

Variation and Evolution

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.6 Inheritance Variation and Evolution
Sub-Topic	Variation and Evolution
Difficulty Level	Bronze Level
Booklet	Question Paper 1

Time Allowed: 58 minutes

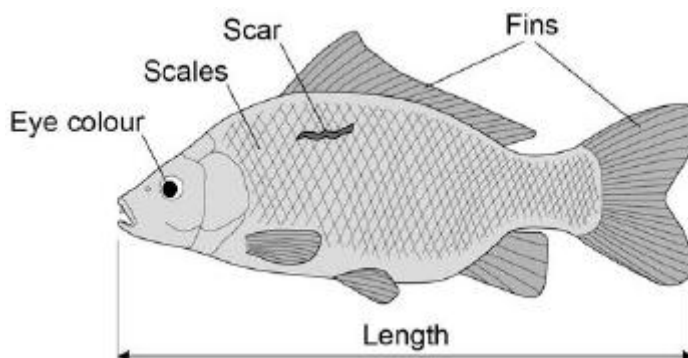
Score: / 56

Percentage: /100

Grade Boundaries:

Q1.Figure 1 shows a fish called a carp.

Figure 1



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?

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)

Q2.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		
	Environment al 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

	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.

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

.....

.....

.....

.....

(2)

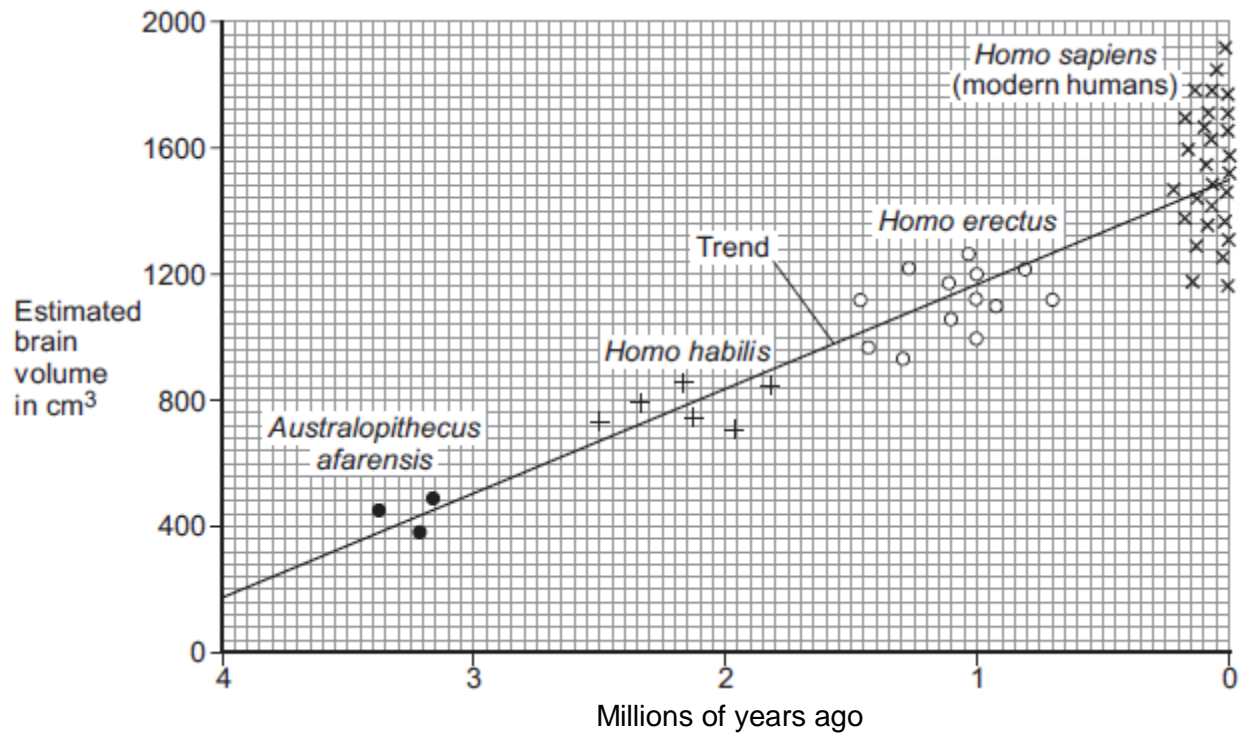
(Total 11 marks)

Q3. This question is about evolution in humans.

The graph shows:

- the estimated brain volume of different species of humans
- the time when the different species existed on Earth.

The data is plotted for modern humans (*Homo sapiens*) and for three types of extinct ancestors of humans.



Key

Each point plotted on the graph shows the estimate for one human.

- (a) (i) As humans evolved, their brain volume changed.

What has happened to human brain volume over the past 4 million years?

.....

(1)

- (ii) Why is the evidence for estimated brain volume for *Homo sapiens* stronger than the evidence for *Australopithecus afarensis*?

.....

(1)

- (b) In a book, the brain volume of a different species, *Australopithecus africanus*, is stated to be about 600 cm³.

Use evidence from the graphic above to estimate when *Australopithecus africanus* lived on Earth.

Estimate = million years ago

(1)

- (c) Scientists believe that modern humans evolved by natural selection from *Australopithecus afarensis*.

- (i) Complete the following sentence.

In the nineteenth century, the scientist who suggested the theory of evolution by natural selection was Charles

(1)

- (ii) In the nineteenth century, many people did not accept this scientist's theory.

Give **one** reason why.

.....
.....

(1)

(Total 5 marks)

- Q4.(a) Complete the sentences about evolution.

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

- (i) Darwin suggested the theory of evolution by

artificial
natural
asexual

selection.

(1)

- (ii) Darwin's theory of evolution says that all species of living things have

artificial

evolved from

complex

life forms.

simple

(1)

(iii) Most scientists believe that life first developed about

three billion

three million years ago.

three thousand

(1)

(b) Darwin's theory of evolution was only slowly accepted by other people.

Give **two** reasons why.

1.....

.....

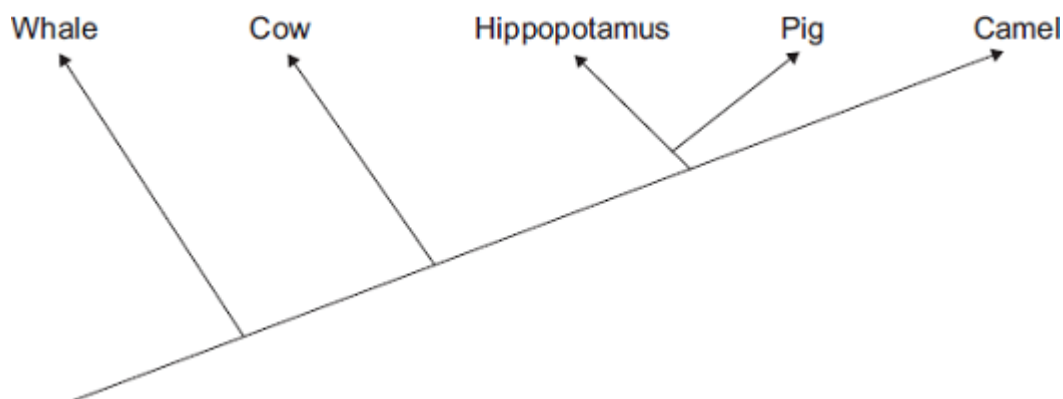
2.....

.....

(2)

(c) **Diagram 1** shows one model of the relationship between some animals.

Diagram 1



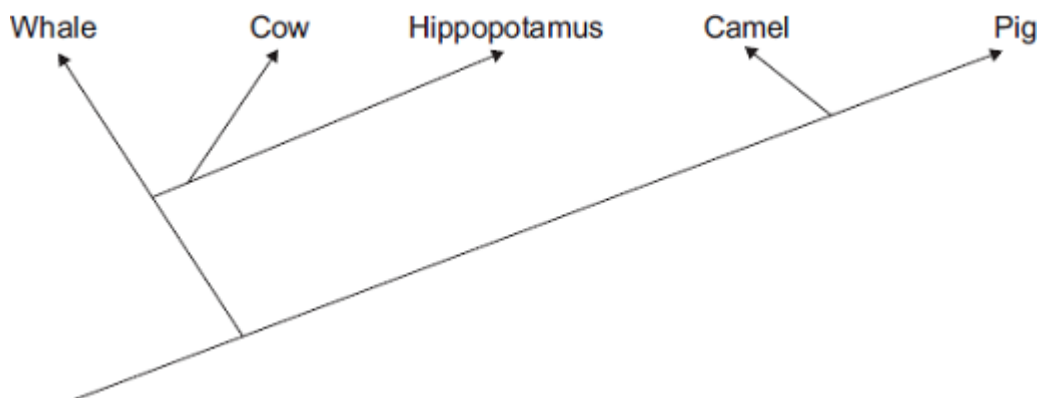
(i) Complete the sentence.

The model shown in **Diagram 1** is an evolutionary (1)

(ii) Which **two** of the animals in **Diagram 1** are most closely related?
..... and (1)

(iii) Diagram 2 shows a more recent model of the relationship between the animals.

Diagram 2



Suggest **one** reason why scientists have changed the model of the relationships between the animals shown in the diagram.

Draw a ring around the correct answer.

more powerful
computers

new evidence
from fossils

new species
discovered

(1)
(Total 8 marks)

Q5. Scientists have produced many different types of GM (genetically modified) food crops.

(a) Use words from the box to complete the sentence about genetic engineering.

clones

chromosomes

embryos

genes

GM crops are produced by cutting out of the
..... of one plant and inserting them into the cells of a crop
plant.

(2)

(b) Read the information about GM food crops.

- Herbicide-resistant GM crops produce higher yields.
- Scientists are uncertain about how eating GM food affects our health.
- Insect-resistant GM crops reduce the total use of pesticides.
- GM crops might breed naturally with wild plants.
- Seeds for a GM crop can only be bought from one manufacturer.
- The numbers of bees will fall in areas where GM crops are grown.

Use this information to answer these questions.

(i) Give **two** reasons why some farmers are in favour of growing GM crops.

1
.....
2
.....

(2)

(ii) Give **two** reasons why many people are against the growing of GM crops.

1
.....
2
.....

(2)

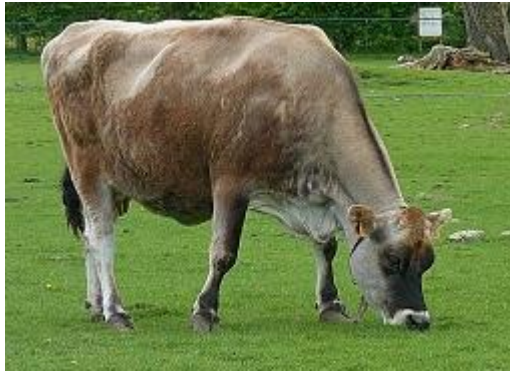
(Total 6 marks)

Q6.The photographs show two breeds of cow.

Friesian cow Jersey cow



By Keith Weller/USDA (www.ars.usda.gov: Image Number K5176-3) [Public domain], via Wikimedia Commons



By Jamain (Own work) [CC-BY-SA-3.0-2.5-2.0-1.0], via Wikimedia Commons

In parts (a) and (b) draw a ring around the correct answer to complete each sentence.

- (a) Cows produce their young (calves) by

asexual reproduction.
cloning.
sexual reproduction.

(1)

- (b) Cows and their calves have many similar characteristics.

- (i) The information for characteristics is carried by

clones.
embryos.
genes

(1)

- (ii) The information for characteristics is passed to the next generation in cells

called

body cells.
gametes.
neurones

.

(1)

- (c) Friesian and Jersey cows can both be used for meat or to produce milk.

The information shows features of Friesian and Jersey cows.

Friesian cows	Jersey cows
Body mass up to 600 kg	Body mass up to 400 kg
Milk contains 3.4% protein	Milk contains 3.8% protein
Can be milked for 325 days after giving birth	Can be milked for 250 days after giving birth
Produce no milk for 55 days before having a calf	Produce no milk for 45 days before having a calf
Produce > 30 litres of milk per day	Produce < 30 litres of milk per day

Use **only** the information above to answer these questions.

In your answers you must make comparisons between the two breeds of cow.

- (i) Give **two** advantages of a farmer keeping Friesian cows and **not** Jersey cows.

1.....

.....

2.....

.....

(2)

- (ii) Give **two** advantages of a farmer keeping Jersey cows and **not** Friesian cows.

1.....

.....

2.....

.....

(2)

- (d) Cow's milk is different from human milk. Cow's milk should **not** be given to young human babies.

Scientists in China have *genetically engineered* cows to produce human milk. Milk from these cows can be fed to young human babies.

- (i) What is *genetic engineering* ?

Tick (✓) **one** box.

Genes from one organism are transferred to a different organism

☐

Cells are separated from an embryo and are transferred to host mothers

☐

The nucleus from a body cell is transferred to an egg cell

☐

(1)

- (ii) Some people are worried about using milk from genetically engineered cows, to feed human babies.

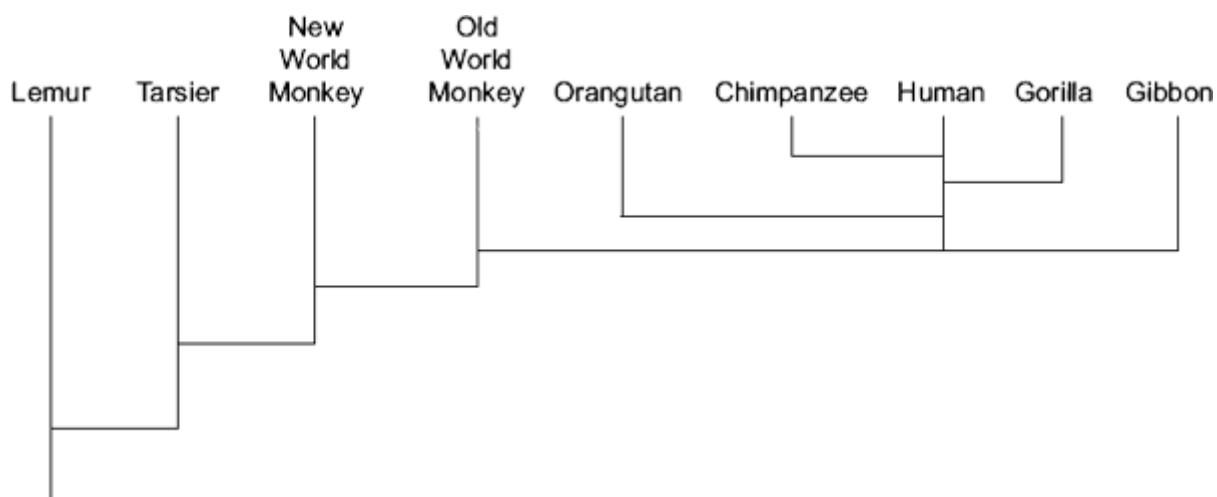
Give **one** reason why.

.....
.....

(1)

(Total 9 marks)

Q7. The diagram shows the evolution of a group called the primates.



- (a) Which primate evolved first?

.....

(1)

- (b) Name **two** primates that developed most recently from the same common ancestor as humans.

1

2

(2)

- (c) (i) The theory of evolution by natural selection was suggested in the 1800s.

Which scientist suggested this theory?

.....

(1)

- (ii) Use words from the box to complete the passage about natural selection.

evolution	environment	generation
mutate	survive	variation

Individual organisms of a species may show a wide range of
..... because of differences in their genes.

Individuals with characteristics most suited to the
are more likely to and breed
successfully.

The genes that have helped these individuals to survive are then passed on to
the next

(4)
(Total 8 marks)