AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.1 REPRODUCTION (PACK 6)

SCORE	PERCENTAGE
/149	%

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Q1.

The genetic material in cells is made of DNA.

(a) Which **two** of the following describe the structure of DNA?

Tick **two** boxes.

A double helix ☐

A monomer ☐

A polymer ☐

A protein ☐

A single strand ☐

(2)

(b) Complete the sentences.

Choose answers from the box.

clone	**disorder**	**gene**
genome	**mutation**	

A small section of DNA which codes for one protein is called a _____ .

All the genetic material of an organism is called its _____ .

(2)

(c) Gametes (sex cells) contain half the amount of DNA compared to body cells.

Give the names of the **two** types of gametes in humans.

_____ and _____

(1)

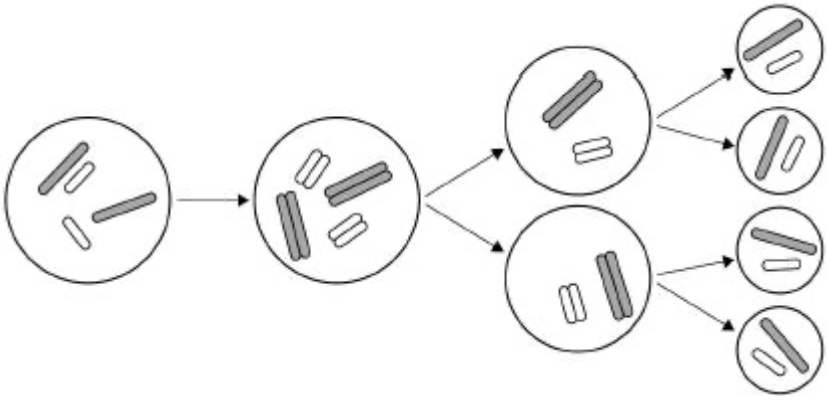
(d) What is the process called when the gametes join?

_____

(1)

(e) The diagram below shows cell division by meiosis to form gametes.

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Which **two** features in the diagram above show that this cell division is meiosis and **not** mitosis?

Tick **two** boxes.

The cell divides twice	☐
The chromosomes pull apart into the new cells	☐
The cytoplasm divides into new cells	☐
The DNA is copied	☐
The new cells have half the number of chromosomes	☐

(2)

(Total 8 marks)

Q2.

Variation in individual organisms can be caused by:

- genes
- the environment
- a combination of both genes and the environment.

Figure 1 shows variations in a woman.

Figure 1

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(a) What is the cause of each variation in the table below?

Tick only **one** box in each row.

Variation	Cause of variation		
	Genes only	**Environment only**	**Both genes and the environment**
Brown eyes			
Light brown skin colour			
Short hair			

(3)

(b) The allele for blue eyes is recessive (**b**).

The allele for brown eyes is dominant (**B**).

A woman has blue eyes.

What are the woman's alleles?

Tick **one** box.

BB ☐ **Bb** ☐ **bb** ☐

(1)

(c) The woman marries a man with the alleles **Bb** for eye colour.

What colour eyes does the man have?

_____

(1)

(d) Complete the Punnett square diagram in **Figure 2** for this man and woman.

Figure 2

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		Woman	
Man	B		
	b		

(1)

(e) What is the probability that a child of this man and woman will have brown eyes?

_____

(1)

(f) What is the scientific term used for the child's eye colour?

Tick **one** box.

- Chromosome ☐
- Condition ☐
- Genotype ☐
- Phenotype ☐

(1)

(g) What effect will a mutation have?

Tick **one** box.

- Almost certainly have no effect ☐
- Definitely change appearance ☐
- Definitely be passed on to all children ☐
- Probably cause a disease ☐

(1)

(Total 9 marks)

Q3.

Many people eat shellfish called oysters.

An oyster has 20 chromosomes in each body cell.

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(a) Which arrangement of chromosomes will a male oyster have in each body cell?

Tick **one** box.

One X and one Y chromosome and 8 pairs of other chromosomes	☐
Two X and two Y chromosomes and 8 pairs of other chromosomes	☐
One X and one Y chromosome and 9 pairs of other chromosomes	☐
Two X chromosomes and 9 pairs of other chromosomes	☐

(1)

(b) Oyster gametes only contain half the amount of DNA compared to a normal oyster body cell.

Describe the type of cell division that produces gametes.

_____

_____

_____

_____

_____

_____

(3)

Biologists have discovered a way to produce oysters that have three sets of chromosomes (triploid) instead of the usual two sets (diploid).

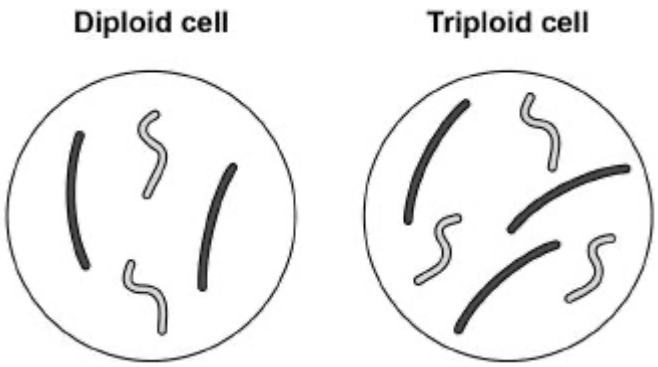
The triploid oysters cannot reproduce and so they grow more quickly.

Diploid oysters do not taste good in the reproductive season. Triploid oysters taste good all year.

The diagram below shows the chromosomes in a diploid cell and in a triploid cell.

Only two sets of chromosomes are shown.

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(c) Suggest why the triploid oysters are **not** able to reproduce.

_____

_____

_____

(1)

(d) Explain why the triploid oysters grow more quickly than the diploid oysters.

_____

_____

_____

_____

_____

_____

(2)

(e) The population of diploid oysters growing in the wild has reduced by over 80% in the last 20 years.

Suggest **two** environmental factors which may be causing this reduction.

Give a reason why each factor may be causing the reduction in the population.

1. _____

_____

2. _____

_____

(2)

(f) Oyster farmers grow the triploid oysters from young seed oysters.

The production of seed oysters involves the use of a chemical called cytochalasin B. Cytochalasin B has been shown to cause cancer in mice.

Evaluate the production of triploid oysters for supermarkets and restaurants.

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_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 15 marks)

Q4.

Sperm cells and egg cells carry genetic information.

(a) What is the name of the chemical that carries genetic information?

_____

(1)

(b) What are sperm cells and egg cells?

Tick **one** box.

Gametes ☐

Genes ☐

Homozygous ☐

Phenotype ☐

(1)

(c) Which process produces sperm cells?

Tick **one** box.

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Fertilisation ☐

Homeostasis ☐

Meiosis ☐

Respiration ☐

(1)

(d) Mice have 40 chromosomes in each body cell.

How many chromosomes will be in each sperm cell?

Tick **one** box.

10 ☐

20 ☐

40 ☐

80 ☐

(1)

A mouse will always have black fur if one **or** two black fur alleles are inherited.

(e) What word describes the black fur allele?

Tick **one** box.

Dominant ☐

Recessive ☐

Heterozygous ☐

Homozygous ☐

(1)

Two black mice both have one black fur allele (**B**) and one brown fur allele (**b**).

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(f) Complete the genetic diagram below to show the possible offspring of these mice.

		Parent 1	
		B	b
Parent 2	B	BB	Bb
	b		bb

(1)

(g) On the diagram above draw a ring around **one** offspring with brown fur.

(1)

(h) What is the chance of the offspring from the two black mice being brown?

_____

_____

(1)

(Total 8 marks)

Q5.

Marfan syndrome is a rare genetic disorder that causes problems with many body systems.

(a) Which sentence best describes a gene?

Tick **one** box.

A long chain of carbohydrate ☐

A short section of DNA ☐

All of the chromosomes in an organism ☐

Several amino acids joined together ☐

(1)

(b) What does a gene code for?

Tick **one** box.

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A carbohydrate polymer ☐

A DNA double helix ☐

One glycerol and three fatty acids ☐

A sequence of amino acids ☐

(1)

(c) What scientific term is used to describe all the genes of one organism?

_____

(1)

(d) What term is used to describe the observed characteristics of an individual?

Tick **one** box.

Allele ☐

Genotype ☐

Homozygous ☐

Phenotype ☐

(1)

(e) Marfan syndrome is caused by a dominant allele, **R**.

The normal allele is recessive, **r**.

A man who is heterozygous for Marfan syndrome has a child with a woman who does not have the disorder.

Draw a genetic diagram to show the probability of their child inheriting Marfan syndrome.

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Probability = _____

(4)

(f) Very rarely, a new case of Marfan syndrome can occur because of a mutation during meiosis.

Explain how a mutation during meiosis could affect every cell in one offspring.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 12 marks)

Q6.

This question is about reproduction.

(a) Complete the sentences.

Choose answers from the box.

asexual	**clones**	**eggs**	**gametes**
meiosis	**mitosis**	**sexual**	**variation**

Identical offspring are produced by _____ reproduction.

These offspring are called _____ .

In another form of reproduction male and female _____ join at fertilisation.

This leads to _____ in the offspring.

The embryo grows by a type of cell division called _____ .

(5)

(b) The body cells of a kangaroo have 16 chromosomes.

How many chromosomes will an egg cell of a kangaroo have?

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Tick **one** box.

4 ☐ 8 ☐ 16 ☐ 32 ☐

(1)

(c) Which sex chromosomes will be in the body cells of a male kangaroo?

Tick **one** box.

XX ☐ XZ ☐ XY ☐ YZ ☐

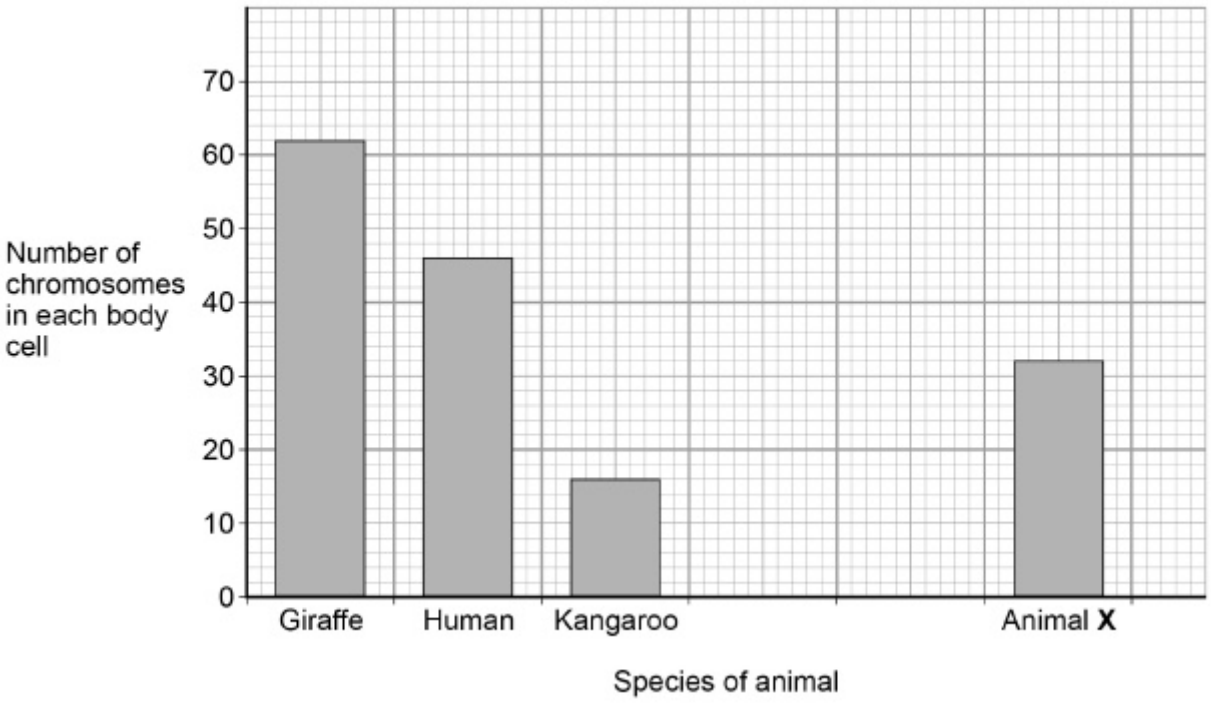
(1)

Different species of animal have different numbers of chromosomes in their body cells.

The table shows the chromosome number of some species.

Species of animal	**Number of chromosomes in each body cell**
Giraffe	62
Human	46
Kangaroo	16
Snail	24
Zebra fish	50

(d) Plot the data from the table for the snail and for the zebra fish on the graph.



(2)

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(e) Look at the graph.

How many more chromosomes are there in the body cells of giraffes than in the body cells of animal **X**?

_____

Number of chromosomes = _____

(1)

(f) A student concluded:

'the bigger an animal, the more chromosomes it has in each body cell.'

This is **not** a valid conclusion.

Give **one** reason why.

_____

_____

(1)

(Total 11 marks)

Q7.

This question is about reproduction.

(a) Describe the difference between the way hormonal and non-hormonal methods of contraception work.

Give **one** example of each method of contraception.

_____

_____

_____

_____

_____

_____

(3)

The urine of women using hormonal methods of contraception contains high levels of progesterone.

Concentrations of 1–3 ng/dm^3 of progesterone are found in the water of rivers near sewage outflow points.

Scientists investigated the effect of different concentrations of progesterone in water on fish reproduction.

This is the method used.

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1. Prepare tanks of water containing different concentrations of progesterone.

2. Put a breeding pair of fish into each tank.

3. Record the number of eggs produced per day by the female in each tank for 14 days.

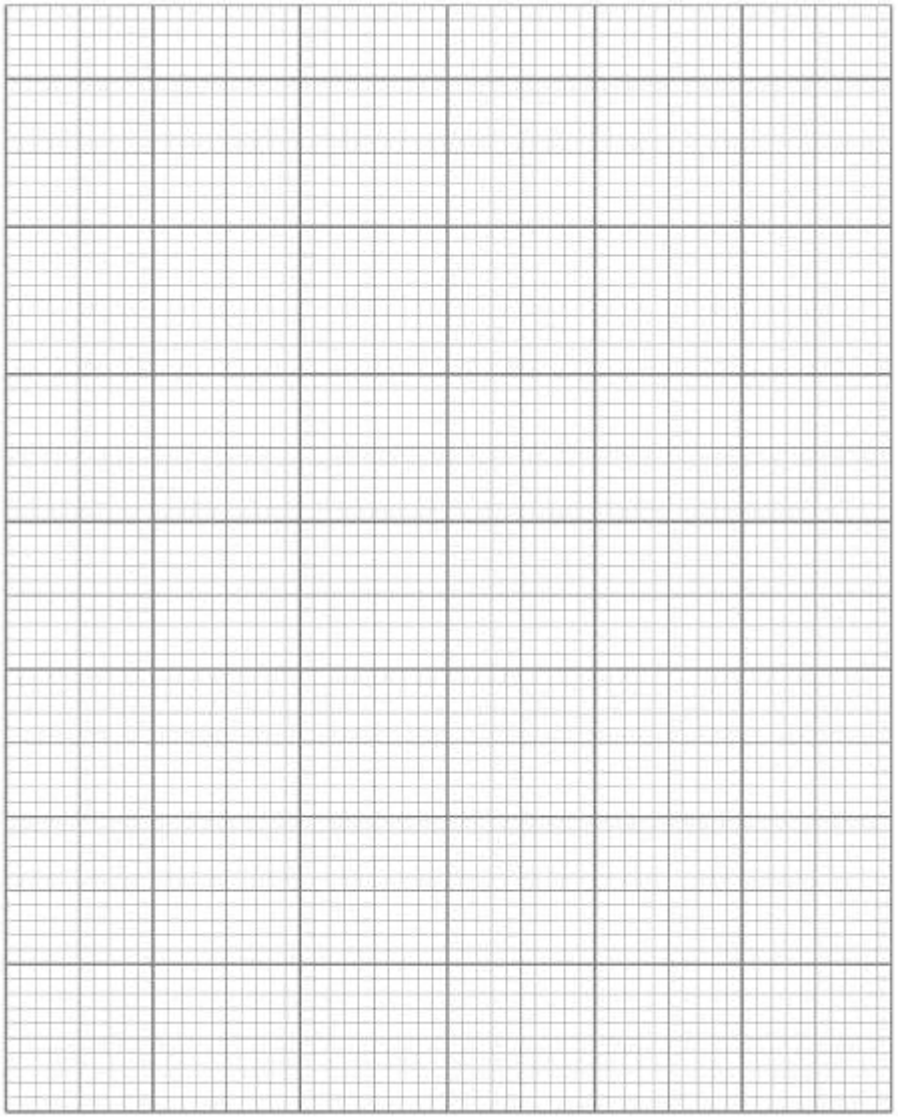
The table shows the results.

Concentration of progesterone in water in ng/dm^3	**Mean number of eggs produced per day**
0.0	28.6
0.8	4.5
1.5	3.2
3.0	2.8
10.0	1.1
20.0	0.2

(b) Plot the data from the table on the grid.

You should:
- label each axis
- use a suitable scale
- draw a line of best fit.

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(4)

(c) Describe the effect on fish reproduction of the concentrations of progesterone found in rivers near sewage outflows.

Use data from your graph.

_____

_____

_____

_____

(2)

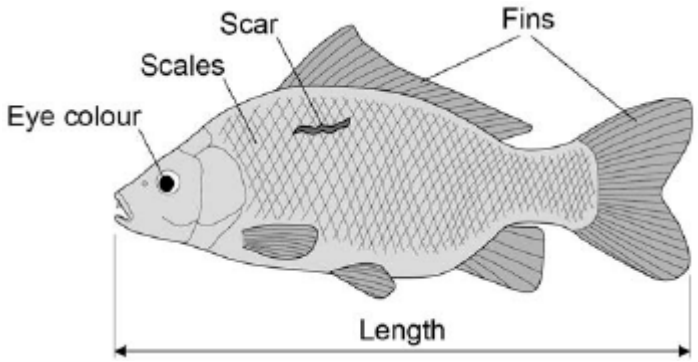
(Total 9 marks)

Q8.

Figure 1 shows a fish called a carp.

Figure 1

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The characteristics of an animal can be a result of:

- only genetic causes
- only environmental causes
- both genetic **and** environmental causes.

(a) Give **one** characteristic shown in **Figure 1** for each different cause.

Only genetic causes _____

Only environmental causes _____

Both genetic **and** environmental causes _____

_____

(3)

(b) Two alleles control the body colour of carp:

- brown (**B**)
- blue (**b**).

The brown allele is dominant to the blue allele.

The genetic cross from breeding two carp is shown in **Figure 2**.

Figure 2

	B	**b**
b	Bb	
b		

Complete **Figure 2**.

(2)

(c) Draw a ring around **one** blue offspring shown in **Figure 2**.

(1)

(d) What is the probability that the offspring from this genetic cross will be brown?

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Tick **two** boxes.

0 ☐

0.25 ☐

0.5 ☐

1.0 ☐

(1)

(e) Carp can produce large numbers of offspring.

The two carp crossed in **Figure 2** had 260 000 offspring.

Approximately how many offspring are expected to be brown?

_____

Brown carp offspring = _____

(1)

(f) A pond contains carp used for breeding.

The carp for breeding are brown or blue.

A red carp has been seen.

The red carp was **not** added to the pond.

Suggest what might have caused the red carp to appear.

_____

_____

(1)

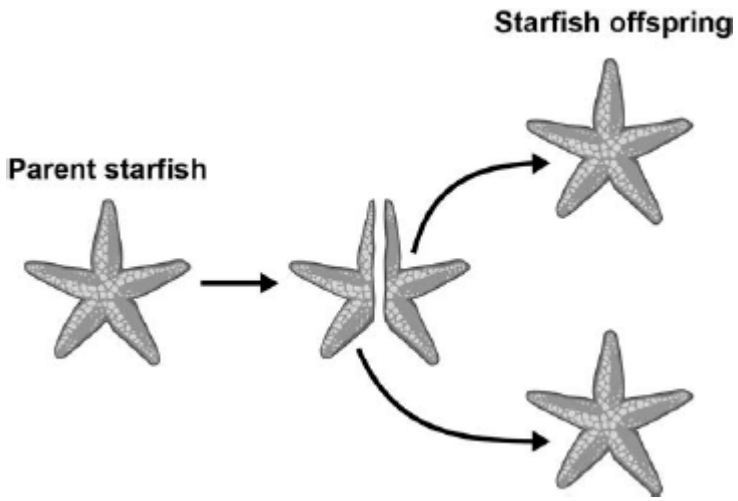
(Total 9 marks)

Q9.

Starfish can split in half. Each half can then grow new arms to form offspring.

This process is shown in the figure below.

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(a) What process produces the starfish offspring?

Tick **one** box.

- Asexual reproduction ☐
- Fertilisation ☐
- Selective breeding ☐
- Sexual reproduction ☐

(1)

(b) More cells are produced as the starfish grows more arms.

What process will produce more cells in the starfish as they grow?

_____

(1)

(c) All the offspring produced are genetically identical.

What name is given to genetically identical organisms?

_____

(1)

(d) Each body cell of the parent starfish contains 44 chromosomes.

How many chromosomes are in each body cell of the offspring?

_____

(1)

(Total 4 marks)

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Q10.

Moose are animals that eat grass.

Figure 1 shows a moose.

Figure 1



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Figure 2 shows a food chain.

Figure 2

Grass → Moose → Wolves

(a) Name the secondary consumer shown in **Figure 2**.

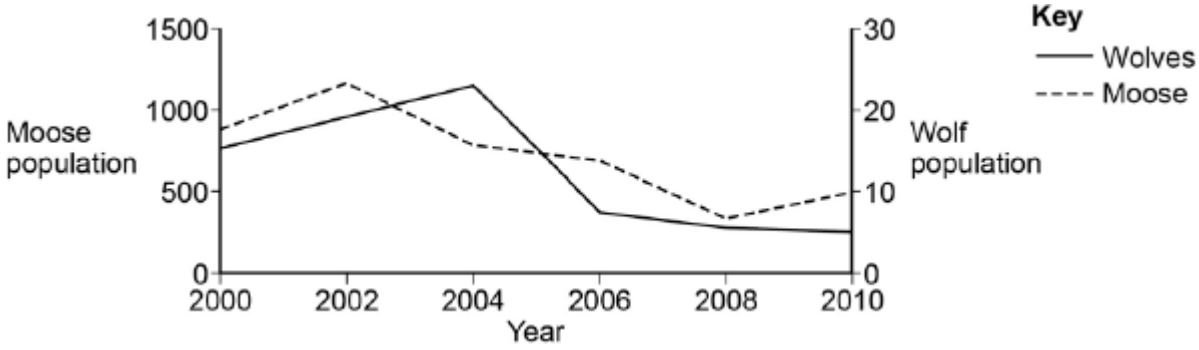
_____

(1)

(b) **Figure 3** shows how the moose population and wolf population have changed in one area.

This is a predator-prey cycle.

Figure 3



In 2004 the line on **Figure 3** for wolves is above the line for moose.

How does **Figure 3** show that there are more moose than wolves in 2004?

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_____

_____

(1)

(c) Suggest why the moose population decreased between 2002 and 2004.

Use information from **Figure 3**.

_____

_____

(1)

(d) The number of wolves is one biotic factor that could affect the size of the moose population.

Give **two** other biotic factors that could affect the size of the moose population.

1. _____

_____

2. _____

_____

(2)

(e) Moose have distinct characteristics such as antlers.

Describe how moose may have evolved to have large antlers.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

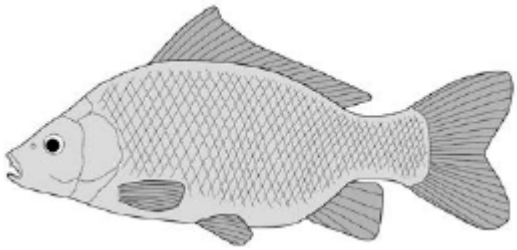
(5)

(Total 10 marks)

Q11.

The figure below shows a carp.

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(a) A mutation causes a blue colour in some carp.

What is a mutation?

_____

_____

(1)

(b) Suggest how a mutation could cause a different colour in carp.

_____

_____

(1)

(c) Two alleles control the body colour of carp:

- brown (**B**)
- blue (**b**).

The brown allele is dominant to the blue allele.

Two carp that are heterozygous for colour are crossed and produce 2.6×10^5 offspring.

Approximately how many of the offspring are expected to be blue?

Draw a genetic diagram to explain your answer.

Give your answer in standard form.

Number of offspring expected to be blue = _____

(5)

(d) A scientist wanted to find out whether a brown carp has the genotype **BB** or **Bb**.

Describe what genetic cross a scientist could do to determine this.

_____

_____

_____

_____

_____

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(2)

(Total 9 marks)

Q12.

Sexual reproduction in humans involves the joining together of an egg cell and a sperm cell.

The sex of an embryo is decided by the chromosomes they inherit from their mother and father.

(a) Where in the cell are the chromosomes?

Tick **one** box.

Cell membrane	☐
Cytoplasm	☐
Nucleus	☐
Ribosomes	☐

(1)

(b) Draw **one** line from each type of cell to the number of chromosomes in the cell.

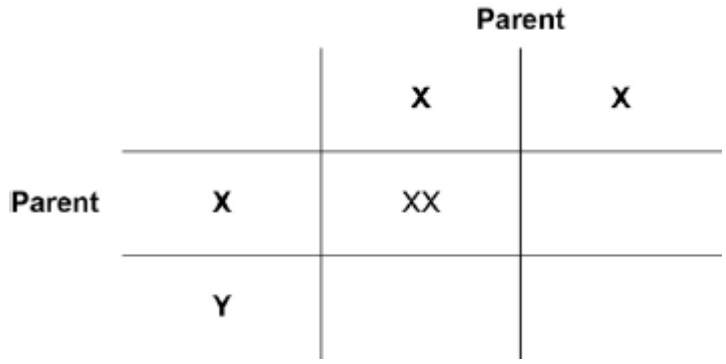
Type of cell	Number of chromosomes
	23
Sperm cell	26
	46
Embryo cell	52
	69

(2)

(c) A man and a woman decide to have a child.

Complete the genetic diagram in the figure below.

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(2)

(d) On the figure above, circle a male child.

(1)

(e) What is the chance of the man and woman having a boy?

Tick **one** box.

1 in 2 ☐

1 in 3 ☐

1 in 4 ☐

1 in 8 ☐

(1)

(Total 7 marks)

Q13.

Huntington's disease is an inherited disorder that affects the nervous system.

It is caused by a dominant allele.

A man is heterozygous for Huntington's disease.

His partner is healthy and does not have the allele that causes Huntington's disease.

(a) What are the genotypes of the man and the woman?

Use:

- **H** for the allele that causes Huntington's disease
- **h** for the healthy allele.

Man's genotype _____

Woman's genotype _____

(1)

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(b) The couple want to have a child.

Use a Punnett square to determine the probability of the child having Huntington's disease.

Circle the genotypes of any children that will have Huntington's disease.

Probability of child having Huntington's disease = _____

(4)

(c) The couple visit a genetic counsellor, who gives them the following options.

1. Adopt a child.

2. Gamete donation – uses sperm from another man to fertilise the woman's eggs by in vitro fertilisation (IVF).

3. Conceive naturally.

4. Use pre-implantation genetic diagnosis (PGD).

   - Many embryos are produced by IVF using gametes from the man and woman.
   - Embryos are tested for Huntington's disease and a healthy embryo is implanted into the woman's uterus.
   - The risk of implanting an embryo with the allele for Huntington's disease is 0.2%.
   - Costs the NHS about £11 000.

5. Conceive naturally and use prenatal diagnosis (PND) once the woman becomes pregnant.

   - A sample of the placenta is taken at 10 weeks of pregnancy or a sample of fluid is taken from around the developing baby at 16 weeks of pregnancy.
   - The sample is tested for the Huntington's allele.
   - A 0.5–1.0% risk of miscarriage.
   - About 1% of samples collected are unsuitable for testing.
   - Costs the NHS about £600.

The couple decide they want to have a healthy baby that is their own biological offspring.

Evaluate the options.

Suggest which option would be best for the couple.

_____

_____

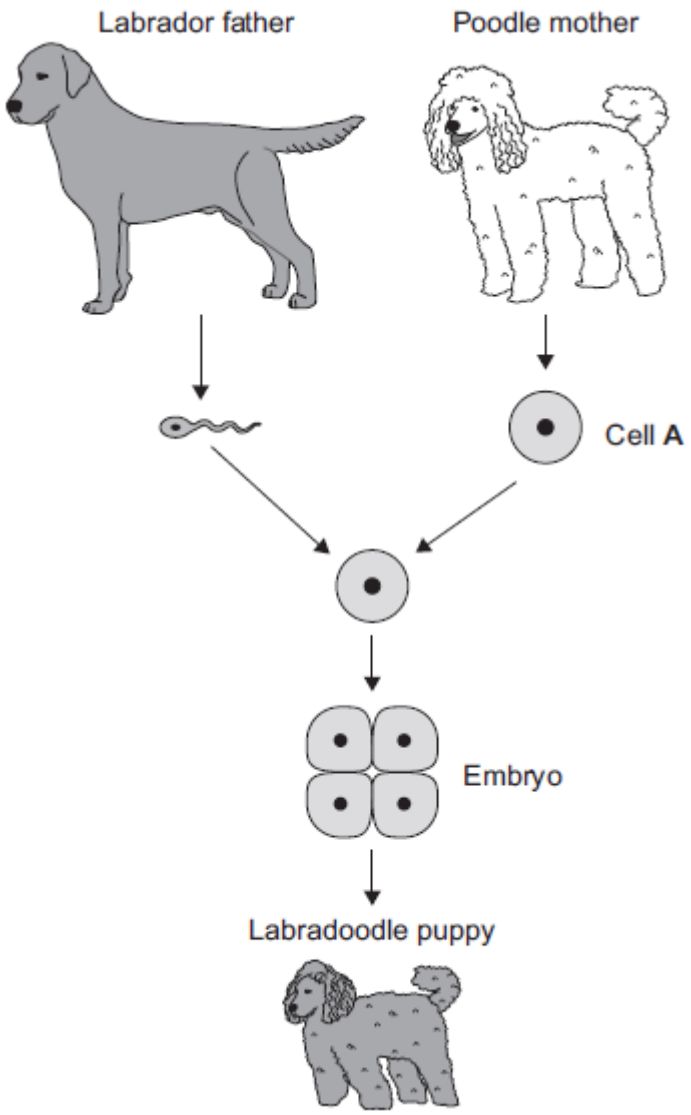
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(6)

(Total 11 marks)

Q115.

The diagram shows how a Labrador can be crossed with a Poodle to produce a Labradoodle puppy.



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(a) (i) What is the name of Cell **A** shown above?

_____

(1)

(ii) Draw a ring around the correct answer to complete each sentence.

The sperm cell and Cell **A** are types of

embryo. **gamete.** **gene.**

The type of reproduction shown in the diagram is called

asexual reproduction. **tissue culture.** **sexual reproduction.**

(2)

(b) The Labradoodle puppy has some characteristics of each of its parents, but it is not identical to either parent.

(i) Give **one** characteristic of the Labradoodle puppy which is similar to the Labrador father but **not** the Poodle mother.

_____

_____

(1)

(ii) Give **one** characteristic of the Labradoodle puppy which is similar to the Poodle mother but **not** the Labrador father.

_____

_____

(1)

(Total 5 marks)

Q116.

Some species of wolf are endangered and are at risk of becoming extinct.

The image shows a Red wolf. The Red wolf is an endangered species.

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Red wolves are only in season (fertile) once a year.

Scientists have developed a method that could be used to protect Red wolves from becoming extinct.

Sperm from a male Red wolf can be used to fertilise eggs from a female Red wolf. The embryos produced can then be frozen.

Later, when female wolves are in season and able to support a pregnancy, the embryos are implanted into their wombs.

All the Red wolf cubs produced would be different from their biological parents and different from each other.

(a) Explain why the Red wolf cubs would be different from their biological parents and different from each other.

_____

_____

_____

_____

_____

_____

(3)

(b) In the long-term it would be better to produce Red wolves that are different from each other.

Suggest why.

_____

_____

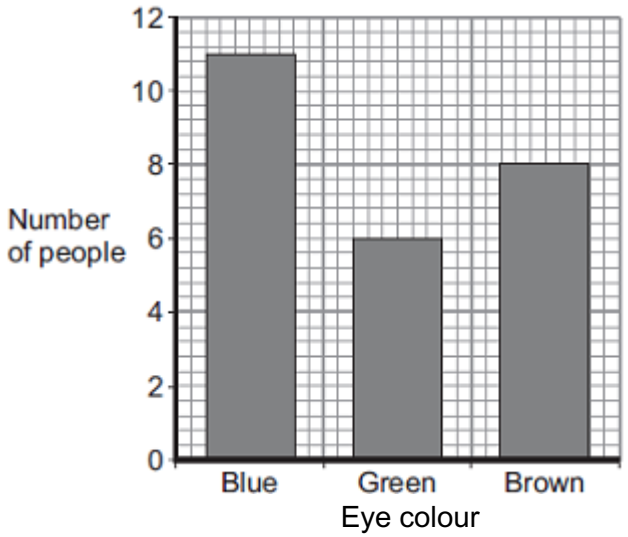
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(1)
(Total 4 marks)

Q117.

A student carried out a survey of eye colour in her class.

Her results are shown in the figure below.



(a) What type of variable is eye colour?

Draw a ring around the correct answer.

categoric **continuous** **control**

(1)

(b) (i) How many people in the class had blue eyes?

Number of people with blue eyes = _____

(1)

(ii) How many people were in the student's class?

_____

_____

Number of people in the class = _____

(1)

(iii) Give **one** conclusion that can be made from the data in the figure above.

_____

_____

(1)

(c) (i) Use the correct answer from the box to complete the sentence.

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a cell	a gene	nucleus

Eye colour is controlled by _____ .

(1)

(ii) Use the correct answer from the box to complete the sentence.

mother's milk	enzyme	sex cells

The information for eye colour is passed from parents to offspring in the

_____ .

(1)

(Total 6 marks)

Q118.

The figure below shows flamingos. Flamingos are birds. They have long legs.

They can walk in deep water and use their long necks to reach food in the mud.



How would Darwin have explained the evolution of the flamingo's long neck?

Use the correct answer from the box to complete each sentence.

mutation	natural selection	sexual reproduction	variation

In a population of flamingos there are birds with different lengths of neck.

This range of differences in neck length is called _____ .

The flamingos with longer necks are better adapted to feed in deeper waters.
They are more likely to survive than flamingos with shorter necks.

This is an example of _____ .

The surviving flamingos pass on their genes for a longer neck to their offspring

during _____ .

(Total 3 marks)

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Q119.

Kittens are usually produced by sexual reproduction.



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Explain how sexual reproduction produces variety in the offspring.

(Total 4 marks)

Q120.

The picture shows a mother with her puppies.



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Photograph supplied by iStockphoto/Thinkstock

(a) Use words from the box to complete the sentences.

asexual	embryos	gametes	genes	sexual

The puppies were produced by _____ reproduction.

This type of reproduction involves the fusion of male and

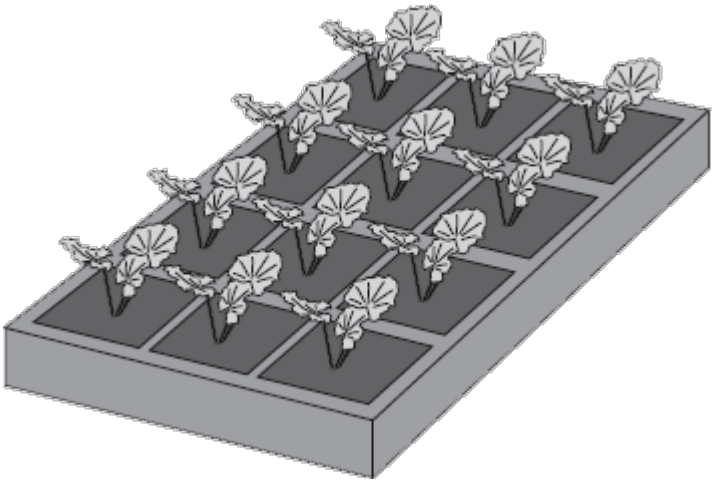
female _____

The puppies all look different because their cells contain different mixtures

of _____

(3)

(b) A gardener produced some genetically identical geranium plants.



Complete the following sentences.

Genetically identical organisms are called _____

Genetically identical organisms are produced by _____ reproduction.

(2)

(Total 5 marks)

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