

UGANDA NATIONAL EXAMINATIONS BOARD
UGANDA ADVANCED CERTIFICATE OF EDUCATION
NOVEMBER - DECEMBER, 2022

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Candidate's Name PS3012 MARKING GUIDE.....

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1. (a) Effect of ingestion of iced water
on the temperature of hypothalamus

Ingestion of iced water caused the temperature of the hypothalamus to decrease; to a minimum; and thereafter the temperature of the O3 hypothalamus increased;

@1mark

Effect of ingestion of iced water
on the temperature of the skin.

Ingestion of iced water caused the temperature of the skin to increase; to a peak/maximum; and thereafter the temperature of the skin O3 decreased;

@1mark

(b). As the temperature of the hypothalamus decreases, that of the skin increases;

A decrease in the temperature of the hypothalamus stimulates the heat gain centre; within the thermoregulatory centre; of the hypothalamus

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This responds by initiating a negative feedback; involving sending out signals to the sweat glands in the skin; causing a reduction in the rate of sweating; with a consequent raise in skin temperature;

As the temperature of the hypothalamus increase, that of the skin temperature decreases; because an increase in temperature of the hypothalamus stimulates the heat loss centre; of the hypothalamus to send out impulses to the sweat glands in the skin; Promoting an increase in energy loss through sweat; with a consequent decrease in the skin temperature;

@1 mark

Total = 12 Marks

Maximum = 10 Marks



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(C). Ingestion of iced water lowers the temperature of the coronary vessels / the core; when this blood passes through the hypothalamus the lower temperature of blood will be detected by the cold thermoreceptors / end bulbs of Krause; These will then send out impulses to the heat gain centre; within the posterior hypothalamus that responds by sending out signals to the sweat glands; in the skin decreasing the rate of sweat production; This results in retaining heat within the skin; hence its temperature rises;
@mark Total = 07 Marks
Maximum = 06 Marks

(d). Ingestion of iced water would reduce the energy loss through evaporation; because of a decrease in the core body temperature; that will be detected by the cold heat receptors / end bulbs of Krause; in the hypothalamus These would send out signals to the heat gain centre; within the posterior part of the hypothalamus

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The heat gain centre would respond by sending out impulses to the sweat glands in the skin; that result into a decrease in sweat production /sweating/ evaporation of water from sweat; causing retention of heat within the skin, with a consequent rise in the skin temperature.

@1mark Total = 08 Marks
Maximum = 07 Marks

(e) (i) Body temperature of the human being may be different from the calorimeter temperature; An ice ingestion should be given later to allow the body temperature of the human to first come into equilibrium with that of the calorimeter. This allows the effect of the ice water ingestion on the temperature of the skin and hypothalamus to be determined more accurately. 03



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(ii). To ensure consistent/
more reliable/more accurate results
/minimise experimental error;
@ 1 mark 01

(f). The lizard would die;
because it is an ectotherm; so
regulates body temperature mainly
by behavioral means;
while inside the calorimeter,
the lizard will be unable to 05
regulate its body temperature;
following the ingestion of the
iced water;
@ 1 mark.

Total for whole
question = 40 Marks.

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2. (a) Having anthers that are higher than the stigma; making pollen to be easily deposited on the stigma surface;

Being bisexual/Having pistil and stamens at sometime; increases chances of self pollination;

Stamens and pistil may be enclosed by the petals; promoting self pollination;

Absence of the anthers to release O8 pollen onto a ripe stigmatic surface before the flower buds open; favouring self fertilisation;

Uneven drying up in the filaments and style of certain flowers; that cause curling of either the filaments or style; so that anther heads rub against the stigma surface;

Some plants have flower petals that only open following fertilisation;

Some flowering plants have vegetative buds; that develop into new plants through mitosis;

@1 mark

Total = 14 Marks
Maximum = 08 Marks

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(b) Stamens and stigmae mature at different times; in bisexual flowers favouring cross pollination;
Having separate male and female flowers on different plants; being dioecious; ensuring only cross pollination occurs;

Brightly coloured petals / scent; favours cross pollination.

Mechanisms of fruit and seed dispersal; reduce competition among offspring;

Enclosed ovary with style; through which pollen tube grows towards the ovule increasing chances of fertilisation;

12.

Double fertilisation; produces a food store / endosperm; that sustains the new plant when the seed germinates;

Produce seeds which can remain dormant; until favourable seasons set in; increasing chances of survival/ propagation;

Some have vegetative organs with food reserves; which are used for propagation;

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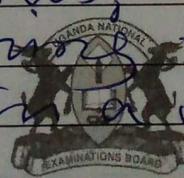
Vegetative organs can also withstand adverse conditions; increasing chances of survival;
Have a resistant sporophyte generation; that protects the delicate gametophyte;

@1mark Total = 22 Marks
Maximum = 12 Marks

3. (a) Light provides energy for photosynthesis; and photophosphorylation; This results into formation of reduced NADP; and adenosine triphosphate; which are fed into the calvin cycle;

In the calvin cycle, the ATP phosphorylates the glyceraldehyde 3-phosphate; while reduced NADP provides hydrogen atoms to this sugar; resulting into its conversion into glyceraldehyde phosphate; / triose phosphate which is converted into glyceral; 12.

The glyceral then combines with three fatty acids; in a condensation reaction; forming three ester bonds; in this liquid molecule
@1mark Total = 12 Marks



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(b) Camels live in arid habitats/deserts where water is in short/limited supply;

The oxidation/respiration of lipids; yields larger amounts of metabolic water; than an equivalent mass of a carbohydrate and protein/other food substances; which enables camels to survive long periods of water scarcity/without drinking water;

Camels also move/travel very long distances on aspect which requires minimum body weight; and is more energy demanding. Thus this makes lipids a preferable storage food material as lipids being lighter, they add little weight to the body of a camel; and also their oxidation releases much more energy; compared to other food substances.

@1mark Total = 08 Marks.

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4. (a) Lactic acid is produced from the fermentation of a Pyruvate molecule; in the absence of oxygen; within the cytoplasm of a muscle cell and this Pyruvate is formed from glucose; during glycolysis;

During glycolysis, a glucose molecule is phosphorylated by an ATP molecule; to produce the phosphorylated 6C sugar/fructose bisphosphate that is split into two molecules of a 3C sugar phosphate/glycerate 3-phosphate;

Glycerate 3-phosphate is then converted into a molecule of P-ribose;

In the absence of oxygen, the Pyruvate molecule accepts hydrogen atoms; from reduced nicotinamide adenine dinucleotide (NADH_2); in the presence of lactate dehydrogenase enzyme; forming lactic acid; 10

@work Total = 11 Marks
Maximum = 10 Marks

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(b). During glycolysis, there is partial breakdown of a glucose molecule; into a pyruvate molecule and the conversion of this Pyruvate into lactate does not yield any energy; thus most of the energy remains locked up within the Pyruvate molecule;

On the other hand, some of the ATP produced during glycolysis is invested in the initial activation of the glucose molecule; which puts a limit on the total amount of ATP that is produced during the whole process; **@almark**

(c) Accumulation of lactic acid in the muscles causes fatigue/muscles become stiff/disrupts mechanism of contraction;

Athletic training improves the blood circulation to the muscles; allowing lactic acid to be removed more quickly;

Athletic training increases the rate of extraction of oxygen from lungs; and also increases its circulation/supply to active/respiring tissues; This increases the rate of aerobic respiration; which lowers the rate of production of lactic acid.

@almark Total = 07 Marks
Maximum = 05 Marks

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5. (a) The water potential of salt marshes is lower than that of root cell sap; creating a steeper osmotic gradient; making these plants prone to water loss; to the surroundings by osmosis; This in order to avoid this water loss, their root cells actively absorb solutes; to maintain a higher solute concentration in their cell sap than that of the surroundings; This encourages osmotic entry of water into their root cells; thereby preventing plasmolysis that would have occurred as they lose water to the marshes;

@1mark

(b). (i) Waterlogging lowers the oxygen content of the soil; which reduces the rate of aerobic respiration; lowering rate of ATP production;

This reduces on the uptake of solutes into the root cells; by active transport; creating a low concentration gradient; which limits osmosis; thus water uptake also reduces;

@1mark

Total = 08 Marks



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(ii). Waterlogging reduces the oxygen content of soil which reduces on the rate of nitrification; and promotes denitrification; thus lowering the nitrogen content of the soil; @1mark

6. (a) (i) Acidic Rain.

The pH range in which the life of a plant exists is small; because the chemical reactions in cells of plants are controlled by enzymes; that work efficiently within a narrow pH range;

Acidic rain lowers the soil pH; which can result into subsequent disruption of enzyme activity/ cell metabolism in plants; 08

Acidic rain also causes leaf damage; and limits the availability of nutrients to plants;

Plants that can tolerate the effects of acidic rain / with enzymes that function better at low pH will show a high index of abundance in areas receiving much acidic rain; while those that have enzymes that function in alkaline conditions will have almost distribution; low abundance @1mark

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(ii) Plants that thrive better at low temperatures are more abundant in temperate / cooler regions; while those plants that can withstand higher temperatures are more abundant in the tropics / deserts;

Also the C₄ plants that are more efficient at fixing carbon dioxide at high temperatures are more abundant in hot climatic regions; Tropical climate whereas C₃ plants grow more efficiently in cooler environment / temperate climates / regions since they can fix carbon dioxide better at lower temperatures;

Some aquatic plants that are able to withstand very / extremely high temperatures thrive in hot springs; while those that can withstand very low temperatures survive in snow;

@elmark

Total = 06 marks



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(b) Plants that grow under a forest canopy have a limited supply of light; so apical dominance enables their shoots to grow taller / become etiolated; its reach out light sources; for photosynthesis. Those that grow in open habitats receive full illumination; making light no longer a limiting factor 06. for photosynthesis / growth; hence less pronounced apical dominance

@1mark

Total = 06 Marks

