 marks

GCSE science calculations

Scan for the solutions

Equations for this topic (cover this box to practise recalling them)

- probability = $\frac{\text{number of outcomes with the feature}}{\text{total number of outcomes}}$ learn this one
- ratio = number with the dominant phenotype : number with the recessive phenotype learn this one
- percentage = $\frac{\text{number of outcomes with the feature}}{\text{total number of outcomes}} \times 100$ learn this one
- ratio = number of one genotype : number of the other genotype learn this one
- ratio = number of one genotype : number of the next : number of the next learn this one
- expected number = probability × total number of offspring learn this one
- percentage = $\frac{\text{part}}{\text{total}} \times 100$ learn this one

Name: _____ **Date:** _____ **Score:** _____ **/ 31**

1 In mice, the allele for black fur (**B**) is dominant to the allele for brown fur (**b**).

The Punnett square shows a cross between two mice.

	B	**b**
b	Bb	bb
b	Bb	bb

What is the probability that an offspring has brown fur? (1 mark)

Answer _____

2 In tomato plants, the allele for a tall stem (**T**) is dominant to the allele for a dwarf stem (**t**).

The Punnett square shows a cross between two tomato plants.

	T	**t**
T	TT	Tt
t	Tt	tt

Give the expected ratio of tall plants to dwarf plants. (2 marks)

Answer _____

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

3 The Punnett square shows how sex is inherited in humans.

	X	**X**
X	XX	XX
Y	XY	XY

What percentage of children are expected to be male? (2 marks)

Answer _____

4 In cats, the allele for short hair (**L**) is dominant to the allele for long hair (**l**).
Two short-haired cats are both heterozygous for this gene. They have kittens.
Calculate the probability that a kitten has long hair. Give your answer as a decimal. (3 marks)

Answer _____

5 In fruit flies, the allele for normal wings (**N**) is dominant to the allele for short, crumpled wings (**n**).
Leila crosses a fly that is homozygous for normal wings with a fly that is heterozygous.
Give the expected ratio of offspring with genotype NN to offspring with genotype Nn. (3 marks)

Answer _____

6 In guinea pigs, the allele for a rough coat (**R**) is dominant to the allele for a smooth coat (**r**).
Two guinea pigs with genotype Rr are crossed.
Give the expected ratio of the genotypes RR : Rr : rr in the offspring. (3 marks)

Answer _____

7 In maize, the allele for purple kernels (**P**) is dominant to the allele for yellow kernels (**p**).
A cob from a cross between two Pp plants has 240 kernels.
Calculate the expected number of yellow kernels on the cob. (2 marks)

Answer _____

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

8 A plant breeder sows seeds from a cross between two barley plants. Some seedlings are green and some are white, because they cannot make chlorophyll.

- 312 seedlings are green.
- 104 seedlings are white.

Calculate the ratio of green seedlings to white seedlings in its simplest form.

(2 marks)

Answer _____

9 A dog breeder has two dogs that are both carriers of a recessive allele that causes an eye condition. Neither dog has the condition.

Their first litter of 5 puppies included 2 puppies with the eye condition.

The dogs have another litter. Calculate the probability that the first puppy born in the new litter has the eye condition.

(2 marks)

Answer _____

10 Cystic fibrosis is caused by a recessive allele (**f**). The dominant allele is **F**.

Hamid and Zara are both carriers of cystic fibrosis. They are planning to have a child.

a. Calculate the probability that their child will have cystic fibrosis.

b. Calculate the percentage chance that their child will be a carrier.

c. Their child is born without cystic fibrosis. Calculate the probability that this child is a carrier. Give your answer as a fraction.

Show your working.

(4 marks)

Answer _____

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

11 In rabbits, the allele for black fur (**B**) is dominant to the allele for white fur (**b**).

Oliver does not know the genotype of his black rabbit. He crosses it with a white rabbit. Over two litters there are 14 offspring:

- 8 are female and 6 are male
- 7 have black fur and 7 have white fur

a. Calculate the ratio of black offspring to white offspring in its simplest form.

b. Give the genotype of the black parent.

Show your working.

(3 marks)

Answer _____

12 In pea plants, the allele for purple flowers (**R**) is dominant to the allele for white flowers (**r**).

Priya crosses a plant with genotype Rr with a plant with genotype rr. She grows 180 seedlings from the seeds.

a. Calculate the expected number of seedlings with purple flowers.

b. When the plants flower, 84 have purple flowers. Calculate the percentage of the 180 plants that have purple flowers. Give your answer to 3 significant figures.

Show your working.

(4 marks)

Answer _____

End of questions | Total 31 marks

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.