

Learning Intentions

- I can name the cell structures and their functions.
- I can describe the process of diffusion.
- I can state the equation of aerobic respiration.
- I understand that food contains chemical energy that can be converted into other forms of energy in cells.
- I understand that respiration is an enzyme controlled process that occurs in all living cells.
- I can complete an investigation into respiration rates of yeast using resazurin (varying respiratory substrate)
- I can give the word equations for anaerobic respiration in yeast & animal cells.
- I understand that aerobic respiration produces more energy from each molecule of glucose.
- I understand plants produce their own food in the form of glucose and store it as starch.
- I can give the word equation for photosynthesis.
- I understand that the rate of photosynthesis is affected by the availability of resources (limiting factors).
- I understand that limiting factors can affect plant growth.
- I will be able to give some of the key properties of enzymes and describe how they work.
- I will design and carry out an experiment into enzyme specificity.
- I will be able to describe how the shape of an enzyme and in particular the active site will make it specific to one substrate.
- I will be able to give examples of reactions and their specific enzymes.
- I can describe the uses of enzymes in biological detergents.
- I will carry out an experiment to compare the efficiency of biological and non-biological washing powders.
- I will practice taking measurements and calculating averages.
- I can describe the uses of enzymes in biological detergents.
- I will carry out an experiment to compare the efficiency of biological and non-biological washing powders.
- I will practice taking measurements and calculating averages.
- I can describe the uses of enzymes in production of cheese.
- I will carry out an experiment to investigate the effect of pH on the activity of Rennet.
- I can describe the uses of enzymes in production of cheese.
- I will be able to describe how Rennet is produced and describes the advantages and disadvantages of the different methods.
- I will create a summary with all the key concepts about Enzymes.
- I know how many chromosomes a human body cell has.
- I know where chromosomes are found in a cell
- I know what DNA is and that it is made up of bases
- I know what a gene is.
- I know how proteins are made
- I know what DNA is and that it is made up of bases
- I know what a gene is.
- I know how proteins are made

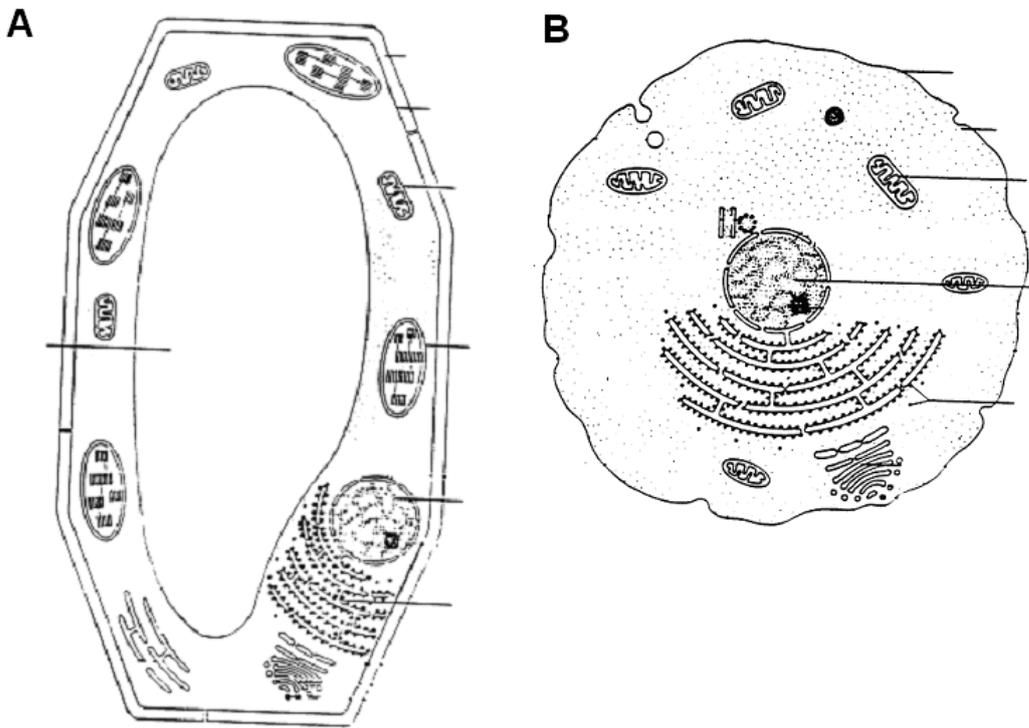
- I can describe disorders caused by inherited genes
- I will be able to explain the importance of cell division in allowing organisms to grow and repair.
- I will be able to describe the process of mitosis.
- I will be able to explain the importance of maintaining a chromosome complement.
- To look at the basic concept of how the cell cycle is controlled and how this links to cancer.
- To research a type of cancer and present your findings appropriately.
- I can describe the process of Genetic Engineering.
- I can give examples of what Genetic Engineering is used for.
- I can understand the issues surrounding Genetic Engineering and GMO.
- I can describe the two types of diabetes.
- I can explain why cases of Diabetes are increasing.
- I can explain the role of insulin in controlling Type 1 Diabetes.
- I can explain what stem cells are and where they can be found
- I can give informed opinions as to the ethical and moral use of stem cells.

National 4 Biology –Cells

1. Complete the following sentence:

_____ are the basic units of living things

2. Look at the diagram below of 2 cells:



a) Label all the parts shown on both diagrams.

b) Which diagram shows a plant cell?

c) List the three main differences between animal and plant cells

Respiration

1. Living cells need energy for a variety of reasons.
Give 3 reasons why cells need energy

2. Complete the word equation for aerobic respiration:



3. Which gas is required for aerobic respiration?

4.a) Which gas is given off during respiration?

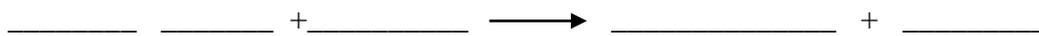
b) Where are the gas components derived from?

5. Which form of energy is released during respiration, which is required for mammals to survive?

Photosynthesis

1) Plants need light energy in order to carry out photosynthesis. It allows them to make their own food.

a) Write the word equation for photosynthesis:



2. A scientist wanted to investigate how changing the level of light intensity would affect their growth. 4 young plant were exposed to different levels of light intensity. 3. The plants were exposed for 12 hours a day, and were measured each week for 3 weeks. The scientist collected the following data:

Plant	Plant height (cm)		
	Week 1	Week 2	Week 3
1	4	4.5	4.9
2	4	5.2	5.7
3	4	5.5	6.1
4	4	6.3	7.5

(i) Calculate the average height of all the plants in week 2

Space for calculation

(ii) Which plant do you think had the highest light intensity?

Plant _____

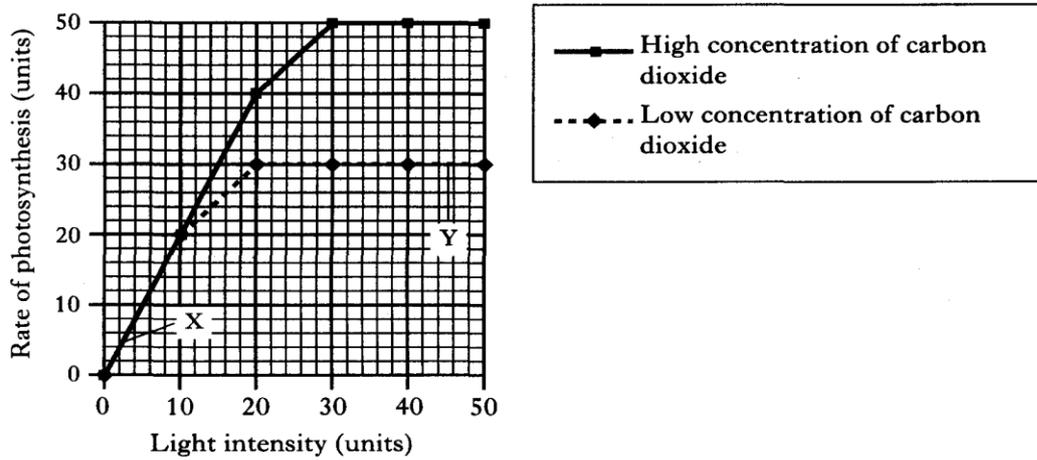
Why?

4) What is meant by the term limiting factor?

5)

M.

The graph below shows the effects of two different environmental factors on the rate of photosynthesis.



(a) What are the limiting factors at points X and Y?

X _____

Y _____

(b) Suggest **one** way that the rate of photosynthesis can be measured.

(c) During the first stage of photosynthesis, light energy is used.

(i) Where is light energy trapped in the cell?

(ii) State **one** use of this light energy.

Enzymes

1. Circle the correct answer

Enzymes are made of:

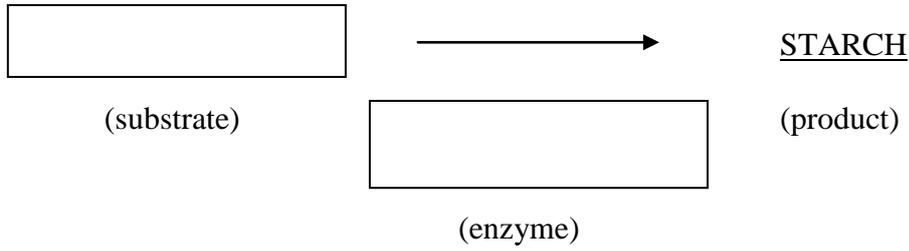
A Fat

B Protein

D Carbohydrates

C Vitamins

2. Complete the following word equation



3. What is meant by the term optimum conditions?

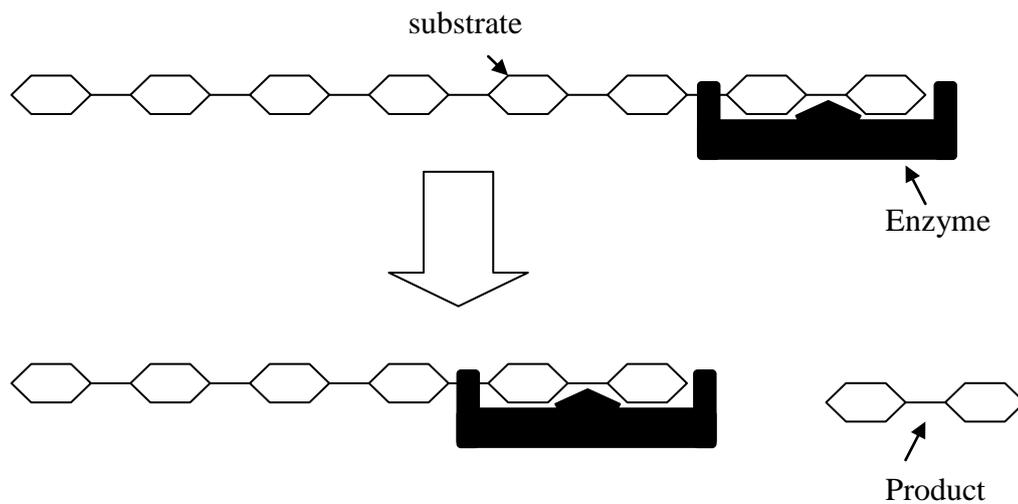
4. Give an example of an enzyme involved in a
a) synthesis reaction

b) the breakdown of a substance

5. Where is pepsin found in the human body?

6. What reaction in humans is pepsin involved in?

7. Amylase is an enzyme found in saliva and is involved in the chemical breakdown of a particular substance



Complete the following table

Enzyme	Substrate	Product
Amylase		

8. 3 groups of students in a class studied how enzymes responded to different temperatures. They produced the following data:

Temperature (° C)	Enzyme rate (standard units)		
	Group 1	Group 2	Group 3
20	34	33	35
30	42	44	43
40	55	54	55
50	3	2	1

a) Calculate the average enzyme activity for group 1 between 20° C and 40° C

Answer _____

b) Calculate the percentage increase in enzyme activity for group 3 between 20° C and 40° C

Answer _____

Micro-organisms and Industry

1. During wine production and dough making, a particular organism is used.

a) Which organism is used? _____

b) What type of organism is this? _____

2. Write the equation showing the action of yeast:



3. What is the difference between aerobic and anaerobic respiration?

4. Cheese and yoghurt production relies on a type of organism.

a) What type of organism is this? _____

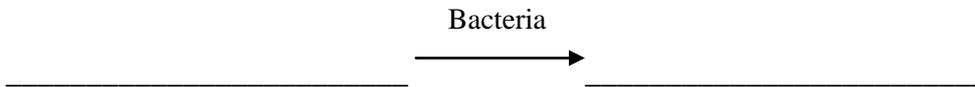
b) Which enzyme is used to separate milk? _____

c) What is the name of the parts which milk is separated into:

_____ + _____

5. If milk is left for a period of time, it will become sour. This is due to a reaction occurring.

a) Complete the following equation showing what happens if milk is left out:



6. A pupil wanted to investigate how much dough would rise if he changed the mass of sugar in the dough mixture. He obtained the following results:

Mass of sugar (g)	Initial height of dough (mm)	Final height of dough (mm)	Difference (mm)
10	15	22	
15	15	27	
20	15	33	

a) Complete the table showing the height difference

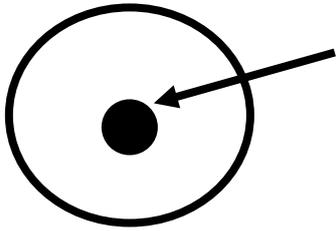
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b) Calculate the % increase in height when 15 of sugar was used in the dough

Answer = _____%

1

DNA Genetic Information

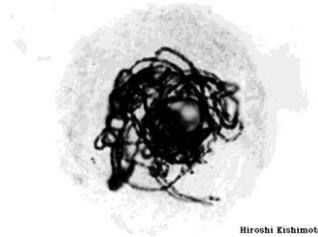
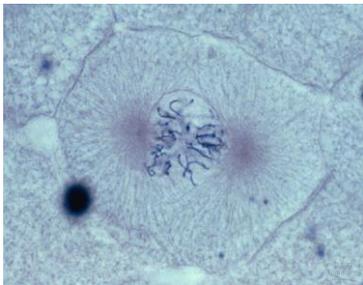


The cell nucleus carries all the information which is used to control the cell. **What is this information?**

Inside the nucleus

The nucleus of all living cells contains distinct thread-like structures called

_____.



Chromosomes contain _____ information. This information gives rise to an organisms characteristics.

This genetic information is the instructions for building _____ which are essential for life.

The structure of a chromosome

Draw the basic structure of a chromosome below:

Chromosomes and Genes

Chromosomes are made from a chemical called _____ which is short for _____.

The DNA is wound up very tightly to form the chromosome.

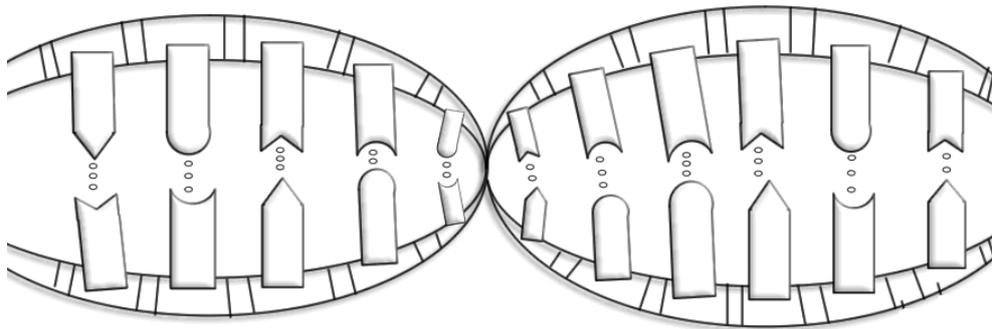
DNA is made up from a chain of structures called _____.

The four different bases are called:

- _____
- _____
- _____
- _____

Colour the Thymines orange  Colour the Adenines green. 

Colour the Guanines purple  Colour the Cytosines yellow. 



What do you notice about how the bases pair up?

Each section of DNA is called a _____.

Each gene contains the instructions for building a different _____.

Examples of proteins include: _____

Sequence of DNA bases

The sequence (order) of bases (A, T, C, G) is like a biological book that can be read. This sequence contains the genetic instructions that control an organism's inherited characteristics, e.g.

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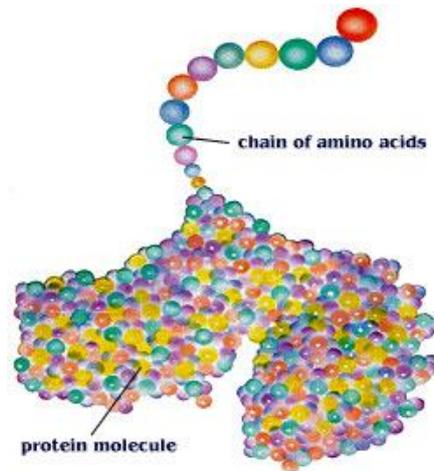
ATGTATCCAGGTAGTGGACGTTACACCTACAACAACGCTGGTGGTAATAATGGCTACCAA
CGGCCATGGCTCCTCCACCCTAACAGCAGTATGGACAGCAATATGGTCAGCAATATGCT
CAGCAGTATGGACAGCAATATGGGCAACAAAATGATCAGCAATTCAGTCAGCAATATGCT
CCACCACAGGTCTCCCCCTATGGCTTATAACAGGCCTGTGTATCCCCCCCTCAATTC
CAGCAGGAACAGGCAAGGCACAATTAAGCAACGGCTACAACAATCCTAATGTAAACGCA
TCCAATATGTACGGTCCACCCAGAAATATGTCATTACCTCCACCTCAAACAAAATATT
CAAGGTACAGAACCTTATCAGTATTCCTCAATGTAAGGCGTAGAAAAGGCTTTGATT
ATCGGTATAAATACATAGGTTCAAAAATCAACTGCGTGGTGTATCAATGATGCTCAT
AACATCTCAACTTTTGTACTAATGGGTACGGTACAGTTCAGATGACATTTGTATATTA
ACTGATGATCAGAACGATTTGGTCAGGGTCCCACTAGGGCTAATATGATAGGGCCATG
CAATGGTTGGTCAAGGATGCGCAACCCAATGATTCCTTGTTCCTTCATTAATCTGGACAT
GGTGGCCAAACTGAAGATTTGGATGGGGACGAAGAAGATGGGATGGATGATGTTATATAT
CCGGTCGATTCGAAACTCAAGGGCCAAATTCGACGATGAAAATGCACGATATAATGGTG
AAGCCCTTACAACAAGGTGTTAGACTAACAGCATTGTTTACTCTTGTTCATTCGGGTACA
GTGTTGGATCTTCCATATACCTATTTCTACTAAGGGTATTTAAGGAGCCCAATATTTGG
AAGGATGTTGGCCAAAGATGGCCCTGCAAGCAGCTATTTTCATATGCCACAGGAAACAGGGCT
GCTTTGATPGGTTCTTTAGGTTCTATATTCAGACCGTTAAGGGAGGTATGGGCAATAAT
GTGGATAGAGAACCGCTGAGACAGATCAAATTCAGCAGCAGATGTTGTTATGTTATCA
GGTTCGAAGGATAATCAAATTTCTGCAGATGCTGTCGAAGATGGGCAAAAATACAGGTGCA
ATGTCCACGCCCTTCATCAAGGTTATGACTTTACAACCACAGCAATCATATTTATCTCTT
TTACAGAACATGAGGAAAGAAATGGCTGGTAAGTATTTCTCAAAAACCAATTTATCATCG
TCACACCCATTGACGTAATACTGCAATTTATTATGTAAG
    
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The order is unique to each organism.

Proteins

All reactions in your body are controlled by _____ which are examples of _____. Every protein is made of sub-units called _____.

Proteins are also involved in the manufacture of muscle, bone and ligament. They form _____ (chemical messengers), _____ (protective molecules) and _____ (in red blood cells).



Amino acids

Proteins are made up of a large number of sub-units called amino acids (there are about 20 amino acids). These are joined together into polypeptide chains consisting of hundreds of amino acids linked together.

The sequence of the amino acids will determine the final structure of the protein and the job it does. So what determines this sequence?

Genetic code

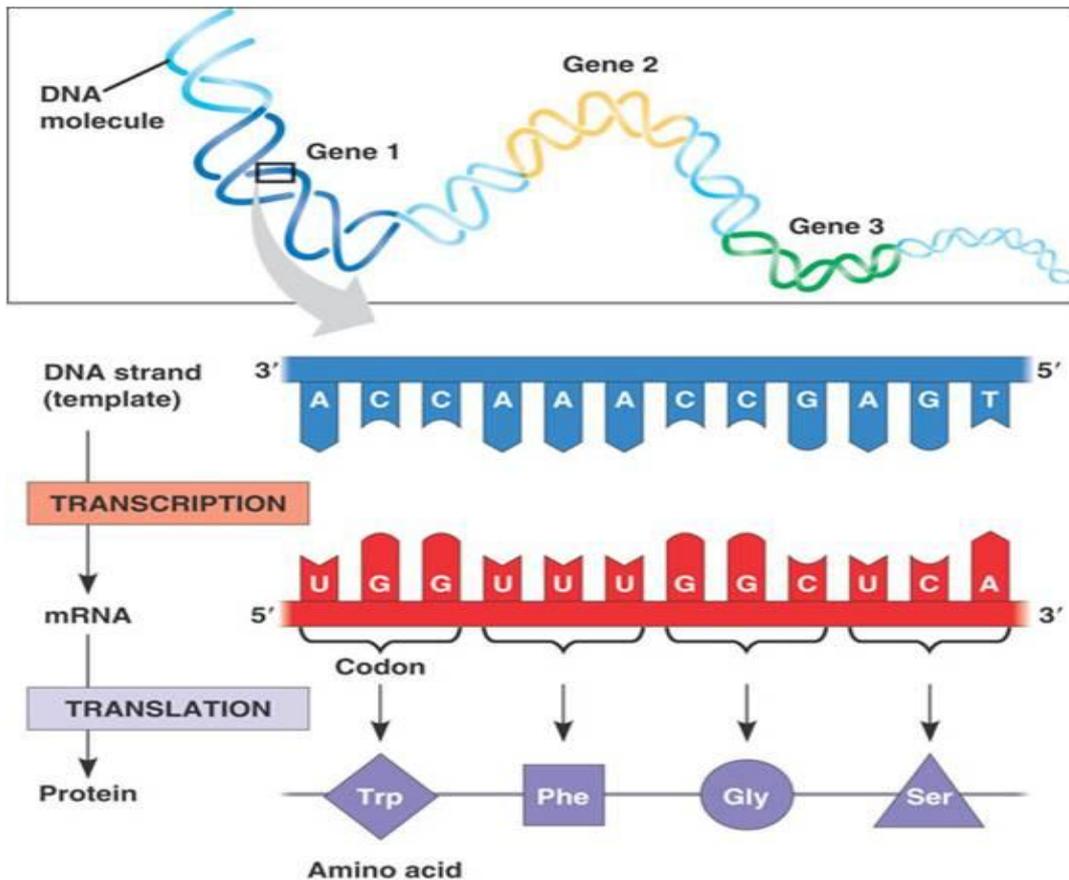
A region of DNA on a chromosome is called a _____. The information in DNA is in _____ code. Each group of _____ bases along a DNA strand represents a 'codeword' for an _____.

Each gene codes for a particular _____ (or polypeptide) by making a molecular 'mirror image' of its DNA and passing it out into the cytoplasm. This "mirror image" is called _____ (mRNA) This message is then **translated** into protein on a special structure called a _____ which is found in the cytoplasm.

The order in which the amino acids become joined together into protein is determined by the order of the bases on the _____.

So to summarise, DNA encodes the information for the particular sequence of amino acids in a protein, which in turn dictates the structure and _____ of that protein.

The following diagram should help.



GENETIC ENGINEERING

Genetic engineering involves the removal of _____ genes from the chromosome of one organism and their insertion into the chromosome of a completely _____ organism, usually a _____. This technique stems from discoveries made in the early 1970's i.e.

Bacteria have their genetic material in rings, one large chromosomal ring and one or more smaller rings called _____.

The basic outline of producing **genetically engineered** bacteria is as follows:

The required gene is located on the donor chromosome.

The gene is removed from the chromosome

A plasmid is removed from a bacterium.

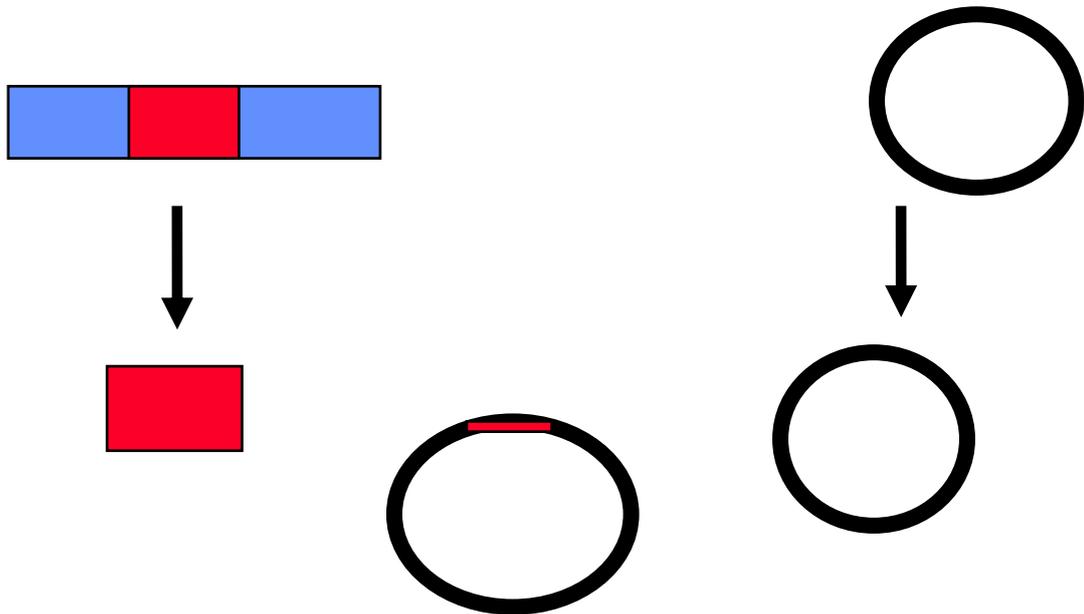
The plasmid is cut open

The gene is inserted into the plasmid.

The **genetically engineered plasmid** is inserted into a bacterium.

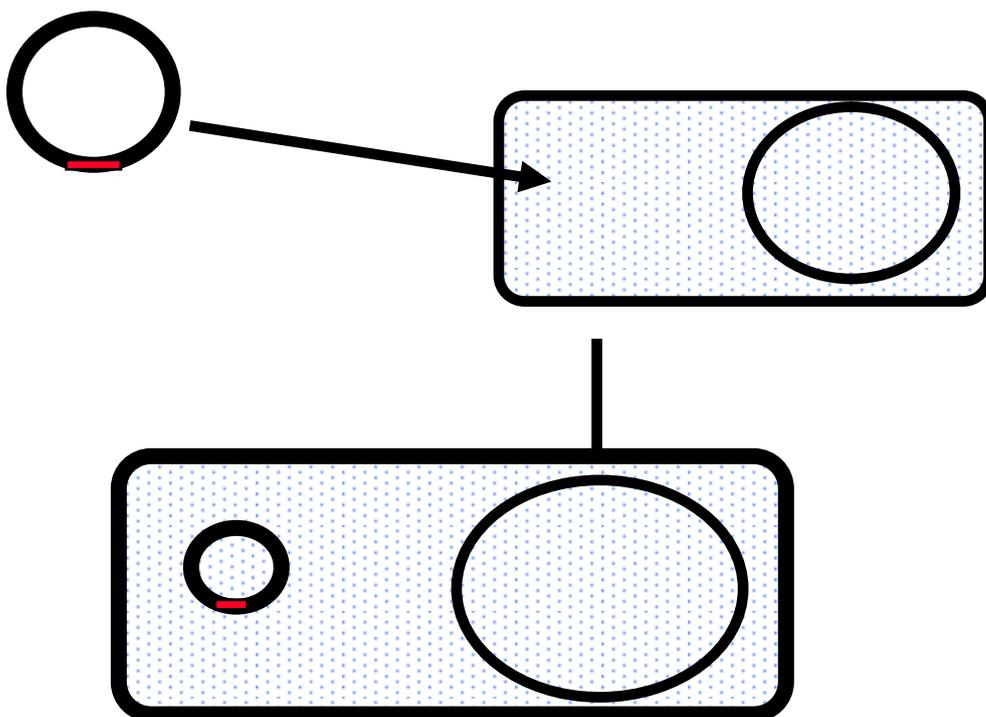
This altered bacterium is propagated in **optimum** growing conditions to produce many identical cells that can be used as biochemical 'factories'.

Label the following diagram to show the stages in genetic engineering:



Use the space below to summarise what is happening in the above diagram:

Label the diagram below to explain the remaining steps in genetic engineering:



Why are bacteria commonly used in this process?

What is the problem of trying to genetically engineer an organism such as a human?

Uses of Genetic Engineering

The transfer of genes from one organism to another has allowed many useful products to be made.

Insulin Production

1. What is insulin?

2. Why does the body need insulin?

3. What source was used to provide insulin before genetic engineering was used?

4. What was the problem with this source?

Three advantages of using genetic engineering to obtain human insulin are:

1. _____
2. _____
3. _____

ADVANTAGES/DISADVANTAGES OF GENETIC ENGINEERING

List some **advantages** of genetic engineering:

List some **disadvantages** of genetic engineering:

Do **you** think genetic engineering is a good thing? Justify your answer.