THE INSTITUTE OF EDUCATION

# Subject: Biology

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COURSE: 5th Year

ACADEMIC LEVEL: Higher

ACADEMIC YEAR: 25/26

## *TOPIC: Sample Exam Questions* – Solutions

Q1.

A number of food samples were tested in the laboratory and the following results obtained. The ✓ indicates a positive result.

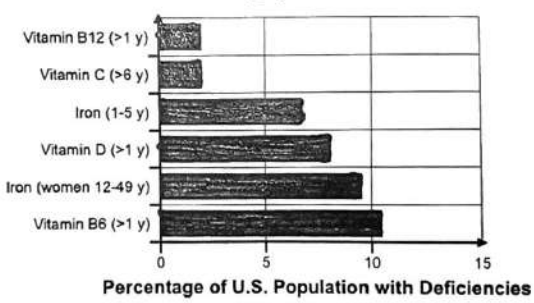
| | Iodine | Biuret | Brown Paper |
|---|---|---|---|
| **Food A** | × | ✓ | × |
| **Food B** | ✓ | × | × |
| **Food C** | × | × | ✓ |

(i) Identify each of the food **biomolecules** A,B and C.

| | |
|---|---|
| A | Protein |
| B | Starch |
| C | Lipid (or Fat etc) |

Q2.

Study the graph below and answer the following questions.

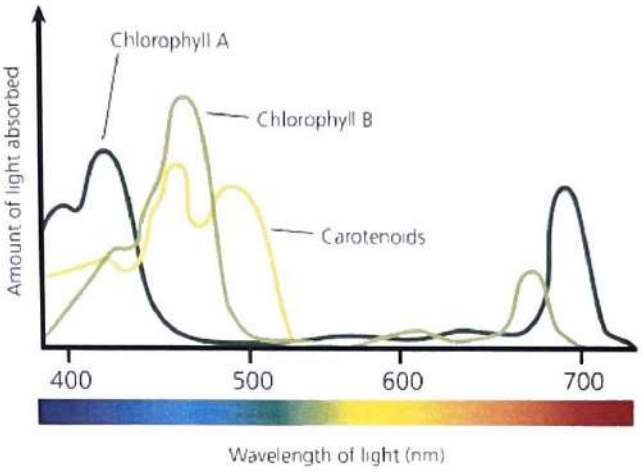



(a) Choose one water soluble vitamin from the graph and indicate **one** good food source where it may be found.

| | |
|---|---|
| Vitamin: | C or B6 or B12 |
| Source: | C → citrus fruit or named citrus fruit<br>B6 or B12 → fish or chicken or Any other Valid |

Q3.

Below is a graph of the absorption of light by chlorophyll pigments. Answer the following questions based on the graph




(a) Suggest a benefit of a plant have more than one type of chlorophyll.

can absorb more light ⇒ greater rate of photosynthesis

(b) Which chlorophyll pigment absorbs the greatest amount of light.

Chlorophyll A

(c) Identify the light colours absorbed by chlorophyll A.

Blue and Red.

(d) What happens to light of the colour green or yellow when it hits the chlorophyll pigments?

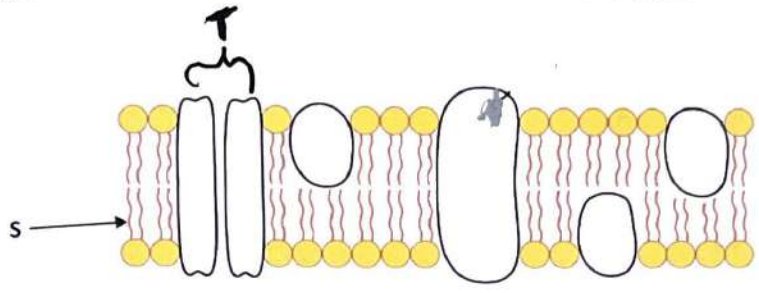
Reflected or not absorbed.

(e) Provide two reasons why light is of importance to plants in photosynthesis

(1) Photolysis (2) Energise electrons.

Q4.

The diagram below shows the ultra-structure of the cell membrane.




(a) Name the type of microscope required to produce the image.

Transmission Electron Microscope.

(b) Identify the component labelled S.

Phospholipid

(c) **Describe** the composition of S.

Glycerol + 2 fatty acids + phosphate

(d) Cell membranes are composed of proteins including the part labelled T. Identify the type of protein labelled T.

Channel proteins

(e) Identify the transport method by which water molecules move through T.

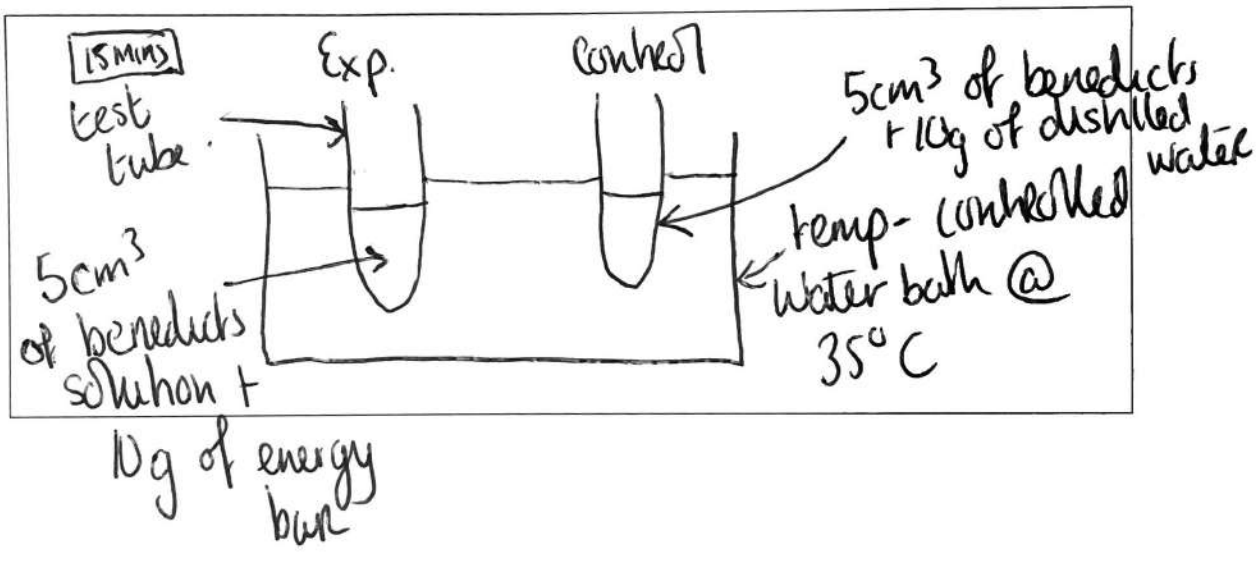
Osmosis

Q5.

Below is the nutritional content of an energy bar.

| Content | Mass per 100g (g) |
|---|---|
| Fat | 20 |
| Reducing Sugar | 35 |
| Protein | 35 |
| Other | 10 |

In the space provided, draw a labelled diagram of the experimental set up to confirm the presence of reducing sugar in the energy bar. Ensure to make reference to the control in your diagram.

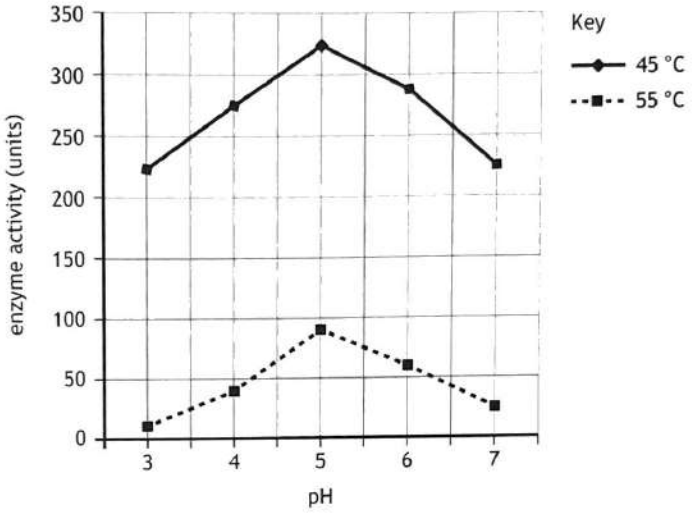


Q6.

The enzyme invertase is commonly used to make soft-centred chocolates. Invertase speeds up the following reaction:

$$\text{sucrose} \xrightarrow{\text{invertase}} \text{glucose} + \text{fructose}$$

(a) An investigation into the effect of pH on invertase at different temperatures was carried out. The results are shown in the graph.




(i)Identify the dependent variable in the above investigation.

enzyme activity

(ii)State the temperature at which invertase was most active.

45°C

(iii) what is the optimum pH of invertase?

5

(iv) What would happen to the enzyme if the investigation was repeated at 100°C? How would this have been identified from the results?

- Denatured
- no enzyme activity

(v) How was the desired temperature achieved in the laboratory when conducting the experiment?

Temp. controlled water bath

(b) A different enzyme speeds up the following reaction:


(i) Identify enzyme X

Amylase.

(ii) Explain why invertase would not speed up this reaction.

Enzymes are specific. Each enzymes works on one substrate only. Inverkase will only work on sucrose due to their complimentary shape.

Q6.

The following data was obtained when a student investigated the effect of pectinase concentration of the volume of juice extracted from 50g of "Granny Smith" apples.

| Pectinase concentration (%) | Repeat 1 ($cm^3$) | Repeat 2 ($cm^3$) | Repeat 3 ($cm^3$) | Mean volume ($cm^3$) |
|---|---|---|---|---|
| 0 (Control) | 8.2 | 7.9 | 8.1 | 8.4 |
| 0.5 | 11.4 | 11.1 | 11.6 | 11.4 |
| 1.0 | 14.8 | 15.2 | 14.9 | |
| 2.5 | 20.6 | 21.1 | 20.8 | 20.8 |
| 5.0 | 26.9 | 27.4 | 27.1 | 27.1 |

(i) What is data?

information (qualitative +/or quantitative) collected.

(ii) What type of data would the student who collected this consider it to be?

Primary

(iii) Provide an explanation why this data would be considered reliable.

- Replicates carried out
- Values for replicates similar to each other

(iv) Identify the independent variable in the above experiment.

Pectinase Concentration.

(v) Suggest one way in which the student could have considered fairness when conducting this experiment.

- Same quantity of apple used each time (50g)
- Same brand of apple, Any other valid

(vi) Calculate the mean volume of juice extracted for 1.0% pectinase concentration.

$14.8 + 15.2 + 14.9 = 44.9 = 15.0$

$\frac{44.9}{3}$

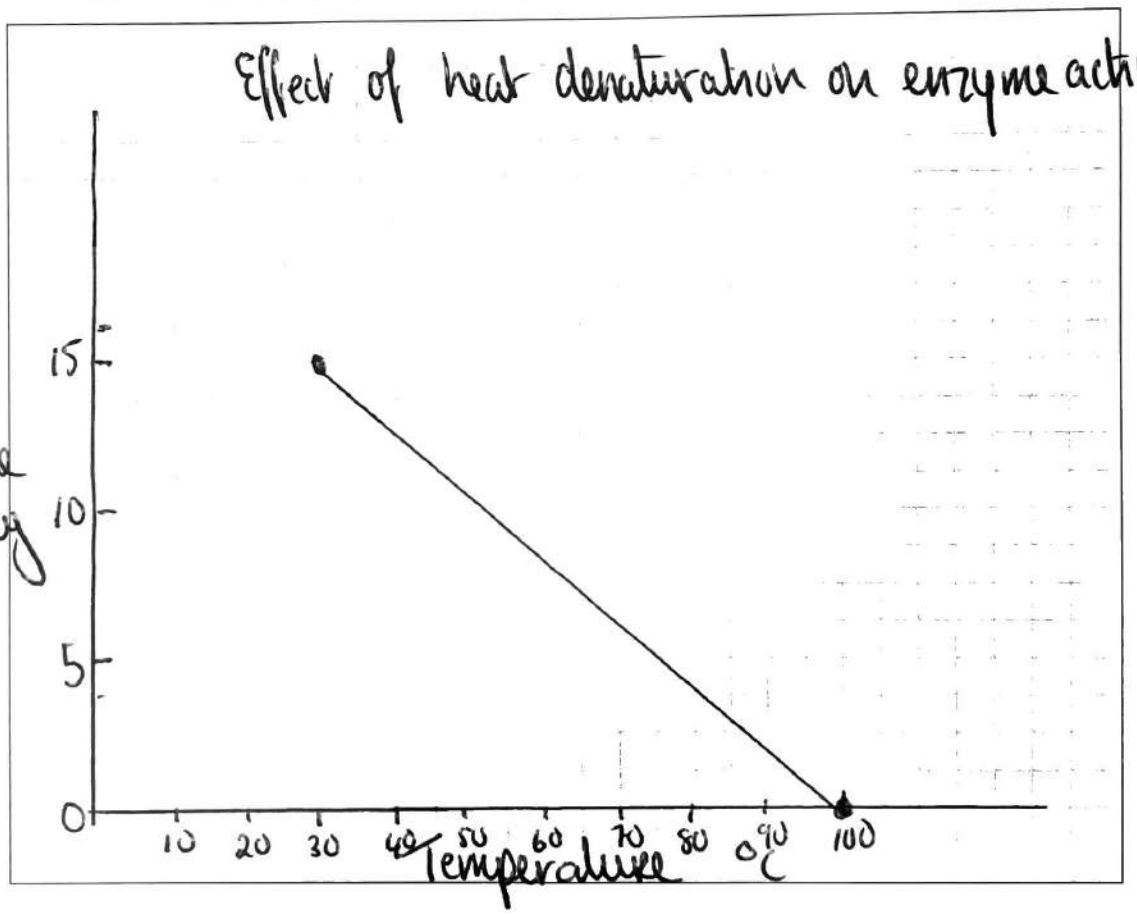
(vii) Analyse the data and write a comment on the effect of pectinase concentration on juice extraction.

As the pectinase concentration increased, the volume of juice extracted increased.

(b) The following results were obtained from investigating heat denaturation of an enzyme;

| Temperature (°C) | Enzyme Activity |
|---|---|
| 30 | 15 |
| 100 | 0 |

(i) On the graph paper plot a labelled graph of the results obtained.




(ii) Provide an explanation of why the enzyme stopped working at 100°C

• enzyme has become denatured (or described)
↳description of denaturation.

Q7.

(a)

The table shows the concentration of potassium and magnesium ions in the cytoplasm of root cells and in soil water. There is a movement of potassium and magnesium ions from the soil water into the cytoplasm of the root cells. Analyse the data.

| | Cytoplasm (mg/l) | Soil water (mg/l) |
|---|---|---|
| Potassium ions | 4.00 | 0.12 |
| Magnesium ions | 0.40 | 0.80 |

(i)

Name the process by which the root cells take up potassium ions through root hairs and provide an explanation for your answer.

- Active transport
- Potassium ions moving from low potassium ion conc to a high potassium ion conc.

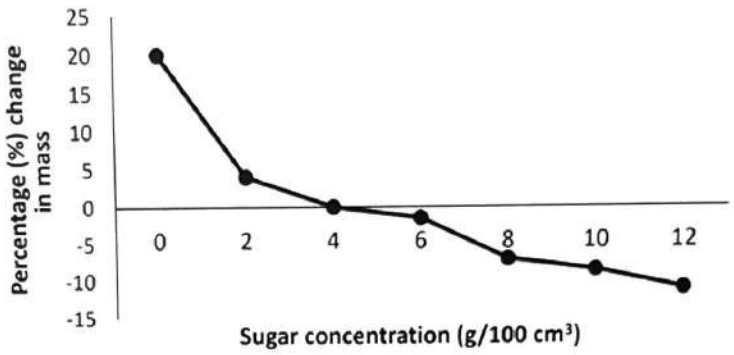
(ii)

Name the process by which the root cells take up magnesium ions through root hairs and provide an explanation for your answer.

- Diffusion.
- Magnesium ions moving from a high Magnesium ion conc to a low magnesium ion concentration.

(b)

The graph shows the changes in mass of plant tissue when placed in solutions of different sugar concentrations.




(i) At what sugar concentration is there no change in the mass of the plant tissue?

4g/100 cm³ (units essential)

(ii) Provide an explanation why there is no change in mass at the sugar concentration you have given in part (b)(i) above.

as the concentration of water is the same in the plant tissue and sugar solution (or sugar conc is same in plant tissue and solution)

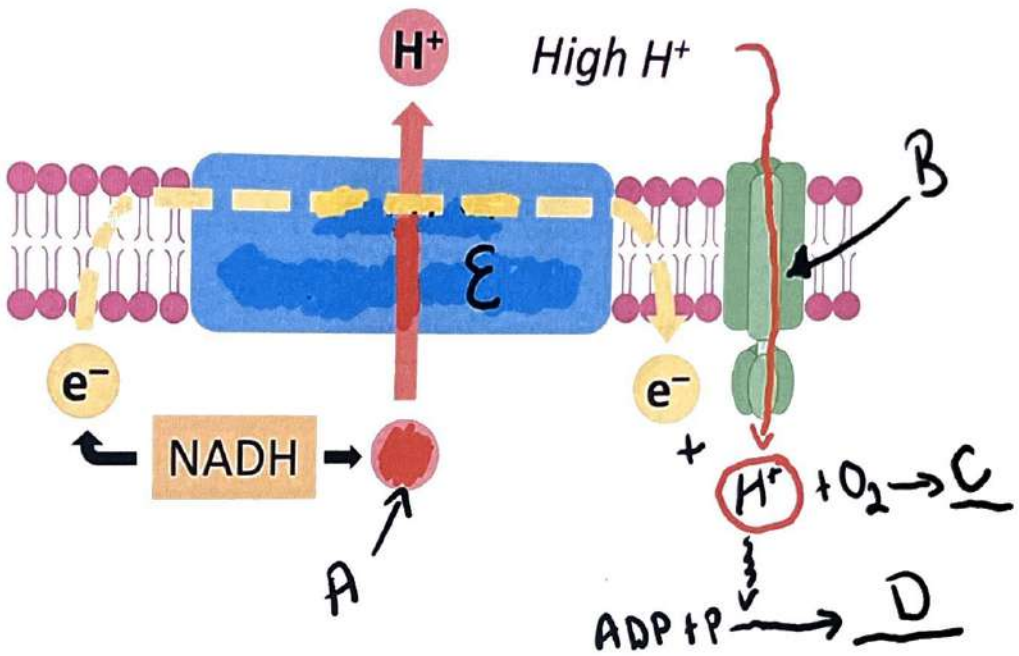
(iii)

1. What term is used to describe the condition of the plant cells that have been soaked in the 0 g/100 cm³ sugar solution?

Turgor

Q8.

The diagram represents the "electron transport chain" of respiration.




(i) Name the cell organelle where the electron transport chain of respiration takes place.

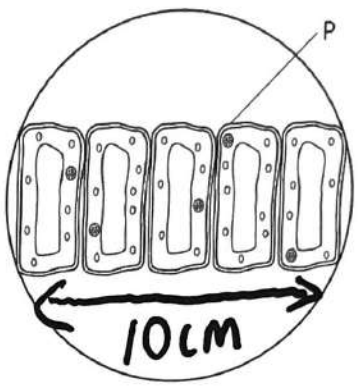
| |
|---|
| Mitochondrion |

(ii) Identify the parts of the diagram labelled A-E;

| Labelled Part | Name |
|---|---|
| A | $H^+$ or protons or hydrogen ions |
| B | ATP Synthase. |
| C | $H_2O$ (water ok) |
| D | ATP |
| E | electron transport chain (or carrier) |

Q9.

Palisade mesophyll cells are found in leaves and carry out photosynthesis. The diagram shows a layer of these cells viewed under a microscope.




(i) Identify a suitable stain used to view plant cells under the microscope.

Iodine

(ii) Identify another use for the stain named in part (i) during the course of your practical investigations.

Test for the presence of starch.

(iii) Calculate the actuals size of each plant cell if the cells were viewed through a microscope using a X20 eyepiece magnification and a X20 objective lens magnification.

$10 \div 5 = 2 \div (20 \times 20) = 0.005\text{cm}$ (units essential)

(iv) Name the part labelled P.

Cell wall

(v) Analyse the image above and state one feature that supports the statement that it is a plant cell.

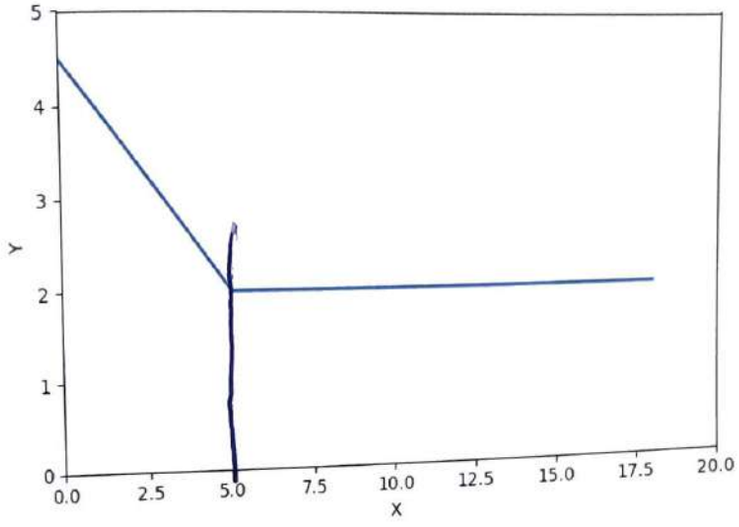
- defined (or Rectangular shape)

OR

- presence of a cell wall.

Q10.

A scientist investigated the impact that variable X had on variable Y and plotted a graph of the data as sketched below.




(a) Explain what is meant by "data".

information collected

(b) Indicate on the graph by drawing a vertical line where the relationship between the X and Y variable becomes constant.

(c) Study the graph and provide a description between the variable on the x axis and the variable on the y axis.

- As X axis value increases, Y axis value decreases
- X axis value continues to increase, Y axis value becomes constant

(d) A scientist will always commence an investigation with a written hypothesis which will then be tested. How is a hypothesis tested?

Conducting an experiment

(e) Safety is an essential consideration when doing an experiment. Identify any safety step taken in a laboratory.

- wear lab coat or safety goggles or gloves or any other valid