NAME:…….. **STREAM**……

SENIOR FOUR

553/1

BIOLOGY

PAPER 1

EXAM 7

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

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

Answers to sections **A** *and* **B** *must be written in the spaces provided in the question paper*

For Examiner's Use Only

SECTION	MARKS
A: 1-30:	
B No. 31:	
No. 32:	
No. 33:	
C No. :	
No:	
TOTAL	

SECTION A (30 MARKS)

ANSWER SHEET

1.	11.	21.
2.	12.	22.
3.	13.	23.
4.	14.	24.
5.	15.	25.
6.	16.	26.
7.	17.	27.
8.	18.	28.
9.	19.	29.
10.	20.	30.

1. What is the meaning of the term growth?
   A. Increase in the number of organisms
   B. Increase in amount of fat in the body
   C. Permanent increase in size of an organism
   D. Increase in form and complexity of an organism

C

2. Which one of the terms below describes the place where a plant or animal lives?
   A. Habitat
   B. Ecosystem
   C. Population
   D. Community

A

3. Which one of the following statements is <u>not</u> correct about some ways of reducing pollution?
   A. Recycling materials
   B. Cleaning up discharges to the environment
   C. Make industrial processes less efficient.
   D. Reducing the use of harmful substances and replacing them with "environmentally friendly" ones.

C

4. All the features below are examples of continuous variation except,
   A. human blood groups
   B. length of mouse tails
   C. height of sweet pea plants
   D. weight of people in a slimming club

A

5. Which one of the following is the site of production of the male gametes in plants?

A. Testes
B. Ovaries
C. Anthers
D. Placenta

C

6. What is the expected genotypic ratio in a cross of two heterozygotes for a trait?
A. 1:3
B. 1:1:2
C. 2:1:1
D. 1:2:1

D

7. Which one of the following describes secondary growth?
A. Upward growth
B. Thickening of stem
C. Growth of side branches
D. Development after growth.

B

8. ……describes reproduction in which fertilized eggs are laid or spawned by the mother and hatch outside her body.
A. Parity
B. Oviparity
C. Viviparity
D. Ovoviviparity

B

Oviparity is a mode of reproduction in which animals lay eggs.

Ovoviviparity is a mode in which animals lay eggs and keep them inside the mother's body until hatching.

Viviparity is the mode of reproduction in which animals directly give birth to young ones

9. Which one of the following explains the main purpose of the larva stages in metamorphosis?
A. Migration
B. Feeding and growth
C. Reproduction and movement
D. Survival during the rainy season.

B

10. Which one of the following terms describes the change from plant proteins to ammonium compounds?
A. Combustion
B. Nitrification

C. Denitrification
D. Putrefaction

D

11. Which of the following occurs when a green plant carries out photosynthesis?
A. Water is used up
B. Oxygen is required
C. Carbon dioxide is used up
D. Chlorophyll is broken down.

C

12. Which one of the following is characteristic of all living things?
A. Feeding
B. Excretion
C. Breathing
D. Photosynthesis

B

13. The day's diet should always contain protein because it
A. supplies all the energy
B. aids digestion of amino acids
C. cannot be stored in the body
D. prevents the deficiency disease of rickets

C

14. In the treatment of sewage the organic matter from the settlement tanks is made less harmful and unpleasant by the use of
A. methane
B. filtration
C. sedimentation
D. aerobic microorganisms

D

15. Which one of the following is caused by the presence of an extra chromosome in the body nucleus?
A. Haemoglobin
B. Tongue rolling
C. Down's syndrome
D. Sickle cell anaemia

C

16. The number of chromosomes in each ovum is
A. twenty three pairs
B. the same as in a spermatozoon
C. one less than in a spermatozoon
D. one more than in a spermatozoon

B

17. Which of the following is concerned with the passage of sound waves from the outer ear to the inner ear?
A. Pinna

B. Cochlea
C. Eustachian tube
D. The three ear bones

D

18. 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

C

19. Which one of the following occurs to the compounds remaining after deamination of amino acids in the liver?
A. Passed out in urine
B. Converted to enzymes
C. Passed out with faeces
D. Converted to carbohydrates

D

20. What is the importance of the division of the lungs into alveoli? It……
A. increases the volume of air that can be taken in
B. increases the time that air is present in the lungs
C. increases the surface area for the exchange of gases
D. allows more blood to pass through the lung capillaries.

C

21. In a mark recapture study of Tilapia population in Lake Victoria, 40 fish were captured, marked and released. In a second capture, 45 fish were captured; 9 of these were marked. What is the estimated number of fish in the lake population?
A. 200
B. 360
C. 800
D. 1800

A

9 marked fish are contained in 45 fish
40 marked fish are contained $\frac{\mathbf{45\ x\ 40}}{\mathbf{9}}$= 200

22. Which one of the following vitamins helps in normal calcium assimilation to make strong bones?
A. Vitamin C
B. Vitamin D
C. Vitamin E
D. Vitamin K

B

23. Which one of the following is not a property of a fully turgid plant cell?
A. The vacuole has maximum volume.

B. There is no more absorption of water by the cell.
C. The cell wall resists further expansion of the vacuole.
D. The cytoplasm is only slightly separated from the cell wall.

D

24. Which of the following pairs of cells does not have nuclei when mature?
A. Erythrocytes and leucocytes
B. Companion cells and leucocytes
C. Sieve tube cells and erythrocytes
D. Sieve tube cells and companion cells

C

25. Which one of the following tissues has a protective function in plants?
A. Xylem
B. Phloem
C. Cambium
D. Epidermis

D

26. Which of the following groups of insects all have similar feeding habits?
A. Bee, butterfly, bedbug
B. Bee, mosquito, caterpillar
C. Tsetse fly, housefly, caterpillar
D. Housefly, cockroach, praying mantis

A

Bee, butterfly, bedbug have sucking mouth parts

27. Which one of the following events does not occur following the contraction of the ventricles?
A. Arterial valves open
B. Atrio-ventricular valves open
C. Blood pressure increases in the aorta.
D. Blood flows from ventricles into arteries

B

Atrio-ventricular valves close to prevent blood returning to atria

28. The results below were obtained from an experiment done to determine the percentage of air in a soil sample:
Volume of water used = $20cm^3$
Volume of soil + water = $50cm^3$
Volume of soil + water after stirring = $47cm^3$
What was the percentage of air in the soil sample used above?
A. 7.5
B. 8.1
C. 10
D. 23.3

B

Percentage of air = $\frac{50-47}{50-20}\ x\ 100 = 10\%$

29. Plants can often be propagated from stems but rarely from roots because stems
    A. have more vascular bundles than roots
    B. often have buds which can easily sprout
    C. have thicker epidermis which prevents water loss
    D. are stronger than roots and can withstand adverse conditions.

B

30. By which means are impulses transmitted across synapses?
    A. Nuclear means
    B. Electrical means
    C. Chemical means
    D. Mechanical means

C

SECTION B: (40 MARKS)
Answer all questions in this section
Answers must be written in the spaces provided.

31. The table below shows daily values for some of the substances filtered from the blood and finally excreted in the urine.

Substance	**1 amount filtered**	**2 amount excreted**	**3 amount reabsorbed**
Urea	55g	44g	11g
Water	$190dm^3$	$1.9dm^3$	$188.1dm^3$
Glucose	190g	Nil	190g
Sodium	550g	11g	539g
Calcium	6g	0.3g	5.7g
Potassium	87g	4g	83g

(a) Fill in the third column of the table to show the amount of each substance reabsorbed. (3 marks)

(b) Identify substances in the table that would be excreted in large amounts as a result of the following environmental conditions. (3 marks)

(i) low external temperatures,
Water (much water is lost in urine instead of sweat)

(ii) Consumption of large amounts of beef,
Calcium (meat contains a lot of calcium)

(iii) Failure of insulin production,
Glucose

(c) Name the;

(i) hormone which affects the amount of water reabsorbed in the kidneys,
Antidiuretic hormone

(ii) process by which water is reabsorbed in the nephrons,
osmosis

(iii) gland which secretes the hormone named in c.i above. (3 marks)
Pituitary gland (posterior)

(d) Briefly describe how homeostasis is applicable to kidney function. (5 marks)
The kidney maintains the concentration of blood more or less constant by adjusting the amount of water absorbed from the filtrate. When the blood is concentrated more water is reabsorbed from the filtrate and when blood is dilute less water is reabsorbed. The kidney also maintains the pH of blood.

(e) A whale, 20000kg in weight, an elephant 2000kg in weight and a mouse 20gms in weight are mammals with a normal body temperature of approximately 37^{o}C. They can each be regarded as holding a given amount of heat within an insulated skin.

(i) Which one of the three has the largest volume? (½ mark)
Whale

(ii) Which one of them contains the greatest amount of heat? (½ mark)
whale

(iii) Give a reason for your answer in e ii above. (1 mark)
Energy is proportional to weight of the flesh

(iv) Give two special features of the elephant that enable it to lose heat while in hot climate. (2 marks)

- Large ears increase surface area for heat loss
- Fan their ears to increase airflow over their skin to lose heat faster
- Wrinkled skin increases surface area to heat loss also wrinkles trap moisture, which then takes longer to evaporate keeping the body cool
- *collect the water in their trunks and, as the name suggests, spray it all over their bodies.*

(v) Suggest two special features of the whale that enable it to retain heat in cold water (2 marks)

- have small surface area to volume ratio
- Small extremities reduce surface area to volume ratio.
- Using their thick blubber layer as an insulator,
- Retaining heat through counter-current heat exchange.

32. (a) What do you understand by the following? (2 marks)

(i) Gene mutation:

A gene mutation is an irreversible change in the structure of a gene.

(ii) A carrier:

A carries is *an individual who carries one deleterious allele for an autosomal recessive disorder.*

(b)(i) State Mendel's first law. (2 marks)

Mendel's first law of segregation states that an organism's characteristics are controlled by two genes (alleles) and only one can be carried by in a gamete.

(ii) What are the expected genotypes and phenotypes in the F_1 generation when a tongue rolling man homozygous marries a non-tongue rolling woman? (6 marks)

R – allele for tongue rolling

r –allele for non- tongue rolling

Parent phenotype Man (tongue rolling) x woman (n0n-tongue rolling

Parent genotype RR x rr

Gametes R r

Offspring genotype Rr

Offspring phenotype: all tongue rolling

33. (a) Describe the following terms as used in life processes in plants. (2 marks)

(i) Pollination:

This is the transfer of pollen grains from an anther to the stigma.

(ii) Fertilization:

Fertilization is the union of the male and female gametes

(b) Outline four characteristics of:

(i) Wind pollinated flowers:

a. Large production of pollen grains.
b. Flowers are not attractive and scent emitting.
c. Feathery and sticky stigma.
d. The pollen grains are light and non-sticky so that they can be transported in wind currents.
e. Flowers do not possess nectar.
f. Anthers is well exposed e.g. maize flower.

(ii) Insect pollinated flowers:

(i) brightly colored petals
(ii) scented
(iii) Have nectar
(iv) Flowers have nectar
(v) Flower have sticky pollen grains

SECTION C: (30 MARKS)

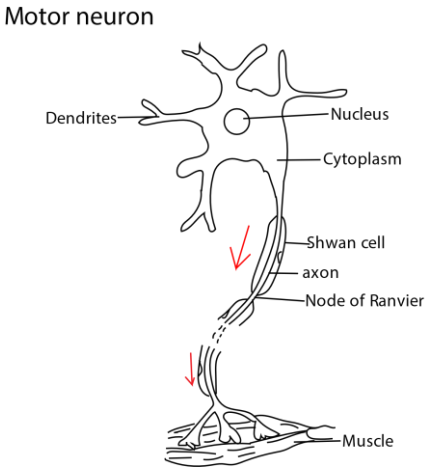
Answer two questions from this section

Answers are to be written in the answer sheets provided.

34. (a)(i) What is a neuron? (2 marks)

A neuron is a nerve cell

(ii) Describe the structure of a motor neuron. (7 marks)



(iii) State 4 differences between a motor neuron and a sensory neuron (4 marks)

	Effector neurons	Sensory neuron
1.	Transmit impulse from CNS to the effector	Transmit impulse from sense organ or receptor to the CNS cell body in the middle of axon
2.	Cell body at the end of the axon	Cell body in the middle of axon
3.	Cell body located in grey matter of spinal cord	Cell body located in dorsal root ganglion of the spinal chord
4	Multipolar	Unipolar
5	Long axon	Short axon
6	Do not Consist of receptor	Consist of a receptor
7	Consists of many short dendrons	Consists of one long dendron

(b) Give the difference in meaning of a reflex action and a voluntary action. (2 marks)

Voluntary actions involve conscious thought (thinking time). Reflex actions do not involve conscious thought (thinking time) and happen very quickly to avoid unnecessary damage to the body.

35. (a)(i) Define the term metamorphosis (1mark)

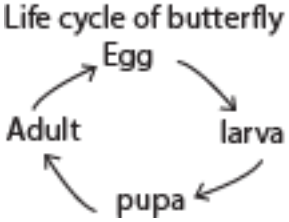
Metamorphosis are developmental changes in form that occur as in an animal from hatching or birth to adulthood.

(ii) Differentiate between incomplete and complete metamorphosis and in each case give two examples of insects. (4 marks)

Complete metamorphosis is the type of insect development that includes egg, larva, pupal, and adult stages, e.g. butter fly, *wasps, ants, and fleas*, which differ greatly in morphology while incomplete metamorphosis is insect development from eggs to nymph to adult *e.g. termites, praying mantis, and cockroaches.*

(b) Describe the life cycle of a butterfly. (7 marks)

Butterfly lays eggs that hatch into larva. The larva develop through pupa to adult



(c) How are the larva, pupa and adult of the butterfly suited to their functions?(3 marks)

- Larva has legs for dispersal and to look for food, it accumulates energy to be used during the pupa stage
- Pupa stage is a dormant stage during which larval structures break down, and adult structures such as wings develops
- Adult butterfly has wings for flight to look for food and to find suitable plants where to lays its eggs.

36. (a)(i) In what part of the body do enzymes begin to digest fat? (1 mark)
Duodenum

(ii) Name two substances that act on fat when digestion commences. (2 marks)
Bile emulsify fats
Lipase break down fats to fatty acids

(b) Describe the changes undergone by a protein molecule from the time it is swallowed until its structural molecules are used in a cell of the skin. (10 marks)

- Big protein particles are broken down into small particle in the mouth by teeth.
- In the stomach Enzyme pepsin in presence of HCl breaks down proteins into short polypeptide chains
- In duodenum *pancreatic protease (trypsin, chymotripsin, carboxy-peptidare and elastase) breaks down proteins and polypeptides into tripeptides and dipeptides.*
- Pancreatic juice also contains nucleases which break down nucleic acids into nucleotides and a variety of peptidases which release some free amino acids from polypeptide chains.
- Absorption of amino acids occurs in the small intestines by diffusion and active transport and transport through the liver to the skin

37. (a)(i) What is meant by transpiration and translocation? (2 marks)
Transpiration is the evaporation of water from leaves in the form of water vapor.
Translocation is the transportation of synthesized products in plants.

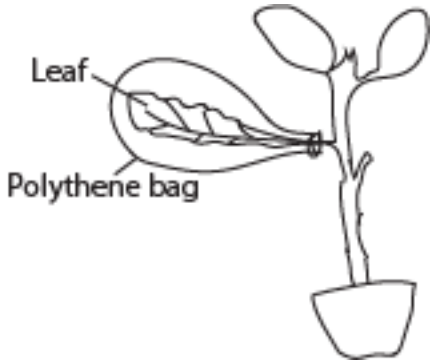
(ii) What is the role of the potometer as an apparatus? (1 mark)
Measures the rate of transpiration

(iii) Outline four precautions undertaken when assembling the potometer for use in a laboratory. (2 marks)

- The plant is cut in water to prevent air entering the xylem.
- Measurement should begin when leaves are dry.
- Caution should be taken when preparing holes in rubber bungs, pushing the glass tube, the cutting and the syringe into the bung. It is crucial to avoid air bubbles in the assembled potometer.

(b) Describe an experiment to demonstrate transpiration using cobalt chloride paper. (10 marks)

- A leaf of a potted plant is enclosed in a polythene paper and left for sometime
- The vapor given off is tested with cobalt chloride paper. It turns pink showing that the vapor given off is water


Leaf
Polythene bag