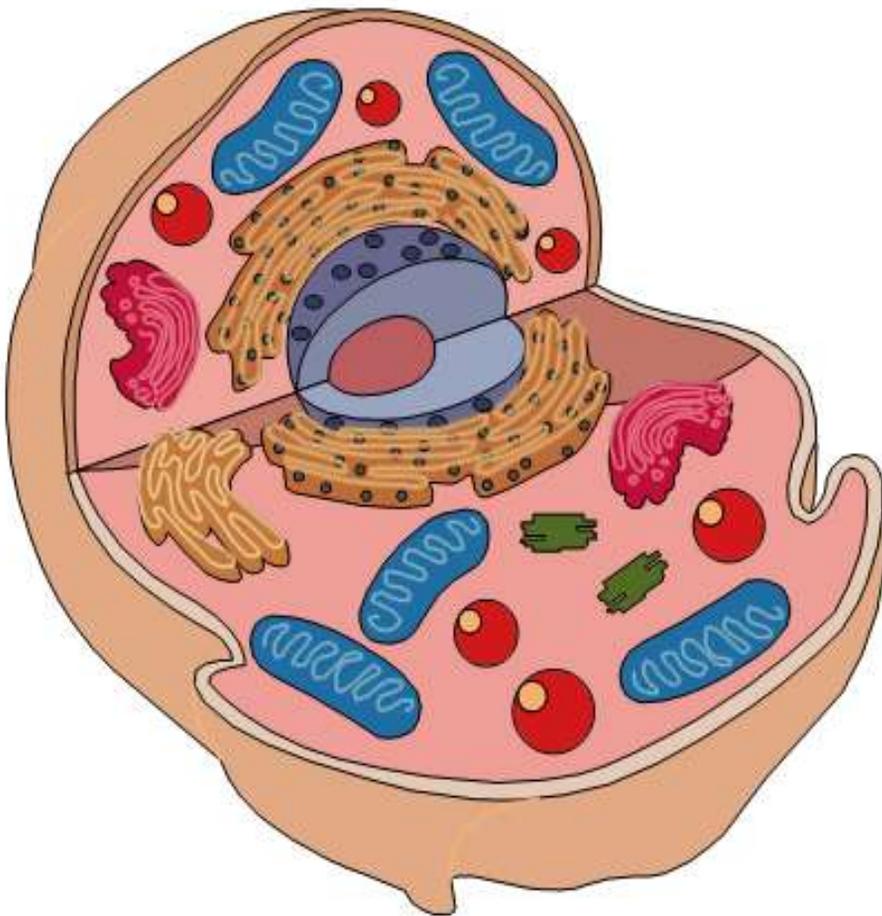


Perth Academy

N5 Biology

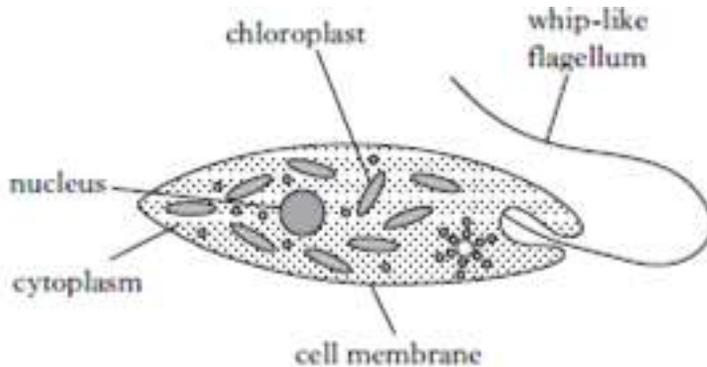
Cellular Biology

Homework



Homework 1

1. *Euglena* is a single celled organism. It is a specialised cell. The diagram below shows some of the structures within *Euglena*.



- (a) *Euglena* has structures found in most cells.

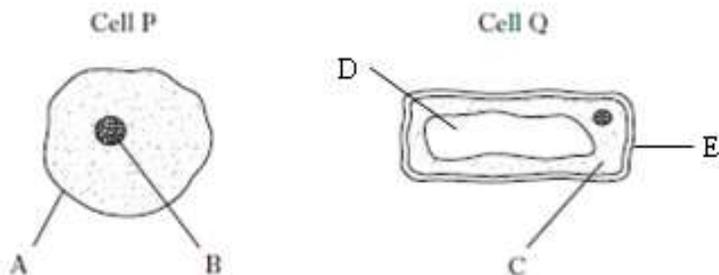
Draw a table to show the names of these structures and their functions.

- (b) Name the structure that identifies *Euglena* as a plant cell.

2. Which structural feature is common to both plant and animal cells?

- A Cell wall
- B Chloroplast
- C Nucleus
- D Large central vacuole

3. The diagram below shows two cells P and Q.

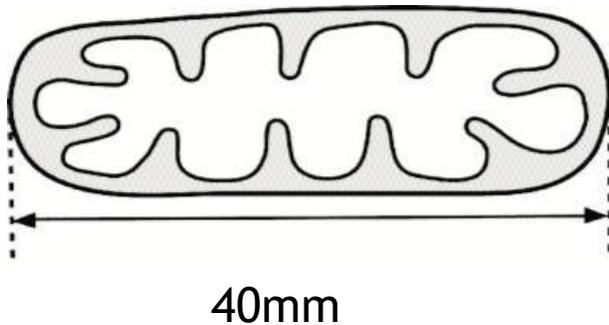


- (a) Which cell is a plant cell? Give a reason for your choice.

- (b) Which labelled part of cell Q is made from a structural carbohydrate?

4. Which of the following is the correct function of a ribosome?
- A It is the site of protein synthesis.
 - B It controls entrance and exit of materials from a cell.
 - C It is involved in release of energy from glucose.
 - D It controls cell division.

5. The cell organelle shown below is magnified ten thousand times.
(1mm=1000 μ m)



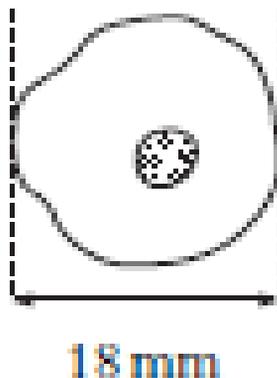
- (a) What is the actual size of the organelle?

- A 0.04 μ m
- B 0.4 μ m
- C 4 μ m
- D 40 μ m

- (b) What is the function of this organelle?

- (c) Give an example of a cell which would contain many of these organelles.

6. The cell shown below is magnified six hundred times. What is the actual size of the cell?



Homework 2

1. Describe what is meant by diffusion
2. Give one reason why diffusion is so important to organisms.
3. Choose one word from the brackets below to make the sentence correct.

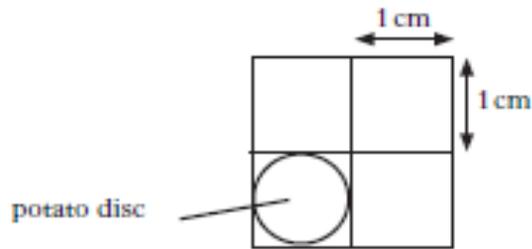
Molecules will enter the cell against the concentration gradient by (**osmosis/active transport**) to do this they require energy and travel via the membrane (**phospholipids/proteins**).

4. To investigate osmosis, a pupil set up an experiment where he placed rods of potato in test tubes of different salt solution. He collected the following results:

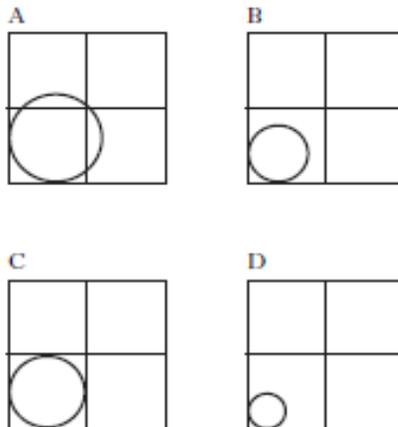
| Sample | Mass at start (g) | Mass at end (g) | % Change in Mass |
|--------|-------------------|-----------------|------------------|
| A | 14.5 | 15.7 | +8.3 |
| B | 13.7 | 17.4 | |
| C | 14.9 | 12.3 | |
| D | 14.2 | 14.2 | |

- a) Calculate the % change in mass for the other 3 samples.
- b) Which Sample was placed in a solution with the highest water concentration. Explain how you know this.
- c) Name 2 variables which would need to be controlled in order for this to be a valid experiment.
- d) How could the results of this experiment be made more reliable?

5. The diagram below shows the initial diameter of a potato disc.



The potato disc was placed in a strong sugar solution for one hour. Which of the following diagrams shows correctly the change in the diameter of the potato disc?



6. Which line in the table below identifies correctly the importance of diffusion to an animal cell?

| | Raw material gained | Waste product removed |
|---|---------------------|-----------------------|
| A | oxygen | glucose |
| B | carbon dioxide | oxygen |
| C | oxygen | carbon dioxide |
| D | glucose | oxygen |

7. Which of the following molecules can both diffuse through a cell membrane?

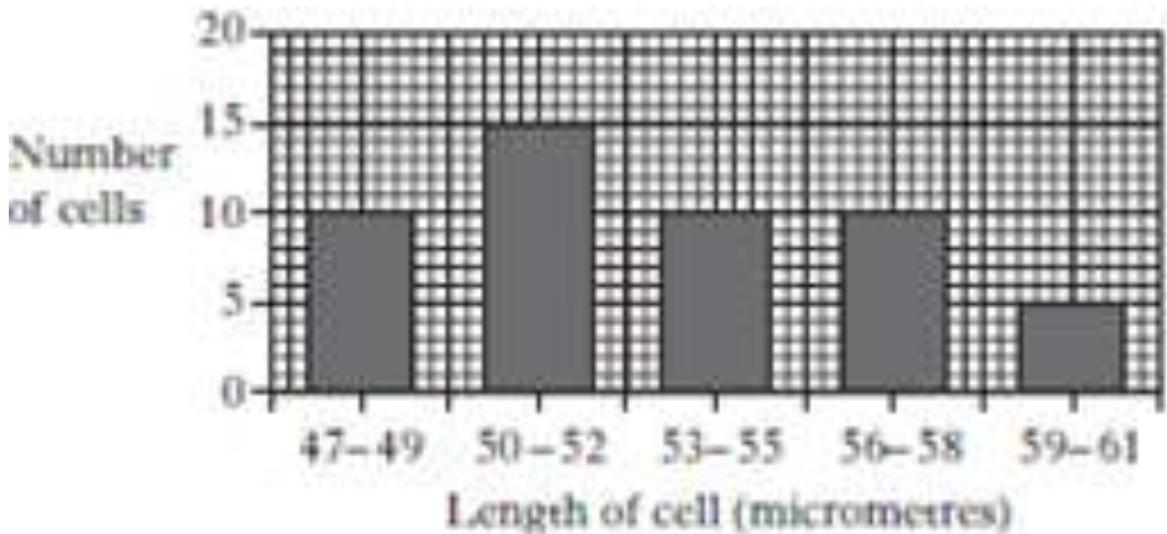
- A Amino acids and starch
- B Amino acids and water
- C Starch and protein
- D Protein and water

8. A plant cell, which was placed in a liquid, gained water by osmosis. The cell would be described as:

- A flaccid
- B turgid
- C plasmolysed
- D burst

9. Plant and animal cells were placed in strong salt solutions and left for two hours. Make a drawing of each cell to show what you would expect to see at the end of the experiment. Your diagram must be labelled.

10. The bar chart below shows the number of cells of different lengths in a sample of onion epidermis.

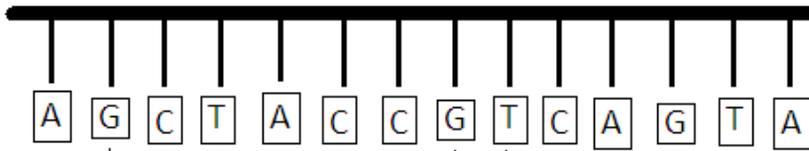


The percentage of cells with a length of greater than 55µm is:

- A 10%
- B 15%
- C 20%
- D 30%

Homework 3

1. What are genes?
2. Where are genes found in the cell?
3. What shape is DNA described as?
4. mRNA carries a copy of DNA inside a cell. Where is mRNA made and where does it travel to?
5. Which cell organelle is protein made at?
6. Below is a strand of DNA. The bases on the complementary stand are missing. Write down the order of bases on the complimentary strand.



7. A student is calculating how many DNA bases are in each gene. She works out that there are a total of 2500 bases in a single strand of a gene.

| DNA Base | Number in Gene | % in gene |
|----------|----------------|-----------|
| A | 1150 | 46 |
| G | 350 | 14 |
| C | | 30 |
| T | | 10 |

- a) Calculate the number of cytosine and Thymine bases in this gene.
 - b) Express the percentage of adenine bases and guanine bases in the gene as the simplest whole number ratio.
8. A strand of a DNA molecule was found to contain 15 000 nucleotides. What is the maximum number of amino acids which could be coded for by this molecule?

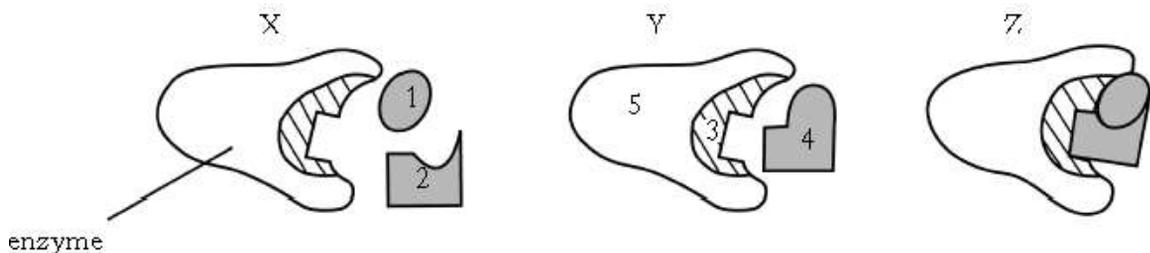
Homework 4

1.a) Enzymes in cells are made of protein. Name 2 other substances in the body that are made of protein.

b) Give a function of one of the types of protein in a).

2. What is the role of enzymes in cells?

3. The diagrams below show the stages that occur when an enzyme converts a substrate into products.



a) Use the letters to put the stages into the correct order to show a degradation reaction.

b) Which number in the diagram shows the active site?

4.(a) Describe the features of an enzyme which allow it to combine with only one substrate.

(b) What happens to an enzyme when it is boiled?

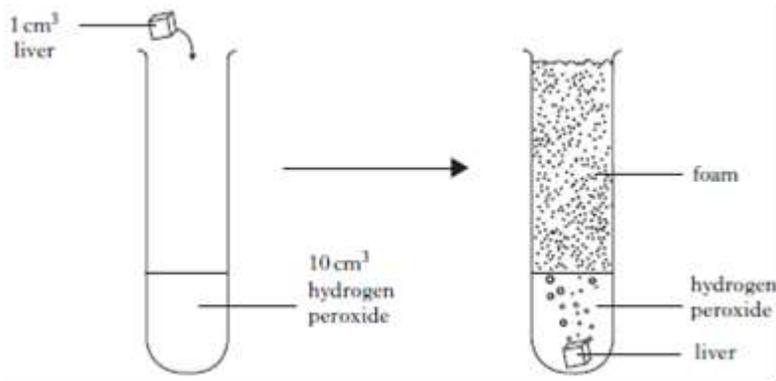
(c) Name a factor, other than temperature, which affects enzyme activity.

5. A student wanted to investigate the effect of temperature on the activity of the enzyme Catalase. The table below shows the volume of oxygen released when Catalase was added to hydrogen peroxide (H_2O_2) at a range of temperatures.

| Temperature of Catalase ($^{\circ}\text{C}$) | Volume of Oxygen released (cm^3) |
|--|---|
| 0 | 2 |
| 5 | 7 |
| 10 | 45 |
| 20 | 26 |
| 30 | 36 |
| 40 | 52 |
| 50 | 13 |
| 60 | 0 |

- On a piece of graph paper, draw a line graph to show the results of this investigation.
- Give a conclusion based on the results of this experiment.
- One of the products of this reaction was Oxygen. What is the other product released when Catalase breaks down Hydrogen Peroxide?
- Based on the experimental results which temperature is the best for catalase activity.
- What term is used to describe the condition at which an enzyme works best?

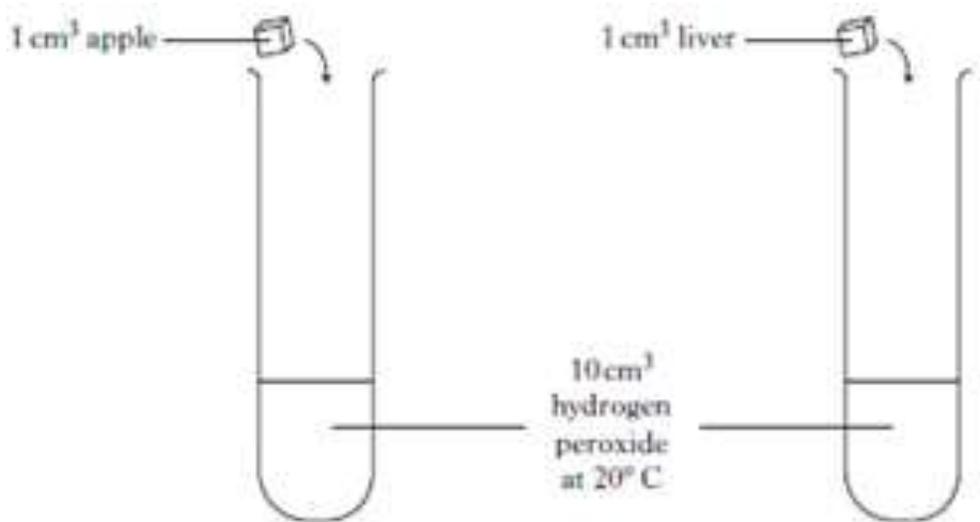
6. a) Liver contains the enzyme catalase. A piece of liver was added to hydrogen peroxide and foam was produced as shown below.



(i) Describe a control which would be used to show that active catalase is needed for this experiment.

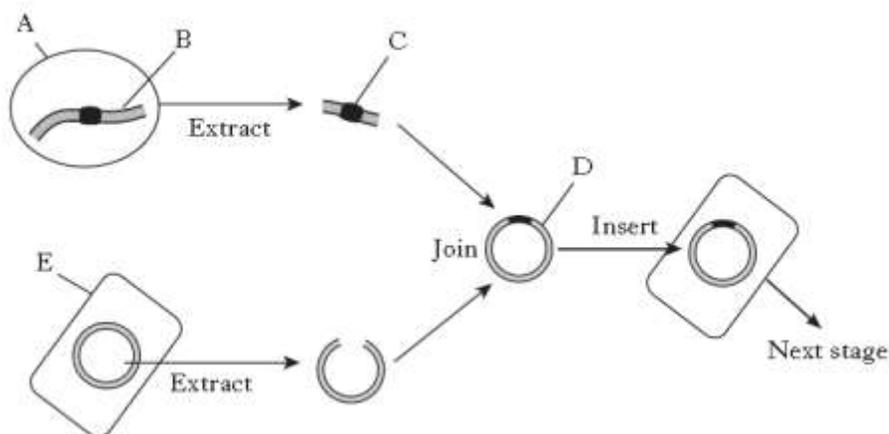
(ii) How could the activity of catalase be measured in this experiment?

(b) The diagram above shows an investigation to compare the activity of catalase in apple and liver. State two variables, not shown in the diagram, that must be kept constant for a valid comparison.



Homework 5

1. The diagram below shows stages in genetic engineering.



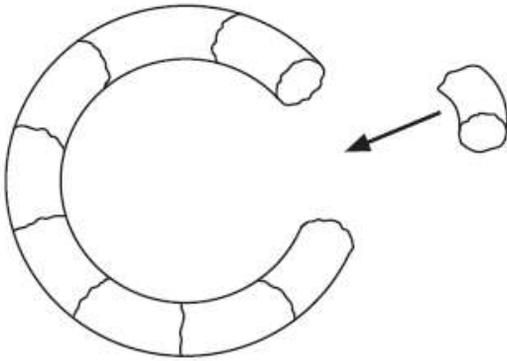
- What do A, B, C, D and E represent.
- Which other molecules not mentioned in the diagram are also required for genetic engineering.

2. a) Scientists wanted to compare the resistance of various crops of barley to attack from insects and disease. 4 fields were planted with the same mass of barley seeds for each crop (0.2 tonnes/ 200kg). No insecticides or fertilisers were used on any crop. When the crop was ripe it was harvested and weighed. The results are shown in the table below.

| Crop | % lost to insects | % lost to disease | Mass of healthy barley harvested (tonnes) |
|-------------|-------------------|-------------------|---|
| Wild barley | 4 | 7 | 0.5 |
| Farm Crop 1 | 10 | 15 | 4.5 |
| Farm Crop 2 | 20 | 5 | 5.5 |
| GM Crop | 7 | 9 | 7.8 |

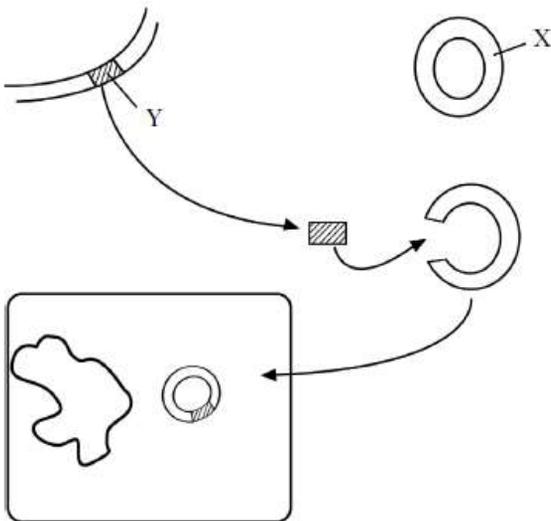
- What conclusion can be drawn about the GM crops resistance to Pests and disease compared to wild barley?
- What is the simplest whole number ratio of mass harvested of wild barley to farm crop 1.
- How many times greater was the % of farm crop 2 lost to insects than that which was lost to disease?
- Would you recommend that farmers change to the GM crop? Give a reason for your answer.

- 3 Which stage in the production of human insulin by genetic engineering is represented in the diagram below?



- A Human gene is inserted into a plasmid.
- B Human gene is inserted into a bacterium.
- C Plasmid is inserted into a human chromosome.
- D Bacterial gene is inserted into a human chromosome.

- 4 The diagram below shows stages in the production of a desired product by genetic engineering.



Which line in the table identifies correctly the structures labelled above?

| | X | Y |
|---|-----------|------------|
| A | bacterium | gene |
| B | plasmid | chromosome |
| C | bacterium | chromosome |
| D | plasmid | gene |

- 5 Which line in the table below identifies correctly one advantage and one disadvantage of genetic engineering to make desired products?

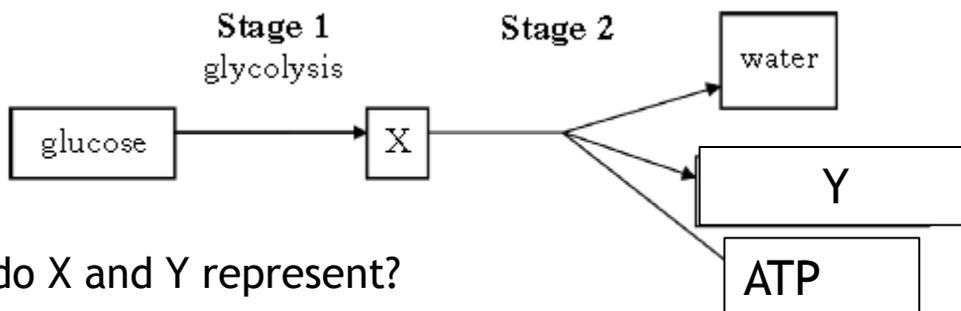
| | <i>Advantage</i> | <i>Disadvantage</i> |
|---|------------------------------|--|
| A | increased rate of production | cost of development |
| B | cost of development | possible release of genetically engineered bacteria into the environment |
| C | increased range of products | increased rate of production |
| D | increased rate of production | increased range of products |

6. Use the letters to place the following stages of genetic engineering in the correct order.

- A- bacterial plasmid cut open
- B- bacteria multiply and synthesise growth hormone
- C- growth hormone gene inserted into bacterial plasmid
- D- bacterial plasmid removed from bacterium
- E- bacterial plasmid inserted into bacterium

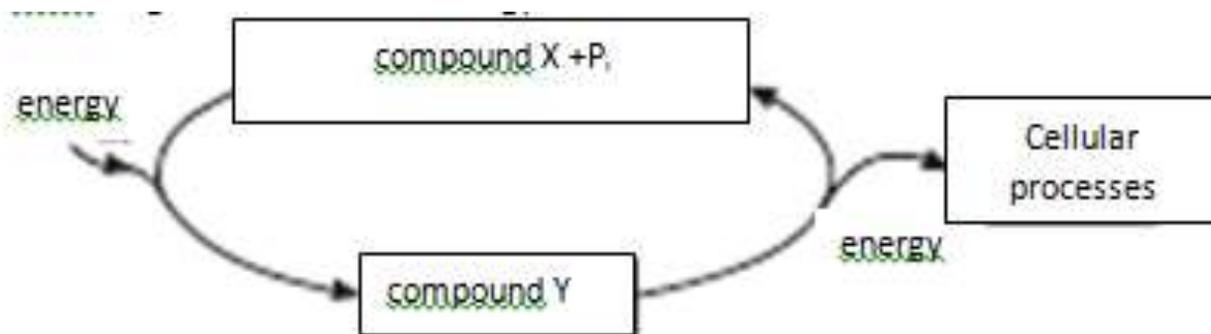
Homework 6

1. The diagram below shows a type of respiration in yeast.



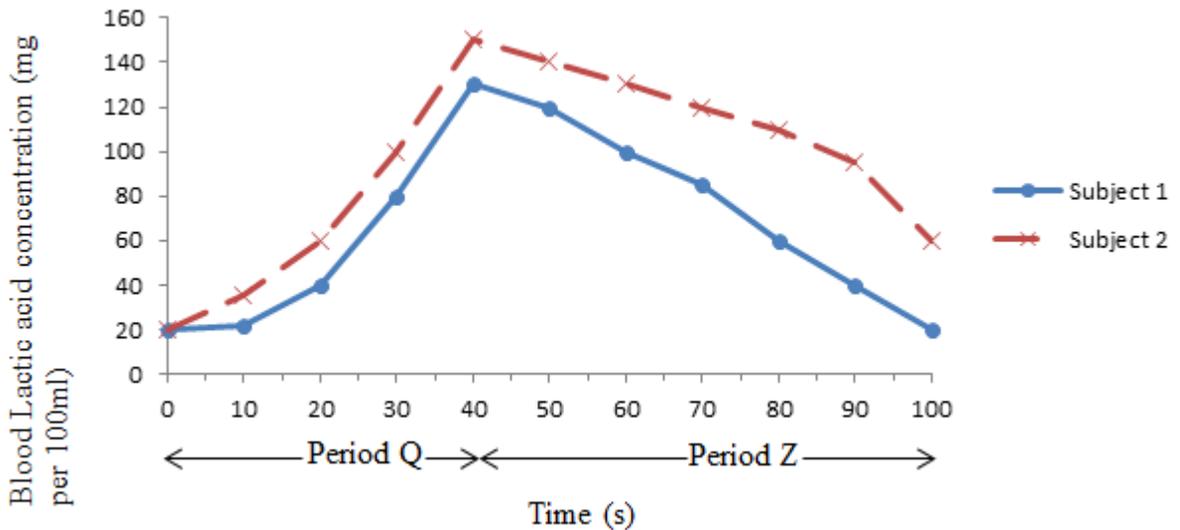
- What do X and Y represent?
- Which type of respiration is shown in the diagram?
- Which stage of this process will provide the most ATP?
- Where would stage 1 and 2 take place in the above reaction?
- Yeast cells are used in the brewing industry:
 - What type of respiration is involved in this industry?
 - What products are produced in plant and yeast cells during this type of respiration?

2. The diagram below shows energy transfer within a cell.



- Name compounds X and Y.
- Identify two cellular processes that would require energy.

3. The graph below shows the lactic acid concentration in the blood during exercise (period Q) and immediately after exercise (period Z) in two different males (Subject 1 and 2) aged 24:



- Name 2 variables, not already mentioned, that would have to be kept the same to ensure valid results in this experiment.
- Describe the change in lactic acid concentration for Subject 1 from 0 to 100s.
- Why does lactic acid concentration not immediately drop when the exercise is over?
- Which subject (1 or 2) is the most physically fit? Explain your answer.

Extended Response Questions

All Questions are worth 5 marks.

1. Describe the osmotic effect of transferring an;
 - i) animal cell into a solution with a high water concentration.
 - ii) a plant cell into a solution with a lower water concentration.

2. Write notes on DNA under the following headings:
 - i. Structure of DNA
 - ii. Complementary bases
 - iii. The importance of the order of the bases

3. Describe the function of yeast in bread making and the fermentation pathway involved in this process.

4. Describe the **two** stages of aerobic respiration **including** the names of the raw materials and products for **each** stage.

5. Bacteria can be used in genetic engineering. Describe the stages involved in this process.