

CLASS: FORM 1

SUBJECT: BIOLOGY

TOPIC 5: NUTRITION IN PLANTS AND ANIMALS

1. Define nutrition.

-Refers to the process by which living organisms obtain and assimilate (utilize) nutrients.

2. Explain the meaning of the following terms.

a) Autotrophism

Mode of nutrition through which living organisms manufacture their own food from simple inorganic substances in the environment such as carbon (IV) oxide, water and mineral ions.

b) Heterotrophism

Mode of nutrition in which living organisms depend on already manufactured food materials from other living organisms.

3. Distinguish between chemosynthesis and photosynthesis.

Chemosynthesis is the process whereby some organisms utilize energy derived from chemical reactions in their bodies to manufacture food from simple substances in the environment while photosynthesis is the process by which organisms make their own food from simple substances in the environment such as carbon (IV) oxide and water using sunlight energy.

4. State the importance of Photosynthesis.

1. Photosynthesis helps in regulation of carbon (IV) oxide and oxygen gases in the environment.

2. Photosynthesis enables autotrophs make their own food, thus, meet their nutritional requirements.

3. Photosynthesis converts sunlight energy into a form (chemical energy) that can be utilized by other organisms that are unable to manufacture their own food.

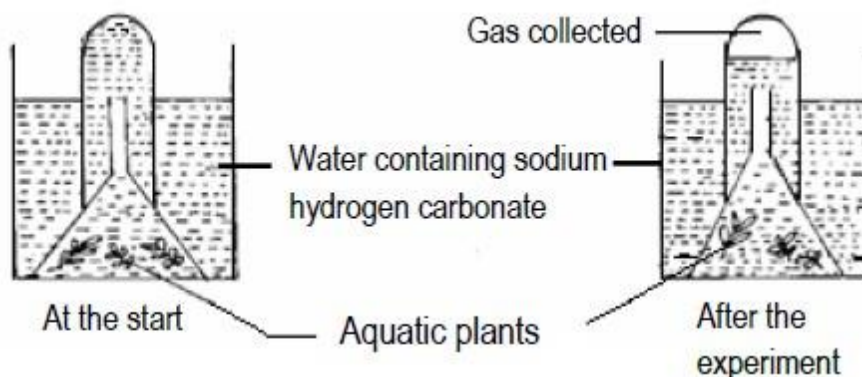
5. Describe the adaptations of the leaf to photosynthesis.

- The leaf has a flat and broad lamina to increase surface area for trapping sunlight energy and for gaseous exchange.
- The leaf has numerous stomata through which photosynthetic gases diffuse.
- The leaf is thin to reduce the distance through which carbon (IV) oxide has to diffuse to the photosynthetic cells.
- The palisade mesophyll cells contain numerous chloroplasts which contain chlorophyll molecules which trap sunlight energy for photosynthesis.
- The photosynthetic mesophyll is located towards the upper surface for maximum absorption of sunlight energy.
- The leaf has an extensive network of veins composed of xylem which conducts water to the photosynthetic cells and phloem to translocate manufactured food materials to other plant parts.
- The epidermis and cuticle are transparent to allow light to penetrate to the photosynthetic cells.

6. Name **two** raw materials for the dark stage process of photosynthesis.

Carbon (IV) oxide, hydrogen ions / atoms

7. The set up shows an experiment to investigate photosynthesis.



a). What gas was collected in the test tube?

-Oxygen gas

b) What was the role of sodium hydrogen carbonate in the experiment?

-Dissociate in water to provide carbon (IV) oxide; which is necessary for photosynthesis;

8. Why is pancreas considered a dual gland?

-Produces hormones / endocrine organs / produce digestive pancreatic juice.

9. The following is a dental formula of a dog and rabbit, state two differences between them.

Dog: I $\frac{3}{3}$ C $\frac{1}{1}$ PM $\frac{4}{4}$ M $\frac{2}{3}$

Rabbit: I $\frac{2}{1}$ C $\frac{0}{0}$ PM $\frac{3}{2}$ M $\frac{3}{3}$

Dog

- Presence of canine
- Has more teeth

Rabbit

- Absence of canines/presence of diastema
- Has few teeth.

10. The word equation below shows a biological process. Water-----→ Hydrogen atom + oxygen a).Name the process.

Photolysis;

b) Where does the process named in a) above take place?

Grana of chloroplast;

c) State two conditions necessary for the process to occur.

Sunlight; chlorophyll;

11. State **two** functions of bile juice in the digestion of food.

Emulsification of fats/breaking into small droplets;

Increase surface area for digestion; neutralizing acidity of chyme/ provide alkaline medium (for enzyme action);

12. Describe what happens during the light stage of photosynthesis.

Light (energy) is absorbed by chlorophyll; the light splits/photolysis water molecule; to form hydrogen ions/atoms and oxygen gas; (Light is converted to) and also forms Adenosine triphosphate (ATP);

13. Name the features that increase the surface area of small intestines.

Presence of villi;

Length;

14. The enzymes pepsin and trypsin are secreted in their inactive forms. Explain why they are secreted in these inactive forms.

To protect digestion of cells that secrete them;

15.(i) Identify the mode of feeding of the animal whose dental formula is shown below

$$\begin{array}{ccccccc} I & \frac{O}{3} & \frac{C}{O} & \frac{O}{O} & PM & \frac{3}{3} & M & \frac{3}{3} \\ & 3 & & O & & 3 & & 3 \end{array}$$

Herbivorous;

(ii) Give reasons for your answer in (i) above

-Presence of horny pad/absence of upper incisors

-Presence of diastema

16. State one adaptation of aquatic plants to photosynthesis.

- Presence of aerenchyma tissue to store C_0_2 for photosynthesis.

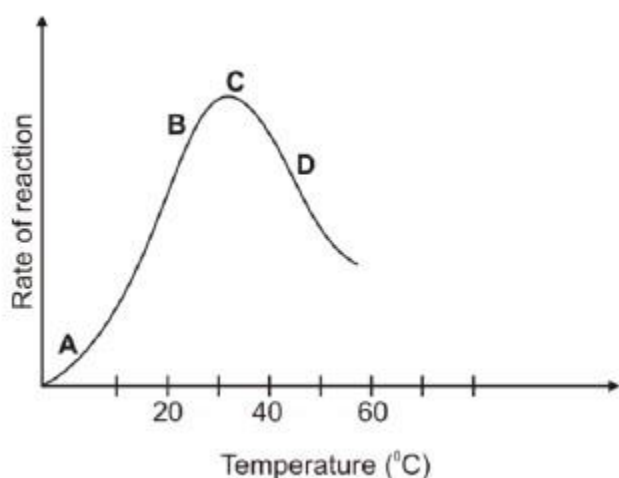
- Presence of chloroplasts which are very sensitive to low light intensity.

- Leaves highly dissected to increase SA for light and CO₂ absorption.

17. State the inactive form of the enzyme trypsin.

-Trypsinogen

18. The graph below shows the rate of an enzyme controlled reaction against temperature (°C)



Explain the shape of the curve: i). Between A and B

Increase in temperature increases the rate of enzyme reaction; because increase in temperature increases kinetic energy causing substrate-enzyme collision.

ii) At Point C

The rate of reaction is at maximum/best; because enzymes are working at their optimum temperature iii) Between C and D

The rate of reaction decreases with increase in temperature; because increase in temperature above optimum denatures the enzymes.

iv) Other than temperature, state two factors that affect the above reaction

pH; substrate concentration; enzyme inhibitors; cofactors and coenzymes.

19. The question below represents a chemical equation that takes place in green plants under certain conditions

Carbon (IV) Oxide + water \longrightarrow Glucose + X a)

Name substance X

Oxygen

(b) Other than the conditions stated in the equation, state two other conditions necessary for the reaction.

Chlorophyll

Temperature

Light intensity

(c) Name two types of cells in which this process occurs

Guard cells

Palisade cells

(d) Name the process represented by the equation given above

Photosynthesis

(e) State the importance of the process named in (d) above

Production of food for plants and animals

Air purification

Release of oxygen in the atmosphere

Basis of source of energy

20. How is a palisade cell suited to carry out photosynthesis?

-Has chloroplast which contain chlorophyll that traps light for photosynthesis

-Located on the upper epidermis in position for maximum absorption of light

-Vertically arranged and closely packed to increase surface area for photosynthesis

21. A biological washing detergent contains enzymes which remove stains like mucus and oils from clothes which are soaked in water with the detergent.

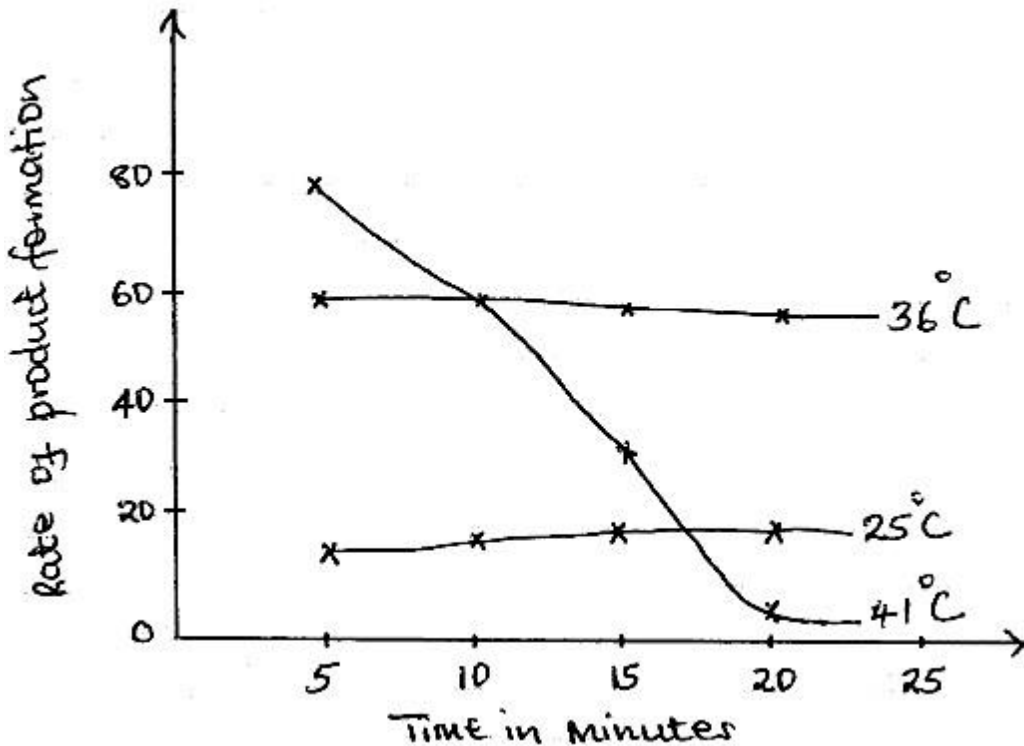
(a) Name the two groups of enzymes that are present in the detergent.

Protease; Lipase;

b). Why would the stains be removed faster with the detergent in water at 35°C rather than at 15°C?

35°C is the optimum temperature for the enzyme to act; at 15°C enzymes are inactivated since the temperature is low;

22. The graph below shows rates of photosynthesis in a plant at different temperatures.



a). Account for the decrease in the rate of product formation at 41°C from 5 to 20 minutes.

Photosynthesis is controlled by enzymes ; the enzymes are denatured at high temperature; hence Decrease in product formation. (b) Explain the results obtained at (i) 25°C.

The rate of product formation is low and constant; enzymes are inactive at low temperature;

(ii) 36°C.

Rate of photosynthesis is high and constant;

This is the optimum temperature for the enzyme activity;

23. Other than temperature, state **one** external factor that affect the rate of photosynthesis.

(i) **Light intensity / carbon (iv) oxide;**

(ii) **Oxygen / glucose / starch;**

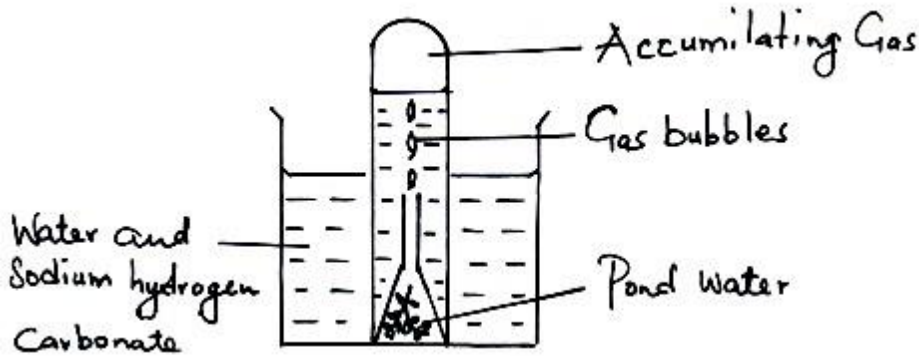
24. State three properties of proteins.

- **form colloidal suspensions in water;**
- **denatured by high temperatures (above 40°C);**
- **are amphoteric (have both basic and acidic properties).**

25. What is the role of light energy during photosynthesis?

-To split water molecules; into oxygen and hydrogen atoms;

26. The apparatus below are used to investigate an aspect of photosynthesis.



a).Name the aspect of photosynthesis being investigated.

Whether oxygen is produced during the process of photosynthesis;

b) How can one verify the identity of the gas that accumulates in test tube? **Using a glowing splint; when the splint is inserted into test tube it is relighted;** c)

State the role of sodium hydrogen carbonate.

To produce carbon (II) oxide;

d) What environmental factor are required in order to give positive results?

Presence of sunlight;

Optimum temperature; any one factor

27. State the functions of the following enzymes. (i) Pepsin.

Breakdown proteins into peptides;

(ii) Salivary amylase. **Breakdown starch into maltose;** (iii)

Enterokinase.

Activates trypsinogen into trypsin;

28. Name an enzyme that is found in the saliva of man and state its function.

Ptyalin (salivary amylase)

Function – Breaks down starch to maltose

29. Give the function of the following organs in digestion.

i) The Tongue

– **Taste food**

- **Push food to the back of the mouth.** ii)

The oesophagus

It's muscle contract and relax causing (peristalsis) which allow swallowing of food.

30. State the PH in the following part of the digestive system.

i) Mouth

Alkaline. ii)

Stomach

Acidic.

iii) Duodenum **Alkaline.**

31. Define the term assimilation.

Incorporation and utilization of digested food substances in the body cells;

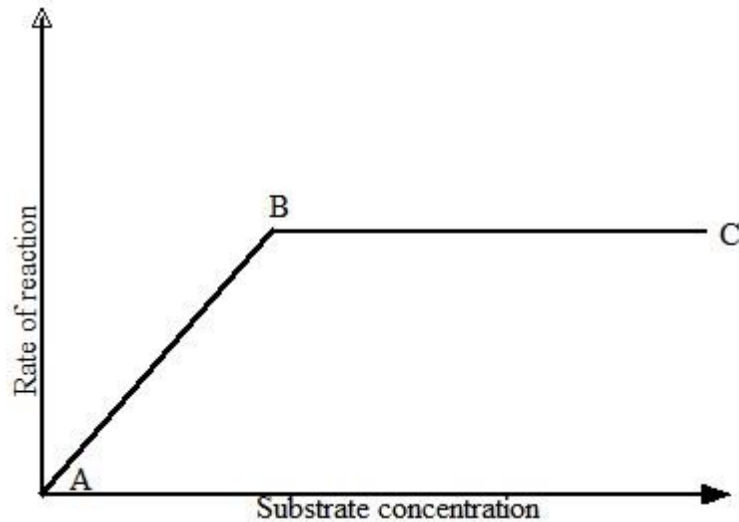
32. State **two** functions of saliva.

Lubricate food; Digest starch (to maltose) ;Provide an alkaline medium ;Soften food ;Moisten food ;Dissolves food ;

33. Describe what happens during the light stage of photosynthesis.

Light (energy) is absorbed by chlorophyll; Light split water molecules / photolysis; to form hydrogen ions and oxygen gas / molecules ;(Light is converted to ATP)

34. The graph below shows the effect of substrate concentration on the rate of enzyme controlled reaction.



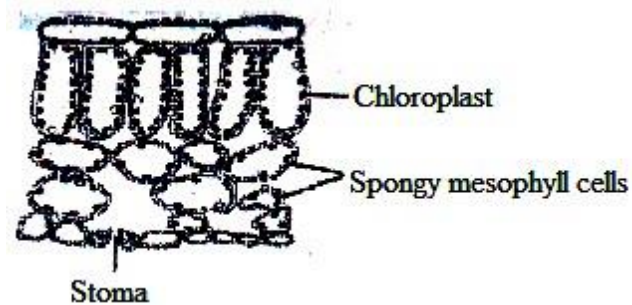
Account for the shape of the graph between B and C.

All the active sites are occupied; hence the rate of reaction remain constant; (even when substrate concentration is increased).

35. State **two** factors that affect the rate of enzyme reaction.

pH; temperatures ; Inhibitors / co-factors ;

36. The figure below shows a section through a leaf. A leaf is designed for photosynthesis and this process provides a supply of simple sugars for a plant.



i) State the function of the chloroplasts in photosynthesis.

Trap light energy and convert it to chemical energy's for photolysis of water // carbon (IV) oxide fixation;

- ii) Explain the advantage of the distribution of the chloroplasts as shown in the figure above. **Most chloroplast located in the palisade mesophyll which is nearer to the upper epidermis and thus exposed to more light // higher light intensity // optimum light intensity hence better rates // optimum photosynthesis.** iii) Suggest the function of the stomata and the spaces between spongy mesophyll cells in the process of photosynthesis.

Allows entry of carbon (IV) oxide; which combines with hydrogen atoms (from light stage) to form glucose.

37. Name one element found in proteins but not in carbohydrates.

Nitrogen;

38. State TWO functional roles of proteins in the body.

- Form haemoglobin for oxygen transport;**
- Form antibodies to protect the body;**
- Farm hormones to regulate body process;**
- Form enzymes which control reactions in the body;**

39. In which phase of photosynthesis are carbohydrates formed? **Dark stage;**

40. Explain the biological disadvantage of growing some aesthetic plants in the living rooms.

At night, plants carry out respiration oxygen is used up in the process while carbon (IV) oxide is given out; carbon (IV) oxide produced can cause suffocation to the occupants of the house;

41. Name the components of the enamel of teeth.

- Calcium phosphate;**
- Calcium carbonates;**

42. Name the diseases of the teeth characteristics by

- i) Formation of cavities in the teeth. **Dental carries;**

ii) Gums become soft and flabby and bleeding of the gums occur.

Periodontal disease;

43. Two glucose molecules combine to form the disaccharide sucrose. The molecular formula of glucose is $C_6H_{12}O_6$ while a single sucrose molecule has the molecular formula $C_{12}H_{22}O_{11}$.

Account for the observation.

-During condensation a water molecule is lost; leading to the loss of 2 hydrogen atoms / ions and an oxygen atom from the resultant disaccharide.

44. How is the dark stage of photosynthesis dependent to light stage?

**-Receives hydrogen ions / atoms which reduces carbon (IV) oxide. -
Receives adenosine tri-phosphate that provides energy ATP.**

45. A group of students set up the following experiments to investigate the factors that affect enzymes

Tube 1	Tube 2	Tube 3	Tube 4
Egg white Amylase / ptyalin at 36°C	Boiled starch dilute acid Amylase 36°C	Boiled starch amylase 36°C	Boiled starch amylase 60°C

a).Identify the property of enzymes being investigated in tubes 1 and 2.

Tube 1 - Enzyme specify;

Tube 2 - effect of pH on enzyme reactions;

b) After 3 hours the students tested the content in the four tubes for starch. They obtained the following results in tube 2, 3 and 4.

Tube 2 - Blue-black color

Tube 3 - Brown color of iodine remained Tube

4 - Blue black color.

Account for the results obtained in tube 3 and 4.

Tube 3 - Enzyme amylase converted starch to reducing sugars; hence no change. Tube

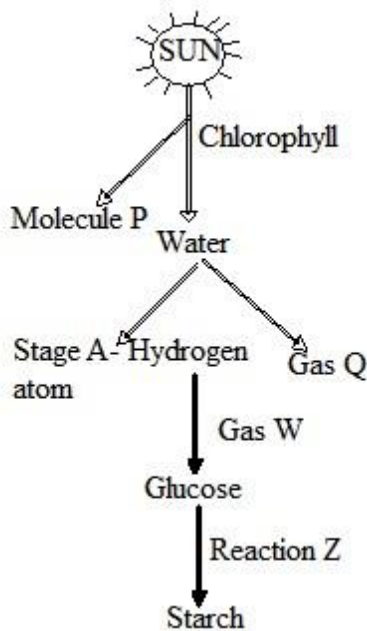
4 - enzymes are denatured by high temperature; hence starch not hydrolyzed;

c) What results would you expect in tube 3 if temperature was maintained at 5°C? Give a reason for your answer. **-Would turn blue black. Enzyme would be inactive at low temperatures hence starch not hydrolyzed;**

46. Name three enzymes found in the pancreatic juice.

- **Pancreatic amylase**
- **Trypsin;**
- **Pancreatic lipase;**

47. Below is a diagrammatic summary of the main biochemical events in photosynthesis. Study it carefully and answer the questions that follow.



a).Suggest the identity of molecule P.

ATP (adenosine triphosphate) ;

b) Name the gas represented by letter W.

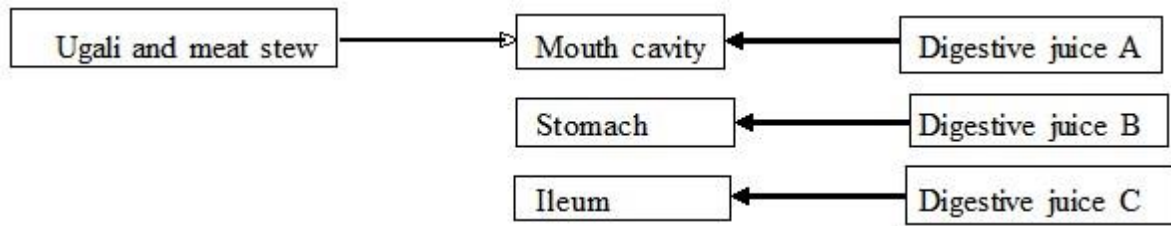
W - carbon ((V) oxide ;

c) Name the specific site for the reactions in stage A. **Stroma** ;

(d) Name reaction Z.

Condensation ;

48. The diagram below represents passage of a meal through the human digestive system. Study the diagram and answer the questions that follow.



a). Name the physical process that will occur in the mouth cavity.

Mastication / chewing / grinding; b) Name the digestive juice

C. Intestinal juice.

c) Name the gland that secretes digestive juice B.

Gastric glands

49. Describe how the chloroplast is adapted to its function.

- Has stroma with enzymes; where CO₂ fixation occurs;
- Has grana containing chlorophyll; which traps light energy from the sun for photosynthesis;
- Has inter grana; that hold the grana in position;

50. Explain the adaptation of the small intestine to their functions.

- Are long and folded to provide large surface area for secretion of digestive juices;
- They are long, coiled and folded which allows more time for digestion and absorption;
- Their inner lining has villi and microvilli, which increase the surface area for absorption;
 - Have opening of ducts through which pancreatic juice and bile get into lumen;
- Have goblet cell and Bruner's glands that secrete mucus for lubrication of food and protection of wall from digestion enzyme;
- Bruner's gland also secretes alkaline fluid which maintains a pH of 7-8 which is optimum pH for action of intestinal enzymes;

- Has intestinal gland that secrete digestive enzyme;
- Has rich network of blood capillaries that supplies oxygen and removes metabolic wastes from the intestinal tissue and transports digested food and offer nutrients;
- The walls have circular and longitudinal muscles whose peristaltic contraction causes movements of food in the gut and mixing of food with digestive enzyme;
- Intestine have a thin epithelium that allows soluble food material to pass through rapidly into the blood stream'
- The villi have numerous blood vessels to transport absorbed nutrients and lacteals to transport absorbed lipids;