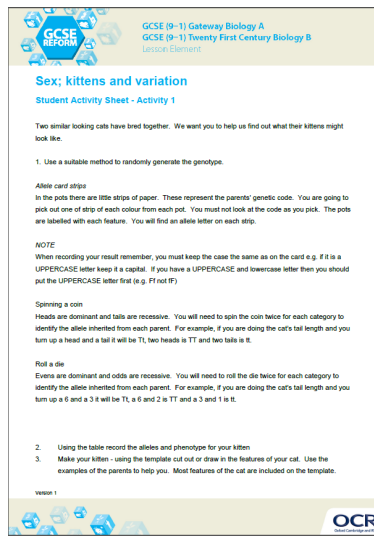


Sexual reproduction – kittens and variation



Instructions and answers for teachers

These instructions should accompany the OCR resource GCSE (9–1) Gateway Biology A and GCSE (9–1) Twenty First Century Biology B ‘Sexual reproduction – kittens and variation’ learner activity which supports OCR GCSE (9–1) Gateway Biology A and GCSE (9–1) Twenty First Century Biology B.



The Activity:

Learning outcomes

- To be able to demonstrate how variation is produced during sexual reproduction
- Describe how genetic variants may influence phenotype
- Explain some of the advantages and disadvantages of sexual reproduction in a range of organisms
- Explain single gene inheritance in the context of homozygous and heterozygous crosses involving dominant and recessive genes.



This activity offers an opportunity for English skills development.

Associated materials:

GCSE (9–1) Gateway Biology A and GCSE (9–1) Twenty First Century Biology B. ‘Sexual reproduction – kittens and variation’ Lesson Element learner activity sheet.



This resource is an exemplar of the types of materials that will be provided to assist in the teaching of the new qualifications being developed for first teaching in 2016. It can be used to teach existing qualifications but may be updated in the future to reflect changes in the new qualifications. Please check the OCR website for updates and additional resources being released. We would welcome your feedback so please get in touch.



Introduction

Summary of the activity

This activity is designed to be used as an introduction into the inheritance of alleles during sexual reproduction and to demonstrate the link between genotype and phenotype.

Prior Knowledge

Students need to be aware that inheritance relies on the genetic information contained in the genome being passed from one generation to the next, whether sexually or asexually. The characteristics of a living organism are influenced by the genome and its interaction with the environment.

Students need to know the processes of sexual reproduction. They should be aware of the processes of mitosis and meiosis and the difference between them.

Misconceptions

Students often get confused between genotype and phenotype. Whilst some students can very quickly pick up the effect of dominant and recessive alleles, some find this concept difficult to understand. This activity may help these students.

Extension activities

Predict the results of single gene crosses.

Explain the impact of the selective breeding of plants and domesticated animals.





Running the activity

Students could work individually, in pairs or small groups.

1. Provide the students with the activity sheet.
2. Students should use a suitable method to randomly generate the genotype.

Examples of suitable methods are:

Allele card strips (possibly the best method, but needs more preparation time)

Label plastic cups/beakers etc with: tail length, nose size, nose colour, ear size, eye colour, whisker length, fur colour, paws. Print the allele card strips onto different coloured cards and cut up. Add the appropriate allele card strips to the pot. Learners should pick out one strip of each colour from each pot. Learners must not look at the code as they pick.

Spinning a coin

Heads are dominant and tails are recessive. Learners will need to spin the coin twice for each category to identify the allele inherited from each parent. For example, if they are doing the cat's tail length and you turn up a head and a tail it will be Tt, two heads is TT and two tails is tt.

Roll a die

Evens are dominant and odds are recessive. Students will need to roll the die twice for each category to identify the allele inherited from each parent. For example, if they are doing the cat's tail length and turn up a 6 and a 3 it will be Tt, a 6 and 2 is TT and a 3 and 1 is tt.

3. Using the record table the students should record their kittens genotype and phenotype for the kitten.
4. The student should then make their kitten using the kitten template.
5. The kittens should then be compared to the parental cats to demonstrate the variation that has occurred by sexual reproduction. Students should underline the differences between your kittens and their parents on the record sheet.
6. The students should compare the variety of kittens within the class.

Extension activity 1

Students could look at their cat and work out the probability of each characteristic (e.g. tail length) from their kitten. This could be done using a using a punnet square or similar method.

E.g. a student who has produced a cat with a long tail

	T	T
T	TT	Tt
T	Tt	Tt

The probability of generating a kitten with a long tail is 0.75 (the probability of a cat with short tail would be 0.25), from these parents.

Extension activity 2

Using the new pool of kittens we would like to develop some designer cats. Teachers could choose some of the recessive traits from the class kittens and discuss selective breeding.

1. Identify the kittens you would choose in a selective breeding programme.
2. Work out the probability of the potential offspring using punnet squares or similar method.
3. Are there any problems with this method (inbreeding depression, unwanted linked traits e.g. small nose and breathing problems, small tail and balance issues).

An example of this is the Manx cat. Manx cats have a dominant mutation. Breeding Manx cats together is problematical and often leads to fatal genetic disorders. The genotype tt produces a true Manx cat (Rumpy). This trait does not breed true so a heterozygous (Tt) tail gene can lead to a Rumpy/Riser/Stumpy tail Manx cat. TT is lethal.

See:

http://www.mun.ca/biology/scarr/Manx_cat_genetics.html

Other examples of this are the Schipperke dog and Old English Sheepdog.



Technician's notes

What you will need:

- Plastic cups or similar (8 labelled: tail length, nose size, nose colour, ear size, eye colour, whisker length, fur colour, paws)
- OR coins (one per group)
- OR dice
- Scissors (class set)
- Student worksheet, either in colour (if available) or outline (one per student)
- Coloured pens/pencils (class set)
- String for whiskers (two lengths 5cm and 2cm, at least one of each length per student)
- Allele card strips if using the plastic cup method. Print the allele card strip template onto different coloured card and cut up appropriately (10 sheets of each colour should be sufficient for the activity as they can be reused)
- Results table (one per student).

Record table

Each student should be provided with a record table. Alternatively a copy of the record table is available on the Student activity sheet, along with the kitten template.



Circle the kitten's genotype and phenotype. Underline the difference between your kitten and their parents.

TT or Tt	Long tail	tt	Short tail
NN or Nn	Big nose	nn	Little nose
BB or Bb	Black nose	bb	Pink nose
EE or Ee	Normal ears	ee	Big ears
GG or Gg	Green eyes	gg	Blue eyes
LL or Ll	Long whiskers	ll	Short whiskers
FF or Ff	Grey fur	ff	Stripy fur
PP or Pp	Stripy legs	pp	Plain legs



Circle the kitten's genotype and phenotype. Underline the difference between your kitten and their parents.

TT or Tt	Long tail	tt	Short tail
NN or Nn	Big nose	nn	Little nose
BB or Bb	Black nose	bb	Pink nose
EE or Ee	Normal ears	ee	Big ears
GG or Gg	Green eyes	gg	Blue eyes
LL or Ll	Long whiskers	ll	Short whiskers
FF or Ff	Grey fur	ff	Stripy fur
PP or Pp	Stripy legs	pp	Plain legs



Circle the kitten's genotype and phenotype. Underline the difference between your kitten and their parents.

TT or Tt	Long tail	tt	Short tail
NN or Nn	Big nose	nn	Little nose
BB or Bb	Black nose	bb	Pink nose
EE or Ee	Normal ears	ee	Big ears
GG or Gg	Green eyes	gg	Blue eyes
LL or Ll	Long whiskers	ll	Short whiskers
FF or Ff	Grey fur	ff	Stripy fur
P or Pp	Stripy legs	pp	Plain legs



GCSE (9–1) Gateway Biology A
GCSE (9–1) Twenty First Century Biology A
Lesson Element

T	t
N	n
B	b
E	e
G	g
L	l
F	f
P	p
T	t
N	n
B	b
E	e
G	g
L	l
F	f
P	p
T	t
N	n
B	b
E	e
G	g
L	l
F	f
P	p





GCSE (9–1) Gateway Biology A

GCSE (9–1) Twenty First Century Biology A

Lesson Element

We'd like to know your view on the resources we produce. By clicking on '[Like](#)' or '[Dislike](#)' you can help us to ensure that our resources work for you. When the email template pops up please add additional comments if you wish and then just click 'Send'. Thank you.

If you do not currently offer this OCR qualification but would like to do so, please complete the Expression of Interest Form which can be found here: www.ocr.org.uk/expression-of-interest

OCR Resources: *the small print*

OCR's resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.

© OCR 2015 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content: Maths icon: Air0ne/Shutterstock.com

Please get in touch if you want to discuss the accessibility of resources we offer to support delivery of our qualifications: resources.feedback@ocr.org.uk

