

- 1 This couple has just found out that the woman is pregnant. They wonder whether the child will be a boy or a girl.



Sex chromosomes

Sex chromosomes

- (a) Fill in the boxes to show the sex chromosomes of the woman and the man.

(2)

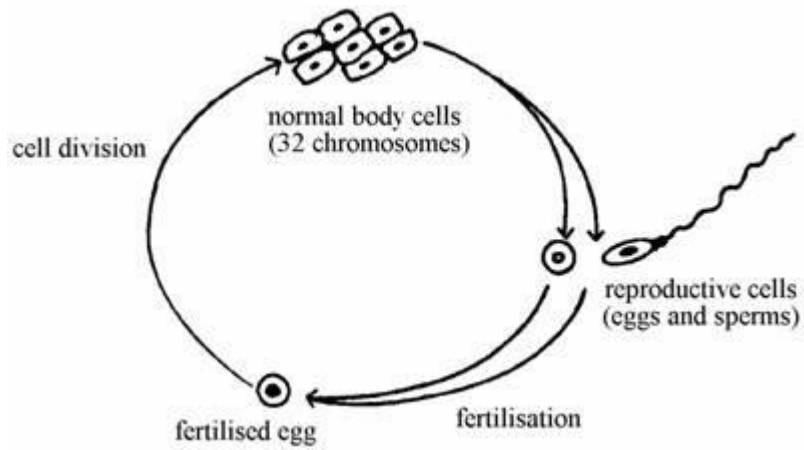
- (b) The couple already has one girl. What is the chance that the new baby will be another girl?

Explain the reason for your answer. You may use a genetic diagram if you wish.

(3)
(Total 5 marks)

2

The diagram shows three types of cells in a life history of a simple animal.



(a) How do the chromosomes of the body cells compare with the chromosomes in the fertilised egg from which they came?

(1)

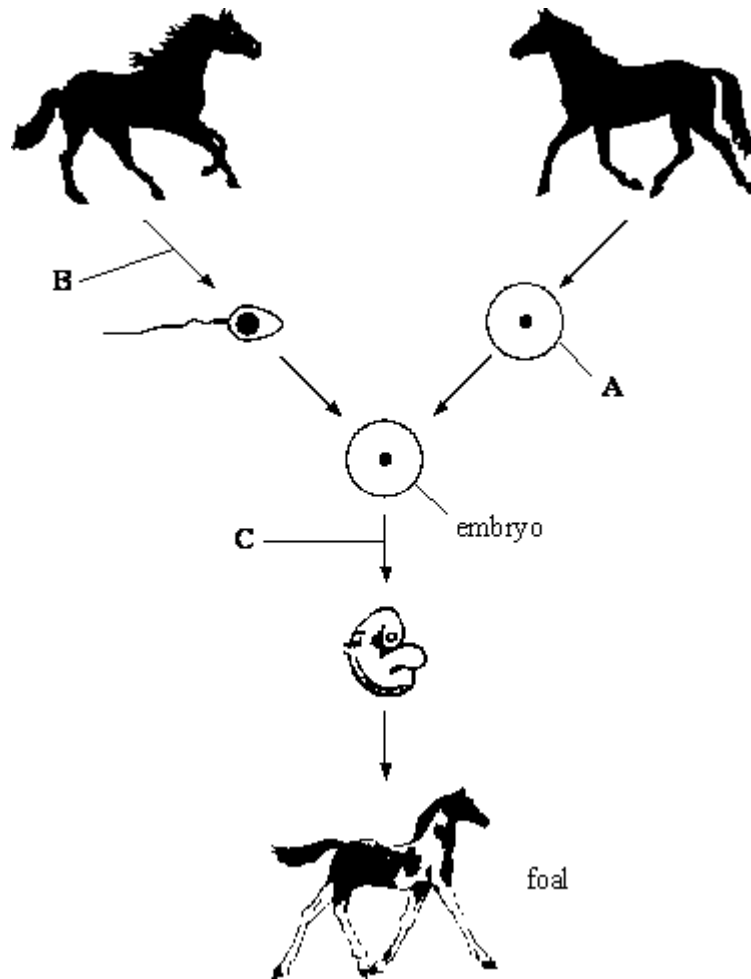
(b) Describe what happens to chromosomes in the nucleus of a body cell when it forms reproductive cells.

(4)

(Total 5 marks)

3

The drawing shows some of the stages of reproduction in horses.



(a) (i) Name this type of reproduction _____

(1)

(ii) Name the type of cell labelled **A** _____

(1)

(b) Name the type of cell division taking place at the stage labelled:

(i) **B** _____

(ii) **C** _____

(2)

(c) How does the number of chromosomes in each cell of the embryo compare with the number of chromosomes in cell **A**?

(1)

(d) When the foal grows up it will look similar to its parents but it will **not** be identical to either parent.

(i) Explain why it will look similar to its parents.

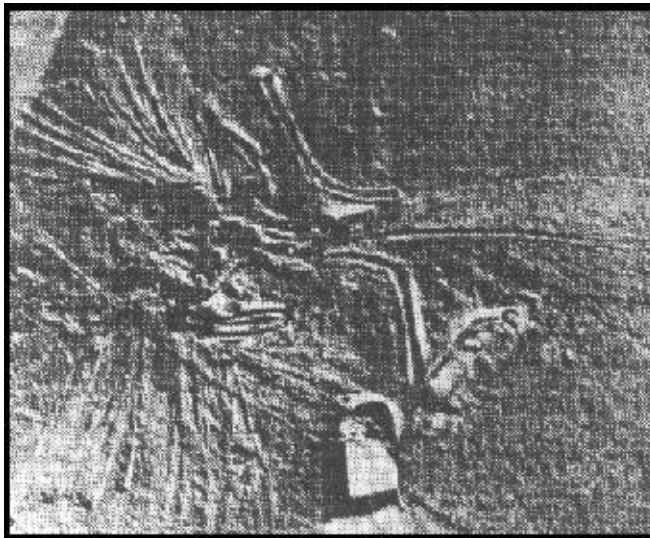
(1)

(ii) Explain why it will **not** be identical to either of its parents.

(2)

(Total 8 marks)

4 The picture shows a fossil.



(a) (i) What is a fossil?

(3)

(ii) Describe **one** way in which fossils are formed.

(2)

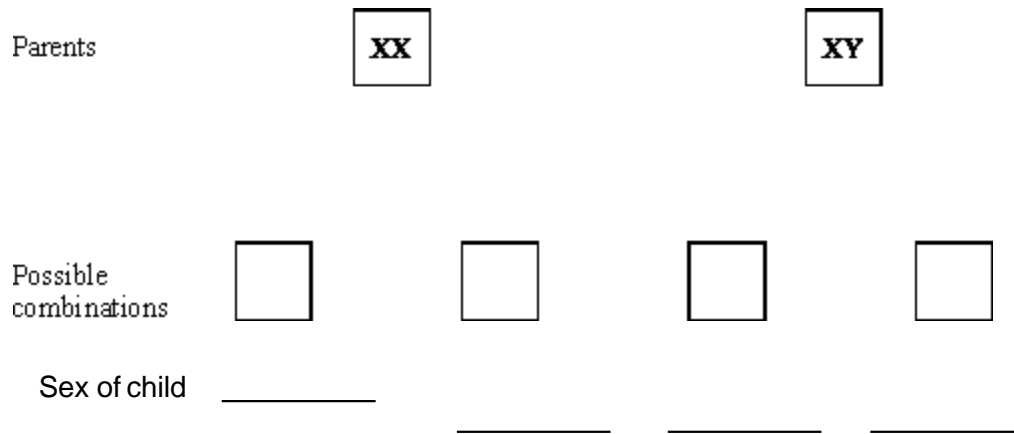
(b) We only know about extinct animals and plants because they have left fossils.
What does the word "extinct" mean?

(1)

(Total 6 marks)

5

(a) (i) Complete the genetic diagram to show the possible combinations of gametes for the four children and state the sex of the child for each combination.



(1)

(ii) What name is given to the process when a cell divides to produce gametes?

(1)

(iii) How many pairs of chromosomes are there in each human body cell?

(1)

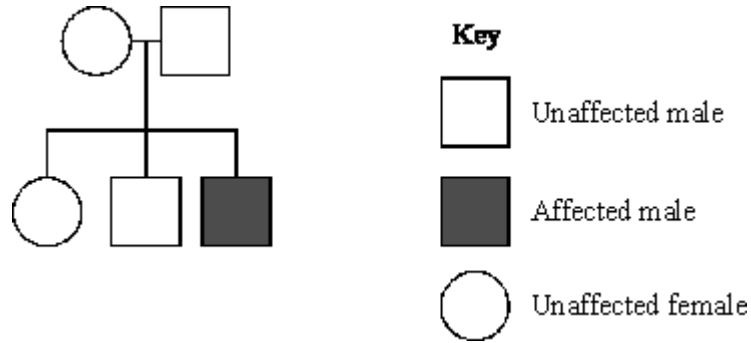
(iv) How many chromosomes are present in a human ovum?

(1)

(b) (i) Give **two** advantages to living things of reproducing sexually rather than asexually.

(2)

(ii) The genetic diagram shows two parents and three children.



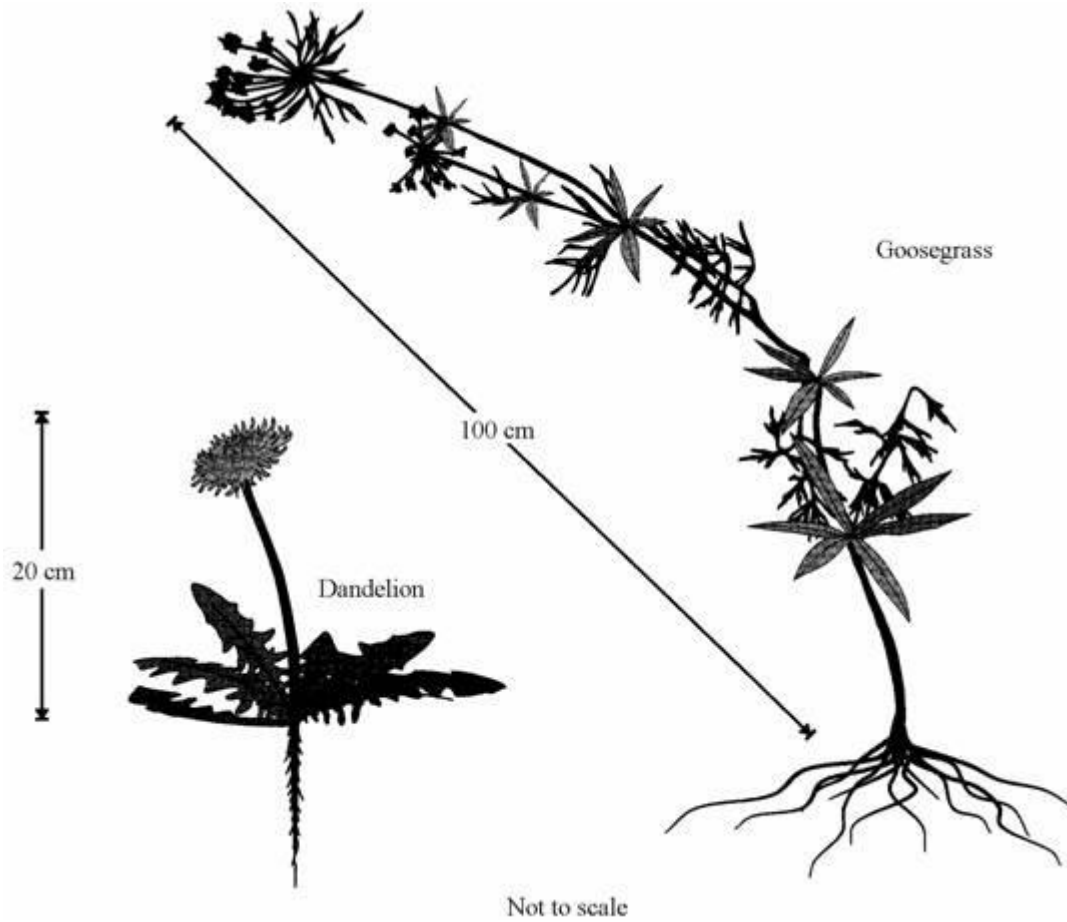
Only the son has cystic fibrosis, which is caused by a recessive allele. What conclusion may be made about the parents' genes?

(1)

(Total 7 marks)

6

Dandelions have become adapted to live in lawns and grass areas where animals graze. Goosegrass, however, has become adapted to live alongside hedgerows and cannot survive being mown.



(a) Use the information in the drawings to suggest **one** advantage of each of the following adaptations.

(i) Dandelion leaves lie flat on the ground.

(1)

(ii) A dandelion has a thick tapered root.

(1)

(iii) Goosegrass stems are long.

(1)

(iv) Goosegrass roots are thin and very long.

(1)

(b) Dandelions and goosegrass are different species of plants.

(i) What name is given to the unit of inheritance which controls one particular characteristic of a plant or animal?

(1)

(ii) Why would you be unlikely to succeed if you tried to breed a new species of plant by crossing a dandelion with goosegrass?

(1)

(c) Animals as well as plants have become adapted to live in different environments.

State **one** way a polar bear has become adapted to living in the Arctic, and the reason for the adaptation.

(2)

(Total 8 marks)

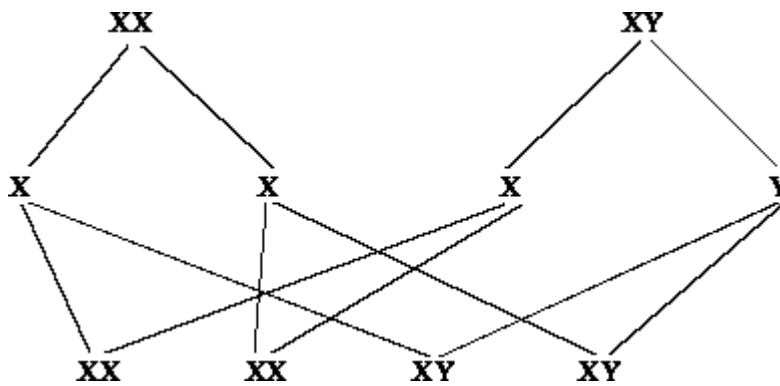
7 A particular species of snail has a shell which may be pink, yellow or brown. It may also be plain or have bands running round it.

The snails are eaten by song thrushes.

Explain why snails with plain brown shells are the most common in hedgerows.

(Total 4 marks)

8 The genetic diagram shows how the chromosomes divide and combine in human reproduction.



(a) Draw circles around the symbols for the **two** male gametes.

(2)

(b) State the chance of a child being a girl.

(1)

(c) (i) How many pairs of chromosomes are there in a human body cell?

(1)

(ii) How many chromosomes are there in a human egg cell?

(1)

(d) Chromosomes contain genes. From what substance are genes made?

(1)

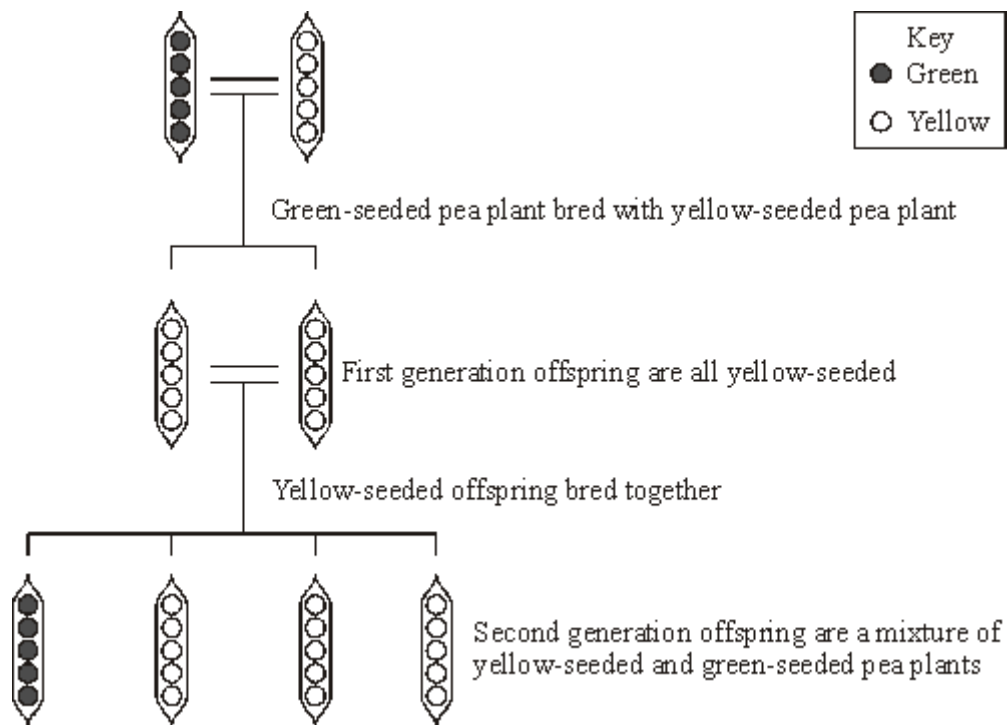
(e) In the process of mitosis, how do the number of chromosomes in the daughter cells compare to that in the original cell?

(1)

(Total 7 marks)

9

The diagram shows one of the experiments performed by a scientist called Mendel in the 1850s. He bred pea plants which had different coloured pea seeds.



(a) Use words from the box to help you to explain the results of this experiment.

dominant factor recessive

(3)

(b) Mendel explained these results in terms of *inherited factors*.

(i) What do we now call *inherited factors*?

(1)

(ii) Where, in a cell, are these *inherited factors* found?

(1)

(Total 5 marks)

10

Read the passage about antibiotics.

People do not always agree about the use of antibiotics in food production.

If we put low doses of antibiotics in feed for animals such as cattle and sheep, it helps to produce high-quality, low-cost food. Antibiotics help to keep animals disease-free. They also help animals to grow. Animals get fatter quicker because they do not waste energy trying to overcome illness.

The use of antibiotics in livestock feed means that there is a higher risk of antibiotic-resistant bacteria developing. The rapid reproduction of bacteria means there is always a chance that a population of bacteria will develop which is antibiotic-resistant. These could be dangerous to human health.

(a) *To gain full marks for this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

Explain how a population of antibiotic-resistant bacteria might develop from non-resistant bacteria.

(3)

- (b) Do you think that farmers should be allowed to put low doses of antibiotics in animal feed?
Explain the reasons for your answer.

(2)

(Total 5 marks)

Mark schemes

- 1** (a) woman XX
man XY
for 1 mark each

2

- (b) 50% / 1 in 2 / evens / 0.5 / 50:50
for 1 mark

mark scheme for genetic diagram

gametes all correct

genotypes of offspring all correct in relation to gametes

for 1 mark each

1

mark scheme for written explanation

half sperm have X chromosome, half have Y
and

all eggs have X chromosome

50% / 1 in 2 / evens / 0.5 chance of egg being fertilised
by X or Y sperm

for 1 mark each

2

[5]

- 2** (a) *idea*
identical (do not allow simply "the same number")
for 1 mark

1

(b) *idea*

chromosomes double/duplicate/copies made
for 1 mark

separate into 2 sets/divide*
gains 1 mark

but

separate into 4 sets/divide twice*
gains 2 marks

number halved compared to bodycell

or

single set (only) 16
accept in terms of cells but only if chromosomes referred to in
first and/or last items)
for 1 mark

4

[5]

3

(a) (i) sexual / sex

(ii) egg / gamete / sex cell / ovum (*reject ovule*)
for 1 mark each

2

(b) (i) meiosis / reduction

(ii) mitosis / somatic
for 1 mark each

2

(c) twice as many (*reject answers based on 23 / 46 chromosomes*)
for one mark

1

(d) (i) information / genes / DNA passed from parents
(chromosomes neutral)
for one mark

1

(ii) genes / genetic information / chromosomes from two parents
alleles may be different
environmental effect / named may have been mutation
any two for 1 mark each

2

[8]

- 4** (a) (i) *ideas that*
- remains of animal/plant of specific organism
 - (from) many years ago/thousands or millions of years
 - found in rocks/covered by sediments
- for 1 mark each*
Mark (a) as a whole to a total of 5 marks.

3

- (ii) *ideas that*
- hard parts/bones/shells/skeletons
link required
 - don't decay
- or**
- no decay
link required
 - conditions needed absent/no oxygen/no water
- or**
- parts replaced by rock mineral chemicals;
Do not accept 'materials' or 'substances'.
 - as they decay
Accept 'hard' or 'soft' parts for 1 mark each

2

- (b) *idea*

died out/none left/died off
Do not accept 'died' alone
for 1 mark

1

[6]

- 5** (a) (i) XX XY XY XX
- female male male female
- the four correct genotypes and sex are required they may be in any order*

1

(ii) meiosis
*correct spelling required but
accept meisosis not miosis or meosis* 1

(iii) 23 1

(iv) 23 1

(b) (i) any **two** from

(introduces) variation
*accept can crossbreed or offspring may gain beneficial
characteristics*

prevents the risk of all being the same
and a disease wiping out population
or prevent monoculture

two parents to raise offspring 2

(ii) both parents carry a recessive allele
or gene **or** are heterozygous
accept both parents are carriers 1

[7]

6 (a) (i) to go under teeth **or** mower
*accept not damaged by grazing animals
accept do not get cut or bitten
accept reduces competition by other plants
do not credit maximum surface of leaves facing Sun* 1

(ii) any **one** from

it can force its way through grass roots
accept in competition with grass roots

it is a store of food (to help the plant
recover)
do not credit a good store of water

to reach down to water

to give good anchorage
accept it is hard to pull up 1

(iii) any **one** from

to reach more light

*accept to get out of the shadow of the
hedge **or** tall grass*

to let seeds be caught on animals' coats
(more easily)

*accept improves access **or** visibility **or** ease for pollination
do not credit to help it grow up the hedge*

1

(iv) any one from

(they reach out from hedge) to find
water

*accept increase surface area
accept to find nutrients **or** minerals
do not award mark if food mentioned*

to give good anchorage

1

(b) (i) gene **or** allele

do not credit chromosome

1

(ii) any **one** from

they do not crossbreed **or** interbreed

*accept different species do not breed together **or** do not fertilise
each other*

do not produce fertile offspring

have different numbers or types of chromosomes

*accept genes are incompatible
do not credit have different genes **or** are genetically different
do not credit do not pollinate each other*

1

- (c) one mark is for the adaptation and one is for an appropriate reason

have white fur

for camouflage

are huge

for large volume to surface area

thick layer of fat

for insulation or to reduce heat loss or retain heat

do not credit to stop it losing heat or withstand the cold or keep it warm

have thick fur

for insulation or to reduce heat loss or retain heat

hibernate

to avoid the coldest part of year

is a carnivore

because animals provide high energy food

has big paws or claws

to be able to walk on snow

have small ears

to reduce heat loss

have furry feet

for insulation from the snow

2

[8]

7

idea brown colour/plain shell inconspicuous

for 1 mark

less likely to be eaten

gains 1 mark

but

less likely to be eaten before breeding

gains 2 marks

so alleles (genes) passed on

for 1 mark

(N.B accept inverse of any of the above)

[4]

- 8** (a) circles round right hand **X** and **Y** gametes
put two ticks or crosses by the circles 2
- (b) 50:50 **or** 1:1 **or** 50% **or** 0.5 **or** ½ equal **or** evens
credit even
do not accept 2:1 or 50 / 50 1
- (c) (i) 23 1
- (ii) 23
credit the same as the one above to be marked consequential 1
- (d) DNA
do not accept nucleic acid 1
- (e) same 1

[7]

- 9** (a) any **three** from:
factor for colour has two forms
accept gene for factor and allele for form
yellow dominant since all first generation yellow
accept F1 for first generation
green recessive since reappears in second generation
accept F2 for second generation 3
- (b) (i) genes
accept alleles / genetic 1
- (ii) nucleus
accept chromosomes / DNA 1

[5]

- 10** (a) **Quality of written communication**
The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme

idea of mutation **or** variation

*do **not** allow 'bacteria get used to antibiotics' **or** idea that antibiotics change the bacteria **or** 'bacteria become immune' **or** references to adaptation or evolution*

1

(resistant cells) survive antibiotic

1

(resistant cells) breed

1

- (b) **EITHER** (yes)

keep animals disease free (1) so grow faster (1 mark) **or** live longer

OR (no)

resistant bacteria may develop (1)

risk to human **or** animal health (1)

allow bacteria become resistant / immune

2

[5]