UACE BIOLOGY P2 P530/2 GUIDE 2019

SECTION A: (40MARKS)

1. (a) (i) Comparison of changes in percentage of blue light transmission through test tubes containing glucose and sucrose

Similarities

- Both start at the same time/are oxidized at 100%;
- For both percentage blue light transmission decreases with time/were reduced by methylene blue; @1mk, max 02mks

Differences

- The blue light transmission for sucrose decreased gradually throughout the experiment; **while** for glucose decreased rapidly at first; then gradually; and then finally became constant;
- The percentage blue light transmission for sucrose was higher than that for glucose throughout the experiment; @1mk, max 05mks

ACC. Quoted x axis values or ranges **Rej**. Description instead of comparison

(ii) **Explanation for the differences**

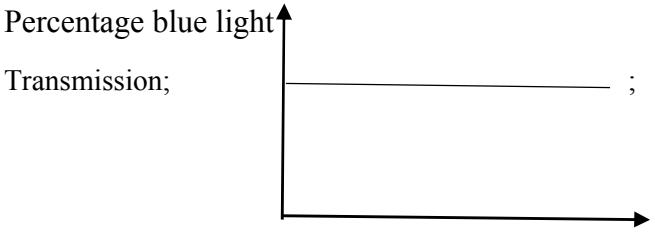
Sucrose is a **complex sugar/disaccharide**; while glucose is **a monosaccharide**; thus glucose is more **easily oxidized**/respired/acted on by enzymes in yeast cells; the rate at which electrons are removed from glucose/addition of hydrogen ions is higher than that for sucrose; there by reducing methylene blue at the same rate; shown by change in colour; @1mk, max 05 mks

(b) **Explanation for variation of blue light transmission through the test tubes containing lactose and sucrose**

The percentage of blue light transmission for lactose remains **constant** at 100% throughout the experiment; while that for sucrose reduced **gradually;** because lactose is not is not a substrate for enzymes in yeast cells/ lack of lactase enzyme; While sucrose combines with the active sites of enzymes; to form glucose and fructose; that are oxidized/respired; electrons removed from it are accepted by methylene blue which is reduced to turn colourless; @1mk, max 08mks

(c) (i) Methylene blue remains blue/percentage of blue light transmission remains at 100%; 01mk

(ii) Graph showing variation of percentage of blue light transmission with time;



Ignore units 04mks

(d) Explanation for pattern of changes in quantities of products of reactions at each temperature

(i) A

For reaction A, the formation of products was very fast; and reached maximum; and later became constant; because initially enzymes were activated more rapidly; until the reaction became complete due to denaturation of enzymes at high temperature;

@1mk, max 05mks

(ii) **B**

For reaction B, initially product formation increased rapidly and finally became constant; because enzymes were optimally activated; finally remain constant due to depletion of all the substrates; @1mks, max 03mks

(iii) **C**

For reaction C, the product formation increased gradually; throughout the period; because enzyme was activated slowly/ activated; by low temperature; and reaction never reached completion; @1mk, max 05mks

(e) At $45^{O}C$, the product would initially form at a rate greater than in B and C; and less than in A; the maximum quantity of products would be greater than in A and C; but less than in B; @1mk, max 04mks

Total 43mks, max 40mks

SECTION B: (60MARKS)

2. **Physiological adaptations**

(a) Vertebrates living in dry environment

- Evaporation of water from lungs is reduced; by exhaling air at a temperature/reduced lower than body temperature; e.g. kangaroo rat;
- Tolerance/ reduced sweating; to conserve water;
- Water reabsorption from the glomerular filtrate; to conserve water in humans;/ Some use metabolic water; to minimize water loss; e.g. kangaroo rat;
- Production of non-toxic wastes; which require little water for excretion; e.g. uric acid in birds; ACC rectal absorption; producing dry feaces; e.g. kangaroo, camel/concentrated urine;
- Going into a state of dormancy/aestivation; to minimize water loss; e.g. lungfish;
- Gaining water through oxidizing fats; which produce metabolic water than carbohydrates in severe drought; e.g. camel;
- Low filtration rate; to minimize water loss; @1mk, max 14mks

(b) **Plants to water shortage**

- Reversing the stomatal rhythm/open the stomata at night and close during day; to minimize water loss;
- Roots with higher solute concentration than surrounding soil water; to allow uptake of water; by osmosis;
- Storage of water; to be used when external solute concentration exceeds that of root cells;
- Increased levels of abscissic acid secretion; closing stomata reduces water loss;

@1mk, max 6mks

3 **Reproductive strategies of flowering plants**

(a) **Diversity (promote cross breeding)**

- Have floral structures; which promote cross pollination and prevent self-pollination;
- Self incompatibility in flowers; to allow fertilization between different flowers;
- Separate male and female flowers on different plants; ensures only cross pollination; **ACC** dioeciousness.
- Stamens and stigma mature at different times; in bisexual flowers allowing only cross pollination; @1mk, max 08mks

(b) **Survival**

- Cross pollination; leads to variation which promotes survival;
- Mechanisms of dispersal of seeds and fruits; which reduces competition among offsprings;
- Enclosed ovary with style; through which pollen tubes grows towards the ovule to increase chances of fertilization;
- Ave double fertilization; which produces the endosperm/food reserve in seeds; which sustains the new plant when the seed germinates;
- Some have short lifecycles forming seeds in a short period; when conditions are favourable;
- Develop seeds which may remain dormant; until favourable conditions are favourable;
- Some have vegetative organs with food reserves; used for propagation; the organs can withstand adverse conditions; and may generate vast numbers of new plants within a short time;
- Resistant sporophyte generation; protects delicate gametophyte;
- Features like scent/brightly coloured petals promote insect pollination **ACC** any feature that promote insect or wind pollination. @1mk, max 12mks

4 (a)

Instinctive	learned
• Inborn/inherited • Permanent/fixed/stereotyped • Same for all organisms • Stimulated by a specific stimulus	• Acquired during the lifetime; • Temporary/maybe unlearned; • Differs widely; • Actions taken after individual decides to do;

@1mk, max 4mks

(b) **Benefits of social behaviour**

- Better protection because some watch as others do other tasks;
- Increased feeding efficiency; due to group feeding/sharing of meals;
- Better use of defence/security; due to collective attack of enemies;
- Increased breeding efficiency; only the fittest are allowed to breed leading to better quality offsprings;
- Increased survival rates of offsprings; through communal feeding and protection;
- Saving energy by endotherms especially the young by staying close together/huddling; e.g. in penguins.
- More successful in catching large preys; when hunting in groups than when alone;
- Enables individuals to do tasks; they could not do alone; e.g. building bee hives;
- Faster learning of young; because the young are close to the adults;
- Establishment of hierarchies increases chances of survival minimizing aggression;

@1mk, max 16mks

5 (a) **Immunity** is the ability of the animal to resist infection/counter the harmful effects of toxins; produced by infecting organisms; 2mks

(b) (i) **Body's reaction when a blood vessel is cut**

Damage to a blood vessel causes platelets to stick together at the site of damage; the damaged cells/ruptured platelets produce clotting substances/**thromboplastin**; which stimulate conversion of plasma protein **inactive prothrombin**; to **active thrombin enzyme;[Rej hormone**] in presence of calcium ions and vitamin K; t**hrombin** catalyses conversion of a **soluble** plasma protein **fibrinogen**; to **insoluble fibrin; which forms a** mesh network of threads a cross a wound/ damaged part; in which red blood cells are trapped forming a clot;

08mks

(ii) **Body's reaction in presence of antigens**

Presence of antigens in the body stimulates the lymphocytes; to produce corresponding antibodies; the antibodies can attack antigens in the following ways;

- Clumps the antigens and destroys it/**agglutinin**;
- Causes antigens to disintegrate/**lysis**;
- Adsorb onto surface of antigens for easier phagocytosis/**opsonins**;
- Neutralizes the toxins/**antitoxins**;
- **Precipitates** the antigen molecules; 06mks

(c) **Consequences of over bleeding**

- It leads to reduced blood pressure; which slows down blood flow;
- It also leads to reduction in number of red blood cells; which lowers blood's ability to carry oxygen/anaemia;

- When the brain does not receive enough blood; it leads to unconsciousness; and eventually death; max 04mks

6 (a) Each trait is produced by a pair of alleles; the alleles pairs of genes separate during gamete formation; and the paired condition is restored; by random fusion of gametes; during fertilization; the zygote formed receives only one allele from each parent; the alleles do not blend but retain their individuality; A recessive allele is not altered by the dominant allele; although it does not express itself in presence of a dominant allele; into the F1 generation; when the F1 individuals are selfed, the ratio of 3:1 is realized; when the recessive alleles express themselves; in a homozygous state; 13mks

OR

Consider a cross between homozygous **tall** as the dominant and a **dwarf/short** plant as the recessive;

Let **T** represent the allele for tallness and **t** represent allele for dwarfness;

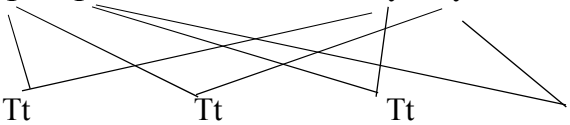
Phenotype: Tall X dwarf

Genotype: TT X tt;

Meiosis ;

Gametes: T T t t

Random fertilization



F1 genotype: Tt Tt Tt Tt ;

F1 phenotypes: All tall;

Selfing F1

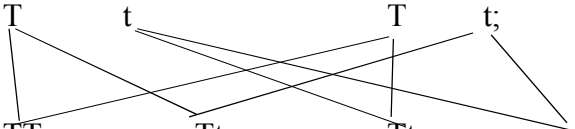
Phenotype: Tall X Tall 12mks

Genotype: Tt X Tt;

Meiosis;

Gammetes: T t T t;

Random fertilization



F2 genotype: TT Tt Tt tt;

F2 phenotype: Tall Tall Tall Dwarf;

Deny marks for gametes if not circled

(b) **Situations where the law of independent assortment may not apply**

- Not applicable to non-diploid organisms; e.g. polyploids like triploids, tetraploids, pentaploids.

- Some traits are determined by more than two alleles/multiple alleles/ polygenes

- Not always that one allele is dominant over the other; some alleles are co-dominant; or partially dominant; or incomplete dominance;
- Epistatic condition; alleles express interacting effects which are not purely dominant or recessive;
- Alleles do not always assort independently they are linked/linkage;
- Mutation;
- Complementary genes;
- Pleiotropy;
- Lethal genes;

@1mk, max 08mks

END
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