AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.3 THE DEVELOPMENT OF UNDERSTANDING OF GENETICS AND EVOLUTION (PACK 4)

SCORE	PERCENTAGE
/210	%

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Q1.

Pseudomonas bacteria cause infections in hospital patients.

A new strain of *Pseudomonas* bacteria has evolved. This new strain can only be killed by one antibiotic called fluroquinolone.

Scientists want to prevent the new strain of *Pseudomonas* from spreading in the human population.

Explain the advice doctors should be given to prevent the spread of the new strain.

(Total 6 marks)

Q2.

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 ☐

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Several amino acids joined together ☐

(1)

(b) What does a gene code for?

Tick **one** box.

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)

Q3.

Some students investigated the compounds in a green lettuce leaf and a red cabbage leaf.

The students placed each leaf in boiling ethanol and then tested each leaf for starch.

(a) The boiling point of ethanol is 78 °C

Ethanol is flammable so should not be directly heated with a Bunsen burner.

Give **one** way ethanol can be boiled safely.

Do **not** refer to wearing goggles in your answer.

_____

_____

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(1)

(b) Describe how the students could test the leaves for starch.

Give the result if starch is present.

Test _____

_____

Result _____

(2)

(c) The students used paper chromatography to investigate the coloured pigments in both types of leaf.

Explain how paper chromatography causes the different pigments to separate.

_____

_____

_____

_____

_____

_____

(3)

Table 1 shows the students' results. The distance the solvent and each pigment moved was measured from the start line.

Table 1

	Green lettuce		**Red cabbage**	
	Distance moved in mm	R_f value	Distance moved in mm	R_f value
Solvent front	120	–	113	–
Yellow-green pigment	18	0.15	14	0.12
Bright green pigment	24	0.20	Not found	Not found
Yellow pigment	40	0.33	46	0.41
Orange pigment	120	1.00	113	1.00

Table 2 shows the known R_f value ranges of some pigments.

Table 2

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Pigment	R_f value
Carotene	0.89 −0.98
Pheophytin a	0.42 −0.49
Pheophytin b	0.33 −0.40
Chlorophyll a	0.24 −0.30
Chlorophyll b	0.20 −0.26
Xanthophyll	0.04 −0.28

(d) One pigment was found in the green lettuce leaf, but was **not** found in the red cabbage leaf.

Describe why it is **not** possible to be certain what this pigment is.

Use the information in **Table 1** and **Table 2** to help you.

_____

_____

(1)

(e) The experiment was repeated and the solvent front travelled 140 mm from the start line.

Calculate the range of distances where the pigment carotene would be seen.

Use the equation for calculating R_f values and the information in **Table 2** to help you.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

From _____ mm to _____ mm

(5)

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(f) Different coloured pigments absorb light at different wavelengths.

Explain how plants could have evolved to contain more than one pigment in their leaves.

(6)

(Total 18 marks)

Q4.

Dravet syndrome is caused by a genetic mutation.

Dravet syndrome causes epileptic seizures. An epileptic seizure is caused by unusual brain activity.

(a) Mutations often happen when cells divide.

Give **one** other cause of genetic mutations.

(1)

(b) Scientists have transferred the mutated gene for Dravet syndrome into zebrafish using genetic engineering.

This means the scientists could test a new drug to treat Dravet syndrome on the zebrafish.

Which **two** of the following are used during the process of genetic engineering?

Tick **two** boxes.

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Enzymes ☐

Placebos ☐

Vaccines ☐

Vectors ☐

White blood cells ☐

(2)

(c) Scientists used the genetically engineered zebrafish to test the new drug.

Describe the processes that then need to happen to test the new drug before it can be used to treat all children with Dravet syndrome.

(6)

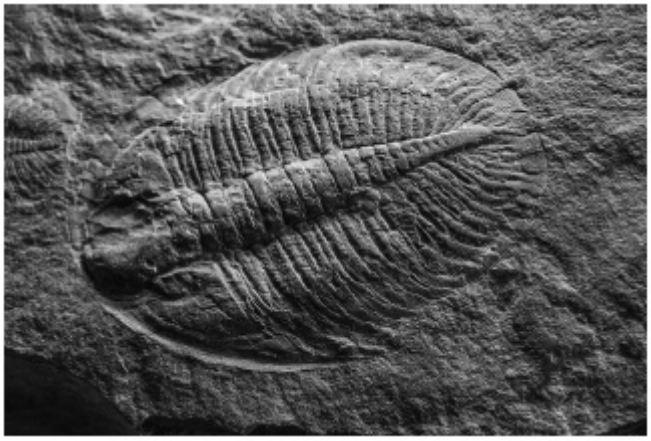
(Total 9 marks)

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Q5.

Figure 1 shows a photograph of a fossil of a trilobite.

Figure 1



(a) When were trilobites alive?

Tick **one** box.

- Between 20 and 50 years ago. ☐
- Between 20 and 50 thousand years ago. ☐
- Between 200 and 500 thousand years ago. ☐
- Between 200 and 500 million years ago. ☐

(1)

(b) Suggest how the fossil in **Figure 1** was formed.

Tick **one** box.

- The organism left a footprint behind. ☐
- The organism was buried by rocks. ☐
- The organism was frozen in ice. ☐
- The organism was replaced by minerals. ☐

(1)

(c) Trilobites are extinct.

What does extinct mean?

Tick **one** box.

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The species evolved into another species.	☐
The species does not have any soft tissue parts.	☐
There are no organisms of that species alive today.	☐
There are not enough of the species alive to reproduce.	☐

(1)

(d) Hyoliths are another type of fossil. Hyoliths were discovered in the 1800s and thought to be a type of snail.

In 2017 scientists used modern techniques to place hyoliths into a different group.

Suggest a modern technique that the scientists may have used.

Tick **one** box.

DNA analysis	☐
Genetic modification	☐
Light microscopy	☐
Selective breeding	☐

(1)

(e) Which scientist developed the traditional classification system for all living organisms?

_____

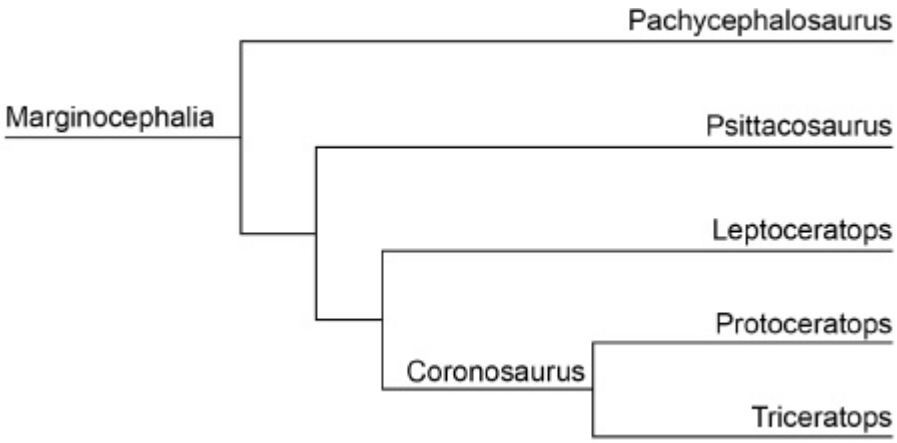
(1)

The fossil record is used to draw evolutionary trees.

Figure 2 shows an evolutionary tree for a group of dinosaurs.

Figure 2

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(f) Suggest which **two** of these dinosaurs are most closely related.

_____ and _____

(1)

(g) Name a common ancestor of Triceratops and Leptoceratops.

_____

(1)

(h) How does the fossil record provide evidence for Darwin's theory of evolution?

Tick **one** box.

Dinosaurs became extinct 65 million years ago.	☐
Fossils have been found in most countries of the world.	☐
Older fossils have a simpler structure.	☐
Trilobites belong to the arthropod group of animals.	☐

(1)

(Total 8 marks)

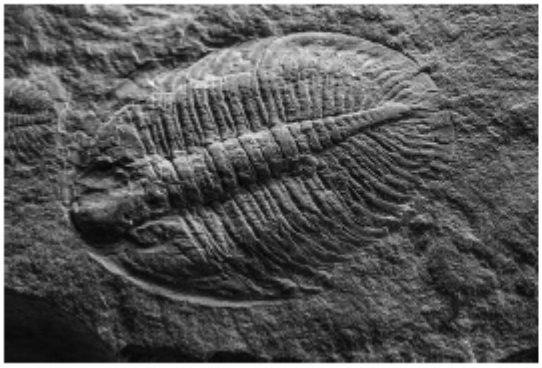
Q6.

Figure 1 shows photographs of fossils of extinct organisms.

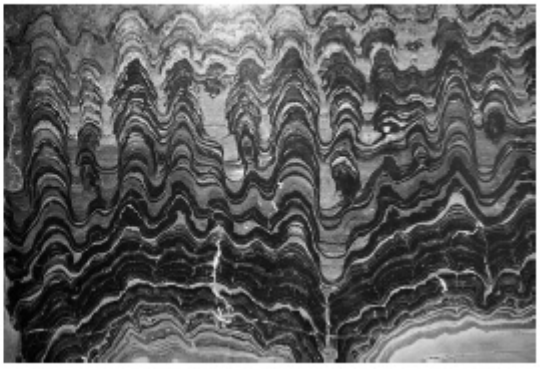
Figure 1

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Fossil A



Fossil B



(a) What is a fossil?

_____

_____

_____

_____

(2)

(b) What does extinct mean?

_____

_____

(1)

(c) **Fossil A** is a trilobite which had a shell, eyes and limbs.

Fossil B is a stromatolite formed by layers of microorganisms.

Which **two** statements suggest that the microorganisms lived at an earlier time than the trilobites?

Tick **two** boxes.

Microorganisms have a more simple structure than a trilobite.	☐
Stromatolites are found in older rock than trilobites.	☐
Stromatolites are layers of minerals left behind by millions of microorganisms.	☐
Stromatolites structures are larger than trilobite fossils.	☐
Trilobites lived in the sediment on the sea floor.	☐

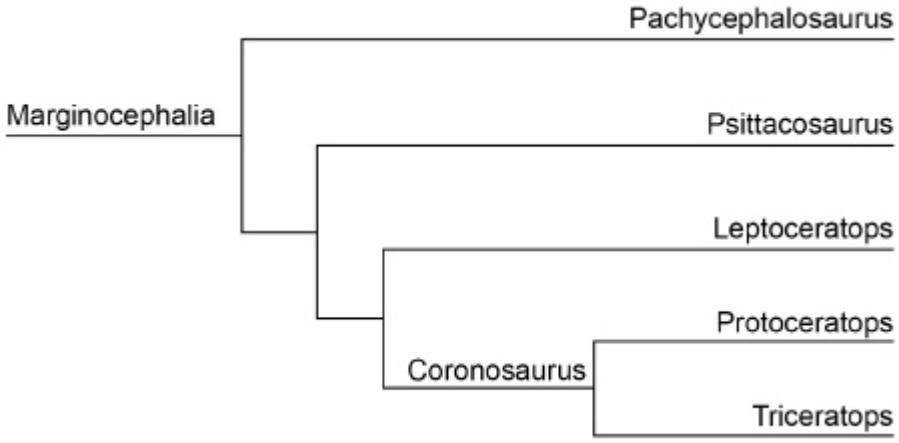
(2)

Figure 2 shows an evolutionary tree drawn from the fossil record in the 1970s.

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The evolutionary tree is for a group of dinosaurs.

Figure 2



(d) Scientists in the 1970s did radiocarbon dating on all the fossils.

Which fossil gave the earliest radiocarbon date?

_____

(1)

(e) Suggest which **two** types of dinosaur fossils showed the most similar features.

_____

(1)

(f) Give **one** reason why this evolutionary tree might **not** be correct.

_____

_____

(1)

(Total 8 marks)

Q7.

Control of blood glucose concentration is an important aspect of homeostasis.

When the blood glucose concentration is too high the hormone insulin is released.

(a) Name the hormone released when the blood glucose concentration is too low.

_____

(1)

(b) Explain how the **two** hormones keep the blood glucose concentration at the correct level in a healthy human body.

_____

_____

_____

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(5)

The two hormones which control blood glucose concentration are proteins.

Proteins are made according to information stored in the DNA structure of genes.

(c) Describe the structure of DNA.

(2)

(d) Describe how DNA controls the structure of a protein.

(2)

(e) Polydactyly and cystic fibrosis are both inherited disorders caused by faulty DNA.

- Polydactyly is caused by a dominant allele.
- Cystic fibrosis is caused by a recessive allele.

Mother **A** has polydactyly.

Mother **B** has cystic fibrosis.

Mother **A** is more likely to have a child with polydactyly than Mother **B** having a child with cystic fibrosis.

Explain why.

Assume the fathers of the children have no alleles for polydactyly or cystic fibrosis.

You may use genetic diagrams in your answer.

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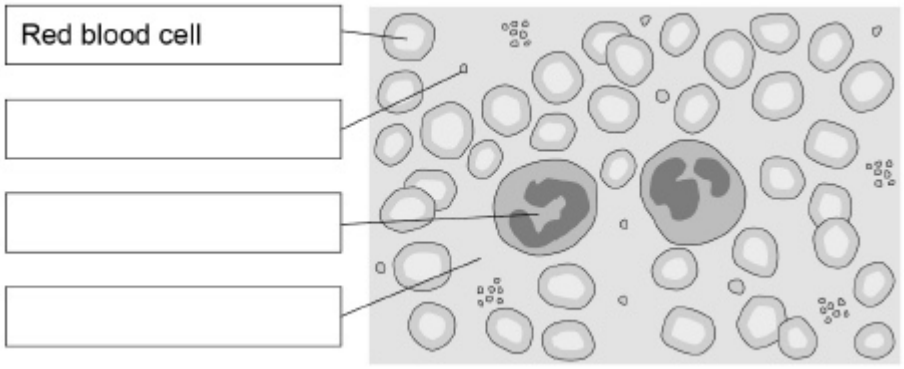
(3)
(Total 13 marks)

Q8.

Figure 1 shows an image of blood viewed with a microscope.

(a) Label **Figure 1**.

Figure 1



(3)

(b) The mean concentration of red blood cells in an adult is 5.5×10^6 cells per mm^3

1 mm^3 = 0.000001 dm^3

Calculate the mean number of red blood cells in 1 dm^3

Give your answer in standard form.

Mean number of red blood cells in 1 dm^3 = _____

(3)

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(c) Calculate the number of red blood cells in an adult who has 5.2 dm^3 of blood.

Use your answer from part (b).

Number of red blood cells in an adult = _____

(1)

Sickle cell disease is an inherited disorder that causes some red blood cells to have a sickle shape.

Figure 2 shows two red blood cells.

Figure 2



Normal shaped red blood cell

Sickle shaped red blood cell

(d) A person only has sickle cell disease if two copies of the sickle cell allele are inherited.

What does this tell us about the sickle cell allele?

(1)

(e) Explain how the shape of the red blood cells in a person with sickle cell disease could affect how much oxygen reaches their muscles.

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_____

_____

_____

_____

_____

(6)

(f) Suggest **one** symptom of sickle cell disease.

_____

_____

(1)

(Total 15 marks)

Q9.

Pompe disorder is an inherited condition that affects thousands of people.

Pompe disorder is caused by the GAA gene.

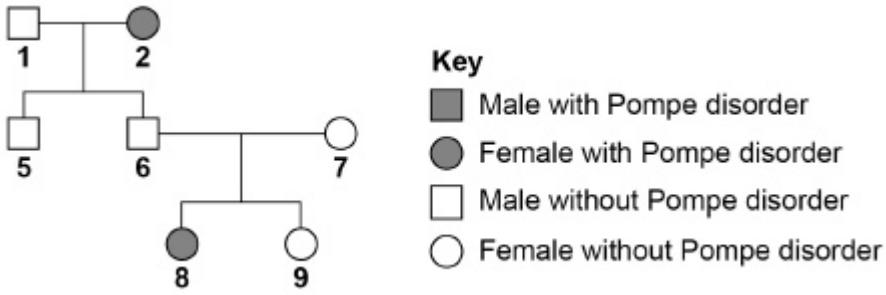
(a) What is a gene made of?

_____

(1)

Figure 1 shows the inheritance of Pompe disorder in one family.

Figure 1



Pompe disorder is caused by a recessive allele.

r is the allele for Pompe disorder

R is the allele for no Pompe disorder

(b) Person **2** has Pompe disorder.

What is the genotype of person **2**?

_____

(1)

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(c) Look at **Figure 1**.

Explain how we can tell Pompe disorder is caused by a recessive allele.

_____

_____

_____

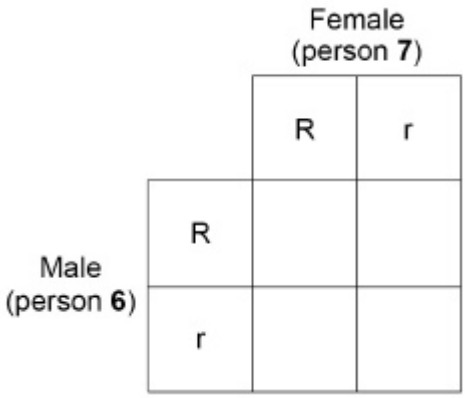
_____

(2)

(d) Persons **6** and **7** decide to have another child.

Complete the genetic diagram in **Figure 2**.

Figure 2



(2)

(e) Draw a ring around any offspring in **Figure 2** who will have Pompe disorder.

(1)

(f) What is the probability of persons **6** and **7** having another child with Pompe disorder?

_____

(1)

(g) A new drug to treat Pompe disorder has been successfullly trialled on mice.

The drug now has approval for the next stage of clinical testing.

Describe the next steps in testing the new drug before it can be approved for use.

_____

_____

_____

_____

_____

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(4)
(Total 12 marks)

Q10.

In 2012 scientists genetically modified goats to produce a specific protein in their milk.

The protein is found in the malarial parasite and can be used as a vaccine against malaria.

In the process:

- cells of goats are modified to produce the malarial protein
- the goats are milked
- the protein is removed from the milk
- the protein is purified.

(a) Describe how goat cells are modified so that they can produce the malarial protein.

(4)

(b) The scientists have only modified female goat cells.

Suggest **one** reason why.

(1)

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(c) Scientists can clone the genetically modified goats.

Suggest **two** reasons why the scientists clone the goats instead of producing offspring by sexual reproduction.

1. _____

_____

2. _____

_____

(2)

(d) The protein in the milk has to be extracted and purified before it can be used as a vaccine.

Scientists are improving the process so the protein will work as a vaccine **without** needing to be extracted and purified.

Give **two** possible advantages of producing goat's milk that contains an effective malaria vaccine.

1. _____

_____

2. _____

_____

(2)

(e) Malaria affects many people across the world.

Describe how the white blood cells might respond to an infection of the malaria pathogen.

_____

_____

_____

_____

_____

_____

(3)

(Total 12 marks)

Q11.

(a) Some antibiotics work by destroying the cell membranes of bacteria.

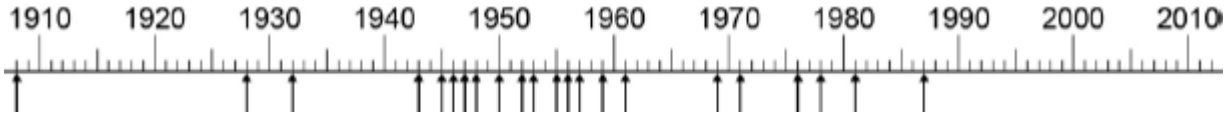
Suggest why these antibiotics may have side effects in the animals that are given these antibiotics.

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_____

(1)

(b) Each arrow on the figure below shows the date of discovery of each new type of antibiotic.



In which 10 year period were most new types of antibiotic discovered?

_____

(1)

(c) The figure above shows 22 new types of antibiotic. These were discovered before 2010.

Determine the percentage of types of antibiotic that have been discovered between 1980 and 2010.

Use information from the figure above.

Give your answer to 2 significant figures.

_____

_____

_____ %

(2)

(d) Bacteria can evolve rapidly.

Many bacteria can develop into new strains which are resistant to antibiotics.

Complete the table below to show if each action is **more likely** or **less likely** to help bacteria to become antibiotic resistant.

Put a tick in each row.

Action	More likely	Less likely
Take painkillers for headache		
Washing with antiseptic hand gel		
Adding antibiotics to food for cows		
Giving antibiotics for colds and flu		
Stopping antibiotics as soon as you feel better		

(4)

(Total 8 marks)

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Q12.

Different antibiotics destroy bacteria in different ways.

- Some antibiotics disrupt the bacterial cell membrane.
- Some antibiotics disrupt the bacterial cell wall.

(a) Antibiotics that disrupt the bacterial cell membrane often cause more side effects in humans compared with antibiotics that disrupt bacterial cell walls.

Suggest why.

_____

(1)

(b) Some antibiotics prevent ribosomes functioning.

Suggest how this damages the bacterium.

_____

(1)

(c) Drug manufacturers are spending less on research into new antibiotics.

One reason why is because new antibiotics are rarely prescribed.

Some people think that governments should pay drug manufacturers to develop new antibiotics.

Suggest why.

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q13.

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?

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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.

		Parent: X	Parent: X
Parent	X	XX	
	Y		

(2)

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(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)

Q14.

A person's characteristics can be due to:

- environmental causes
- genetic causes
- both environmental and genetic causes.

(a) Complete **Table 1**.

Put a tick to show what each characteristic is due to.

Table 1

Characteristic	Characteristic due to		
	Environmental causes	Genetic causes	Both environmental and genetic causes
Eye colour			
A scar			
Weight			

(3)

(b) Draw **one** line from each key term to the correct definition.

Key term	Definition

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	The set of alleles for a characteristic
Genotype	The genus of an organism
	The inheritance of chromosomes
Phenotype	The mutation of genes
	The physical characteristic of an organism

(2)

(c) Farmers use selective breeding to control the characteristics in cows.

Table 2 shows the stages of selective breeding in cows.

Complete **Table 2** to show the correct order of the stages.

The first stage has been numbered for you.

Table 2

Stage in selective breeding	**Order of stage**
Cows are bred over many generations	
Parents are bred together	
Cows with the desired characteristics are chosen	1
Calves with the most desired characteristics are bred together	

(2)

(d) Farmers selectively breed cows for many different reasons.

Suggest **two** characteristics that cows may be bred for.

Do **not** suggest coat colour.

1. _____

_____

2. _____

_____

(2)

(e) Selective breeding can lead to problems.

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Suggest how problems caused by selective breeding in cows can have negative financial effects for the farmer.

_____

_____

_____

_____

(2)

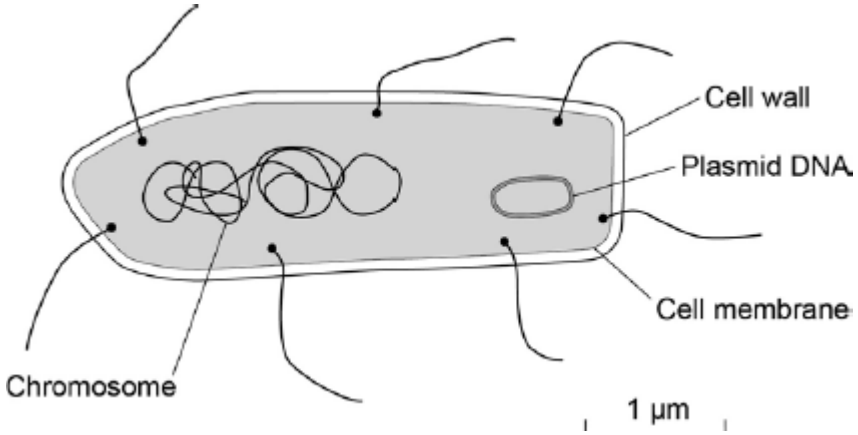
(Total 11 marks)

Q15.

Bacteria can cause disease.

Figure 1 shows some features of a *Salmonella* bacterium.

Figure 1



(a) Draw **one** line from each feature of the *Salmonella* bacterium to the function.

Feature	Function
Cell membrane	Controls the movement of substances into and out of the cell
	Carries genetic information
Plasmid DNA	Provides support and protection
	The site of protein synthesis

(2)

(b) How is *Salmonella* spread between people?

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Tick **one** box.

Animal bites ☐

Contaminated food ☐

Sneezing ☐

Sexual contact ☐

(1)

(c) Give **two** ways you could stop *Salmonella* from spreading.

1. _____

_____

2. _____

_____

(2)

(d) Harmful bacteria can also be useful.

Scientists are doing research to find out if *Salmonella* can be used in a vaccine to treat cancer.

The *Salmonella* vaccine can be injected into the blood or swallowed in a tablet.

One benefit of injecting the vaccine is that it gets to the cancer quickly in the blood.

What is another benefit?

Tick **one** box.

All cancers can be treated by the injection ☐

It will not cause sickness and diarrhoea side effects ☐

The injection is not painful to the patient ☐

The injection introduces cancer cells into the body ☐

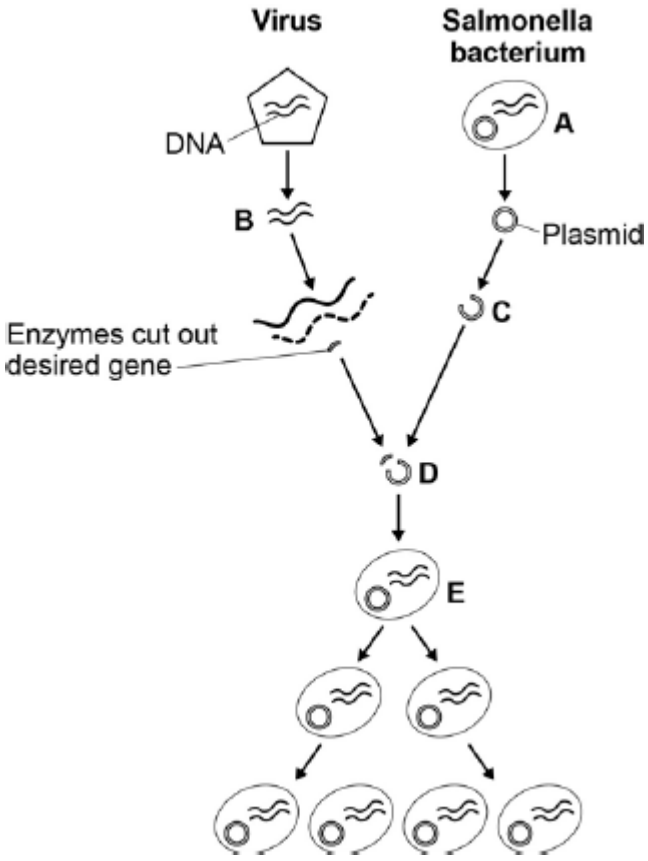
(1)

(e) The *Salmonella* bacterium used in the vaccine is genetically modified using part of a virus.

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Look at **Figure 2**.

Figure 2



Complete the sentences.

Use the letters from **Figure 2**.

Bacteria reproduce quickly in part _____

DNA with the desired gene is removed from the virus in part _____

The chosen gene is inserted into the plasmid in part _____

(3)

(Total 9 marks)

Q16.

Humans can use different methods to produce animals and plants with desired characteristics.

The figure below shows some different breeds of horse.

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(a) All breeds of horse are of the same species.

Suggest what you could do to show this.

(2)

(b) Horse racing is an ancient sport.

Selective breeding has been used for centuries to produce racehorses.

Describe the steps involved in selective breeding to produce a racehorse.

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(3)

(c) Another way of producing organisms with desired characteristics is genetic engineering.

Bt cotton is a variety of cotton that has been genetically engineered to produce a poison.

The poison kills several different species of insect that feed on cotton plants.

The poison is naturally produced by a soil bacterium called *Bacillus thuringiensis*.

Describe how cotton plants can be genetically engineered to produce the Bt poison.

(3)

(d) Describe the advantages and disadvantages of growing Bt cotton.

(4)

(Total 12 marks)

Q17.

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

It is caused by a dominant allele.

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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)

(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.

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- 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.

(6)

(Total 11 marks)

Q75.

(a) (i) Darwin's theory of evolution states that all species of living things have evolved from simple life forms.

Draw a ring around the correct answer to complete the sentence.

Simple life forms first developed on Earth more than

3 thousand years ago. **3 million years ago.** **3 billion years ago.**

(1)

(ii) Darwin's theory of evolution was not accepted when he first suggested it.

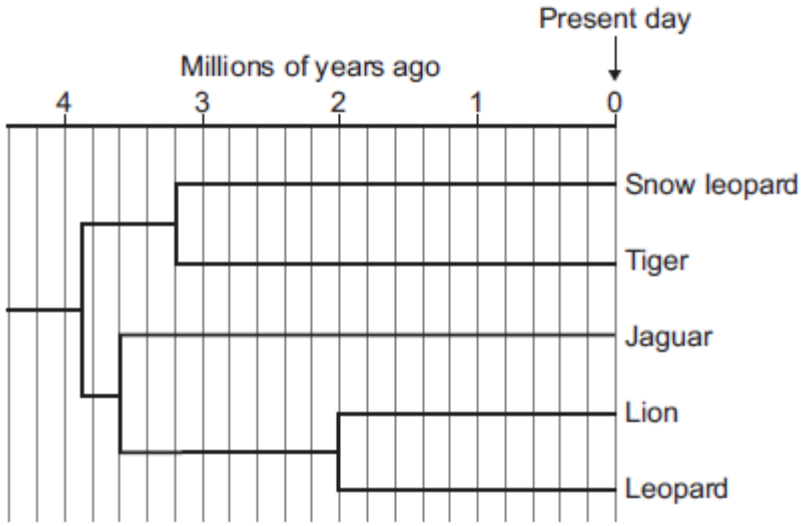
Give **one** reason why.

(1)

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(b) **Figure 1** shows an evolutionary tree for the 'big cats'.

Figure 1



(i) How long ago did the lion evolve?

_____ million years ago

(1)

(ii) Which animal is the closest relative to the tiger?

_____

(1)

(c) **Figure 2** shows a tiger. Tigers are large, striped animals. Tigers live and hunt in grassland and forest areas of Asia. They feed on animals such as deer.

Figure 2



© Jupiterimages/PHOTOS.com/Thinkstock

Suggest how stripes help the tiger to survive in its habitat.

_____

_____

(1)

(Total 5 marks)

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Q76.

Bacteria and viruses can reproduce quickly inside the body and make people feel ill.

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

antibodies	antitoxins	toxins

Bacteria and viruses make us feel ill because they produce _____ .

(1)

(b) (i) Antibiotics can be used to treat some infections.

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

bacteria	bacteria and viruses	viruses

Antibiotics are medicines that kill _____ .

(1)

(ii) New strains of pathogens have developed which are resistant to antibiotics.

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

are short of food	invade body cells	mutate

New strains are produced when pathogens _____ .

(1)

(iii) What will scientists have to develop to kill these new resistant strains?

_____

_____

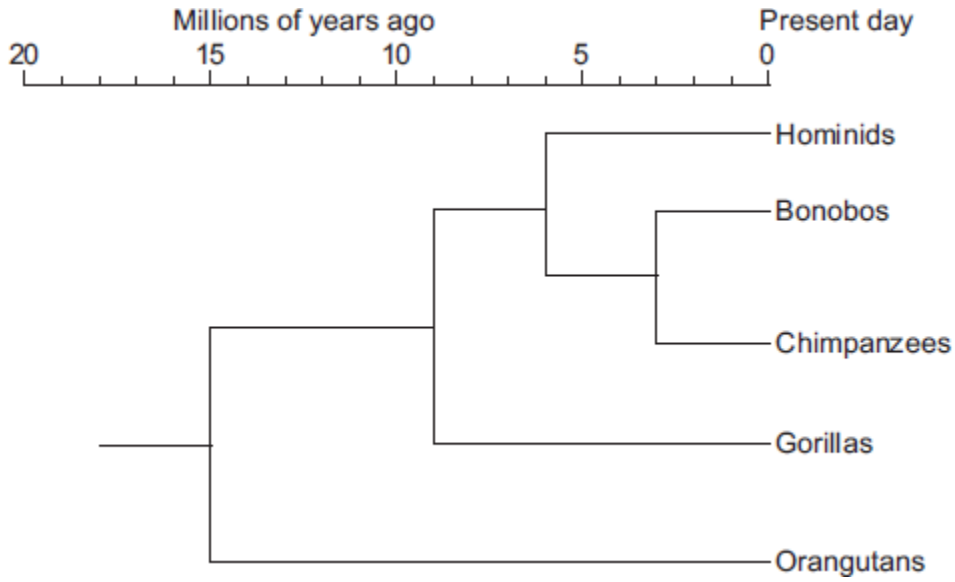
(1)

(Total 4 marks)

Q77.

The diagram shows an evolutionary tree for the great apes.

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(a) (i) How many years ago did chimpanzees evolve?

_____ million years ago

(1)

(ii) Which animal shown in the diagram is the most distant relative of hominids?

_____

(1)

(b) Charles Darwin is well known for his theory of evolution.

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

Darwin's theory states that evolution happens by a process

called

mutation
natural selection.
variation.

(1)

(ii) People did not accept Darwin's theory when it was first published.

Give **one** reason why his theory was not accepted at first.

_____

_____

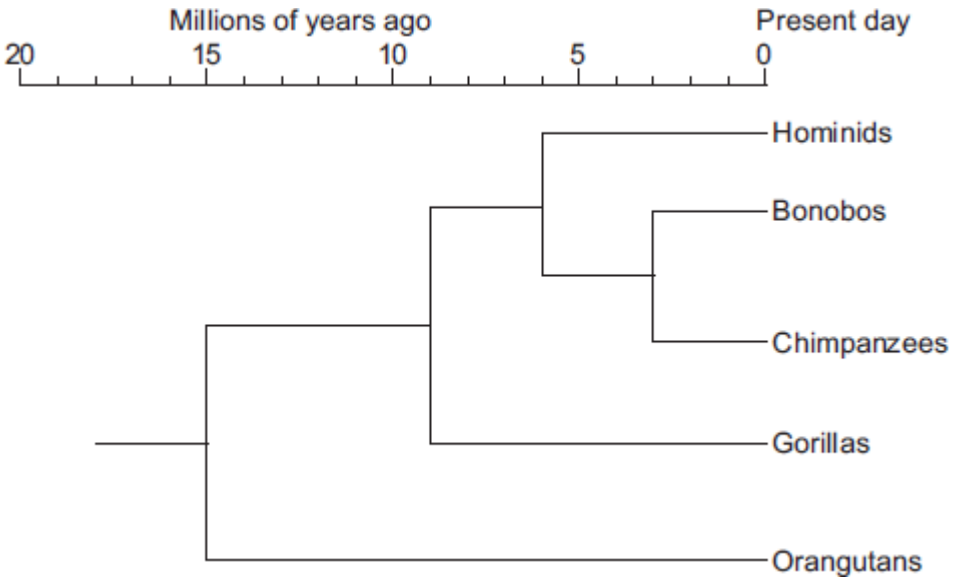
(1)

(Total 4 marks)

Q78.

The diagram shows an evolutionary tree for the great apes.

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(a) (i) How many years after gorillas did hominids evolve?

_____ millions of years

(1)

(ii) Which animal in the diagram is the most distant relative of chimpanzees?

_____

(1)

(b) Charles Darwin is well known for his theory of evolution.

Complete the sentence.

Darwin's theory states that evolution happens by a process called

_____

(1)

(Total 3 marks)

Q79.

The body defends itself against pathogens.

(a) Give **three** ways that white blood cells defend the body against pathogens.

Tick (✓) **three** boxes.

Ingest pathogens ☐

Produce antibiotics ☐

Produce antibodies ☐

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Produce antibodies ☐

Produce antitoxins ☐

Produce vaccines ☐

Stop pathogens entering the body ☐

(3)

(b) Bacterial infections can be treated with antibiotics.

Sometimes bacteria are resistant to antibiotics.

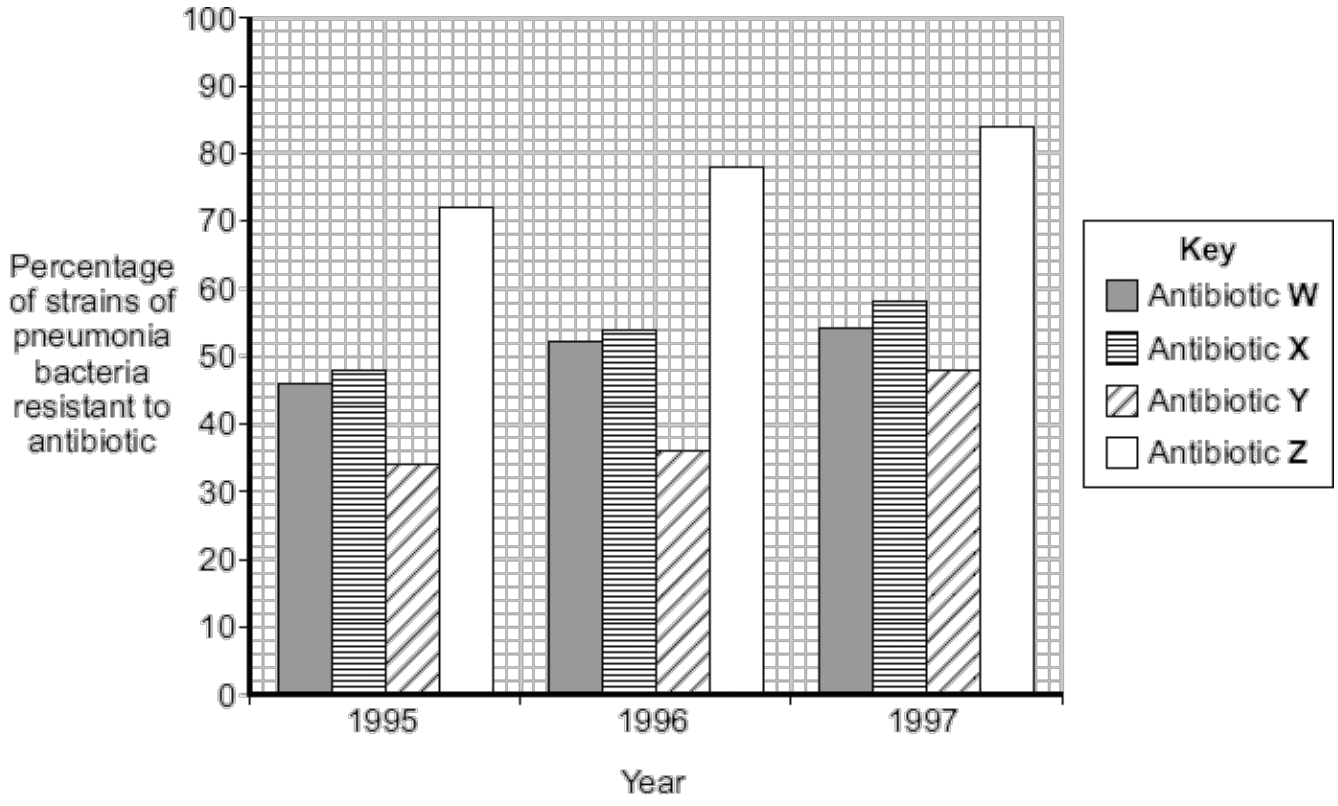
What does *resistant to antibiotics* mean?

_____

_____

(1)

(c) The bar chart shows how the percentage of strains of pneumonia bacteria that are resistant to four different antibiotics changed between 1995 and 1997.



(i) Which would have been the best antibiotic to use against pneumonia bacteria in 1995?

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Write the correct answer in the box. Antibiotic

(1)

(ii) Calculate the change in the percentage of strains of pneumonia bacteria resistant to antibiotic **W** between 1995 and 1997.

Show clearly how you work out your answer.

_____

_____

Answer = _____ %

(2)

(iii) Suggest **two** possible reasons for this change in the number of strains of pneumonia bacteria resistant to antibiotic **W**.

1. _____

2. _____

(2)

(Total 9 marks)

Q80.

Darwin's theory of evolution states that all species of living things have evolved from simple life forms.

(a) Draw a ring around the correct answer in the box to complete the sentence.

Simple life forms first developed on Earth more than

3 thousand
3 million
3 billion

years ago.

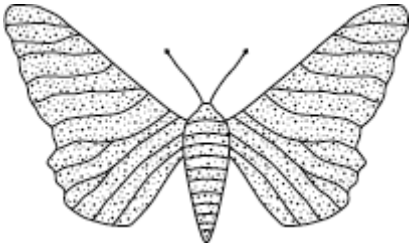
(1)

(b) Before the 19th Century, almost all peppered moths in the UK were light-coloured. During the 19th Century, factories began to pollute the environment with soot. A dark-coloured form of the moth then became more common.

Birds feed on both types of moth.

Pale form (light-coloured)	**Dark form** (dark-coloured)

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Use words from the box to complete each sentence.

Use words from the box to label structures **A**, **B** and **C**.

evolution	**mutation**	**selection**	**variation**

The change in a gene that produced the dark-coloured moth was caused by

_____

In the late 19th Century, birds ate mainly the light-coloured moths. More of the dark-coloured moths survived.

This is an example of _____

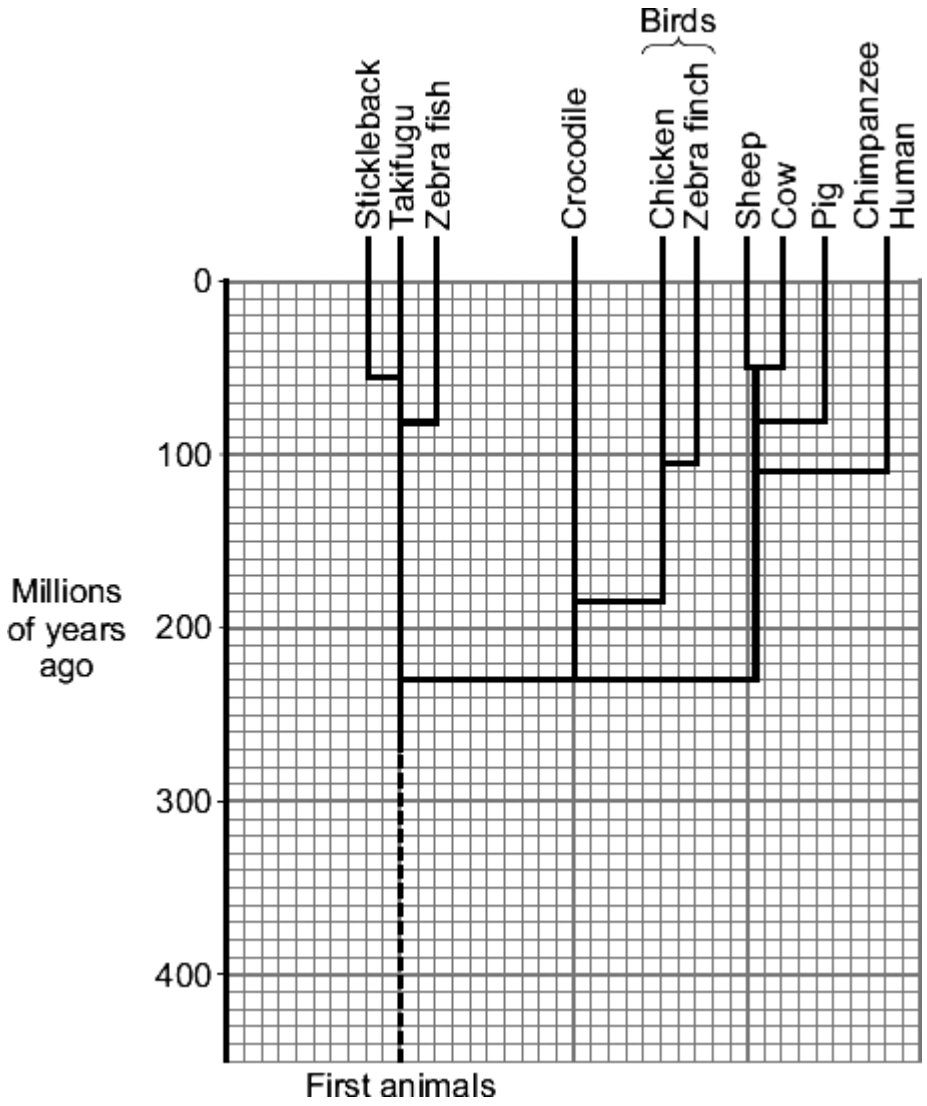
Over a long period of time, new species of moths develop.

This is an example of _____

(3)

(c) The diagram shows how and when some different types of animal are thought to have evolved.

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(i) Which animal is most closely related to birds?

_____

(1)

(ii) How long ago did pigs evolve?

_____

(1)

(Total 6 marks)

Q81.

Head lice live on people's heads and feed on their blood.
Head lice cause itching and people may develop open wounds from scratching.

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By CDC/James Gathany (http://phil.cdc.gov/phil/ #9217) [Public domain], via Wikimedia Commons

A poisonous chemical has been used to kill head lice for many years.
Recently, the chemical has not been as successful at killing head lice. Many head lice now survive treatment with the chemical.

Explain in terms of **natural selection** why most head lice are no longer killed by the chemical.

_____

_____

_____

_____

_____

_____

(Total 3 marks)

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