Name:...MARKING GUIDE.....Centre/Index No:...../.....

553/1
BIOLOGY
THEORY
Paper 1
JULY/AUGUST, 2022
2½ *hours*

JINJA JOINT EXAMINATIONS BOARD

Uganda Certificate of Education

MOCK EXAMINATIONS JULY/AUGUST, 2022

BIOLOGY

THEORY

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Answer ALL *questions in section* A *and* B, *plus any* TWO *questions in section* C.

Answers to section A *and B* should be written in the spaces provided strictly.

For Examiner's Use Only

SECTION	MARKS
A: 1-30:	28
B No. 31:	~~28~~ 22
No. 32:	~~2~~ 10
No. 33:	10
C No. : —	15
No: —.	15
TOTAL	100%

SECTION A (30 MARKS)

ANSWER SHEET The two names were taken to number 31

1	D	11	D	21	A
2	Not applicable	12	A	22	D
3	C	13	C	23	C
4	D	14	A	24	C
5	D	15	A	25	Not applicable
6	C	16	B	26	B
7	C	17	D	27	C
8	D	18	D	28	C
9	B	19	A	29	B
10	B	20	C	30	D

1 What is the significance of the biconcave shape of the red blood cells? To.....

A: reduce the weight of cells
B: enable cells carry more energy
C: enable cells pass through the capillary walls
D: allow cells fit into the narrow lumen of the capillaries

2 Why is it that enzyme maltase will not only hydrolyse maltose? Because enzymes.....

A: are specific in nature

B: are protein in nature

C: work best at specific PH

D: control reactions that are reversible

3 Which one of the following is not a variant of coronavirus?

A: Alpha

B: Delta

C: Covidex

D: Omicron

4 Which one of the following provides active acquired immunity to the very young child?

A: Receiving antibodies from mother's milk

B: Developing antibodies as a result of inherited genes

C: Receiving antibodies from mother via the placenta

D: Receiving injections of antigens which cause the body to make antibodies

5 Which one of the following best describes the effect of one-sided illumination on the distribution of auxins in a shoot tip?

A: The auxins are evenly distributed around the tip

B: The light inhibits movement of auxins down the tip

C: The auxins increase on the illuminated side of the tip

D: There is a reduction of auxins on the illuminated side of the tip

6 Which one of the following structures of a flower develops into a seed coat after fertilization?

A: Ovary

B: Receptacle

C: Integument

D: Embryo sac

7 Which one of the following is part of the appendicular skeleton?

A: Skull

B: Atlas

C: Scapulae

D: Lumbar vertebra

8 Which one of the following is the least important function of humus in the soil?

A: Water retention

B: Improving soil aeration

C: Increasing soil fertility

D: Prevention of soil erosion

9 At which of the following levels of classification can organisms interbreed and produce fertile off-springs?

A: Class

B: Species

C: Phylum

D: kingdom

10 By which one of the following processes does carbon dioxide leave the blood capillaries into the alveoli?

A: Osmosis

B: Diffusion

C: Capillarity

D: Active transport

11 Which one of the following methods would be the best for estimating the population density of rats in a bush?

A: Line transect

B: Direct counting

C: Quadrat method

D: Capture - recapture method

12 Which one of the following would be a correct sequence of plant succession on an abandoned tarmac compound?

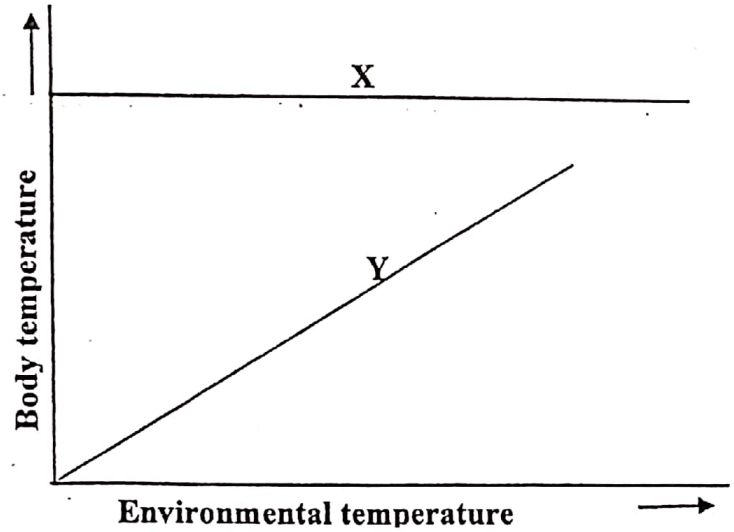
A: Mosses → herbs → shrubs → trees

B: Herbs→ mosses→ shrubs → trees

C: Shrubs → herbs → trees → mosses

D: Mosses → herbs → trees → shrubs

13 The graph below shows how the body temperature of animals X and Y vary with environmental temperature.



Which one of the following is demonstrated in the graph above?
A: Y losses more heat than X
B: X has a higher body temperature than Y
C: Body temperature of Y is dependent on environmental temperature
D: Body temperature of X is dependent on environmental temperature

14 Which of the following features show continuous variation?
A: Weight
B: Haemophilia
C: Sickle cell trait
D: A, B and O blood group

15 Which of the following bones are connected by a pivot joint?
A: Atlas and axis
B: Femur and tibia
C: Carpals of the wrist
D: Humerus and scapula

16 By which of the following are impulses transmitted across synapses?
A: Thermal means
B: Chemical means
C: Electrical means
D: Mechanical means

17 Which one of the following is the best definition of a gene? A.....
A: part of a single chromosome in the nucleus
B: factor responsible for producing a characteristic
C: portion of a chromosome responsible for several characteristics
D: part of a chromosome responsible for producing one characteristic

18 Which one of the following pairs are components of viruses?
A: Protein and lipid
B: Lipid and carbohydrate
C: Protein and carbohydrate
D: Protein and nucleic acid

19 Which one of the following excretory products are removed from the body by the kidney?
A: Excess water, excess salts and urea
B: Excess water, urea and carbon dioxide
C: Excess salts, urea and carbon dioxide
D: Excess water, excess salts and carbon dioxide

20 Which one of the following substances accumulates in muscles during vigorous exercise?
A: Water
B: Oxygen
C: Lactic acid
D: Carbon dioxide

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21 Which one of the following is the likely cause of short sightedness
A: Lens becoming thicker
B: Expansion of iris muscles
C: Contraction of the ciliary muscles
D: Suspensory ligament becoming shorter

22 Which one of the following parts of the mammalian ear is concerned with balance?
A: Cochlea
B: Oval window
C: Eustachian tube
D: Semi- circular canal

23 Which one of the following controls salt levels in the body of humans?
A: Liver
B: Rectum
C: Kidney
D: Bladder

24 Which of the following is produced in the lymph nodes?
A: Fibrinogen
B: Blood platelets
C: Some white blood cells
D: Red blood cells and white blood cells

25 When the environmental temperature is at 18°c, which one of the following represents the temperature of the air breathed out?
A: 37.0°C
B: 24.0°C
C. 30.0°C
D.98.4°C

26 Which of the parental crosses below would produce 25% albino offspring if A stands for normal skin colour and a the recessive character?
A: aa x aa
B: Aa x Aa
C: AA x aa
D: AA x Aa

27 Which one of the following does not cause an increase in human body temperature?
A: Shivering of muscles
B: Increased metabolic rate
C: Dilation of deep lying blood vessels
D: Constriction of peripheral blood vessels

28 What is the significance of secondary growth in plants? It causes an increase in....
A: height
B: length
C: thickness
D: number of branches

29 A population in equilibrium would be characteristic of a natural community in which
A: immigration is occurring rapidly
B: succession has reached a climax
C: the pyramid of energy has been reversed
D: pioneer organisms are increasing rapidly

30 Red flowered peas were crossed with white flowered peas. The F_1 generation were all pink flowered. What would be the result of selfing these pink flowered peas?
A: All the flowers would be pink
B: Half the flowers would be red and half pink
C: Half the flowers would be pink and half white
D: A quarter of the flowers would be red, half pink and a quarter white

SECTION B (40 MARKS)
Answer all questions in this section.

31 The table below shows the percentage composition of inhaled and exhaled air, in a human being at rest and also the composition of exhaled air during exercise.
Use the information in the table to answer the question that follow:

	Oxygen	Carbon dioxide	nitrogen	Water vapour
Inhaled air at rest	20.96%	0.03%	79%	Variable
Exhaled air at rest	16.2%	4.1%	79%	0.8%
Exhaled air during exercise	15.58%	4.5%	79%	0.92%

a. Give a reason for each difference stated in a above (6 marks)

- Inhaled air contains more oxygen than exhaled air; because some oxygen is used; in respiration of cells;
- Inhaled air contains less carbondioxide than exhaled air; because more carbondioxide is produced; during respiration;
- Inhaled air contains less water vapour than exhaled air; because water is produced; during respiration;

Deny names if figures are used in description

Accept any two comparisons given ie

or - Inhaled air at rest vs Exhaled air at rest
or " air vs Exhaled air during exercise
or Exhaled air at rest vs Exhaled air during exercise

....

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b. State the changes that occur in the composition of exhaled air in a human being who is previously at rest, then takes an exercise. (3 marks)

- The water vapour in exhaled air during exercise increases; (by 0.12%);
- Carbondioxide in exhaled air during exercise also increases (0.4%);
- Oxygen in exhaled air during exercise reduces (by 0.62%);

03

c. Give a reason why each change stated in(c) above occurs. (3 marks)

- During exercise, the muscles are more active; more oxygen is utilized in tissue respiration; hence causing its further reduction;
- The rate of respiration increases; to provide energy; for the exercise, hence producing more Carbondioxide as a bi product;
- The rate of respiration increases to generate more heat; in the body for evaporation of water;

OR: Rate of respiration increases, producing more metabolic water;

04

Deny it

Deny marks if (b) is wrong

d. During exercise, the breathing rate increases. From the information provided suggest why this happens. (3 marks)

~~The rate of respiration increases; to pr~~
The breathing rate increases to supply more oxygen; to meet the oxygen demands for tissue respiration; (prevent anaerobic respiration/ oxidize the lactic acid); 04
To remove the carbondioxide quickly; which would harm the cells if allowed to accumulate;

e. Why is the percentage of nitrogen constant in inhaled and exhaled air? (2 marks)
Nitrogen is not involved in Metabolic reactions in the body; 02

Total = 22

32. A mouse 20gms, an elephant 2000kg and a whale 20000kg are mammals with a normal body temperature of approximately 37°c.

i. Which of the three mammals has the smallest volume? (½ marks)
Mouse; 01/2

ii. Which one contains the least amount of heat? (½ marks)
Mouse; 01/2

iii. Give reasons for your response in(ii) above. (2 marks)
Has ~~a small~~ a large surface area to Volume ratio; over which heat is lost; 02

iv. Which of the three animals has the smallest surface area in proportion to its volume?

(1 mark)

Whale; ✓ 01

v. The elephant normally lives in hot climates where endothermic animals usually need to lose heat to maintain a constant body temperature. Give two special features of the elephant that enable it to lose heat. (2 marks)

Has less hair / thin fur on the skin surface; ✓
Has long trunk; ✓ any 02
Enormous extremeties like ears; ✓ to provide a large surface area over which heat is lost; ✓

Mark the first two responses

vi. State two special features of the whale that enable it to retain heat. (2 marks)

A layer of fat under the skin and related organs; ✓
Very big in size; ✓
Reduced extremeties. ✓
Some hair on the skin; ✓

Mark the first two responses

mark first two 02 responses = 02

vii. What features enable the mouse to retain heat in a cold climate? (2 marks)

Thick hair on the skin; ✓ 02
Fat layer beneath the skin; ✓

Total = 10

.....

.....

33 a Give four characteristics of gaseous exchange surfaces in plants. (4 marks)

Mark the first four responses given

i. • Large surface area to Volume ratio; ✓

ii. • Have Moist surfaces where gases can dissolve before diffusing ✓

iii. Thin membrane to reduce the distance covered by the diffusing gases; ✓

iv. Well ventilated with large air spaces for easy movement of gases; ✓ 04

• permeable to allow gases go through;

Reject: pores, stomata, numerous

b. Fill in the spaces in the table below:

ANIMAL	RESPIRATORY SURFACE
FISH	Gill filaments; ✓ ✗
INSECT	Tracheoles; ✓ ✗
FROG	Alveoli / Lining of buccal cavity / skin; ✓ ✗
AMOEBA	cell membrane; ✓
RAT	Alveoli; ✗
PARAMECIUM	cell membrane; ✓ ✗

03 ✓✓@ 2

Reject: Gills spiracles Lungs Buccal cavity.

c. Explain why diffusion alone meets the gaseous exchange requirements of protozoans. (3 marks)

• Protozoans are single celled with a large surface area to volume ratio; hence a large area provided for diffusion of gases; ✓

• Thin cell membrane which provides a short diffusion distance; ✓ and 03

• permeable membranes which easily allows gases to enter. ✓

Total = 10

SECTION C (30 MARKS.)

Answer any two questions in this section:

34. a. How does passive immunity differ from active immunity? (4 marks)
    b. In what other ways does the body protect itself against infection? (11 marks)

35. a. Distinguish between osmosis and diffusion. (2 marks)
    b. Describe an experiment to demonstrate osmosis using a named plant material. (9 marks)
    c. Outline the importance of osmosis to plants. (4 marks)

36. a. Outline the role of hydrochloric acid in the stomach. (5 marks)
    b. Describe how the small intestine is adapted to its function. (10 marks)

37. a. Describe the term pollution. (2 marks)
    b. Describe four causes of air pollution and their effects. (8 marks)
    c. State five ways of controlling air pollution. (5 marks)

End

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SECTION C

34(a)

Passive immunity	Active immunity.
- The body receives antibodies;	The body makes antibodies;
- Short lived;	Long lasting;
- No exposure to antigens is required;	Involves exposure to antigens;
- Fast response;	Slow response; 04

(b) - Blood clotting at damaged area; to prevent entry of microbes;
- Cornified layer of the skin; prevents entry of microbes;
- Presence of White blood cells; which engulf microbes;
- Tear glands; keep the eye balls moist; and thus wash away dust and bacteria;
- Wax produced; in the outer ear channels to neutralise germs;
- Hydrochloric acid in the stomach; kills bacteria;
- The mucus membranes eg nasal mucus; and hair; of the nassal channels are kept moist to trap microbes; in inhaled air

Total = 15

Total 14 MAX = 11

35(a) Osmosis is the movement of water (solvent) molecules from a region of their high concentration to a region of their lower concentration across a semi permeable membrane while diffusion is movement of substances down the concentration gradient from a more concentrated to a less concentrated area; 02

Marks given once to the correct definitions

(b) Aim: To demostrate osmosis using ~~a named plant material~~ Irish potato tissue; 01 (1 mark)

Materials

Scapel, ruler, heat source, Irish potato, beaker, petri dish, water, sugar/salt. any 2 ½ @ = (1 mark). 01

Procedure:

- Peel 3 large potatoes from which cubes of 3cm sides can be cut; Curve out a cavity in each cube;
- Immerse one of the potato cups in water and boil it; for 5 minutes to kill the protoplasm;

- Place each of the potato cups in petri dish with same volume of water;
- Pour ½ a teaspoon of sugar crystals into the cavity of any of the unboiled potato cups; and in the boiled potato cup;
- Examine the cavities of the potato cups after 40 minutes and let the set up stand for about 2 hours;

Observation.

After 2 hours, it will be observed that water molecules will have entered the cavity containing sugar; forming a solution; ~~to equilibrium~~ in the unboiled potato cup.

No water will enter the cavity of the potato cup without sugar; and in the cup of the boiled potato.

However, movement of water have occured in the unboiled cup with sugar;

09

Conclusion

Osmosis occurs in living plant material.

(c)
- Facilitates absorption of water by root hairs from the soil.
- It brings about support due to turgidity when cells absorb water;
- Causes movement of water with in plants;
- Opening and closing of petals due to turgidity.
- Facilitates opening and closing of stomata due to turgidity;

any 4 = 4 marks

Total = 15

36 (a)

Hydrochloric acid;
- Initiates the hydrolysis of sucrose to glucose + fructose;
- Provides the correct condition for absorption of iron;
- Provides acidic medium suitable for pepsin and renin to act;
- Stimulates the opening of the pyrolic valve;
- activates the inactive pepsinogen to pepsin;
- destroys micro organisms like bacteria which are present in food; / prevents fermentation of food in the stomach

any 5 @ 1 mark (5 marks)

36 - It has numerous enzymes to maximise digestion of food;
(b) - It is long which increases the surface area for food digestion and absorption;
- It is highly coiled to slow down the movement of food materials to increase time for digestion and absorption;
- The small intestines have digestive glands which secrete digestive enzymes that completes the process of digestion;
- It has muscular walls which enhance peristalsis;
- The ileum has mucus glands which secrete mucus to prevent digestion of the wall of the intestines and to lubricate the food easing movement of food;
- The small intestines is narrow which brings food into contact with the wall;
- Its inner surface is lined with finger like structures called villi which increase the surface area for absorption;
- The inner lining has a thin layer of cells through which the food pass for absorption;
- It is highly vascularised / a dense network of capillaries into which the digested food materials pass for absorption
- Inside the villi are lacteals through which fatty acids and glycerol pass for absorption;

any 5 = 10 marks.
(@ 2 marks)

Total = 15

37 (a) Pollution is the introduction of harmful materials into the environment. These harmful materials are called pollutants; and pollutants can be natural; or created by human activity; causing damage to the quality of air, water and land; (2 marks)
Defn = 1 mark, other description 1 mk @ ½ any two

(b) (i) Gaseous industrial wastes such as carbon dioxide and sulphur dioxide cause pollution and the resultant effect is respiratory poisoning, acidification of rain water / causes global warming / for green house effect
causes green house effect / for global warming.

(b) (ii) Fossil fuel combustion, of, petrol and wood charcoal when burnt produce carbon dioxide and other carbon wastes which pollute the environment; resulting into effects like eye irritation, breathing difficulties and respiratory diseases like bronchitis and pneumonia;

(iii) Motor vehicle exhaust from combustion of leaded petrol lead to pollution; with the resultant effect of reduced visibility on roads, lead interferes with mental development in children and affects kidney and liver functioning;

(iv) Dust from cement works, road construction and dusty roads pollute the air; which results in reduced visibility on roads; limits photosynthesis as a result of dust on leaves;

v) Aerosols from perfume sprays with chlorofluoro carbon (CFC), copper and lead; the resultant effect being the ozone layer depletion leading to increased penetration of ultraviolet rays which cause skin cancer.

Bursting of atomic bombs

(1 mark, for correct cause, 1 mark for correct effect = 2 total = 8 marks)

Mark the first four responses given

Eruption of Volcanic mountains (first 4)
Lava produces carbondioxide

(c) - Use of lead free petrol;
- Wet scrubbers in chimneys to dissolve soluble gases such as sulphur and nitrogen dioxide before releasing emissions from industries;
- Fitting exhaust filters in vehicles; / catalytic converters
- Restricting excessive smoking from automobiles;
- Discouraging use of either heavy cargo vehicles or private cars in towns to reduce on the amount of emission;
- Through legislation, air acts can be enacted (made) by government to reduce on the amount of pollutants in the air.
- Recycling of plastics other than burning;

Given for the first five responses

Total = 15

any 5 @ 1 mark = 5 marks.