Candidate's Name : DRAFT MARKING GUIDE .....

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Random No.						Personal No.		

(Do not write your School/ Centre Name or Number anywhere on this booklet.)

553/1
BIOLOGY
(Theory)
Paper 1
Oct./Nov. 2022
2½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

BIOLOGY

(THEORY)

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of sections; **A**, **B** *and* **C**.

Answer **all** *questions in sections* **A** *and* **B**, *plus* **two** *questions in section* **C**.

Write the answers to section **A** *in the boxes provided, answers to section* **B** *in the spaces provided and answers to section* **C** *in the answer booklets provided.*

For Examiners' Use Only			
Section		**Marks**	**Examiner's Signature and No.**
A	**No. 1-30**	30	
B	**No. 31**	20	
	No 32	10	
	No. 33	10	
C	**No.**	34,36	15@
	No.	35,37	
Total			

SECTION A (30 MARKS)

Answer **all** *questions in this section. Write the letter representing the correct answer to each question in the boxes provided.*

1. Which one of the following is a property of sandy soil?

A. Low capillarity.
B. High nutrient content.
C. Good water retention.
D. Poor aeration.

A ✓

2. Which one of the following occurs in the human body as a corrective measure when blood glucose level rises above normal?

A. Absorption of glucose in the ileum reduces.
B. Less insulin is produced.
C. More glucose is converted to glycogen.
D. Oxidation of glucose reduces.

C ✓

3. Which one of the following hormones controls the secretion of digestive juices from the pancreas?

A. Secretin.
B. Insulin.
C. Adrenaline.
D. Thyroxine.

A ✓

4. If the parents are carriers of a gene for albinism, what are the chances that they would produce an albino child?

A. 100 %
B. 75 %
C. 50 %
D. 25 %

D ✓

5. Which one of the following statements is correct about discontinuous variation? It is

A. exhibited by humans only.
B. controlled by a single gene.
C. present in all plants.
D. controlled by many genes.

B ✓

6. Plants are usually propagated using stems but **not** roots because

A. stems can store food needed during growth.
B. stems bear leaves which manufacture food for the offspring.
C. roots lack chlorophyll and stomata for gaseous exchange.
D. roots lack buds that can develop into new plants.

D ✓

7. The most accurate way to measure the growth in plants is by use of

A. dry weight. B. fresh weight.
C. height. D. volume.

A ✓

8. During inhalation in bony fish,

A. nostrils open.
B. floor of the buccal cavity is lowered.
C. operculum is forced open.
D. mouth is closed.

B ✓

9. Which one of the following represents the correct sequence of stages in cell division?

A. Interphase, metaphase, prophase.
B. Metaphase, prophase, telophase.
C. Prophase, metaphase, anaphase.
D. Anaphase, interphase, telophase.

C ✓

10. Which one of the following sets of natural resources consists of renewable resources only?

A. Forests, water, oil.
B. Water, forests, fish.
C. Minerals, solar energy, water.
D. Forests, minerals, fish.

B ✓

11. What is the most correct reason for the ileum being highly coiled? To

A. ensure it is compact enough to fit in the abdomen.
B. slow down food movement to allow time for digestion.
C. transport digested food to the liver.
D. bring the food into contact with its walls for absorption.

B ✓

12. Figure 1 shows structures of a vein and an artery.

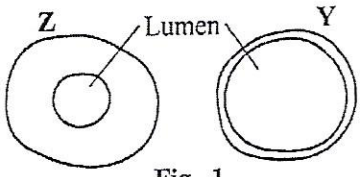


Fig. 1

C ✓

Which one of the following is true about the vessels?

A. Z is a vein because it has a thin wall.
B. Y is an artery because it has a thick wall.
C. Y is a vein because it has a wide lumen.
D. Z is an artery because it is fibrous.

13. A healthy adult person has an average of 8,000 leucocytes per mm^3 of blood. What would be the likely concentration of leucocytes per mm^3 of blood in an adult with a bacterial infection?

A. 4,000.
B. 7,000.
C. 8,000.
D. 12,000.

D ✓

14. Which one of the following processes contributes to the gaining of heat by the body?

A. Sweating.
B. Constriction of skin blood capillaries.
C. Shivering.
D. Standing of hair on skin surface.

C ✓

15. A student made a drawing of a cockroach. The length of the drawing was 5 cm and the actual length of the cockroach was 2.5 cm.

What is the magnification of the drawing?

A. × 12.5
B. × 7.5
C. × 2.0
D. × 0.5

C ✓

16. Water is moved up the stem of woody plants by

A. capillarity and transpiration pull.
B. osmosis and diffusion.
C. osmosis and active transport.
D. diffusion and active transport.

A ✓

17. Which of the following are functions of the cerebrum? It controls

A. muscular movement and posture.
B. reflex activities such as breathing.
C. heart beat and breathing.
D. learning and memory.

D ✓

18. Which one of the following does **not** apply to tropisms?

A. Depends on direction of stimulus.
B. Involve growth.
C. Stimulated by hormones.
D. Whole organism moves.

D ✓

19. Which of the following diseases can be transmitted by both the house fly and the cockroach?

A. Cholera and dysentery.
B. Dengue fever and yellow fever.
C. Trypanosomiasis.
D. Cholera and yellow fever.

A ✓

20. What is the function of the hormone testosterone in humans?

A. Prepares the body for flight.
B. Enlarges the skeletal muscles.
C. Increases heartbeat.
D. Increase levels of blood sugar.

B ✓

21. During the pupal stage in the life cycle of an insect, there is

A. rapid cell division.
B. much food consumption.
C. a lot of air intake.
D. tissue re-organisation.

D ✓

22. Epigeal germination occurs as a result of the

A. hypocotyl elongating faster than the epicotyl.
B. epicotyl elongating faster than the hypocotyl.
C. radical elongating faster than other parts.
D. cotyledons elongating faster than other parts.

A ✓

23. The correct difference between complete and incomplete metamorphosis is

	Complete metamorphosis	Incomplete metamorphosis
A.	Young and adult have same feeding habits	Young and adult have different feeding habits.
B.	Young and adult are different	Young and adult look alike.
C.	Involves 4 stages	Involves 2 stages .
D.	Dormant stage is the egg.	Dormant stage is the pupa.

B ✓

24. Which of the following blood vessels carry blood with a high concentration of urea?

A. Hepatic vein and renal artery.
B. Renal vein and hepatic portal vein.
C. Hepatic artery and renal vein.
D. Pulmonary vein and renal vein.

A ✓

25. Chicken, grass, man and grasshopper are in a food chain. Which one of them has the highest amount of energy?

A. Chicken.
B. Man.
C. Grasshopper.
D. Grass.

D ✓

26. Which one of the following cells does not carry out photosynthesis?

A. Guard cells.
B. Spongy cells.
C. Palisade cells.
D. Epidermal cells.

D ✓

27. Which one of the following parts of a flower produces gametes?

A. Stigma.
B. Anther.
C. Filament.
D. Corolla.

B ✓

28. Which one of the following is the importance of tactic responses to organisms? It enables

A. animals to escape from injurious stimuli.
B. plant roots to grow towards water.
C. non-woody plants to obtain mechanical support.
D. animals to regulate their body temperature.

A ✓

29. The interaction of plants, animals and non-living things in their environment forms

A. a population.
B. an ecosystem.
C. a community.
D. ecology.

B ✓

30. Which one of the following is true about the common mould? It

A. feeds parasitically on animal flesh.
B. exhibits holozoic nutrition.
C. ingests food by engulfing.
D. digests food outside its body.

D ✓

SECTION B (40 MARKS)

Answer **all** *questions in this section.*
Answers **must** *be written in the spaces provided.*

31. Figure **2** shows the changes in the population of zebras that were introduced in an isolated island. Study the figure and answer the questions that follow.

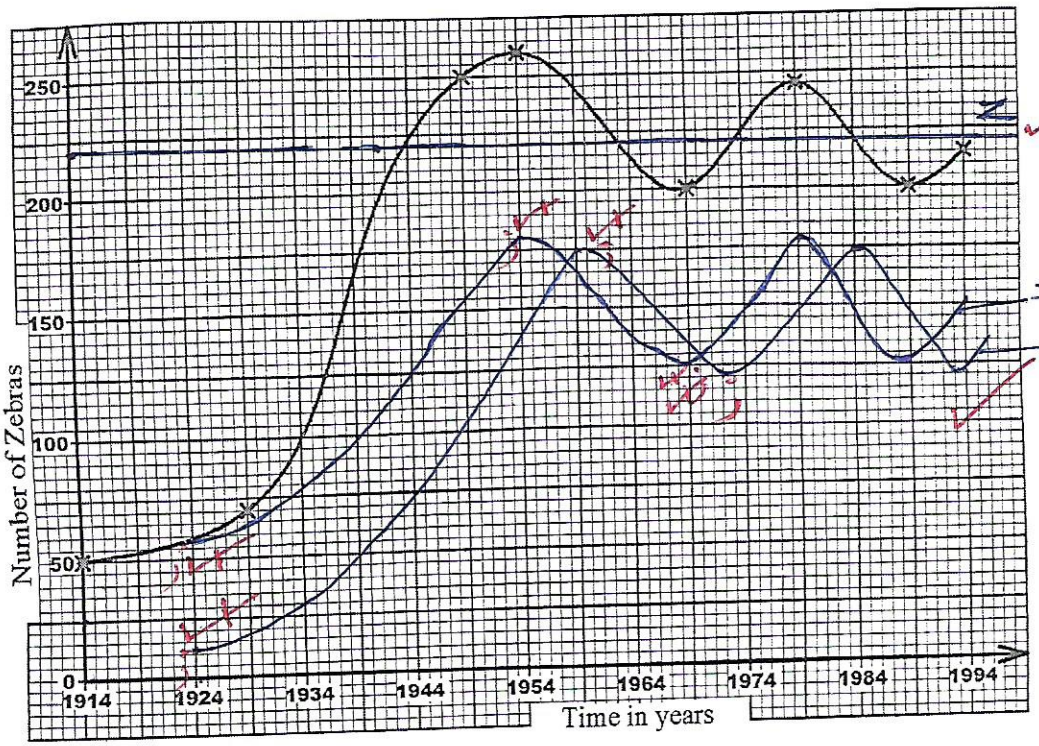


Fig. 2

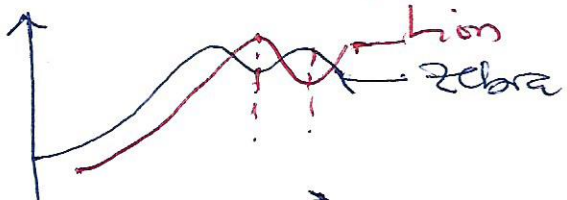
(a) Explain the changes in the population of the zebras during the following periods.

(i) 1914 to 1929. *(03 marks)*

From 1914 to 1929, population of zebras increased gradually because the zebras are still adapting/establishing themselves to new conditions on new island; also because of few reproductive individuals that are widely displaced on the island; hence breed slowly;

Zebra and Lion population sketch
- Starting point
- Shape of the curves
- Correct position of peaks
- Carrying capacity of lion lower than that of zebra

Accept: Alternative sketch/shape of the lion and zebra population curve



(ii) 1929 to 1949. *(03 marks)*

From 1929 to 1949, population of zebras increases rapidly; because increase in number of reproductive individuals; zebras are fully adapted to the island; availability of abundant resources such as food; thus less environmental resistance; Natality rate rapidly highly exceeds mortality rate, increasing population size; 03

(iii) 1949 to 1954. *(03 marks)*

From 1949 to 1954, population of zebras increased gradually, to peak because increase in population leads to competition of limited resources, therefore natality rate starts decreasing as mortality increases, leading to low population growth. 03

(b) (i) Draw a line on the graph in figure **2** to indicate the zebra carrying capacity of the island. Label it **Z**. ~~*(02 marks)*~~ 1 mark

(ii) Give reasons for the position of the carrying capacity line you have drawn on the graph. *(01 mark)* see graph on page 7

1 mark from (b)(i) transfered to b(ii) (02 marks) 1 mark

Increase in population of zebras beyond carrying capacity line; increases the environmental resistance restoring population to carrying capacity / setpoint / normal;

Decrease in population of zebras below carrying capacity line; decreases environmental resistance restoring population of zebra to carrying capacity/ set point / normals; 02

(c) (i) If in 1919 a pride of 10 lions were introduced to the isolated island, sketch curves on the same axes of figure 2 to show the variation in the population of the zebras and lions. *(04 marks)*

- Ranges for the lion population must be based on sketched curve
- Key marks for explanation if the curve for lion population was not sketched

(ii) Explain your answer in (c)(i). *(04 marks)*

From 1919 to 1934 population of Lions increased gradually because they fed on small population of zebras; thus breed/reproduce slowly
From 1934 to 1959, population of Lions increased rapidly; to peak because lions fed/preyed on a high population of zebras and reproduced faster/highly
From 1954 to 1969, population of zebra decreased rapidly; because the lions highly fed on them; later the Lion population decreases; due to Competition for few prey population;

04

32. (a) Why is it important for the body's internal environment to remain constant? *(02 marks)*

Because body metabolic processes take place within small/narrow ranges of optimum conditions; ensuring suitable conditions for enzymes to work best;

02

(b) Explain the role of each of the following body organs in maintaining a constant internal environment:

(i) Lungs. *(03 marks)*

Accept: Other correct well explained role(s)
- removal of water
- removal of excess heat through expired air

Lungs remove carbon dioxide produced during body metabolism; carbon dioxide in blood diffuses along its concentration gradient into alveolar space at the lungs; and expelled out of the body on breathing out; which would change the pH;

03

(ii) Liver. *(03 marks)*

Increasing blood glucose concentration above normal stimulates Langerhans secretion of insulin from beta cells of islets of Langerhans of pancreas which moves through blood to Liver to; increase rate of glucose metabolism; promote conversion of excess glucose to glycogen or fats for storage; hence lowering blood glucose levels to the normal/set point. 03

Award: explanation of role of liver in regulating blood glucose level when fall below the normal.
Accept: - Other correctly explained homeostatic role of the liver

(c) Name any other **two** homeostatic organs in the human body. *(02 marks)*

skin ;
Kidney ; 02

33. During an investigation, a well-watered potted plant was kept in darkness for 24 hours. After that, three of its leaves were marked **X**, **Y**, **Z** and then treated as shown in figure **3**.

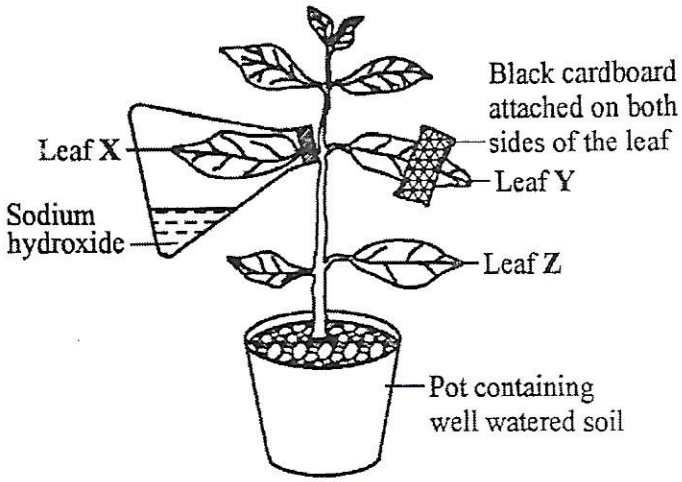


Fig. 3

The whole set up was then exposed to sunlight for about 6 hours and the 3 leaves were tested for starch.

(a) What was the purpose of keeping the potted plant in darkness for 24 hours? Explain your answer.

Purpose *(01 mark)*

To destarch the leaves; ✓ (01)

Explanation *(03 marks)*

In darkness, photosynthesis doesn't take place; ✓ due to absence of light; ✓ therefor starch previously available stored is used up respiration; ✓ (03)

(b) (i) What was being investigated in leaves marked **X** and **Y**?

(02 marks)

X to show that carbon dioxide is necessary for photosynthesis; ✓

Y to show that light is necessary for photosynthesis; ✓ (02)

(ii) Why was leaf **Z** considered as a control in this experiment?

(02 marks)

Because it was left under normal/natural environmental conditions; ✓ of atmospheric carbon dioxide and full/complete exposure to light; ✓ (02)

(c) State what was observed when leaf **Y** was tested for starch. *(02 marks)*

Award for observation
brown/black
not deduction eg
starch present/absent

Part of leaf Y covered with black cardboard turned to brown ✓

Part of leaf Y not covered with black cardboard turned to black ✓

02

SECTION C (30 MARKS)

Answer any **two** *questions from this section.*

34. (a) Why is the circulation of blood important in mammals? *(06 marks)*

(b) Explain why plants are able to survive without a circulatory system. *(09 marks)*

35. (a) (i) Explain why the human body temperature increases during physical exercises. *(04 marks)*

(ii) How does the body restore the normal body temperature after a physical exercise? *(08 marks)*

(b) Why does a human baby feel colder than its mother on a cold day? *(03 marks)*

36. (a) What is meant by the following:

(i) simple reflex action,

(ii) conditioned reflex action? *(04 marks)*

(b) Describe the role of the secretions of the pituitary gland in the human body. *(11 marks)*

37. (a) Explain the different ways of controlling water pollution. *(07 marks)*

(b) Giving an example in each case, explain why it is important to conserve insects. *(08 marks)*

END

Qn-34

(a) 'Blood circulation' transports oxygen from lungs to respiring body tissues; ✓

transports carbon dioxide from body tissues to lungs for removal from the body; ✓

transports excretory waste products such as urea from metabolically active cells to excretory organs such as lungs, kidney for excretion; ✓

Distributes heat from active/respiring tissues of the body to other parts to ensure uniform distribution

transports antibodies to wounded areas of the body for defence; ✓

transports digested food from digestive organs to body tissues for respiration; ✓

transports hormones from sites/organs of secretion/glands to various target organs/glands for regulating body processes; ✓

(b) Plants reuse some of their excretory ~~organs~~ products; forexample carbon dioxide from respiration is reused in photosynthesis; thus no need for circulatory system to transport carbon dioxide to sites of excretion

Plants have vascular tissues/bundles, such as xylem and phloem, for long distance movement of water, mineral salts, and organic solute/food, within the plant

In simple plants such as algae, distribution of ~~water~~ materials is sufficiently achieved by diffusion and active transport, to move nutrients and excretory products from cell to cell due to large surface area volume ratio;

Energy demand in plants is less; the circulatory system that would rapidly distribute nutrients and necessary requirements for rapid metabolism, is therefore not required/absent

Every living cell in plants is present very close to the plant surface; this enables exchange of gases ~~by diffusion~~ between the atmosphere and the plant cells by diffusion; for example Carbon dioxide diffuses ~~out~~ from atmosphere through stomata into plant cells by diffusion; without use of a circulatory system.

Qn. 35

(a) (i) During exercise, rate of metabolism / respiration in tissues increases; energy produced is used by the body muscles to contract; and remaining energy converted to heat energy; which is distributed by blood throughout body increasing body temperature. ✓

(ii) Receptors in hypothalamus; detect increase in temperature of blood as it passes through the brain; thermoregulatory centres then send impulses to different effectors to ensure loss of excess heat from the body; and lower / decrease heat production by:-

increasing the rate of sweating; to ensure cooling;

Vasodilation of superficial blood vessels that lead blood to the skin; allowing more blood carrying heat to flow towards the skin surface where heat is lost; by convection, conduction or radiation;

decrease in metabolic rate; to reduce amount of heat energy liberated;

relaxation of hair erector muscle; reducing the thickness of insulation; as hair lie horizontally on the skin surface, allowing excess heat loss; ✓

(b) Baby has a larger surface area to volume ratio than its mother; therefore baby loses more heat on cold day and feels colder than its mother. ✓

15

Qn. 36

(a) (i) Simple reflex action is a rapid automatic response of an organism not initiated by the brain; It occurs in the reflex arc; for example withdrew of hand from sharp object; 02

(ii) Conditioned reflex action is a learned response that an organism develops after practice of 02 associating a strange signal or stimulus with a meaningful/familiar stimulus; for example, dog in Pavlov's experiment learnt to associate sound of the bell with food;

(b) Secretions of the anterior pituitary gland:-

growth hormone; stimulates growth mainly; in bones; Over secretion of growth hormone leads to gigantism while under secretion leads to dwarfism 1½

Prolactin; stimulates milk secretion; in mothers' breasts; 1½

Luteinising hormone; stimulates secretion of testosterone; in testes; causes ovulation and development of corpus luteum in ovaries 1½

Follicle stimulating hormone; stimulates growth of graafian follicles; in ovaries; stimulates secretion of oestrogen; in the ovaries; or formation of sperms; in testes; 1½

Thyroid stimulating hormone / thyrotropin; stimulates thyroid gland; to secrete thyroxine; and regulates growth of the thyroid gland; 1½

Secretions of the posterior pituitary gland:-

antidiuretic hormone; (vasopressin); promotes reabsorption of water; in the kidney; reducing quantity of water lost as urine; raises blood pressure by constricting arterioles 1½

oxytocin; induces parturition / birth; by causing contractions of the uterus; stimulates milk flow from the mammary glands. 1½

½ link-secretion ½ hormone ½ link-role ½ target organ/gland/cell/part of the body

Qn. 37

(a) Use of mulch / compost / farm yard manure; other than synthetic fertilizers that would easily be washed into water bodies introducing nitrates and phosphates

Treatment of sewage water, by use of sewage treatment plants, to clean sewage water before releasing it into water bodies;

Restrict use of oil-engine ~~automobiles~~ such as engine boats, whose oil leakages / spills pollute water

Proper discharge of domestic ~~waste~~ and industrial sewage ~~wastes~~, which contain detergents with phosphates and nitrates

Construction of human / man-made water bodies, for alternative sites for cooling power plants other than the natural water bodies

Recycling of non-biodegradable wastes, to avoid accumulating in the environment; as they can easily be eroded into water bodies by running water or other agents.

Educating / sensitizing the community around water bodies about the dangers of water pollution

Restrict use of pesticides and herbicides on farm lands near water bodies as they can easily be washed into the waters by erosion.

(b) Insects are good biological specimens, for scientific study purposes such as dissection of cockroach

Products of insects for example honey, made by bees is ~~a source of~~ eaten as food by man

Insects themselves for example the white ants, grasshoppers are eaten as food by man

Insects are used as poultry feeds, for example termites, locusts, maggots

Insects carry out pollination of crops of man,

Insects are biological indicators, used in monitoring various pollutants in environment since they are sensitive to slight changes in environment, forexample beetles, ants honey bees

Insects transmit diseases, hence disease vectors forexample housefliés are vectors for cholera and dysentery, Mosquitoes are vectors for malaria

Insects that feed on decaying organic matter, enable recycling of matter forexample bugs, dung beetles, maggots.

15