Name: .....

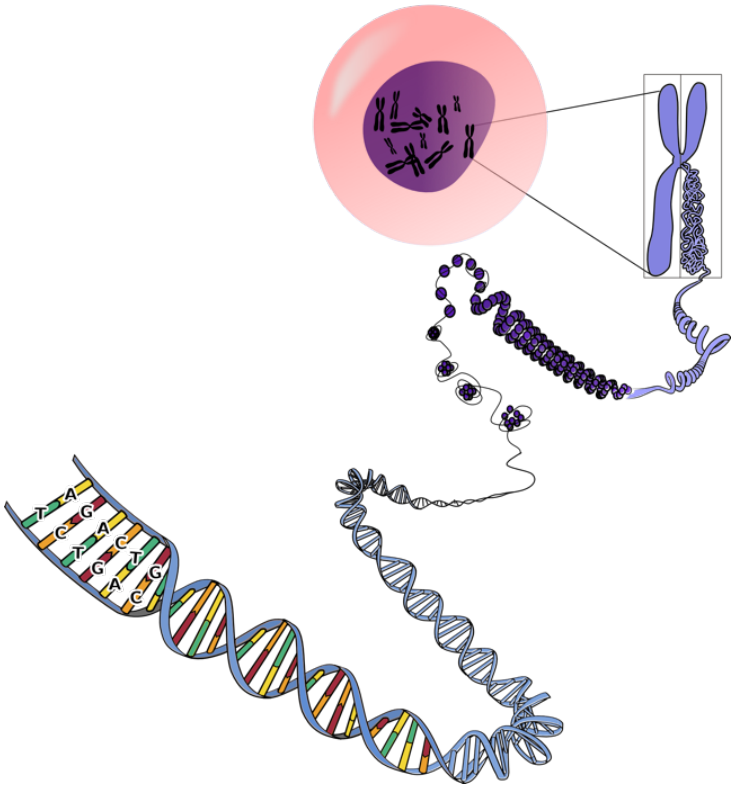
Date: .....

Class: .....

IGCSE BIOLOGY EDEXCEL 9-1

CHAPTER WORKBOOK

CHROMOSOMES, GENES AND DNA



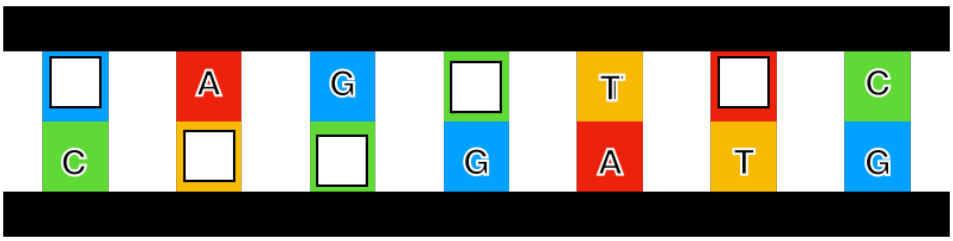
DNA and Chromosomes

1. Write the structures below in order from **smallest** to **largest**.

Tissue	Gene	Base	Nucleus	Cell
	Organism	Chromosome		

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....

2. Write the letters to represent the bases that are missing on the simplified DNA strand below:



3. Define mutation.

.....

.....

4. Fill in the gaps to describe the structure of chromosomes.

A length of DNA that contains the information for a single protein is called a ..... . A long length of DNA (containing many genes) can be ..... around proteins called ..... . A huge length of supercoiled DNA forms a ..... . Humans have ..... sets of chromosomes, and each one contains a different strand of DNA, with different ..... on them. In humans (and many other organisms), each cell has ..... versions of each chromosome. One of those is inherited from the ..... and the other from the ..... .

5. The diagram below shows all of the chromosomes in a single human cell. Use the diagram and your own knowledge to answer the questions below.

Image credit: Courtesy: National Human Genome Research Institute - Extracted image from http://www.genome.gov/glossary/resources/karyotype.pdf., Public Domain, https://commons.wikimedia.org/w/index.php?curid=583512

a) The total number of chromosomes in a human cell is:

.....

b) The number of pairs of chromosomes in a human cell is:

.....

c) The total number of chromosomes inherited from the female parent in humans is:

.....

d) The total number of chromosomes inherited from the male parent in humans is:

.....

e) In humans the haploid number is ..... and the diploid number is .....

f) **BONUS QUESTION:** Does the image above show the chromosomes for a male or a female?

.....

Genes and Alleles

1.

a) Define *gene*.

.....

.....

b) Define *allele*.

.....

d) Define *genome*.

.....

.....

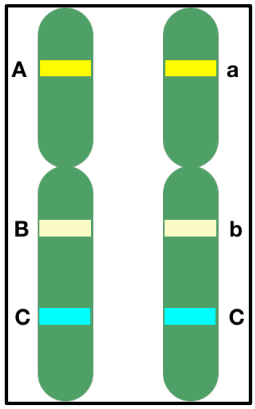
c) How many alleles are there for every gene in diploid organisms (e.g. humans)?

.....

2. Look at the diagram below showing chromosomes. Use the diagram below and your own knowledge to answer the questions.

a) How many chromosomes are represented?

.....



a) How many homologous pairs are represented?

.....

b) How many genes are labeled?

.....

c) How many unique alleles are there for gene A in the diagram?

.....

d) How many unique alleles are there for gene C in the diagram?

.....

Triple Award

DNA Structure and Replication

1. Draw the detailed structure of a DNA molecule, including the following labels:

Hydrogen bonds		Deoxyribose	Phosphate
group	Adenine	Thymine	Cytosine
Guanine		Gene (length of DNA)	

2. Compare the structure of DNA with the structure of mRNA. (You should include ways that they are similar as well as ways in which they are different).

Optional: use a diagram to support your answer

.....

.....

.....

.....

.....

.....

Triple Award

3. Draw diagrams to represent the steps of DNA Replication:

DNA strands separate	Each strand acts as a template strand for new DNA nucleotides to assemble
DNA polymerase assembles the new strands	Two identical DNA molecules are formed

Triple Award

Protein Synthesis

1. In the following questions you will describe the process of protein synthesis.

a) Describe transcription. Include ALL of the keywords below.

template	non-template	mRNA	unzip
double helix	exposed bases	complimentary	
base pairing	bond(s)	uracil	thymine

b) Describe translation. Include ALL of the keywords below.

mRNA	tRNA	start codon	stop codon
anticodon	triplet	amino acid	
ribosome			

Triple Award

Mutations

1. Explain why a mutation can affect the phenotype of an organism.

.....

.....

.....

.....

2. Explain how a mutation may occur but have no effect on the phenotype of an organism.

.....

.....

.....

.....

3. List the factors that can increase incidences of mutations

.....

.....

.....