Exercise walk-through

6.1 Reproduction, DNA and genomes (4.6.1.1–4.6.1.5)

AQA · GCSE · Biology

Reproduction and meiosis

- **Sexual reproduction** involves the joining of male and female sex cells, each called a **gamete** : sperm and egg cells in animals, pollen and egg cells in flowering plants.
- It mixes genetic information from two parents, so the offspring vary. **Asexual reproduction** involves only one parent and no gametes.
- Its offspring are genetically identical to the parent, a **clone** (apart from any mutations).
- In plants and animals it uses cell division by **mitosis** .

DNA, genes and the genome

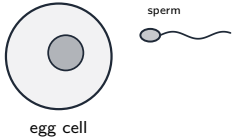
- DNA is a **polymer** made of two strands twisted into a **double helix** .
- It is found in the nucleus, in structures called chromosomes.
- A **gene** is a small section of DNA that codes for a particular sequence of amino acids, which makes a particular protein.
- The **genome** is all the genetic material of an organism.

Selective breeding, genetic engineering and cloning (2)

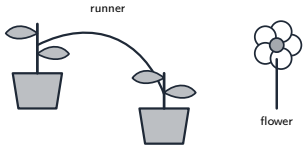
- **Embryo transplants** : cells are split apart from a young animal embryo before they specialise, and each one grows into an identical embryo, which is placed in a host mother.
- **Adult cell cloning** : the nucleus is removed from an unfertilised egg; the nucleus from an adult body cell is put in its place; an electric shock makes the egg divide into an embryo; the embryo is placed in the uterus of a host mother. Dolly the sheep, born in 1996, was cloned in this way.

Exercises 2.1·2.2

2.1 How many chromosomes are in a human egg cell? How many are in the fertilised egg? [2]

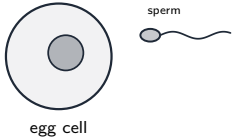


2.2 Give **two** differences between sexual and asexual reproduction. [2]



Exercises 2.1·2.2

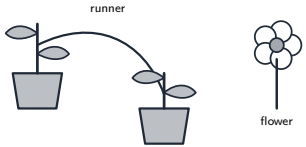
2.1 How many chromosomes are in a human egg cell? How many are in the fertilised egg? [2]



2.1

- **23**; **46**

2.2 Give **two** differences between sexual and asexual reproduction. [2]



2.2

- any two: sexual needs two parents, asexual one; sexual uses gametes; sexual gives variation, asexual gives clones; asexual uses mitosis only

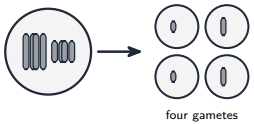
exercises.lol exercises.com.cn

Exercises 2.3·3.1

2.3 Write the bases on the other strand of this piece of DNA. [2]



3.1 Explain why the gametes made by meiosis are genetically different from each other, and why this matters. [3]



Exercises 2.3·3.1

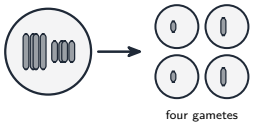
2.3 Write the bases on the other strand of this piece of DNA. [2]



2.3

- T A G; C C T

3.1 Explain why the gametes made by meiosis are genetically different from each other, and why this matters. [3]



3.1

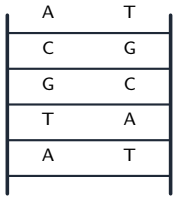
- in meiosis the chromosome pairs are separated and shared out in different combinations
- so each gamete gets a different mix of alleles
- the offspring show variation, which helps a species survive if the environment changes (natural selection)

Exercise 3.2 (a)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	A / %	T / %	G / %	C / %
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(a) Calculate the percentage of C in wheat DNA. [2]

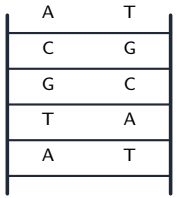


Exercise 3.2 (a)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	A / %	T / %	G / %	C / %
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(a) Calculate the percentage of C in wheat DNA. [2]



(a) $100 - (27.3 + 27.1 + 22.7) = \mathbf{22.9}\%$

Exercise 3.2 (b)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	**A / %**	**T / %**	**G / %**	**C / %**
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(b) Explain why the percentage of A is almost the same as T, and G is almost the same as C. [3]

Exercise 3.2 (b)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	**A / %**	**T / %**	**G / %**	**C / %**
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(b) Explain why the percentage of A is almost the same as T, and G is almost the same as C. [3]

(b) DNA has two strands joined by base pairs; A always pairs with T, and C always pairs with G (complementary pairs); so there is one T for every A and one C for every G

Exercise 3.2 (c)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	**A / %**	**T / %**	**G / %**	**C / %**
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(c) One strand of a gene has 900 bases. How many amino acids does the gene code for? [2]

Exercise 3.2 (c)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	**A / %**	**T / %**	**G / %**	**C / %**
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(c) One strand of a gene has 900 bases. How many amino acids does the gene code for? [2]

(c) three bases code for one amino acid; $900 \div 3 = \mathbf{300}$ amino acids

Exercise 3.2 (d)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	**A / %**	**T / %**	**G / %**	**C / %**
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(d) Strawberry plants reproduce sexually with flowers and asexually with runners. Compare the advantages of sexual and asexual reproduction. [6]

Exercise 3.2 (d)

3.2 Scientists measured the percentage of each base in the DNA of three organisms.

organism	A / %	T / %	G / %	C / %
human	30.9	29.4	19.9	19.8
wheat	27.3	27.1	22.7	?
a bacterium	25.0	25.0	25.0	25.0

(d) Strawberry plants reproduce sexually with flowers and asexually with runners. Compare the advantages of sexual and asexual reproduction. [6]

(d) points to include:

- sexual: the offspring show variation, so some may survive a change in the environment (natural selection)
- sexual: farmers can use it for selective breeding
- asexual: only one parent is needed, so it is faster and uses less energy
- asexual: no need to find a mate or rely on insects for pollination
- asexual: many identical offspring when conditions are good, but all could be killed by the same disease

Levels: **5–6** a full, logical answer with correct biology and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.