MARKING GUIDE

ST. MICHAEL HIGH SCHOOL MUKONO

END OF YEAR ASSESSMENT 2023

S5 Biology

Paper 1

TIME: 2 Hours and 30 Minutes.

INSTRUCTIONS:

- *This paper consists of two sections A and B*
- *Answer all questions in both sections A and B in the spaced provided*
- *In section A write the most correct alternative A, B, C or D on the answer grid attached and section B in the given spaces.*

SECTION A

1 In a dividing animal cell crossing over occurs during

A Prophase of mitosis B Metaphase I of meiosis
C Prophase I of meiosis D Anaphase of mitosis

2 A testcross between a heterozygous tall plant form F_2 generation where the allele for tallness was dominant over the allele for shortness would yield a mixture of tall and short plants in the ratio ... respectively

A 3:1 B 1:1 C 1:2 D 2;3

3 The food manufactured by green plants is transported from the leaves to other plant parts in the form of

A Glucose B Fructose C Maltose D Sucrose

4 The parasite that causes malaria to humans belongs to the kingdom

A Prokaryote B Plantae C Protoctista D Invertebrata

5 A chromosomal mutation involving gain of an extra sex chromosome by the female genets for sexually reproducing animal species is referred to as

A Klinefelter syndrome B Down's syndrome
C Mongolism D Acromegaly

6 Uptake of dissolved mineral ions form the soil solution by the plant root hair cells occurs mainly by

A Osmosis B Facilitated diffusion
C Simple diffusion D Active transport

7 Which one of the following statements is typical prokaryotic cells?

A They possess a tiny nucleus
B Lack a plasmid
C They lack membrane bounded organelles
D They have linear DNA

8 Protein synthesis will not occur in a cell lacking
A Nucleoli and ribosomes
B Ribosomes and nucleoplasm
C Nuclei and nucleoplasm
D Endoplasmic reticulum

9 The tertiary structure of a protein is the
A Bonding together of several polypeptide chains by weak bonds
B Order in which amino acids are joined in a polypeptide chain
C Unique three dimensional shape of the fully folded polypeptide
D Organization of a polypeptide chain into an α helix or β pleated sheet.

10 The relationship between legumes and nitrogen fixing bacteria is described as
A Parasitism B Mutualism C Inhibition D Facilitation

11 Which one of the following ~~plants~~ could most likely lead to ozone layer depletion
A High fluorine levels
B High carbondioxide concentration in the atmosphere
C High accumulation of chloro-fluoro carbon compounds in the atmosphere
D High oxygen levels.

12 Which one of the following doesn't adapts the stratified tissue for its function?
A Toughness B Impervious
B Greater thickness D Single layer of cells

13 Which one of the following factors will least affect the rate of synthesis of a protein in a plant?
A Relative humidity B Temperature
C Light intensity D Carbondioxide concentration

14 Which one of the following plant tissues lacks fibres?
A Xylem B PhloemC Sclerenchyma D Collenchyma

15 Which one of the following would occur immediately following entry of sodium ions into the axoplasm of a post synaptic neuron?
A Hyperpolarization B Repolarization
C Depolarization D Generation of an action potential

16 The structures of a moss containing the same genetic condition as that of a spermatozoan is
A Spores B Spore mother cells C Zygote D Sporangium

17 Which one of the following preservatives existing allele frequencies in a population?
A Stabilizing selection B Disruptive selection
C Directional selection D Recurrent selection

18 The genes responsible for transfer of the ABO blood groups in humans are typical of
A Polygemic inheritance B Mendelian inheritance
C Lethal allele inheritance D Dihybrid inheritance

19 Hydrophytes do not have support tissues because they
A Lack roots where support tissues are found
B Have parenchyma tissue which makes them buoyant

C Obtain support from the high density of water
D Have a lignified epidermis that provides additional support.

Which one of the following methods suitable for estimating the population size of animals that congregate in open habitats?

A Capture recapture
B Quadrat
C Aerial photography
D Sampling method

21 One reason why starch lacks structural properties possessed by cellulose is that it

A Lacks folded chains
B Lacks cross linkages
C Has fewer micro fibrils
D Has shorter chains

22 Which one of the following events of photosynthesis is not directly affected by light intensity?

A Photolysis of water
B Emission of electrons from chlorophyll
C Conversion of PGA to PGAL
D Chemiosmotic synthesis of ATP

23 Which of the following is an example of positive feedback?

A Regulation of blood glucose
B End product inhibition
C Secretion of oxytocin during labour
D Regulation in concentration of thyroxin in blood

24 Which one of the following is the role of cholesterol in a plasma membrane?

A Reduces escape or entry of non polar molecules
B Reduces entry or escape of polar molecules
C Reduces escape or entry of organic molecules
D Prevents drying up of the membrane

25 Which one of the following has the highest biomass?

A Primary consumers
B Secondary consumers
C Primary producers
D Detritirvores

26 The respiratory pigment found in arthropods is

A Haemoerythrin
B Haemoglobin
C Chlorocruorin
D Haemocyanin

27 The biological role of proteins is determined by their

A Sequence of amino acids in them
B Pattern of folding of the polypeptide chain
C Other organic molecular with which it is associated
D The specific three dimensional shape

28 Skin colour in humans is an example of inheritance through

A Systematic genes
B Polygenes
C Sex linkage
D Multiple alleles

29 Which one of the following polysaccharides contains an amino acid group?

A Murein B Cellulose C Chitin D Glycogen

30 The site for the light dependent reactions of photosynthesis in a plant cells chloroplast is the A

Stroma B Quontasomae C Thylakoids D Chloroplast DNA

31 Production of hypertonic urine is mainly due to high levels of
A Aldosterone B Vasopressin C Insulin D Adrenaline

32 In which of the following areas is columnar epithelium with microvilli most likely to be found?
A Colon B Duodenum C Ileum D Stomach

33 The streamlined body shape of a shark, penguin and the whale is an example of
A Co-evolution B Convergent evolution
C Divergent evolution D Adaptive radation

34 The graph in figure 1 below shows the changes in the body size of in invertebrate with time.

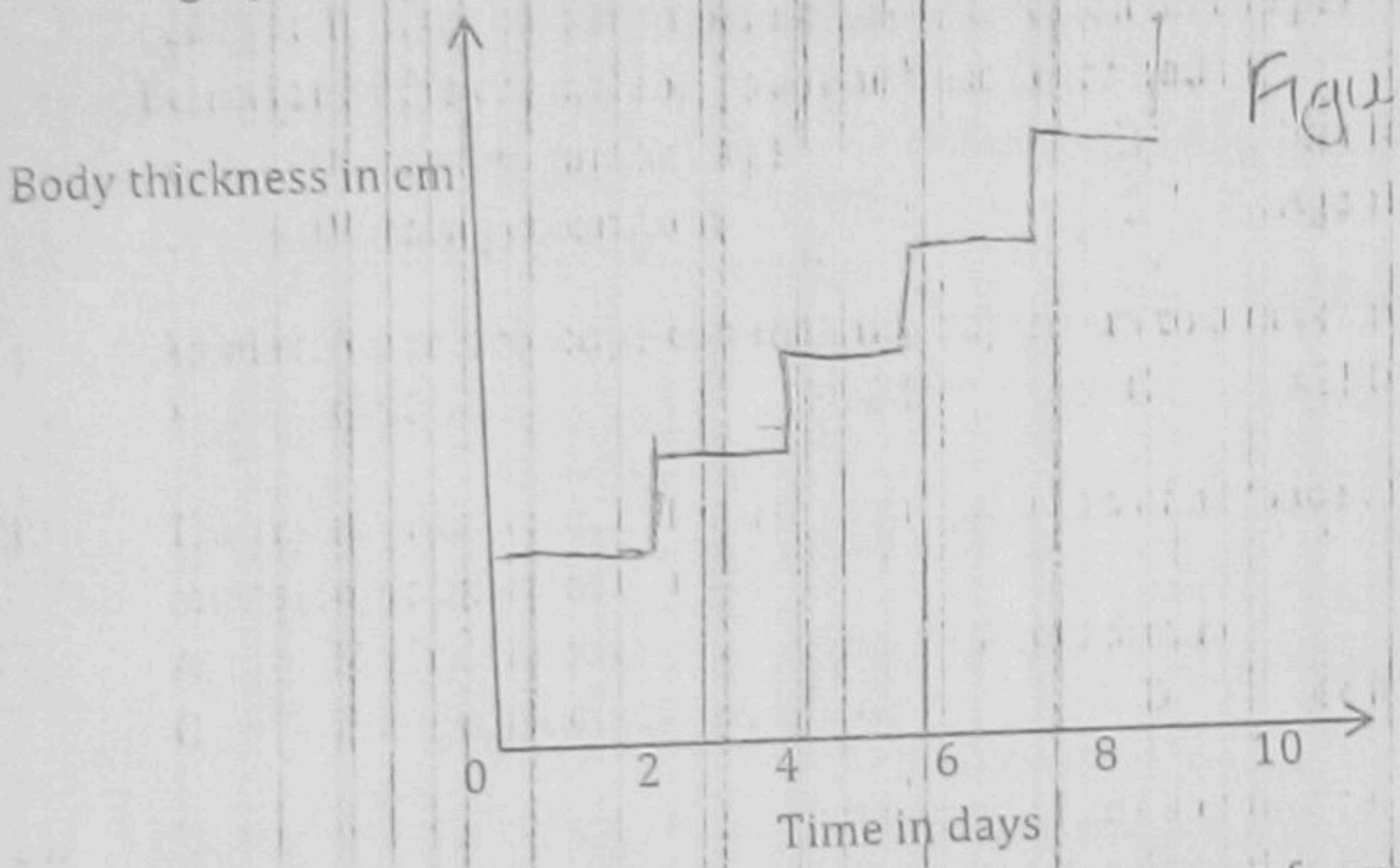


Figure 1

Which one of the following best describes the pattern of growth in figure 1 above?
A Allometric growth B Continuous growth
C Isometric growth D Intermittent growth

35 In a field visit to a forest near the school compound a dull green chameleon was seen to have changed its skin colour to pale black and rested on the pale black bark of the tall tree. The behavior of the chameleon could be best described as;
A Disruptive camouflage B Mimicry
C Warning coloration D Agonistic behavior

36 An electron microscope can magnify objects up to a maximum of
A X1500 B X1000 C X250,000 D X500

37 The most suitable stain for use in preparation of herbaceous plant stem and root tissues for microscopic examinations is;
A Methyleneblue B Acetocamine
C Phliloroglucinol (acidified) D Iodine

38 The number of chromosomes in an organisms somatic cell is 28. How many chromosomes are most likely to be found in each of the genets of the above organisms if it reproduces sexually?
A 28 B 7 C 56 D 14

39 The gene mutation involving loss of some genes is referred to as
A Substitution B Inversion C Deletion D Duplication

VAC

If the code for an amino acid is ATG on DNA molecule, this code on the transfer RNA molecule involved in translation may be written as

A TAC B VAC C AUG D DUC

Section b (60 marks)

41 a) What is meant by the terms;

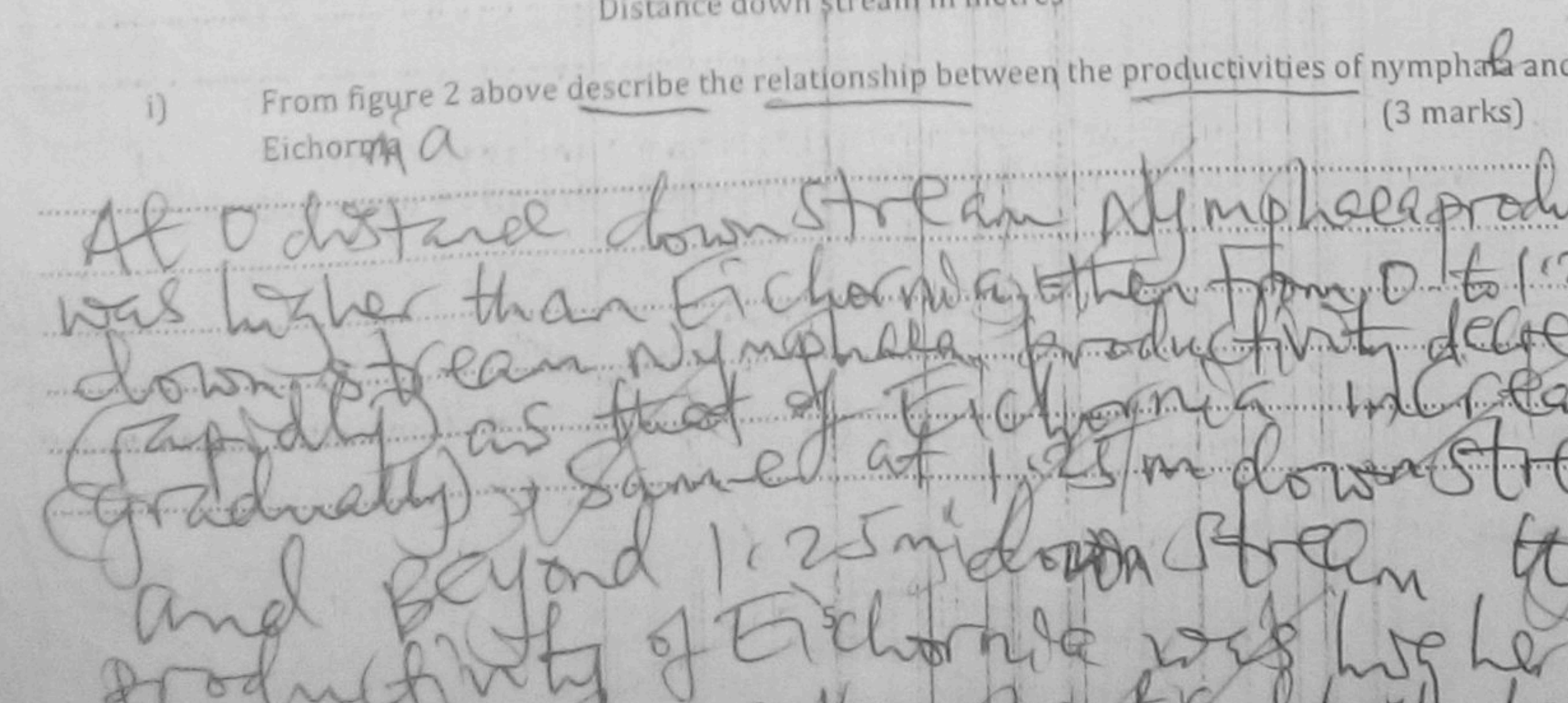
i) Gross primary productivity (GPP) (1 mark)

The total amount of energy accumulated in the primary producers in an ecosystem resulting from photosynthesis/ autotrophism. 01

ii) Net primary productivity (NPP) (1 mark)

The amount of energy availed by the primary producers to the primary consumers at successive trophic levels in the food chains. 01

b) The graph below shows the variation in productivities of two hydrophytes with increasing distance downstream in a lake ecosystem. Use it to answer the questions that follow



i) From figure 2 above describe the relationship between the productivities of nymphaea and Eichornia (3 marks)

At 0 distance down stream Nymphaea productivity was higher than Eichornia then from 0 to 1·25m downstream Nymphaea productivity decreased rapidly as that of Eichornia increased gradually. Same at 1·25m downstream and beyond 1·25m downstream the productivity of Eichornia was higher than Nymphaea throughout and both decreased gradually.

At 1.25m both plants reached compensation point

ii) Explain the relationship in bi) above (3 marks)

Nymphaea productivity at 0 distance down stream was higher than Eichornia because Nymphaea as a floating hydrophyte gets high sunlight intensity for photosynthesis with adequate temperatures for photosynthetic enzyme action while Eichornia as a benthic plant receives less sunlight & low submerged plant

Nymphaea had higher productivity at high temp & light while Eichornia does better at low temp & light intensity

State any two adaptations of floating hydrophytes. (2 marks)

- Have large leaves with broad lamina to maximise sunlight absorption; have air floaters aerenchyma to resist surface tension of water; Have numerous stomata on upper leaf epidermis to lose excess water; have superficial root system to reduce weight absorb nutrients. ANY 2

42 a) Define the terms;

i) Guttation (1 mark)

The loss of excess water from a plant in form of liquid droplets through hydathodes on the leaf margins.

ii) Translocation (1 mark)

The movement of manufactured food in a plant in form of sucrose from the leaves via the phloem to other plant parts.

b) Suggest any two differences between guttation and transpiration (2 marks)

- In guttation water is lost in form of liquid droplets whereas in transpiration this in vapour form. - Transpiration is highest at higher temperatures whereas guttation occurs at lower or moderate temperatures.

c) Briefly explain the roles of each of the following physiological events on the upward movement of water from the soil solution upto the leaves of a tall tree.

i) Capillarity (2 marks)

- The cohesive forces between the water molecules and adhesive forces between water molecules and lignified walls of xylem vessels ensure upward movement of water from xylem vessels in roots / stem to leaves by capillarity

ii) Root pressure (2 marks)

- Uptake of dissolved mineral salts by the root hair cells increase the osmotic pressure of the protoplasm of root hair cell above the neighbouring root cortex cells to ensure continuous

Osmotic uptake of water by plant root hair cells to the xylem up

(2 marks)

iii) Casparian strip/band in the root endodermis

— This actively pumps salts e.g. NH and leaves into the stem xylem to increase the osmotic pressure for continuous uptake of water from roots to stem up to leaves via symplast route to xylem vessels in stem up to leaves.

(2 marks)

43 a) Distinguish between photophosphorylation and photorespiration

Photophosphorylation is the synthesis of ATP from ADP and inorganic phosphate using energy from the sun while photorespiration is the uptake of oxygen and release of carbondioxide by plants in presence of light.

b) State five differences between cydic photophosphorylation and non cyclic photophosphorylation. (5 marks)

— Favoured by low light intensity | Favoured by high light intensity

Cyclic photophosphorylation	Non cydic photophosphorylation
Electron donor is PSI	Electron donor is water / photolysis of water
Last electron acceptor is ~~NADP~~ PSI	Last electron acceptor is NADP+ / oxygen.
Product is ATP only	Products are ATP, $NADPH_2$ and
Involves PSI only	Involves PSI and PSII
Electron flow is cyclic	Electron flow is non-cyclic

(2 marks)

c) What is the significance of photosynthesis in nature?

— Reduces carbondioxide concentration in atmosphere and greenhouse effect.
— ~~Produce~~ Produces oxygen used in formation of ozone layer.

d) Suggest one evidence to show that manufactured food in a plant is stored in the leaves. (1 mark)

A leaf from a potted green plant kept in darkness for 24 hours and exposed to sunlight for 6 hours upon addition of iodine solution turns to blue/black showing starch is present.

44 Explain why the structure of the plasma membrane according to the fluid mosaic model hypothesis is said to be;

i) Fluid in nature (2 marks)

Components of the membrane ie phospholipids cholesterol, proteins and glycolipids are in constant/continuous lateral movement to and fro in the membrane.

ii) Mosaic in nature (2 marks)

Proteins of different shapes, types and sizes (intrinsic, extrinsic) and transmembrane proteins irregularly distributed within the membrane with in the bilayer

b) Explain how the following factors affect the fluidity of the cell membrane.

i) Increase in temperature (2 marks)

Increases membrane fluidity because the components gain kinetic energy and move faster.

ii) Cholesterol at high temperature (2 marks)

- Reduces membrane fluidity because it binds to phospholipids and restricts their movement.

c) Explain how the plasma membrane is adapted for transport of materials. (2 marks)

- Phospholipids with hydrophilic heads to allow movement of polar molecules across the membrane.
- Phospholipids with hydrophobic tails to allow movement of non-polar molecules across it.
- Globular proteins on the surface allow movt of materials by active transport and facilitated diffusion.
- Transmembrane proteins allow movement of materials by osmosis.
- Fluid in nature to allow material movt by cytosis.

Number
2
1

a) What is meant by each of the terms for enzyme controlled reactions

i) Competitive inhibition (1 mark)

A type of inhibition where the inhibitor competes favourably with the substrate for the enzyme active site and increasing substrate concentration increases reaction rate.

ii) Non competitive inhibition (1 mark)

This is where the enzyme inhibitor attaches to another site of the enzyme other than the active site to make it impossible for the enzyme catalyzed reaction to occur.

iii) End product inhibition (1 mark)

This is where when the end product of a metabolic pathway accumulates it ~~may~~ acts as an allosteric inhibitor of the enzyme controlling the first step of the pathway.

iv) Prosthetic group (1 mark)

Is an organic cofactor that is tightly bound to the enzyme on a permanent basis to assist in a catalytic activity of its enzyme eg FAD, Haem etc.

v) Coenzyme (1 mark)

Are organic molecules that act as cofactors but do not remain attached to the enzyme between reactions eg NAD, ATP, CoA, NADPH etc derived from vitamins.

b) Briefly show how temperature and a non competitive inhibition affect the rate of an enzyme controlled biochemical reaction.

Temperature (2 marks)

- At low temperatures reaction rates are low because molecules have little kinetic energy.

Increase in temperature increases the rate of enzyme catalyzed reaction up to the optimum temperature beyond which the rate decreases due to enzyme denaturation by high temperatures.

Non competitive inhibition (3 marks)

In Non Competitive reversible inhibition the rate of enzyme reaction decreases with increasing inhibitor concentration up to saturation point whereas irreversible inhibition the substrate from Competitive completely from accessing the enzyme's active site. stopped

eg very small flat bird Sulphydryl groups
Concentrations of
heavy metal ions eg Mercury (Hg^{2+})
Silver (Ag^{+}) and Arsenic (As)

46 a) Distinguish between the terms bio-magnification and water pollution. (6 marks)

Biomagnification is the accumulation of some
non biodegradable pollutants eg pesticides in
the organisms at successive trophic levels
along a food chain from the producers to
the top consumers at the highest trophic levels.

b) Briefly describe how biological introduction of alien species may lead to lake water pollution. (4 marks)

Water pollution is the
addition of waste materials to water body that
are harmful to aquatic life.
Alien species may lead to rapid growth of algae leading
blooms resulting from eutrophication. This leads
to death of aquatic life due to high Biochemical (BOD)

c) Briefly outline any three measurable parameters that could be used by fresh water ecologists as evidence of heavily polluted lake water. (3 marks)

- Change in quality and pH of water
- Level of turbidity of the water
- Change in nitrate and phosphate content of the water.
- Presence of Bioindicators of polluted water eg Sediments of aquatic plants & invertebrates.
- depth of the water level in waterbody.

END