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553/1

Biology Theory

Paper I

July/August 2019

2 ½ hours



ACEITEKA JOINT MOCK EXAMINATIONS 2019

UGANDA CERTIFICATE OF EDUCATION

BIOLOGY THEORY

TIME: 2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES:

- Answer all questions in section A and B.
- Write the answers to section A in the boxes in the margin of each question.
- Write answers to section B in the spaces provided.
- Answer only two questions from section C.
- Write the answers to section C on the answer sheets provided.

FOR EXAMINERS USE ONLY

SECTION	MARKS
A	
B 31	
B 32	
B 33	
C	
C	
TOTAL	

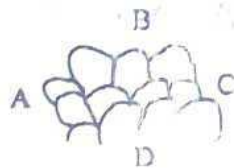
SECTION A: 30 MARKS

1. The commonest pioneer species during ecological succession are:
A. Lichens
B. Mosses
C. Ferns
D. Forests A
2. One major characteristic feature present in mesophyll cells but lacking in other plant cells is:
A. Sap vacuole
B. Chloroplasts
C. Mitochondria
D. Cell walls B
3. One major disadvantage of an exoskeleton is that it is:
A. Impermeable to water
B. Impermeable to oxygen
C. Rigid, hindering movement
D. Rigid, hindering growth D
4. When amoeba is placed in a hypotonic solution, formation of contractile vacuoles occurs at a:
A. High rate in order to eliminate excess water
B. High rate in order to eliminate excess salts
C. Slow rate because there is little water
D. Slow rate because there is little salt C
5. The tape-like structure of a tapeworm is for increasing
A. Camouflage
B. Rate of reproduction
C. Diffusion rate
D. Protection from the hosts enzymes B
6. Brightly coloured large petals in flowers increases the following chances except:
A. Self pollination
B. Insect pollination
C. Cross pollination
D. Variability D
7. Which one of the following may not be considered as a contraceptive method?
A. Rhythm method
B. Abstinence method
C. Tubal ligation
D. Coitus interruptus B

8. One advantage of complete metamorphosis over incomplete metamorphosis in insects is that complete metamorphosis
- Occurs faster
 - Occurs slowly
 - Involves 4 stages
 - Reduces competition



9. The figure below shows part of the skin and scales on a fish. The most probable position of the head to the tail is in direction:



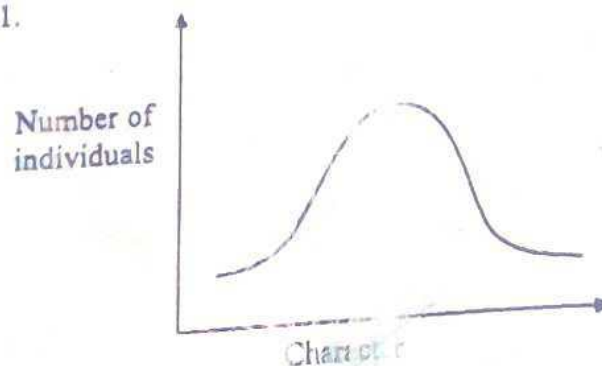
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-
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10. Which one of the following is the major factor in leaching soil?
- Large number of microorganisms
 - High nutrient content
 - Large number of anaerobic organisms
 - High rainfall



11.



- The following characters may give rise to the curve above except
- Height in humans
 - Weight in cattle
 - Skin colour in humans
 - Blood groups in humans



12. Genes on the same chromosome are usually inherited together because they are
- Dominant
 - Linked
 - Recessive
 - Co-dominant



13. Amino acids are to proteins as are to starch.

- A. Glucose molecules
- B. Fatty acid molecules
- C. Glycerol molecules
- D. Maltose molecules

A

14. Which combination of the following factors will lead to high transpiration rate?

- | | |
|--------------------------------|-------------------------------|
| i) High temperature | v) Low temperature |
| ii) High humidity | vi) Low humidity |
| iii) High atmospheric pressure | vii) Low atmospheric pressure |
| iv) High wind velocity | viii) Low wind velocity |

- A. i, ii, iii, iv
- B. v, vi, vii, viii
- C. i, iii, iv, vi
- D. i, iv, vii, viii

C

15. Agglutination of blood is most likely to occur when the respective donor and recipient are of blood group:

- A. A and AB
- B. B and AB
- C. O and AB
- D. AB and O

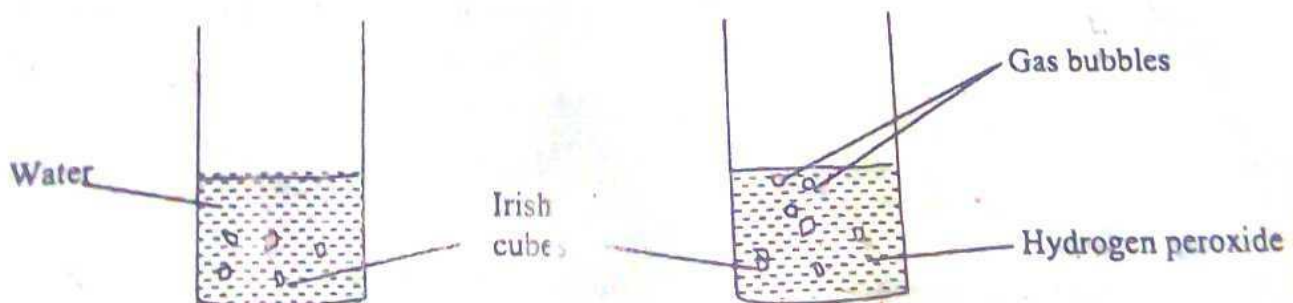
D

16. The major advantage of narrow lumen of arteries is

- A. Fast delivery of metabolites to the organs
- B. Reduced blood pressure
- C. Protection from bursting
- D. Fast return of blood to the heart

C

17. The enzyme property under investigation in the figure below is that enzymes are:



- A. Protein in nature
- B. Specific
- C. Affected by pH
- D. Denatured by heat

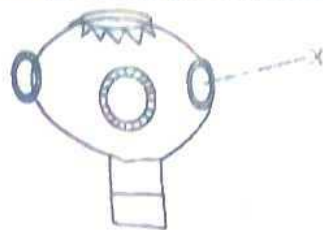
B

18. When *Mimosa pudica* is touched, its leaves fold, this response belongs to same group as
- A. Growth of plant shoots towards light
 - B. Opening of flowers of some plants in the morning
 - C. Euglena swimming towards light
 - D. Plant shoot growth away from the pull of gravity
- B
19. Which one of the following is a major reason for lack of special excretory organs in plants?
- A. Plants do not excrete
 - B. Plants do not use protein
 - C. Plants deposit some excretory products in organs which are later shed off
 - D. Plants do not take in oxygen during respiration
- C
20. Which one of the following pair of hormonal deficiency lead to excessive loss of water from the body?
- A. Insulin and ADH
 - B. Oestrogen and Insulin
 - C. Thyroxine and ADH
 - D. Oxytocin and insulin
- A
21. Fusion of some bones in bird's skeleton is for
- A. Reduction in weight
 - B. Streamlining the body
 - C. Formation of a rigid framework
 - D. Increasing surface area
- A
22. Which one of the following could increase the "green house effect"?
- A. Planting more trees
 - B. Using solar energy instead of fossil fuels
 - C. Building more industries which use petroleum
 - D. Increased use of hydro-electric power, HEP
- C
23. The stage in cell division where synthesis of protoplasm and replication of genetic material is
- A. Prophase
 - B. Interphase
 - C. Metaphase
 - D. Telophase
- B
24. Insects are one of the most successful classes of animals because of the following except
- A. They lay very many eggs
 - B. Short life cycle
 - C. Many mouth modifications
 - D. Intermittent growth
- D

25. Which one of the following pairs of structures represents homologous organs?
- A. Wings of a bat and the forelimb of a bird
 - B. Flippers of whales and wings of insects
 - C. Hands of humans and wings of insects
 - D. Wings of insects and fins of fish

B

26. The figure below shows the structure of a tapeworm. The part labeled X is used for



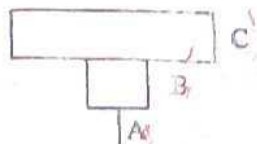
- A. Sight
- B. Feeding
- C. Excretion
- D. Anchorage

B

27. Products of digestion absorbed in the lacteals are transported by the
- A. Blood capillaries
 - B. Lymphatic vessels
 - C. Veins
 - D. Arteries

B

28. The figure below shows an inverted pyramid



Which one of the sets below shows the correct organisms at trophic levels A, B and C in their respective order?

- A. Tree, Birds, Mites
- B. Grass, Cattle, Ticks
- C. Grass, Antelopes, Lions
- D. Trees, Termites, lizards

A

29. The figure below shows a Bidens fruit



Part labeled Q is formed from

- A. Corolla
- B. Calyx
- C. Style
- D. Filaments

B

30. A small body needs more covering on a cold day than a big adult because the small body has a

- A. Delicious skin
- B. Small surface area to volume ratio
- C. Large surface area to volume ratio
- D. Low metabolic rate

C

SECTION B

31. An investigation was carried out into the concentration of lactic acid in the blood of a man before, during and after a vigorous exercise. The results are summarized below

Time (minutes)	Concentration of lactic acid (mg/100cm ³)
-10	9
0	14
10	80
15	95
20	70
40	35
50	22
80	18

a) Represent the above information on a suitable graph. (9 marks)

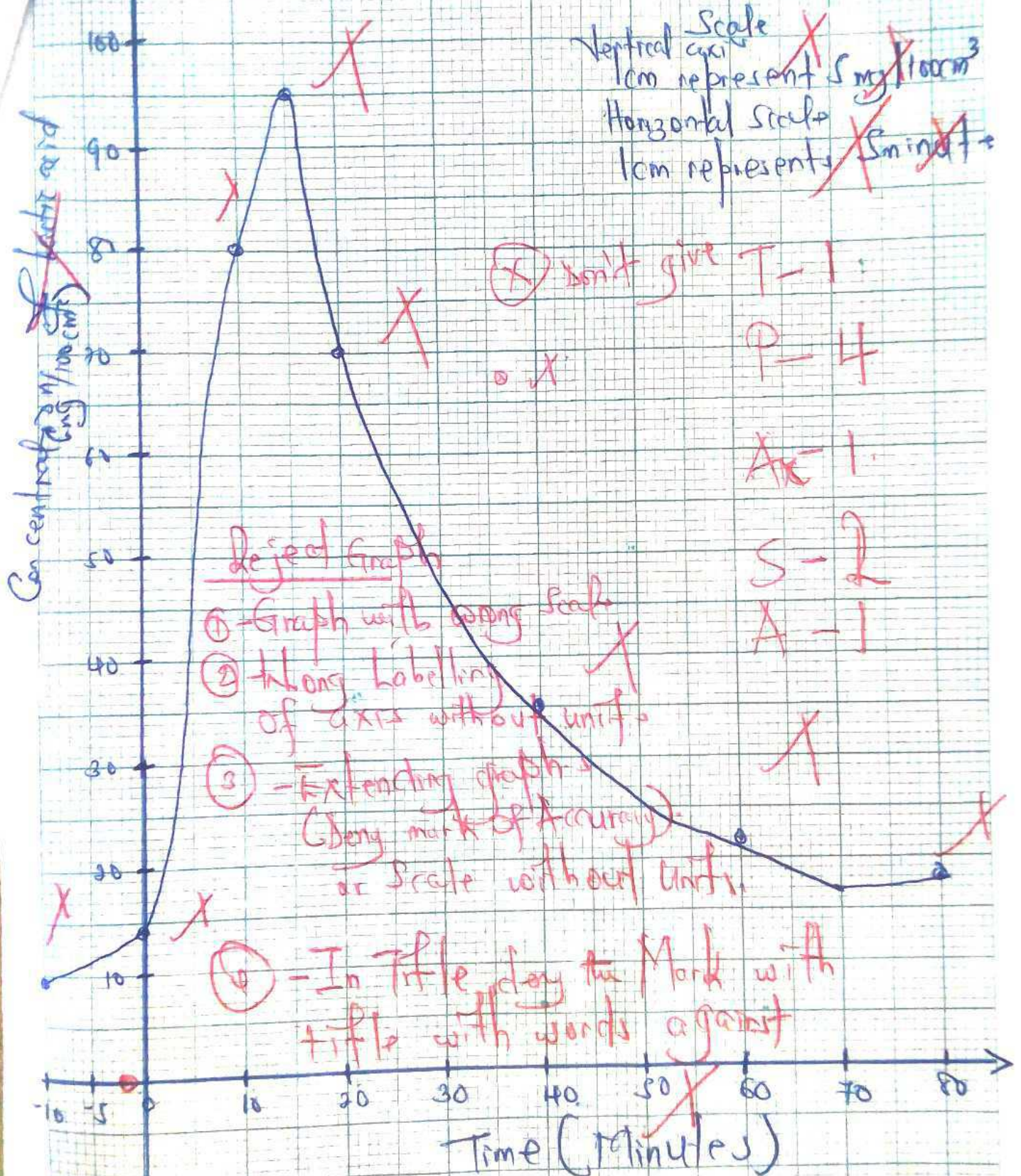
b) Where in the human body is lactic acid produced during the exercise? (1 mark)

Muscles

c) i) Describe the graph obtained. (4 marks)

From 10 to 0 minutes, the concentration of lactic acid increases gradually. From 0 to 15 minutes, the concentration of lactic acid increases rapidly until it attains a peak. From 15 to 40 minutes, the concentration of lactic acid decreases rapidly. From 40 to 80 minutes, the concentration of lactic acid decreases gradually.

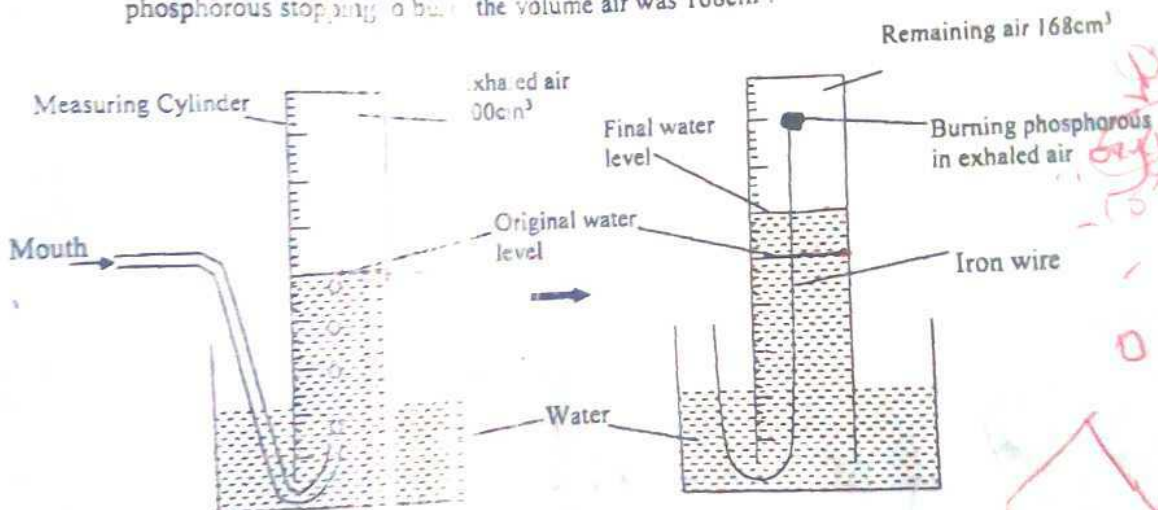
A graph showing the Variation of Lactic acid in blood of man before, during and after a vigorous exercise with time.



ii) Give reasons for the observed changes in concentration of lactic acid in blood

From 10 to 15 minutes, the rate of metabolism was low, the cells were respiring aerobically. From 15 to 40 minutes, the metabolic rate increased rapidly to provide energy for muscle contraction. The cells start respiring anaerobically. From 40 to 80 minutes, the products of anaerobic respiration increase the breathing rate therefore increasing the delivery of oxygen which is used to break down lactic acid in the liver. The rate of metabolism decreases as the cells divert from anaerobic to aerobic respiration.

From 40 to 80 minutes, the rate of breakdown of lactic acid decreases because of less contraction. In an experiment, a measuring cylinder was filled with water and then inverted over a delivery tube. 200 cm³ of exhaled air was bubbled into the measuring cylinder. A piece of phosphorus burning on a wire was pushed into the exhaled air in the cylinder. After phosphorus stopping to burn, the volume of air was 168 cm³.



a) State the aim of this experiment.

The aim is to determine that exhaled air contains oxygen and water vapour.

Enology ✓
 Soil Conservation ✓
 - Insect ✓

b) i) Calculate the percentage decrease in volume of air after the burning of phosphorus. (3mks)

$$\text{Decrease in Volume} = (200 - 168) \text{ cm}^3$$

$$= 32 \text{ cm}^3$$

$$\text{Percentage decrease} = \left(\frac{32}{200} \times 100 \right) \%$$

$$= 16 \%$$

c) Explain why the volume of air decreases at the end of the experiment.

Beacoz; Oxygen was used during Burning;
 The water vapour condensed from exhaled to form water

d) What volume of air would remain if the same volume of atmospheric air was used instead of exhaled air?

$$\% \text{ of oxygen} = 21 \%$$

$$\text{Volume Oxygen} = \left(\frac{21}{100} \times 200 \right)$$

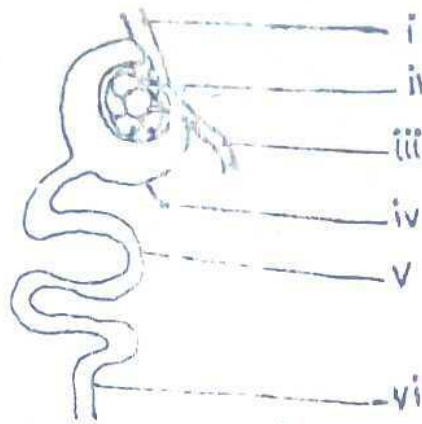
$$= 42 \text{ cm}^3$$

$$\text{Remaining volume of air} = (200 - 42)$$

$$= 158 \text{ cm}^3$$

33. The diagram below shows part of a human nephron

(3mks).



Reject
① - Any wrong spelling.

a) Name the labeled parts.

i. Afferent arteriole
ii. Glomerulus
iii. Efferent arteriole

iv. Bowman's capsule
v. Proximal convoluted tubule
vi. Loop of Henle

b) Explain how part (ii) is adapted for its functions.

- ① - Numerous capillaries - To increase on surface for ultra filtration
- ② - They have thin membrane - To shorten the distance over which materials move
- ③ - They have pores - To selectively allow small sized molecules to go through

c) What is the importance of the diameter of vessels (i) and (ii)?

The afferent arteriole has a bigger diameter than the efferent arteriole because; to generate a high blood pressure for ultra filtration.

d) State the importance of the process which occurs in part (v).

To reabsorb useful substances from the glomerular filtrate to the body e.g. Glucose, amino acids and water.

SECTION C (30 MARKS)

Answer two questions

34. In which ways is water important to living organisms? (15 marks)

35. a) State the importance of water in a human body.
b) State the difference between an exoskeleton and endoskeleton.
c) Describe the processes leading to bending of a human arm.

36. a) Explain how plants adapt for

- i) cross pollination
- ii) wind pollination
- iii) insect pollination

b) State the difference between the processes leading to fertilization in flowers and humans.

37. A cross between Pink and White flowered snapdragon plants produces F_1 offspring with Pink flowers only.

- a) Explain the absence of white and red flowered plants in the F_1 . Fully show your working.
- b) Calculate the genotypic and phenotypic ratios of a cross between F_1 plant and a white flowered plant.

END

- 34 - Forms part of the blood plasma
- Facilitates Sexual reproduction by acting as medium for swimming of reproductive gametes.
 - It ~~show~~ used during seed/fruit dispersal.
 - It is used in transportation of mineral salts into xylem of most plants.
 - They used in hydrolysis reaction of digestion.
 - It is raw material for photosynthesis.
 - It is medium for most of the body metabolic processes (reactions).
 - It is medium for action of all enzymes
 - It is a medium for exchange of materials across surfaces.
 - It forms hydrostatic skeleton in Earthworms
 - It provides turgidity to non-woody which is form of support
 - Through sweating, water regulates the body temperature.
 - Through transpiration, evaporation of water causes cooling of the plant.
 - It act as a habitat for aquatic animals.
 - It forms part of protoplasm.
 - It is a medium in which nutrients are transported to all other body parts.

a) Importance of Bones:

- It provides support by forming a rigid frame work over which body organs are suspended
- It provides surfaces for attachment of muscles
- It protects delicate organs of body
- It is a site for manufacture of red blood cells and white blood cells
- The rib cage can't adjust the volume of thoracic cavity during breath
- It is used in transmission of sound by ear ossicles

b) Difference Between

Exoskeleton	Endoskeleton
① - Made up of chitin	- It is made of bones and cartilage.
② - It is found outside the body	- It is found ⁱⁿ inside the body
③ - It is found in Arthropods	- It is found in chordates
④ - It is less rigid because of deposition of phosphorus and calcium.	- It is ^{more} rigid due to high deposition of phosphorus and calcium

- h) The bending is brought about by contraction and relaxation of Biceps and Triceps.
- When the Biceps Muscle contracts, triceps muscle relaxes. This pulls on the radius, thus bending the fore limb/arm.

- ✱

36 a) Cross pollination:

- ① - Protandry - stamen ripens before the stigma
- ② - Protogyny - stigma ripens before the stamen
- ③ - Dioecious Condition: Bears a pistillate or staminate but not both
 A plant
- ④ - Self Incompatibility genes:
Where pollen grains from the same flower fails to fertilize the stigma of the flower
- ⑤ - Structure of the flower:
 - Sometimes the carpel is taller than the stamen of the same flower and in some the corolla covers the stamens preventing self-pollination.

ii) Wind pollination

- They produce large amount of pollen to increase the chances of pollination.
- They produce light pollen grains which can easily be blown/carried by wind.
- They have feathery stigma in order to increase the chances of attachment of pollen grains.

ii) Insect pollination

- They have brightly coloured petals to attract pollinators.
- They well scented to attract pollinator.
- They produce nectar to attract pollinator.
- They produce ~~stuck~~ sticky pollen grains to easily attach on the body of the pollinator.

b) Fertilization in Flower

- ① - Reproductive gametes includes pollen grains and ovules.
- ② - Transfer of gametes involves pollination.
- ③ - Fertilization takes place in the ovary.
- ④ - Pollen grains are transported via developing pollen tube.

Fertilization in Humans

- Reproductive gametes includes sperms and ova.
- Transfer of gametes involves mating.
- Fertilization takes place in the fallopian tube.
- Sperms are transported through the vagina, uterus and cervix.

medium

- a) Let R represent the allele for red flower.
Let r represent the allele for white flower.

Parents Phenotype: white flower $\times$ red flower

Genotype: $rr \times RR$

Meiosis

Gametes (n)

r

r

R

R

F_1 genotype ($2n$)

Rr

Rr

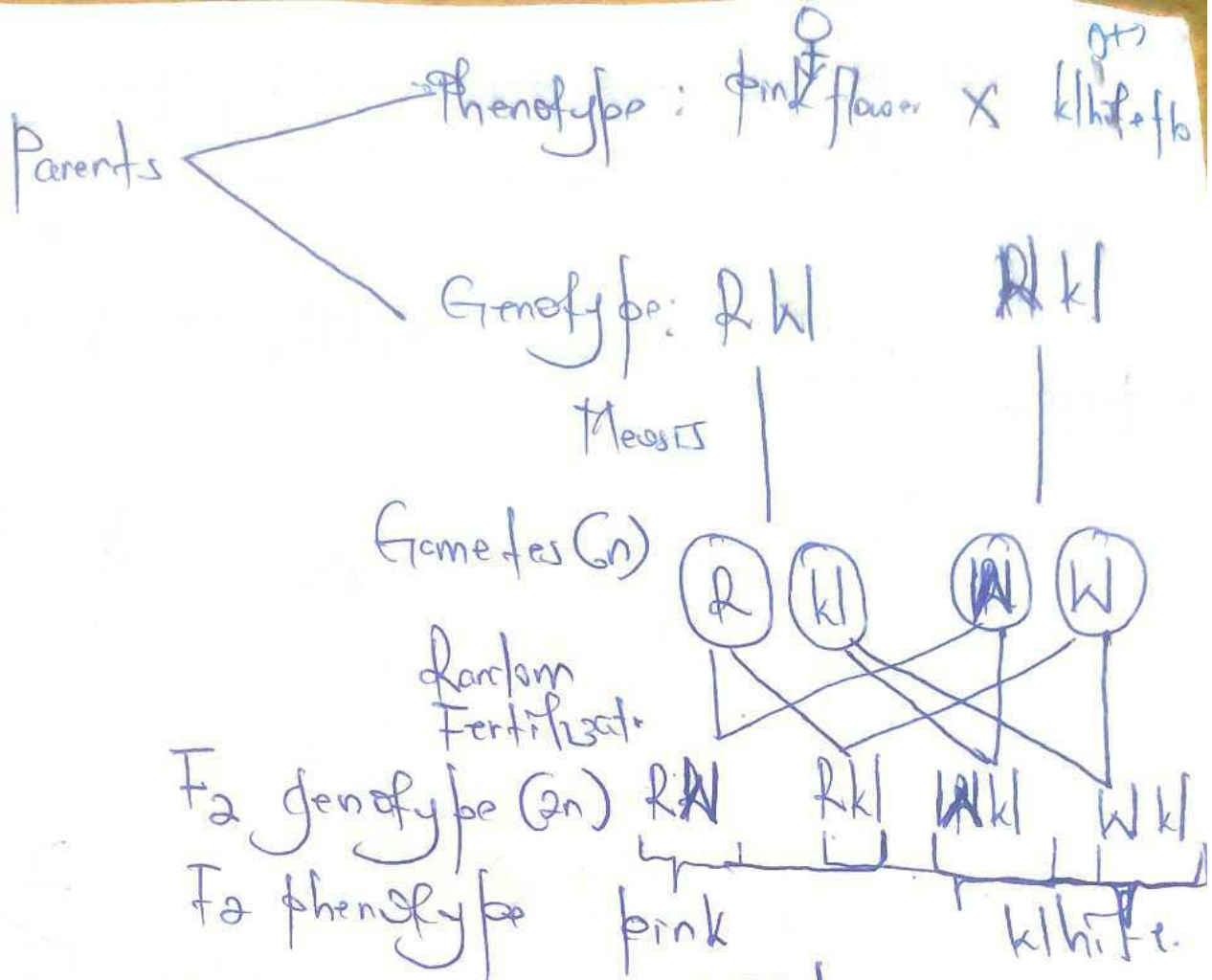
Rr

Rr

F_1 phenotype

All pink

b)



F₂ Genotypic ratio: $1Rk : 1RW$

F₂ phenotypic ratio: $2 \text{ pink} : 2 \text{ white}$
 $= 1 \text{ pink} : 1 \text{ white}$