

WAKISSHA JOINT MOCK EXAMINATIONS
MARKING GUIDE
Uganda Advanced Certificate of Education
UACE August 2019
BIOLOGY P530/2



SECTION A (40 MARKS)

- causes
 - results
 - leads

1. (a) i) Increase in skin temperature from 32°C causes gradual increase in rate of sweating then increase in skin temperature from 32°C to 33°C causes rate of sweating to increase rapidly finally increases in skin temperature from 33°C to 34°C causes a gradual increase rate of sweating; (03)
 Accept $32.2 - 33.2, 3.4 - 34.1 - 2.2$
- ii) (03)
 - Maximum rate of sweating is higher at rest than under light exercise; - deny peak
 - Rate of sweating is higher under light exercise than at rest; From $30.2^{\circ} - 34.1 / 34$
 - The maximum skin temperature at rest is higher $/ 37^{\circ}\text{C}$ than maximum skin temperature under light exercise $/ 34^{\circ}\text{C}$;
(03)
 - 32 to 34°C , rate of sweating under light exercise is rapid while the rate of sweating at rest is slow/ gradually; Constant.
- Similarities; In both**
- Rate of sweating increased as skin temperature increased;
 - From 30°C to 31°C rate of sweating increased gradually;
 - From 33°C to 34°C rate of sweating increased gradually;
 - $30 - 30.3$ Rate of Sweating is the (06 marks max)
 - Both have maximum values/rate
- iii) (03)
 Sweating cools the body temperature. As skin temperature increases more water evaporates from the skin surface; as a result the body loses heat; as latent heat of vaporization; (04 marks max)

(b) i.) At rest:

~~Adjust~~
 ~~$30 - 30.2^{\circ}\text{C}$~~
 There is almost constant/gradual increase in the rate of sweating from 30 to 35.5°C due Physiological mechanisms regulate body temperature leading to low rate of sweating; 35.5 to 37°C there is a rapid increase in rate of sweating because physiological mechanisms cannot lower skin temperature is at a rate the environmental temperature raised; Skin temperature beyond which physiological mechanisms can regulate (03 marks max) (03)

ii) Under light exercise;

During light exercise, there is a gradual increase in rate of sweating 30 to 32°C due to increasing rate of metabolism; where heat is generated; There is a rapid increase in rate of sweating 32 to 33°C because of increased metabolism leading to more heat generated; between 33 to 34°C rate of sweat production increases gradually because skin physiological mechanisms fail to lose heat at a rate it is produced; (05 marks max)

iii) Under heavy exercise; ✓

Under heavy exercise, there is a rapid increase in skin temperature 30 to 31°C; due to high rate of metabolism, where more heat is produced; ✓
As a result more sweating occurs to lower body temperature; ✓

04 marks

31 to 35°C there is a gradual increase rate of sweating in. The skin mainly loses heat in form of radiation and convection hence reduced sweating; ✓
33.5 to 34°C rate of sweating increases more rapidly due to excess heat produced by body metabolic rate, thus this heat has to be lost by increased sweating in addition to convection and radiation; ✓ (04 marks max)

(c) A rise in the body temperature is detected by the thermo receptors in the skin; which send impulses via ~~efferent nerves~~ ^{sensory nerves} to the hypothalamus/ thermo regulatory centre and interpreted; ✓
Impulses are sent back to the skin via efferent nerves, to sweat glands in skin stimulating sweat glands to increase rate of sweating; ✓
The thermo regulatory centre in the hypothalamus is stimulated by a rise in temperature of blood flowing through it. It then sends impulses via different nerves to sweat glands stimulating them to secrete sweat; (04 marks max) Max 6 marks

(d) 04 Flask A is closed at the surface; hence low heat loss by evaporation and convection; ✓
04 Flask B shows a drastic temperature loss because it is more open/ exposed to the environment; ✓
There is more heat loss by evaporation and convection; (04 marks max)

ii. Animal A – lives in a cold environment; ✓

Animal B – lives in a relatively hot/ warm environment; 62 (04 marks max)

iii. Animal represented by flask A with much fur;

- High metabolic rate; ✓
- Reduced/ smaller extremities; ✓
- Use of counter current exchange in limbs to minimize heat loss; ✓
- Thick subcutaneous fat; ✓
- Dark colour of the body fur; ✓
- Large body size to reduce surface area to volume ratio; (04 marks max)
- Shivering

04 only TOTAL = 40 MARKS

SECTION B (60 MARKS)

2. (a) Sun light energy is absorbed by the green plants(producers) to synthesize organic nutrient and passed on to the primary consumers during feed. Secondary consumers obtain this energy when they feed on the primary consumers, this energy is passed on from one trophic level to another until it reaches the decomposers, which recycle the energy and nutrient back in to the atmosphere; However at each trophic level energy is continuously lost back into the atmosphere; ✓ heat, excretion ✓ 04 (04 marks max)

- (b) i) Poaching for meat, tusks; ✓
 - Deforestation destroys habitat; ✓
 - Predation of poorly camouflaged prey its population declines to a level when other factors may lead to extinction
 - Extensive agriculture; modification of habitat/ destruction of swamps;
 - Use of pesticides kills top consumers;
 - Disease outbreak causes massive death of animals; ✓
 - Pollution kills animals;
 - Natural disasters kill many animals; ✓
 - Drought- kills many animals; ✓
 - Competition for limited resource once animals; occupy the same niche(s) overlap; ✓

(10 marks max)

- ii). - Easily seen by predators and hunters; ✓
 - High food demand; ✓
 - Low reproductive rate; ✓
 - Take long time to grow; ✓
 - Have support problems; ✓
 - Require thick vegetation to blend with environment; ✓
 - Slow to escape from predation.

06

3. (a) General features common to all receptors.

- Transforms energy to action potential; ✓
- Specialized in structure and position; Is specific ✓
- Creates generator potential; ✓
- Has a threshold value of stimulation; ✓
- Becomes adapted; ✓
- Sensitive to low intensity stimulation; ✓

05 maximum

- Precise
- Sensitivity

(05 marks max)

- (b) It allows organisms to maintain a stable internal environment; irrespective of changes in the environment; hence maintaining continuous rate of metabolism.

- Prevents damage to body part and structures. ✓
- Enable acquire food, mates, light nutrients. ✓
- Avoid danger / for defence. Escape from predators. ✓
- Synchronization of body processes leading to cascade of physiological changes.



- (c) Organ of corti is made up of the tectorial membrane, sensory hair cells, basilar membrane, and the auditory nerve. Here the pressure waves in the endolymph, is converted to generator potentials, by the sensory hair cells; pressure waves cause basilar membrane to vibrate which displaces sensory hair cells, distorting the hair-like processes; causing generator potentials to be generated in the hair cells which if they reach threshold, action potentials are fired in the auditory neurone, slight displacements of the basilar membrane stimulate cells at the apex of the basilar membrane where it is flexible, while greater displacement of the basilar membrane

(03marks max)

~~12 max~~

stimulate cells at the base; this is important in discriminating pitch; where the basilar membrane is rigid; sensory cells have varying thresholds of stimulation; which is important in discriminating intensity of sound:

(@01 mark 12 marks max)

4. (a) Sympathetic nervous system is alerted; and adrenaline is secreted into the blood stream; It causes an increase in cardiac output; and general constriction of ~~blood vessels~~ except those serving vital organs; ventilation rate increases to provide a lot of oxygen to the lungs; metabolic rate increases; This is caused by shortage of ATP;

Local dilation of the arterioles occurs due to building up of carbon dioxide in the muscle tissues; local dilation increases blood flow through the muscle;

Stretch receptors are stimulated due to rapid movement of the limbs; Receptors transmits impulses to the respiratory centre increasing ventilation rate;

Chemo receptors monitor level of carbon dioxide; leading to adjustments in ventilation rate and blood flow;

Muscles respire anaerobically; due to insufficient oxygen delivered to the muscle;

Lactic acid accumulates causing local dilation of arterioles; stimulating receptors in aortic and carotid bodies; which accelerates cardiac output and ventilation rate.

Sweating occurs due to rise in body temperature; because of increased metabolism; sweating cools the body;

~~10 mks~~

(@0 $\frac{1}{2}$ mark 09 marks max)

(b) - Specific;

- Distinguishes self from foreign;

- Memory;

- Self-regulating;

- Switches off response in absence of pathogen;

~~03 mks~~

(03marks max)

(c) Invasion of a pathogen stimulates T- lymphocytes which release lymphokines; that stimulate B- cells; to produce antibodies; and plasma cells; Anti bodies combat the pathogens; in various ways while plasma cells change to memory cells; which later recognize the pathogen; if it attacks the body another time; This is primary immune response.

Phagocytes engulf pathogen; and digest it;

(@01 mark 7 marks max)

5.

- (a) i) t- RNA transfers amino acids to translation sites; and it ensures correct sequence of amino acids formed due to pairing of its anticodon with m- RNA codons; t- RNA holds amino acids ensuring peptide bonds are formed between adjacent amino acids;

~~(03 marks max)~~

ii) m- RNA is a mediator; to allow the synthesis of only required proteins in each particular moment;

The transcription of DNA into multiple copies of m- RNA; determines the producing of protein molecules; necessary for normal cell functioning;

~~03~~

~~04~~

(b) **Similarities**; in both. *Both require enzymes*.

- 1) DNA helicase catalyses breakdown of hydrogen bonds in between strands;

- 2) Copying of sequences of nitrogenous bases occurs: 03
- 3) A nucleic acid is formed; *Reactions are anabolic*

In both Nucleus, Step occurs in the nucleus

Differences;

Protein synthesis

- Single strand copied;
- Protein is formed;
- RNA polymerase used;
- Product exists the nucleus;
- Occurs in both nucleus and cytoplasm;

DNA replication

- Both DNA strands copied ✓

- New DNA strands formed ✓

- DNA polymerase used ✓

- Product remains in nucleus ✓

- Occurs only in nucleus ✓

(c) Characteristics of genetic code;

- It's a triplet code ie 3 bases code for an amino acid; ✓
- It's a degenerate code since amino acids can be coded for by more than one codon; ✓
- It's a universal code; since a codon codes for the same amino acid is almost all living things; ✓
- It is punctuated due to presence of start and end codons separating genes from each other; ✓
- Its non-overlapping since a base belongs to only one codon, but not another at ago; ✓
- It is redundant; non-ambiguous ✓
- It has polarity; it's read from a fixed direction ✓

05

6. (a) In zone of cell division cells of procambium divide mitotically; forming daughter cells of which some proceed to zone of cell elongation; where the cells rapidly increase in size due to osmotic uptake of water; into their vacuoles and enlarging the vacuoles; this leads to development of pressure potential; such that the 1^o cell wall expands; during cell differentiation the cells of procambial strands form the proto xylem; due to lignification of cell walls, towards the inner side; while towards the outer side the phloem. During 2^o growth cells of vascular cambium divide mitotically; forming 2^o xylem/ meta xylem on the inside; and 2^o phloem/ meta phloem on the outside; ✓

10 marks

(@01marks 10 marks max)

- (b) i. Unilateral light in shoot; causes auxin to accumulate more on dark side; hence this side grows faster bending towards source of light; while in roots it causes illuminated side to grow faster bending into the ground; ✓

Unidirectional gravity causes auxins to accumulate on lower side; hence shoot bends away from gravitation pull; while the opposite occurs in roots; Unidirectional water/ moisture causes auxins to accumulate on the hydrated side; causing roots to bend towards source of water; while shoot shows the opposite response. ✓

(@01 marks 06 marks max)

06

- ii. Auxins regulate cell extension, and differentiation of vascular bundles; Auxins produced from apical meristems inhibits lateral buds from forming/ apical dominance; Auxins influence leaf expansion, growth of fruits/ seeds, and auxins are involved in tropic responses in plants; ✓

04 marks

stimulates pathogenesis (@01 marks 04 marks max)

END

4C.

→ Invasion of a pathogen is recognized by antigen presenting cells; such as Macrophages and B-cells or B-lymphocytes; these process and present antigens of the pathogen on the surface of the pathogen on cell surface which are recognized by their T-helper cells; help T-cells release lymphokines; which stimulates repeated division and differentiation of specific B-cells into plasma cells; some plasma cells release antibodies; which combat the pathogen in various ways; and some still the plasma cells form Memory B-cells; which recognize the pathogen if it attacks the body any other times; this is the primary immune response; 07 max

6(a)