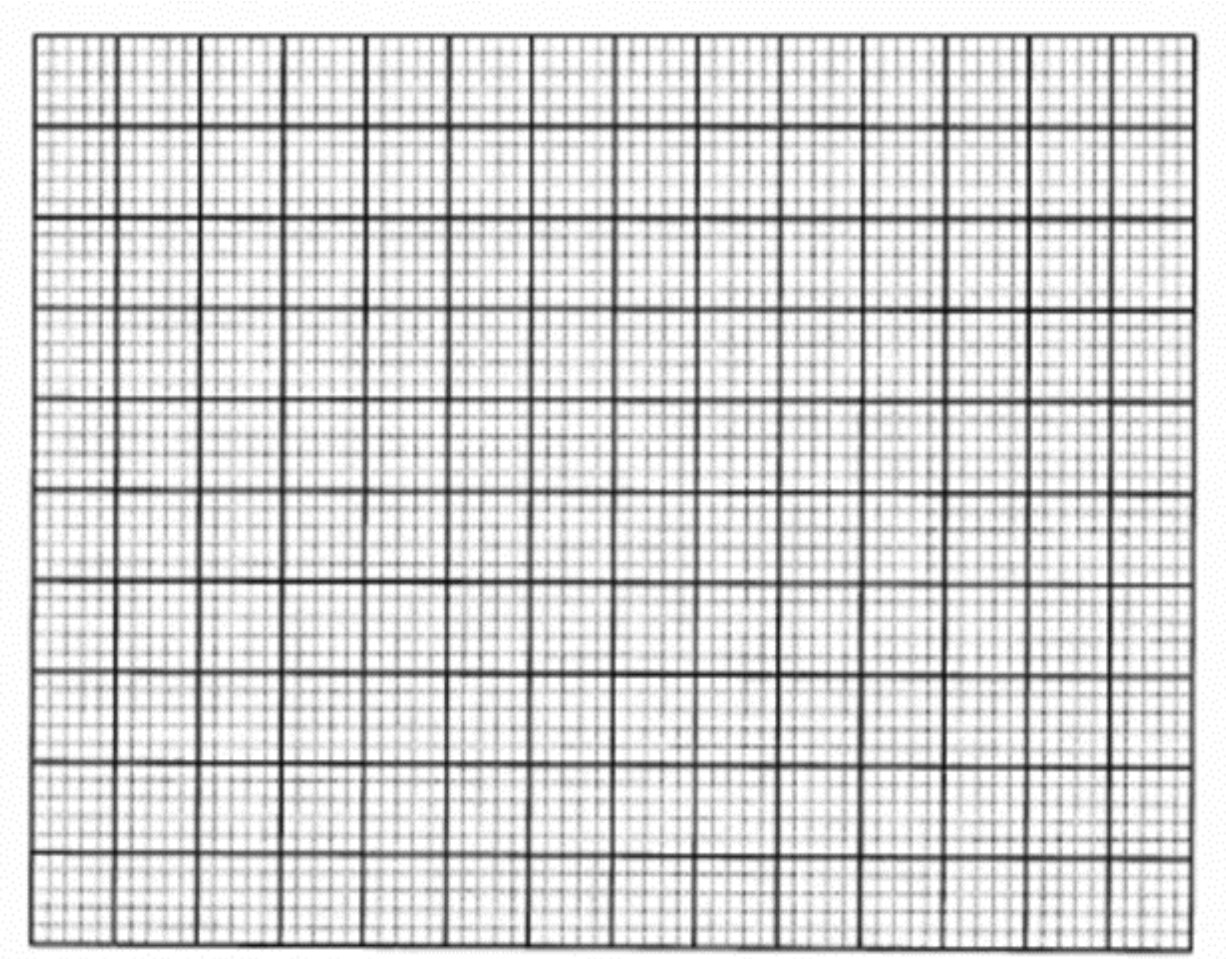
Enzymes

(a) A group of students conducts an experiment to investigate the rate of reaction of enzyme X at different temperatures. The results of the experiment are shown in Table 1.

Table 1: **RATE OF REACTION OF ENZYME X AT DIFFERENT TEMPERATURES**

Temperature (ºC)	**Rate of Reaction of Enzyme X (mg of product per min)**
0	0
5	3
15	9
25	15
30	24
40	8
50	0

i. Plot the data in the Table 1 on the grid below.



(4 marks)

ii. Use the graph plotted in (a) (i) identify the optimum temperature for Enzyme X. (1 mark)

iii. - Account for the shape of the graph: Between 5^{o} C and 30^{o}C
- Above 40^{o}C

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……2 marks.

iv. State ONE precaution that the students should take when carrying out this experiment.

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……1 mark.

b. i. Name TWO enzymes that break down protein.

…… 2 marks.

ii. Name Two parts of the human alimentary canal where enzymes that break down protein are found.

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…… 2 marks.

iii. Suggest TWO reasons why the different enzymes for breaking down proteins are located in two different parts of the alimentary canal.

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……2 marks.

c. Leguminous plants such as peanuts are able to manufacture proteins with the help of nitrogen-fixing bacteria that live in the nodules on their roots.

i. Identify the type of relationship that exists between the peanut plant and the bacteria.

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……1 mark

ii. Explain your answer in (c) (i) above.

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……3 marks.

iii. Describe a suitable procedure for testing the presence of protein in peanuts.

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……..3 marks.

iv. Suggest TWO reasons why plants need protein.

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……4 marks.

Total: 25 points

1. (a) (i) State THREE differences between a plant cell and an animal cell.

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…… **3pts**

(ii) State **TWO** differences between a prokaryotic cell and a eukaryotic cell.

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…… **2pts**

(b) State the function of each of the following :

(i) Cell Wall:

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….. **1pt**

(ii) Cell membrane:

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….. **1pt**

C. (i) Explain what happens to an animal cell when it is removed from the organism and placed into concentrated sucrose solution.

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…… **2 pts**

(ii) Explain what happens to an animal cell when it is removed from the organism and placed into distilled water.

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…… **2 pts**

(iii) Describe how the results would be different from (c) (i) and (ii) for a plant cell in concentrated sucrose solution and distilled water respectively.

Concentrated sucrose solution:

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…… **2 pts**

Distilled water:

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…… **2pts**

15 pts total.

. Figure 3. Represents the Whittaker Five- kingdom classification of living organisms.

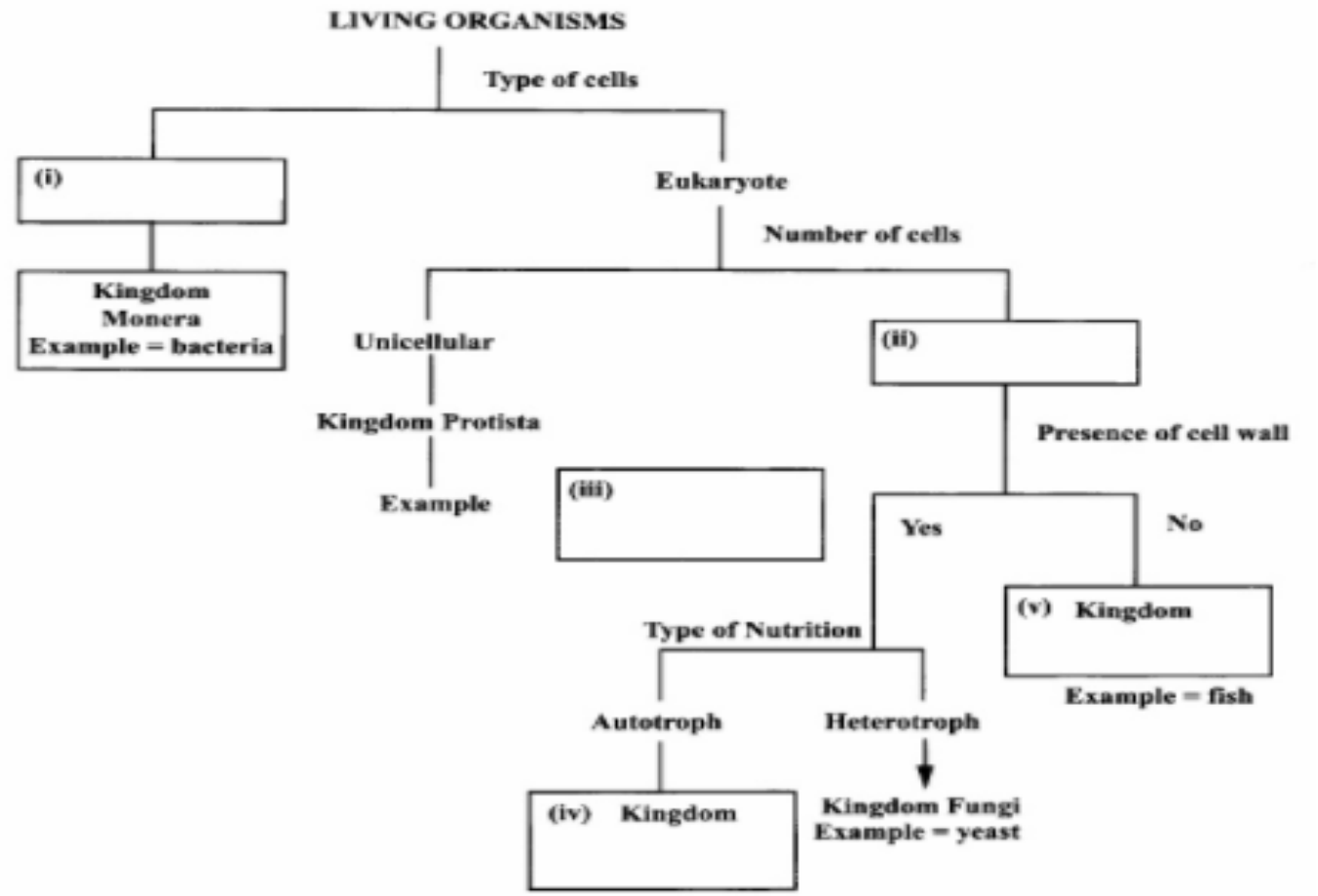

Figure 3. Whittaker Five-Kingdom Classification of living organisms

a. Complete the classification by writing the correct answers at (i), (ii), (iii), (iv) and (v) in Figure 3.
(**5 pts**)

b. Each kingdom is further subdivided into taxa with the lowest rank being the level of species.

i. Define the term species.

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…… (**2 pts**)

ii. Using the human species as an example, explain why physical appearance or morphology is NOT always useful for identifying organisms belonging to the same species.

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……(**2 pts**)

iii. Suggest **ONE** reason why biologists use the biological concept of species instead of physical characteristics to classify organisms.

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c. Some lizards were washed away on a log during a hurricane and landed on a remote island. Several years later, they were classified as a new species.

(i) Using the biological concept of a species, state TWO reasons why they were reclassified.

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……..(**2 pts**).

(ii) The new species of lizards living in the mountainous region of the island were found to be smaller than those living on the lowlands. Suggest TWO reasons for this variation.

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15 pts total

4. a. Blood that has been oxygenated in the lungs must first be pumped through the heart before it is sent to all the other organs of the body. Describe the pathway that blood takes as it flows into the heart from the lungs, until it is pumped out of the heart to be sent to the rest of the body.

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…….(**4pts**)

ii. Identify TWO physiological diseases that affect the circulatory system.

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…….(**2pts)**

b. Chemotherapy is a treatment that destroys both the malignant (bad) cells and the good cells in the body. Explain why a person undergoing chemotherapy would have decreased natural immunity.

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c. Peter who has not had a tetanus vaccine, gets his foot punctured by a nail. He is given a tetanus antiserum injection at the hospital. Suggest why he is given an antiserum injection instead of a vaccine.

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15 <u>Pts.</u>

5. a. Describe how genetic engineering is used to produce human insulin using the bacterium ***E. Coli.***

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……**(4pts) .**

b. Discuss THREE differences between genetic engineering and artificial selection used by farmers to produce improved varieties of crop plants.

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(6 pts).

ii. Suggest THREE advantages of using genetic engineering to produce insulin.

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……**3 marks.**

iii. Use the Theory of natural selection to explain 'antibiotics resistance'.

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……**2 marks.**

15 <u>Marks.</u>

6. Figure two is a diagram of the female reproductive system.

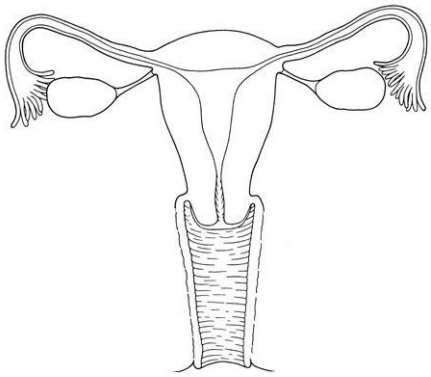

Figure 2. Structure of the human female reproductive system.

(a) Label the organs in Figure 2 to show where

(i) The female gametes (ova) are made

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(ii) Fertilization would occur

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…… (1 pt)

(iii) Implantation of a fertilized gamete would normally occur
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…… (1 pt)

(b) Outline the mechanism by which male and female gametes come together in the human reproductive system to form a zygote.
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…… (3 pts)

(c) (i)Name the type of cell division by which female gametes are made.
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……(1 pt)

(ii) Describe TWO ways in which the type of cell division named in (c) (i) differs from that by which the embryo grows and develops after fertilization of an ovum.
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(d) Embryonic stem cells are undifferentiated cells formed as the embryo grows and develops. These cells are capable of differentiating into specialised cells of tissues and organs in the human body.

(i) Suggest TWO reasons why cell specialization is important.

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……(**2pts**)

(ii) Explain why embryonic stem cells can be used in the treatment of physiological diseases.

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……(**2pts)**

15 marks.

7. a. I. Explain how structures in the human eye control the amount of light that enters the eye.

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…… **(4 pts)**

II. Jenny enters a dimly lit room and cannot see that colours of the furniture until the lights are switched on. Explain how jenny is able to discern objects in the dimly lit room but cannot see the colours until the lights are switched on.

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b. A certain form of colour-blindness is inherited as a recessive allele carried on the X chromosome. It is thus said to be 'X-linked' or 'sex-linked'. A woman with normal colour vision, whose father is colour-blind, mates with a colour blind man. What is the chance of them having colour-blind children? Use a genetics diagram to explain your answer.

Use **B** for the allele for normal vision and **b** for the allele for colour-blindness. **6 pts.**

15 marks.

Albinism is seen in persons who are homozygous for recessive allele of a certain gene. This gene codes for the production of the skin pigment, melanin. Persons who inherit the dominant allele of this gene produce normal amount of melanin for their race.

(a) Distinguish between the following paired terms:

- Allele / Gene:

- Dominant / Recessive:

- Homozygous / Heterozygous

(6 mks)

(b) (i) Use a genetic diagram to show how a couple with normal pigmentation may produce an albino child. Use the following symbol to represent the alleles:
A- Normal ; a- albino. (4 mks)