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| Name:          |
| Science Class: |
| Teacher:       |
| Hand in day:   |

Y9 Science

**Term 1: Homework Booklet**

Biology

|   | Hand in Date | Parents Signature |
|---|--------------|-------------------|
| <b>Inheritance, Variation and Evolution</b> |              |                   |
| Homework 1                                  |              |                   |
| Homework 2                                  |              |                   |
| Homework 3                                  |              |                   |
| Homework 4                                  |              |                   |

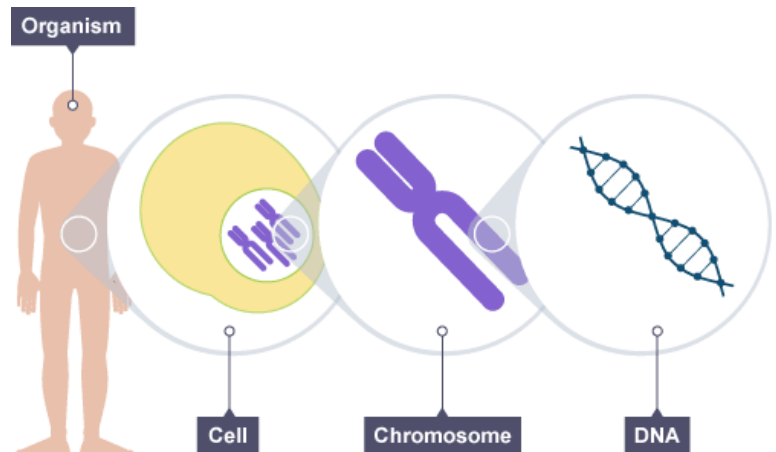
## Inheritance, Variation and Evolution: Homework 1

### Comprehension Task:

#### DNA

DNA stands for **deoxyribonucleic acid**. It is a chemical made up of two long molecules. The molecules are arranged in a spiral, like a twisted ladder. We call this the **double helix** structure.

There is DNA in the **nucleus** of every cell. DNA carries genetic information. It has all the instructions that a living organism needs to grow, reproduce and function.



#### Genes

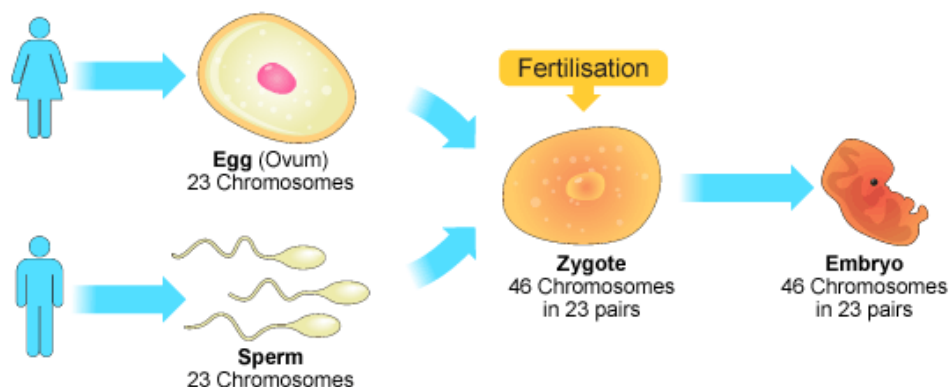
Genes are short sections of DNA. Genes carry information for particular characteristics, such as ear shape or eye colour. Different sets of genes carry information for different characteristics. There are many genes in a chromosome.

#### Chromosomes

In a cell nucleus, DNA is organised into coiled strands called **chromosomes**. Humans have 46 chromosomes in each cell.

Half the chromosomes are inherited from one parent and half from the other. As humans, therefore, we have **23 chromosomes** from each parent.

Children generally look a little like their mother and their father, but are not identical to either. They inherit their features from each parent's DNA. Every sperm and egg cell contains half of the genetic information needed for an individual (23 single chromosomes). When the chromosomes fuse during fertilisation, a new cell is formed, which is known as a zygote. It has all the genetic information needed for an individual.

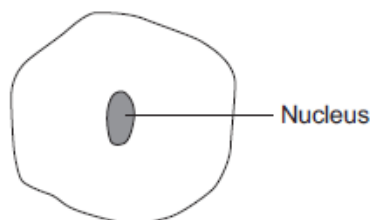


**Questions**

1. What does DNA stand for?
2. How do we describe the structure of DNA?
3. In which part of a cell is DNA found?
4. What are genes?
5. Genes determine our eye colour. Give another example of a characteristic that is determined by our genes.
6. What are chromosomes?
7. How many chromosomes are found in most body cells?
8. Why are chromosomes found in pairs?
9. How many chromosomes are found in sex cells?
10. What is the name of the cell formed when a sperm fuses with an egg cell?

**Inheritance, Variation and Evolution: Homework 2****Complete the exam questions below:**

1. The diagram below shows a cell.



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

(i) In the nucleus of a cell, genes are part of

|              |
|--------------|
| chromosomes. |
| membranes.   |
| receptors.   |

(1)

(ii) Different genes control different

|                 |
|-----------------|
| characteristics |
| gametes         |
| nuclei          |

of an organism.

(1)

(b) In sexual reproduction, an egg fuses with a sperm.

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

An egg and a sperm fuse together in the process of

|                |
|----------------|
| cloning.       |
| fertilisation. |
| mitosis.       |

(1)

(ii) Egg cells and sperm cells each contain the structures given in the box.

|                   |             |                |
|-------------------|-------------|----------------|
| <b>chromosome</b> | <b>gene</b> | <b>nucleus</b> |
|-------------------|-------------|----------------|

List these three structures in size order, starting with the smallest.

1 \_\_\_\_\_ (smallest)

2 \_\_\_\_\_

3 \_\_\_\_\_ (largest)

(2)

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- (iii) The egg and the sperm contain genetic material.

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

The genetic material is made of

carbohydrate.

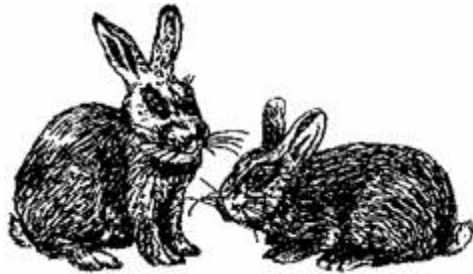
DNA.

protein.

(1)

(Total 6 marks)

2. These young rabbits look like their parents. This is because information about characteristics such as fur colour is passed from parents to their young.



Choose words from this list to complete the sentences below.

body

chromosomes

clones

cytoplasm

genes

nucleus

sex

Information is passed from parents to their young in \_\_\_\_\_ cells.

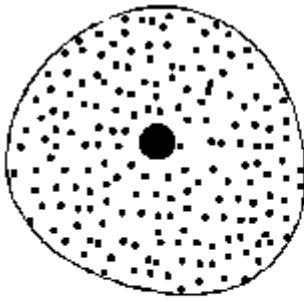
Each characteristic, e.g. fur colour, is controlled by \_\_\_\_\_.

The structures which carry information for a large number of characteristics are called \_\_\_\_\_.

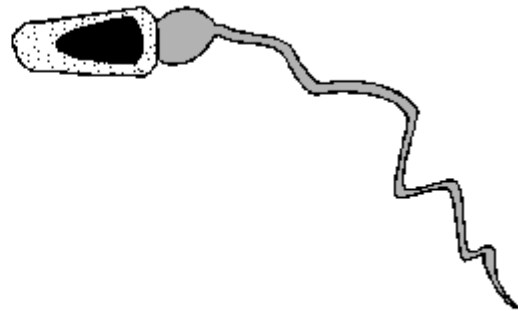
The part of the cell which contains these structures is called the \_\_\_\_\_.

(Total 4 marks)

3. Men and women produce different gametes (sex cells).



Female gamete



Male gamete

Not to scale

(a) In sexual reproduction the male and female gametes join together.

What is the name for this process?

\_\_\_\_\_

(1)

(b) Complete the sentences about sex cells.

(i) Male gametes are called

\_\_\_\_\_

They are produced in the

\_\_\_\_\_

(2)

(ii) Female gametes are called

\_\_\_\_\_

They are produced in the

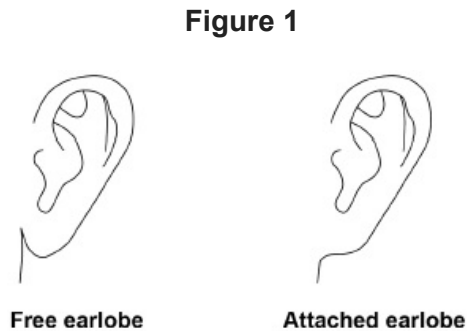
\_\_\_\_\_

(2)

(Total 5 marks)

4. The shape of a person's earlobes is controlled by a gene.

**Figure 1** shows two types of earlobe.



A dominant allele codes for free earlobes.

(a) What is a dominant allele?

Tick (✓) **one** box.

- An allele expressed even if a person only has one copy of the allele
- An allele expressed only if a person has two copies of the allele
- An allele expressed only if a person has no recessive allele
- An allele expressed only if it is inherited from the male parent

☐☐☐☐

(1)

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- (b) A man with free earlobes and a woman with attached earlobes have children together.

Complete **Figure 2** to show the possible genotypes of the children.

Use the symbols:

**E** = allele for free earlobes

**e** = allele for attached earlobes

**Figure 2**

|     |   | Woman |   |
|-----|---|-------|---|
|     |   | e     | e |
| Man | E | Ee    |   |
|     | e |       |   |

(2)

- (c) What is the probability that one of the children would have attached earlobes?

Use **Figure 2**.

Tick (✓) **one** box.

0.125 ☐

0.25 ☐

0.5 ☐

0.75 ☐

(1)

(Total 4 marks)



**Inheritance, Variation and Evolution: Homework 3**

1. Complete the sentences to describe the theory of natural selection:

|         |           |            |         |             |           |
|---------|-----------|------------|---------|-------------|-----------|
| Survive | Variation | Genes      | Species | Environment | Reproduce |
| Passed  | Evolve    | Generation | Adapted |             |           |

- Individuals in a s\_\_\_\_\_ show a wide range of v\_\_\_\_\_ and this variation is because of differences in their g\_\_\_\_\_.
- Individuals with characteristics most suited to their e\_\_\_\_\_ are more likely to s\_\_\_\_\_ and r\_\_\_\_\_. The genes that allow these individuals to be successful are passed to their offspring.
- Those that are poorly a\_\_\_\_\_ to their environment are less likely to survive and reproduce. This means that their genes are less likely to be passed on to the next g\_\_\_\_\_.
- Given time, a species will gradually e\_\_\_\_\_.
- Both genes and the environment can cause variation, but only genetic variation can be p\_\_\_\_\_ on to the next generation.

2. Peppered moths can either be light coloured or dark coloured. During the 19<sup>th</sup> century, an increase in pollution caused the bark on trees to go darker. How did this affect the numbers of each type of moth and why?

|                       | What happened to the number of each type? | Explanation |
|-----------------------|---|-------------|
| <b>Light coloured</b> | Increase/Decrease                         |             |
| <b>Dark coloured</b>  | Increase/Decrease                         |             |

**Inheritance, Variation and Evolution: Homework 4**

Complete the exam question below:

The photographs show two breeds of cow.

**Friesian cow**



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

**Jersey cow**



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) |                                      | asexual reproduction. |
|     | Cows produce their young (calves) by | cloning.              |
|     |                                      | sexual reproduction.  |

(1)

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

|     |   |          |
|-----|---|----------|
| (i) |   | clones.  |
|     | The information for characteristics is carried by | embryos. |
|     |   | genes    |

(1)

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

|        |             |
|--------|-------------|
|        | body cells. |
| called | 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.

| <b>Friesian cows</b>                             | <b>Jersey cows</b>                               |
|--|--|
| 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.

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2.

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**(2)**

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

1.

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2.

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**(2)**

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- (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.

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(1)

(Total 9 marks)