

A. Reproduction, meiosis, DNA and the genome

1. What is a gamete?
2. Name the male and female gametes in a) a human b) a daisy plant
3. For each row, tick one box to show which method of cell division is correct

	Meiosis	Mitosis
Genetic mixing happens		
Gamete production occurs		
New cells show variation		
New cells have same number of chromosomes as parent		
Happens in skin cells		
Two divisions occur		
Two new cells are formed as a result		
Identical cells are formed		

4. How many chromosomes are found in the nucleus of a human:
 - a) ovary cell?
 - b) egg cell?
 - c) embryo cell?
 - d) a cell just after fertilisation has occurred?
 - e) a testes cell?
5. Name the shape which best describes the DNA polymer.
6. How is DNA organised inside the cell nucleus?
7. Which is larger, a chromosome or a gene?
8. What does a gene code for?
9. Write down the definition of the genome of a horse.
10. List **two** reasons why it is important to understand more about the human genome.

Biology only

11. What are three advantages of sexual reproduction?
12. What are three advantages of asexual reproduction?
13. List three organisms which reproduce using both sexual and asexual reproduction methods.
14. Where would you find a nucleotide?

15. What does a nucleotide consist of?
16. What are the symbols of the 4 bases found in DNA?
17. What does the code for an amino acid consist of?
18. Fill in the missing terms:

The long strands of DNA are made of alternating _____ and _____ sections.

Attached to each _____ is one of the four bases.

The DNA polymer is made up of repeating _____ units.

Higher Tier biology only

19. In the complementary strands of DNA – which base is T always linked to?
20. Which organelle in the cytoplasm carries out protein synthesis?
21. What do carrier molecules bring to the organelle from the cytoplasm?
21. What happens in protein synthesis once the protein chain is complete?
22. What happens if a mutation codes for a slightly altered enzyme protein with a different shape?
23. What can non-coding parts of DNA do?

B. Genetic Inheritance, Inherited disorders and sex determination

1. Complete the sentences below using one of the following words:

genotype phenotype homozygous gamete chromosome

The same alleles for a particular characteristic are described as

Mice fur can be described by its colour. This is known as the

The alleles for a particular characteristic determine its

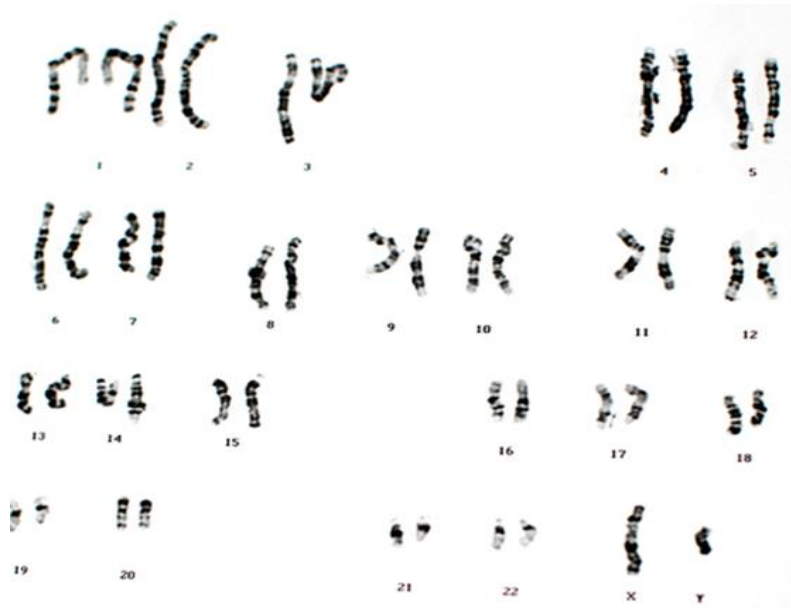
The pollen of a rose plant can also be described as a male

2. What are the different forms of a gene called ?
3. Why is it easy to describe an organism’s phenotype for a particular characteristic but very difficult to state the genotype?
4. List the alternative ways of describing the following outcome of a genetic cross:

3 in every 4 crosses will have black fur.

5. If two heterozygous tall plants were crossed 75 times, what proportion of the offspring would you expect to be short?
6. What is polydactyly and is it caused by inheriting a recessive or dominant allele?

7. Look at the following picture of a person’s chromosomes. How many chromosomes does this person have in a normal body cell?



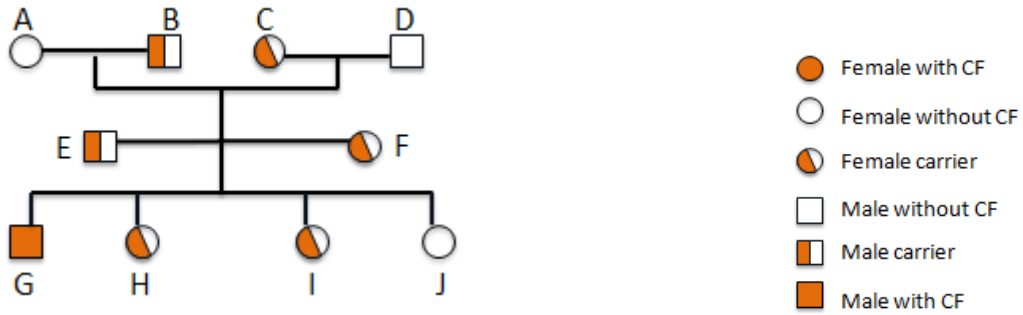
8. What sex is the person and how do you know?
 9. Black fur is dominant to brown fur in mice.

Use B to represent black fur and b to represent brown fur.

- a) Copy and complete the Punnett square diagram to show the outcome of a genetic cross between two heterozygous mice.

Gametes		

- b) What is the phenotype of the parent mice?
 c) What are the chances of a homozygous recessive mouse being born to two heterozygous mice?
10. Is someone who is heterozygous for cystic fibrosis healthy?
 11. The family tree shows the inheritance of cystic fibrosis (CF). Cystic fibrosis is a condition caused by a recessive allele. Let F = healthy allele and f = CF allele



- a) What is the genotype of a female carrier?
- b) Explain why person G inherited cystic fibrosis.
- c) Explain why person J did not inherit cystic fibrosis.
- d) What is the probability of a fifth child having cystic fibrosis?
- e) Many people feel opposed to the screening of embryos to identify the CF allele.

Suggest **two** reasons why they may feel this way.

Higher tier questions

12. The flower colour for pea plants is controlled by a single gene. Red flowers are dominant to white flowers.

A homozygous dominant plant and a heterozygous plant are crossed to produce offspring.

- a) What is the phenotype of the homozygous dominant plant?
- b) Draw a genetic diagram to show all the possible arrangements of alleles in the offspring.
- c) What is the chance of producing homozygous dominant red flowering plants?

C. Variation, evolution, selective breeding and genetic engineering.

1. 1. What does variation mean?
2. Complete the table to indicate the likely cause of variation in phenotypes for the following characteristics:

	Eye shape	Gender	Blood group	Ear lobe shape	Weight	Freckles
Genetic	✓					
Environmental						
Both						

3. Write a definition for evolution.
4. What does the theory of evolution by natural selection state?
5. What is the definition of the term species?

6. Humans choose animals or plants to breed from based on usefulness or appearance. List **four** characteristics which would be selected for e.g. a thick woolly coat in sheep (two in plants and two in animals).
7. What is a major disadvantage caused by selective breeding?
8. How often do mutations occur?
9. How likely is it that a mutation will lead to a new phenotype?
10. What is genetic engineering?
11. What human product is made by genetically engineered bacteria to treat diabetes?
12. What are plants called which have had their genome modified?

Higher tier only

13. How are the required genes isolated from the host?
14. What is the biological definition of a vector ?
15. Name a common vector for inserting genes into the required cells.
16. When in the life cycle must genes be transferred to the cells of animals, plants or microorganisms?
17. List three reasons which people are concerned about in relation to genetic engineering

Biology questions

18. What is tissue culture?
19. Why is tissue culture important?
20. Why is an electric shock used in adult cell cloning?
21. What is the term used to describe the technique gardeners use to produce many identical new plants from a parent plant?

D. Theory of evolution (biology), speciation (biology), Understanding of genetics (biology), evidence for evolution, fossils, extinction, resistant bacteria and classification of living organisms.

1. Name two pieces of evidence for Darwin's theory of evolution through natural selection which mean it is now largely accepted.
2. What are fossils?
3. How are fossils formed?
4. List two reasons why there are not many traces of early life on Earth.
5. What can be learned from studying fossils?
6. What does an evolutionary tree show?
7. What does it mean when we say an organism is extinct?

- List four factors which may contribute to the extinction of a species.
- Why do bacteria evolve rapidly?
- Name a bacterial pathogen which is resistant to several strains of antibiotics.
- Why are pharmaceutical companies not developing new antibiotics ?
- Name three things that can be done to reduce the rate of development of antibiotic resistance.
- Name the seven groups that Linnaeus used to classify living organisms.
- What is the binomial naming system?
- Carl Woese used information from chemical analysis to suggest a new method of classification. What is it called?
- List the groups that organisms are divided into using Carl Woese's method.

Biology only

- What theory did Charles Darwin propose?
- List three observations Darwin made which led him to propose his theory.
- What was Charles Darwin's book called?
- List three reasons why Charles Darwin's theory was only partially accepted.
- Jean Baptiste Lamarck put forward his theory of evolution. What was his idea?
- Alfred Wallace also put forward his theory of evolution by natural selection independently to Darwin but what work is he best known for?
- List the steps needed for a new species to be formed.
- What did Gregor Mendel observe when he carried out breeding experiments on pea plants?
- What was discovered in the late 19th century which helped to develop our understanding of genetics further?
- When was the structure of DNA determined and the mechanism of gene function determined?