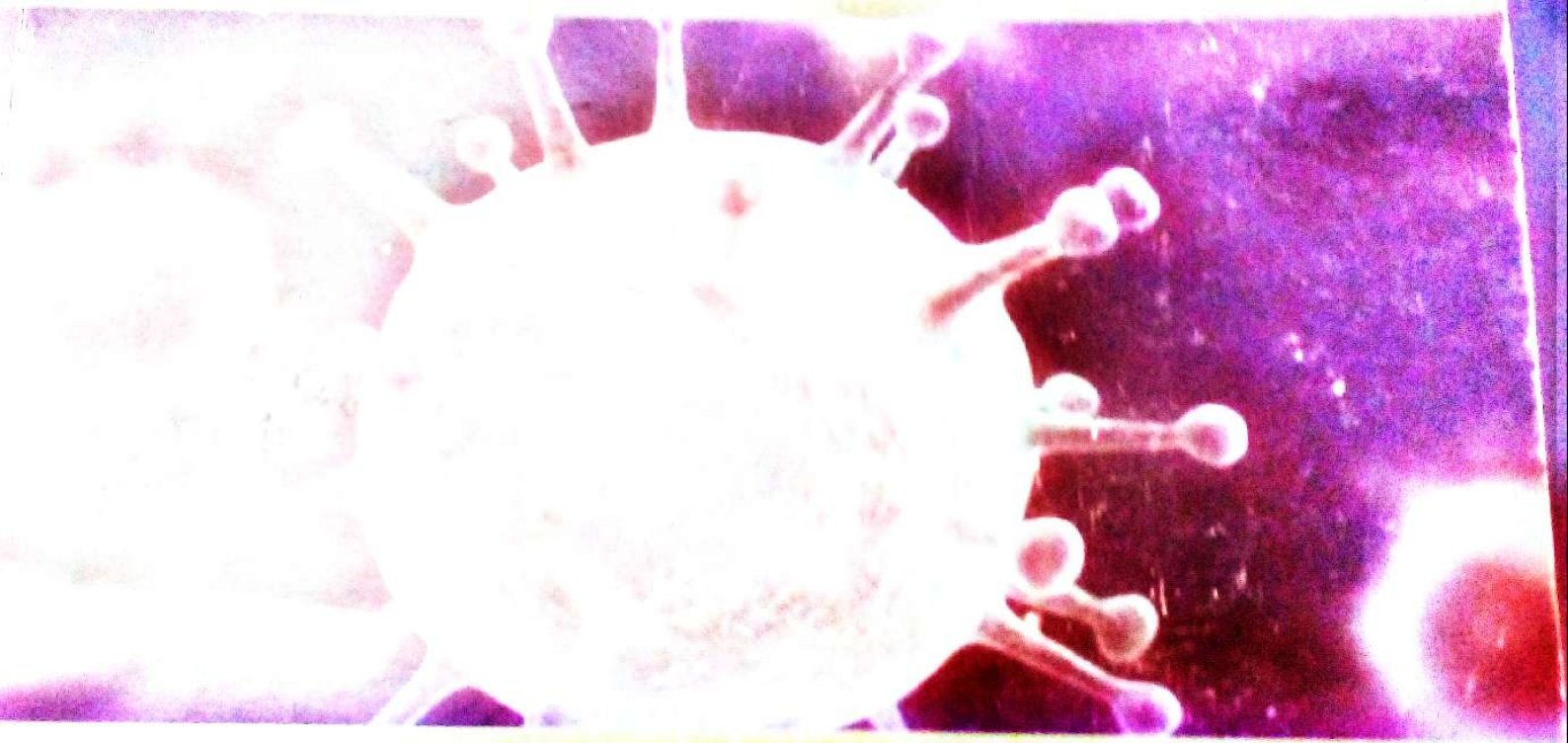
ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

EMERALD KEY

BIOLOGY
4025



GCE ORDINARY LEVEL

Volume 1

November 2018 - November 2019 Examinations

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

4025/1

BIOLOGY

PAPER 1 Multiple Choice

NOVEMBER 2018 SESSION 1 hour

dditional materials:
Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

1 hour

RUCTIONS TO CANDIDATES

t open this booklet until you are told to do so.

your name, centre number and candidate number on the answer sheet in the spaces led unless this has already been done for you.

are **forty** questions in this paper. Answer **all** questions. For each question there are ossible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in soft on the separate answer sheet.

very carefully the instructions on the answer sheet.

ORMATION FOR CANDIDATES

correct answer will score one mark. A mark will not be deducted for a wrong answer.

ough working should be done in this booklet.

1 The study of body parts and their functions is called

A anthropology.
B osteology.
C cytology.
D physiology.

2 What is the function of glucose in living organisms?

A storage compound
B structural material
C respiratory substrate
D growth material

3 An example of a disaccharide is

A cellulose.
B galactose.
C maltose.
D starch.

4 Which cell changes shape to perform its function?

A neurone
B lymphocyte
C phagocyte
D erythrocyte

5 Which branch of Biology involves the production of genetically engineered organisms?

A mycology
B biotechnology
C cytology
D microbiology

6 A root hair cell is specialized for its function in that it

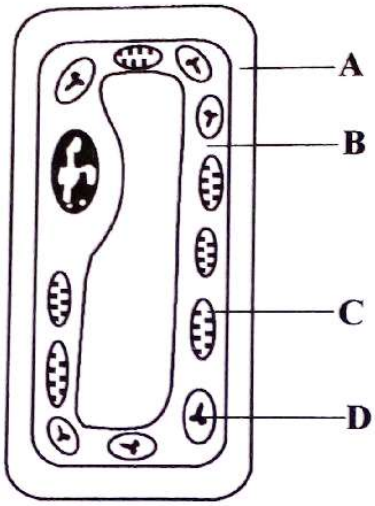
A lacks a nucleus.
B lacks mitochondria.
C has a large surface area.
D has numerous chloroplasts.

7 Which polysaccharide is stored in animals?

A cellulose
B chitin
C glycogen
D starch

8 The diagram shows the structure of a plant cell.

In which part, **A**, **B**, **C** or **D**, is the most energy produced?



9 Which enzyme, in a bio-detergent, would remove a fatty stain?

A amylase
B cellulase
C lipase
D protease

10 Which one is an adaptation of a leaf for photosynthesis?

A shiny surface
B presence of stomata
C presence of hairs
D waxy cuticle

11 Which element is essential for osmotic balance in plants?

A calcium
B nitrogen
C phosphorus
D potassium

12 Which factor reduces plant productivity?

A high light intensity
B low water availability
C presence of mineral ions
D absence of pests and diseases

13 Which plant tissue is responsible for translocation?

A cortex
B epidermis
C phloem
D xylem

14 Which feature of a leaf minimises water loss?

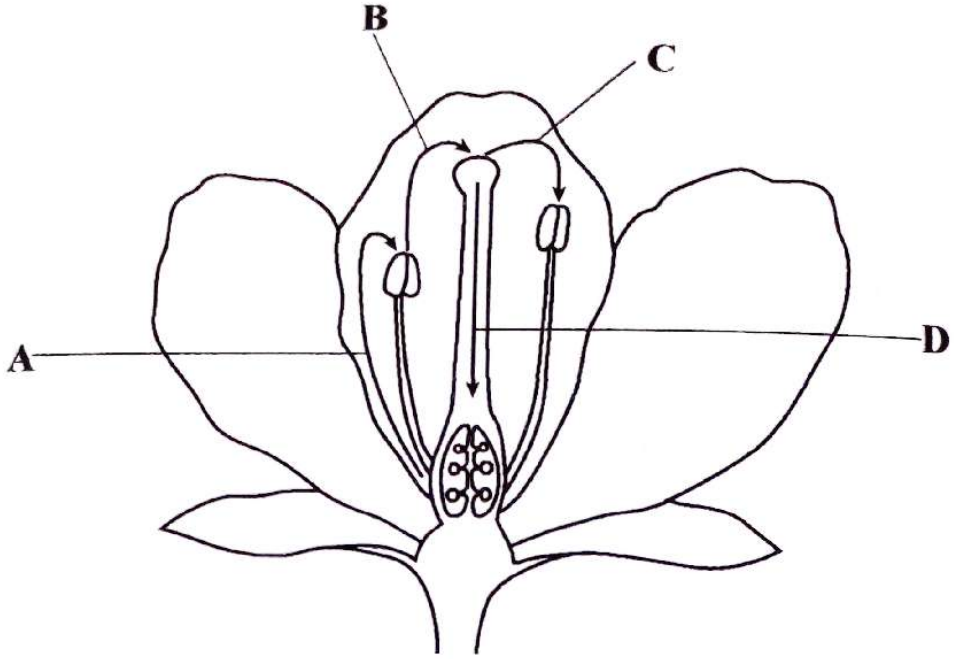
A large surface area
B presence of hairs
C thin leaf blade
D thin waxy cuticle

15 Which plant can be propagated by rhizomes?

A banana
B runner grass
C sugar cane
D sweet potato

16 The diagram shows a section through a flower.

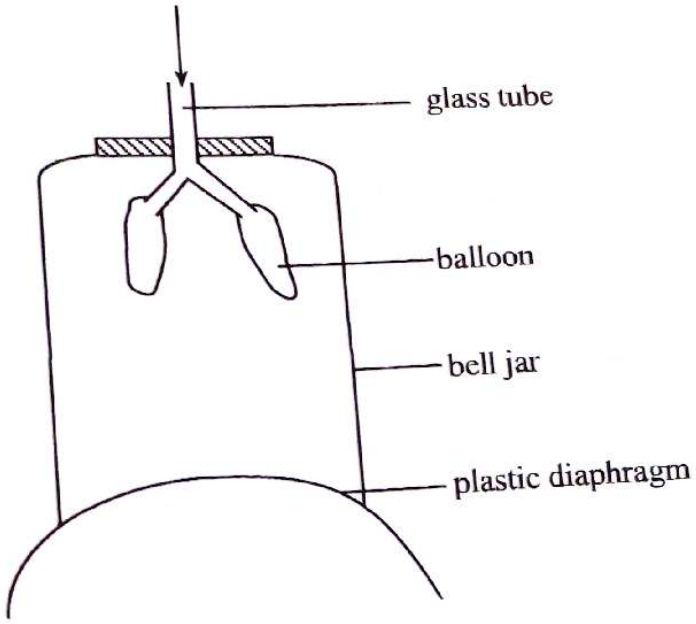
Which arrow, **A**, **B**, **C**, or **D**, represents pollination?



17 Which disease is a result of iron deficiency?

A scurvy
B rickets
C kwashiokor
D anaemia

18 The diagram shows a model of the chest organs illustrating breathing mechanism.



What is the effect of pulling the plastic diaphragm downwards?

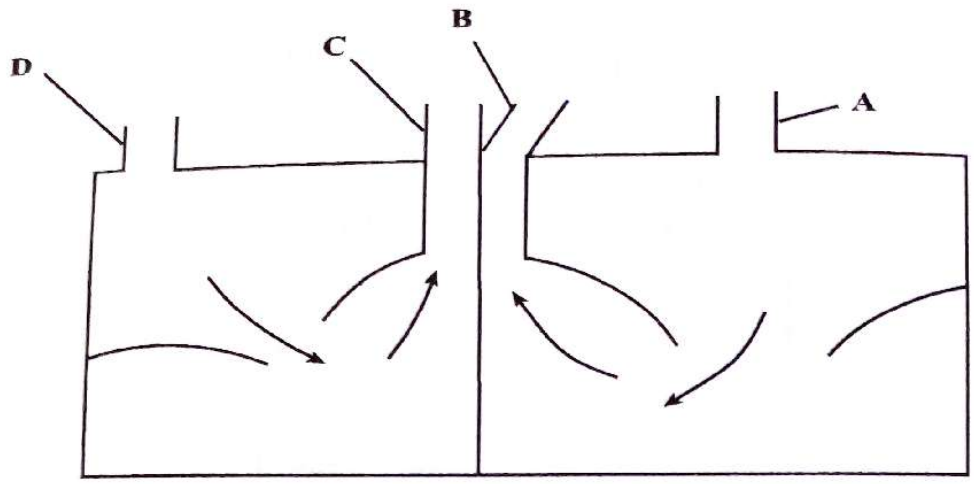
A Air moves into the balloons.
B Air moves out of the balloons.
C Air moves into the bell jar.
D Air moves out of the bell jar.

19 What are the by-products of anaerobic respiration in plants?

A carbon dioxide and lactic acid
B carbon dioxide and water vapour
C ethanol and carbon dioxide
D ethanol and water vapour

20 The diagram is a model mammalian heart.

Which part, **A**, **B**, **C**, or **D**, represents the pulmonary vein?

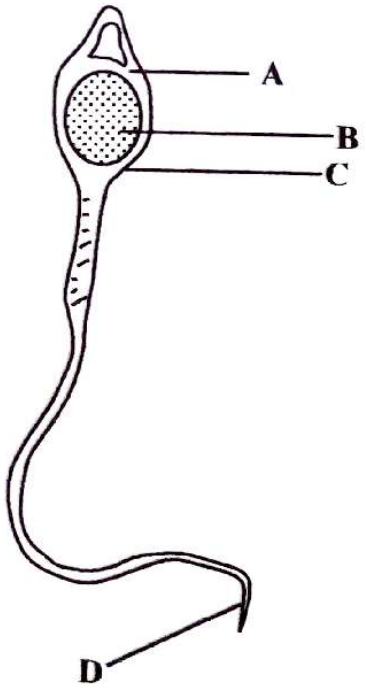


21 Which component of blood is responsible for clotting?

A plasma
B platelets
C red blood cells
D white blood cells

22 The diagram shows the structure of a sperm.

Which part, **A**, **B**, **C**, or **D**, is responsible for mobility?



23 Which hormone is secreted in response to low blood glucose level?

A adrenaline
B glucagon
C insulin
D oestrogen

24 One benefit of recombinant DNA technology is the production of

A bread.
B cheese.
C insulin.
D yoghurt.

25 The word that describes the observable characteristics of an organism is

A allele.
B chromosome.
C genotype.
D phenotype.

26 Two parents are heterozygous for albinism.

What is the probability of the parents, producing an albino child?

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

27 Down's syndrome is caused by

A carcinogens.
B radiation.
C gene mutation.
D chromosome mutation.

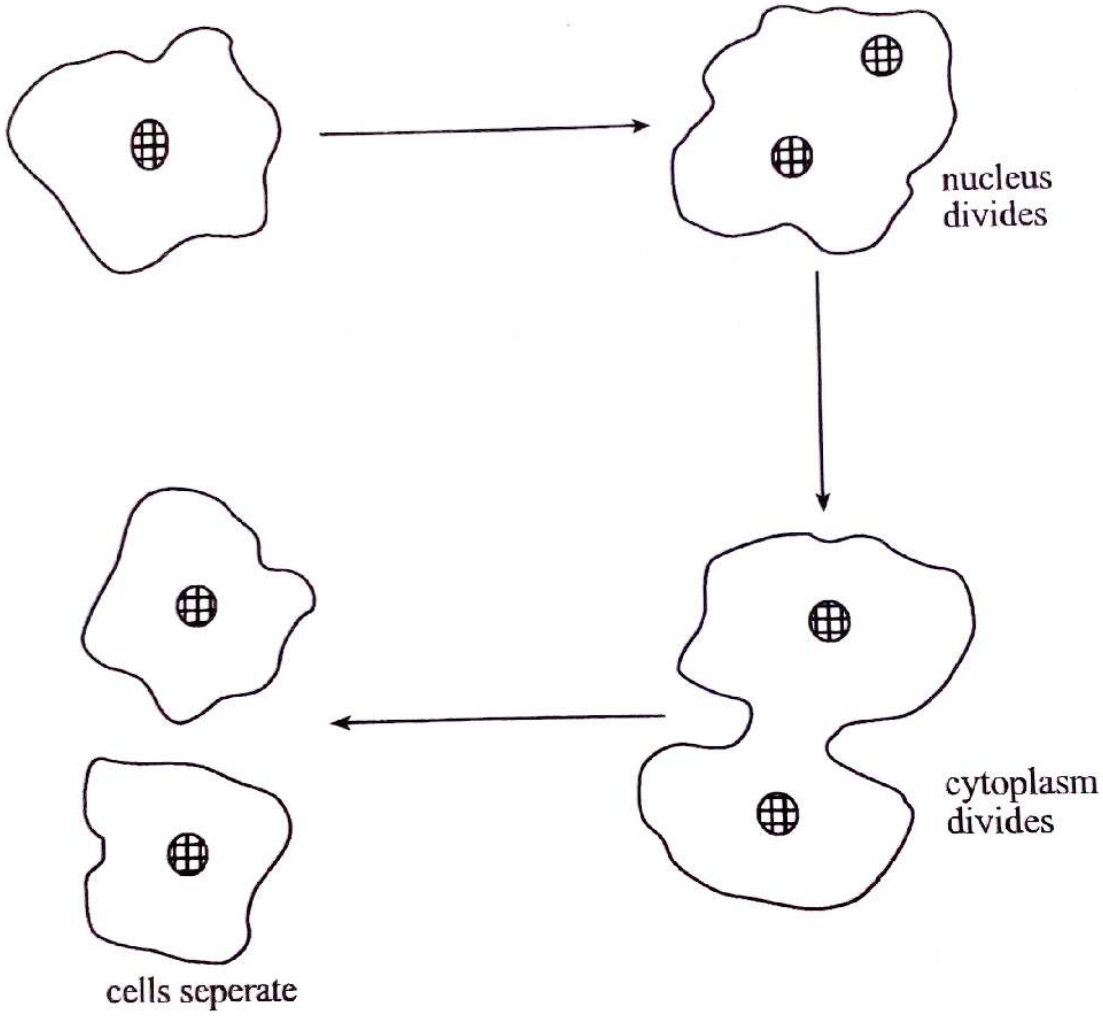
28 Which statement is correct about discontinuous variation?

A results from effects of genes only
B it has many intermediates
C gives a normal distribution
D results from effects of the environment

29 Which kingdom does the organism shown belong to?

A plantae
B prokaryotae
C fungi
D animalia

30 The diagram shows reproduction stages in amoeba.



What type of reproduction is shown?

A spore production
B binary fission
C budding
D meiosis

31 In which organisms are eggs fertilised externally?

A birds
B reptiles
C mammals
D amphibians

32 An organism which digests dead organic matter belongs to the kingdom

A animalia.
B fungi.
C plantae.
D protoctista.

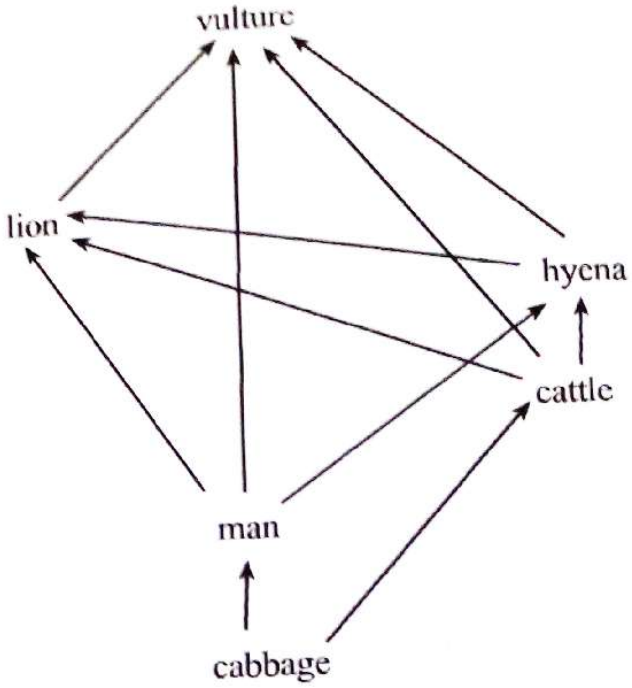
33 An ecosystem is the

A place where an organism lives.
B organisms which live in a particular habitat.
C level in a food chain at which an organism feeds.
D interdependence of living organism and their environment.

34 Which one is a physical component of an ecosystem?

A bacteria
B nematodes
C termites
D water.

35 The diagram shows a food web.



Which organism has the highest amount of energy?

A cabbage
B cattle
C lion
D vulture

36 What is the effect of exceeding the carrying capacity of land?

A soil erosion
B increased birth rate
C high productivity
D increased species diversity

37 Which method is effective in destroying mosquitoes at the larval stage of development?

A burning mosquito coils
B killing by hand
C spreading oil on water
D using mosquito repellents

38 Use of prophylactic drugs is one method of preventing

A bilharzia.
B cholera.
C malaria.
D typhoid.

39 The organism that causes cholera is a

A bacterium.
B fungus.
C protozoan.
D worm.

40 Typhoid is transmitted by

A sexual contact.
B droplet infection.
C sharing bath towels.
D drinking contaminated water.

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

BIOLOGY PAPER 1 (4025/1) NOVEMBER 2018

SUGGESTED ANSWERS AND COMMENTS

Question	Answer	Comment
1	D	There is need to be familiar with a higher number of Branches of Biology.
2	C	Candidates should identify glucose as a monosaccharide which is a respiratory substrate.
3	C	Knowledge on classes of carbohydrates and their functions required.
4	C	Functions of specialised cells.
5	B	Knowledge of definition of biotechnology.
6	C	
7	C	Examples of polysaccharides and their functions.
8	C	Identification of cell organelles from diagrams when given functions.
9	C	
10	B	
11	B	
12	B	Only factor which impacts negatively on productivity.
13	C	Translocation is movement of organic molecules which occurs in phloem.
14	B	Required knowledge of plant adaptations to minimise transpiration.
15	B	Link method of vegetative reproduction to crops/plants grown using each method.

16	B	Definition of pollination and identification from the diagram of the parts involved.
17	D	
18	A	Practical experiments with models help candidates to understand the breathing mechanism. Pulling down the plastic diaphragm is similar to inhalation which results in increase in chest volume, lowering pressure inside the chest cavity, causing air to rush into lungs which increase in size. Balloons represent lungs.
19	C	
20	A	Identify parts as represented in models of the heart.
21	B	
22	D	
23	B	Glucagon is secreted by pancreas in response to low glucose levels. Adrenaline causes a rise in blood glucose level in preparation for fight or flight.
24	C	
25	D	Knowledge of definitions of key genetic terms.
26	A	Application of genetic diagrams to solve monohybrid inheritance problems. Albinism is caused by a recessive allele.
27	D	Carcinogens and radiations are causes of mutations while the others are types of mutations. Down's syndrome is a result of chromosome mutation.
28	A	Knowledge of differences between continuous and discontinuous variation very helpful in answering this type of question.
29	D	Eyes on the diagram showed that it is an animal.
30	B	The amoeba divides into two daughter cells.
31	D	
32	B	
33	D	

34	D	The only non-living component in the group.
35	A	Energy is lost at each trophic level, less and less energy becomes available to next trophic level. Producers have the highest energy.
36	A	The only negative effect on the ecosystem.
37	C	Larvae live in water bodies and breathe air. Oil interferes with air circulation in water bodies.
38	C	
39	A	Pathogens and examples of diseases they cause.
40	D	Knowledge of mode of transmission of various diseases required.

Surname	Forename(s)	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY 4025/2

PAPER 2 Theory

NOVEMBER 2018 SESSION 2 hours

Candidates answer on the question paper
Additional materials: Electronic calculator
Pencil (type HB is recommended)

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed.

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page and your centre number and candidate number on the top right hand corner of every page of this paper.

Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **four** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

[Turn over

Section A

*Answer **all** questions in this section.*

1 (a) **Fig.1.1** shows a group of specialised cells.

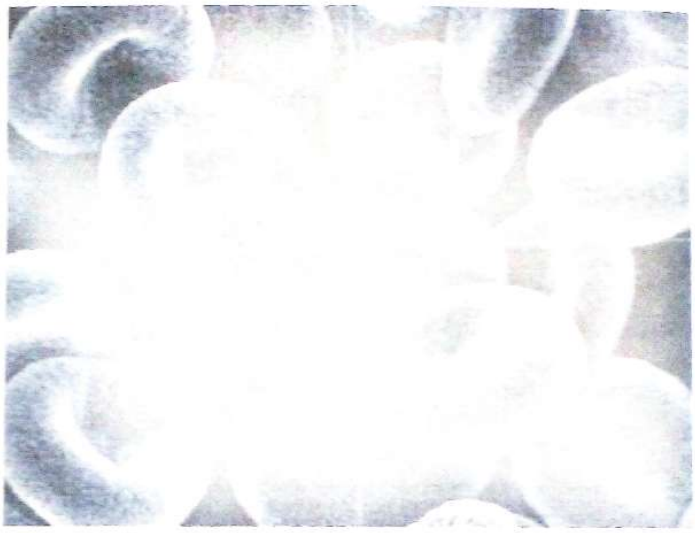


Fig. 1.1

(i) Identify the specialised cells in **Fig.1.1**.

_____ [1]

(ii) State any **three** ways in which these cells are specialised for their function.

1. _____

2. _____

3. _____ [3]

1 (b) (i) State any **three** factors that influence the rate of photosynthesis.

1. _____

2. _____

3. _____ [3]

(ii) Explain the importance of photosynthesis in a natural ecosystem.

_____

_____

_____ [3]

[Total:10]

2 **Fig. 2.1** shows a section through a human tooth.

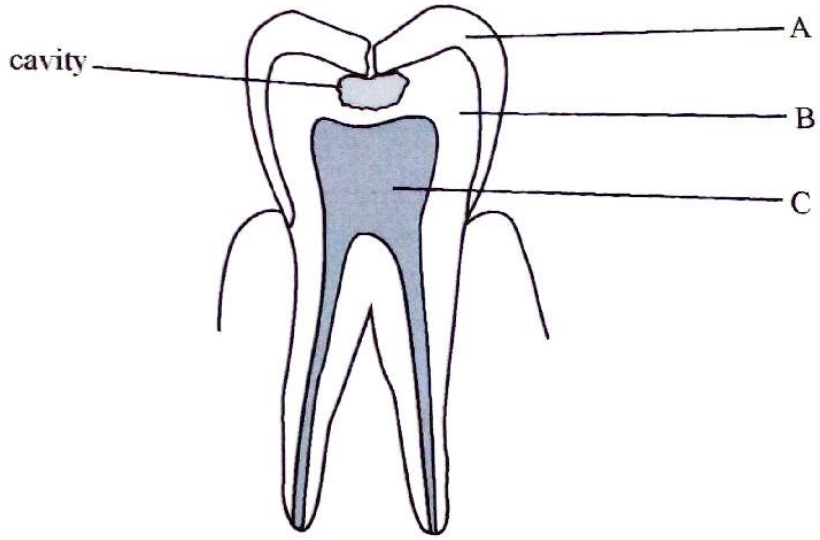


Fig.2.1

(a) (i) Name the parts labelled A, B and C.

A _____

B _____

C _____ [3]

2 **(a)** **(ii)** *Identify* the type of tooth shown in **Fig.2.1**.

_____ [1]

(b) **(i)** State the function of this tooth.

_____ [1]

(ii) Describe any **two** structural adaptations of this tooth to its function.

adaptation 1 _____

_____

adaptation 2 _____

_____ [2]

(c) Explain the formation of the cavity.

_____

_____

_____

_____

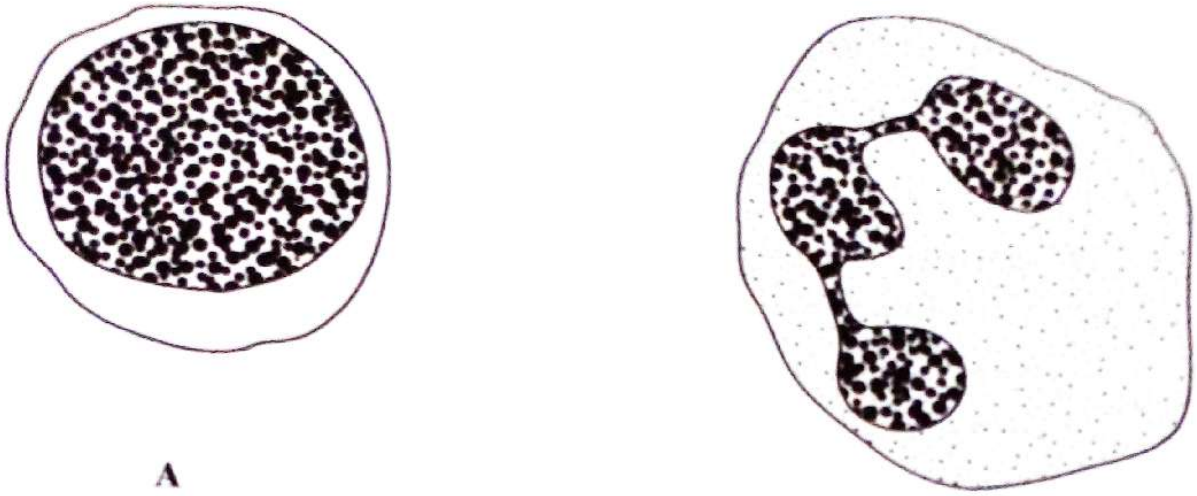
_____

_____

_____ [3]

[Total: 10]

3 **Fig.3.1** shows **two** types of white-blood cells, **A** and **B**.



A

B

Fig.3.1

(a) Identify the cells **A** and **B**.

A _____

B _____ [2]

(b) State **three** visible differences in structure between cells **A** and **B**.

1. _____

2. _____

3. _____ [3]

(c) Describe the functions of the:

1. blood plasma _____

_____

_____

2. platelets _____

_____

_____ [4]

(d) Name **any** substance that is found in blood plasma and not in tissue fluid.

_____ [1]

[Total: 10]

(a) State the functions of the following parts of a joint

ligament _____

cartilage _____

tendon _____ [3]

(b) Name **one** type of joint and describe the type of movement it allows.

_____

_____

_____ [2]

(c) Outline the functions of the skeleton.

[5]
[Total:10]

5 (a) (i) Define *malnutrition*.

[2]

(ii) Describe the symptoms of:

1. kwashiokor

2. scurvy

[4]

(b) **Fig.5.1** shows a malnutritional disorder.

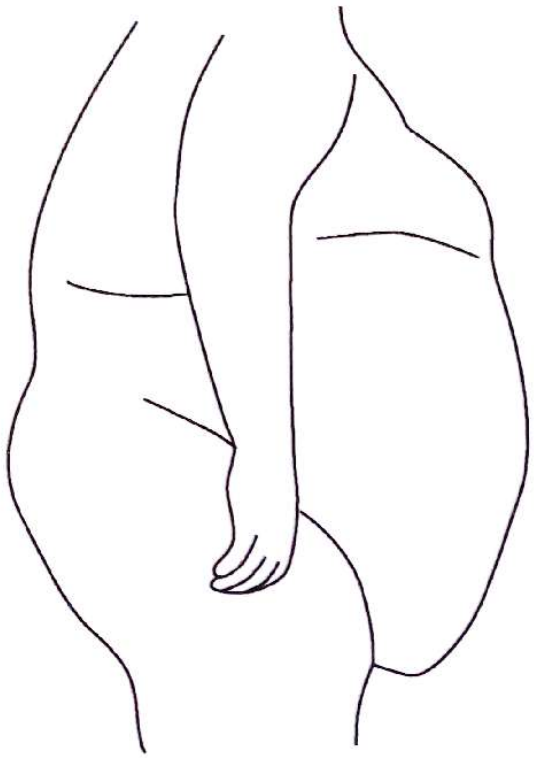


Fig.5.1

(i) Identify this disorder.

_____ [1]

(ii) Explain why a person with this disorder is likely to suffer from Coronary Heart Disease.

_____

_____

_____

_____

_____ [3]

[Total:10]

6 **(a)** Explain the term *variation*

_____

_____

_____ [2]

(b) Identify the **two** types of variation giving an example of a human feature in each case.

type 1: _____

example: _____

type 2: _____

example: _____ [4]

(c) Sketch graphs that would be produced for features mentioned in **(b)**.

[4]

[Total:10]

Section B

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

7 **(a)** State and explain any **three** properties of enzymes.

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____ [6]

(b) Explain the importance of enzymes to living organisms.

_____

_____

_____

_____

_____

_____ [4]

[Total:10]

8 (a) Explain why a maize plant is classified as a monocotyledonous plant.

[4]

(b) Describe how plants that grow in arid areas are adapted to minimize water loss.

[6]
[Total:10]

(a) Outline the functions of blood.

10

[6]

(b) Explain the structural adaptations of arteries to their function.

[4]

[Total:10]

10 (a) Explain the effects of nitrates that are released from agricultural activities.

[6]

(b) Describe the measures taken by a farmer to restore lost nitrates.

[4]

[Total: 10]

11 **Fig.11.1** shows a longitudinal section of a flower.

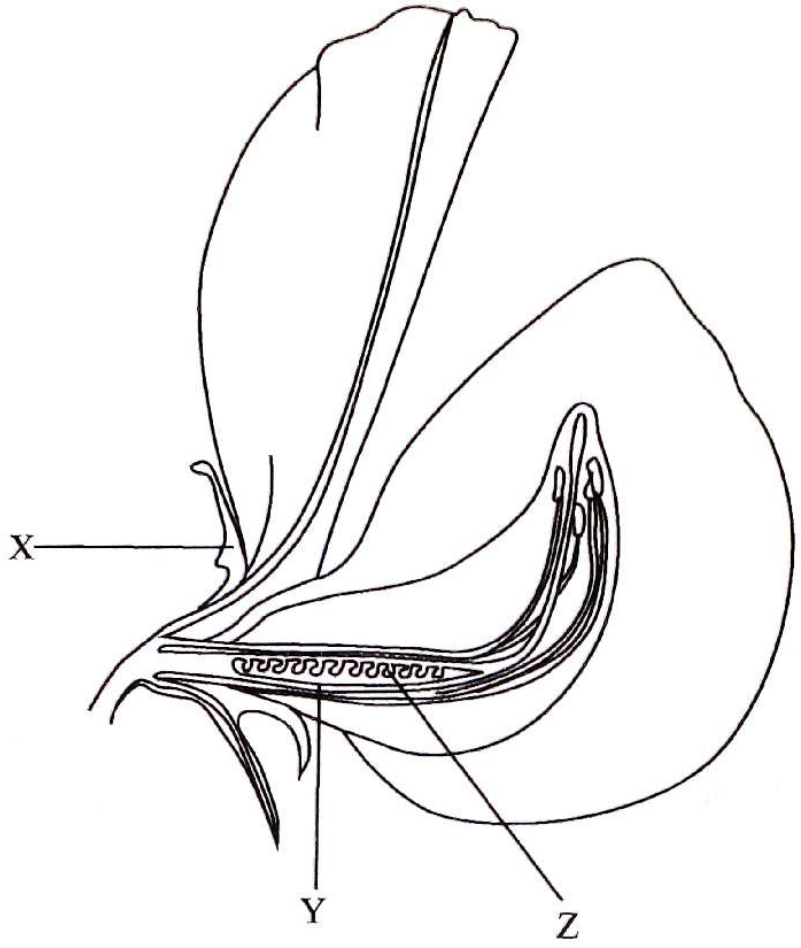


Fig.11.1

(a) Describe the changes which occur to parts X, Y and Z after fertilization.

_____

_____

_____

_____

_____

_____ [6]

11 (b) Explain the mechanisms adapted by flowers to promote insect pollination.

[4]
[Total:10]

12 **Fig.12.1** illustrates a reflex arc causing the movement of the human hand away from a hot object.

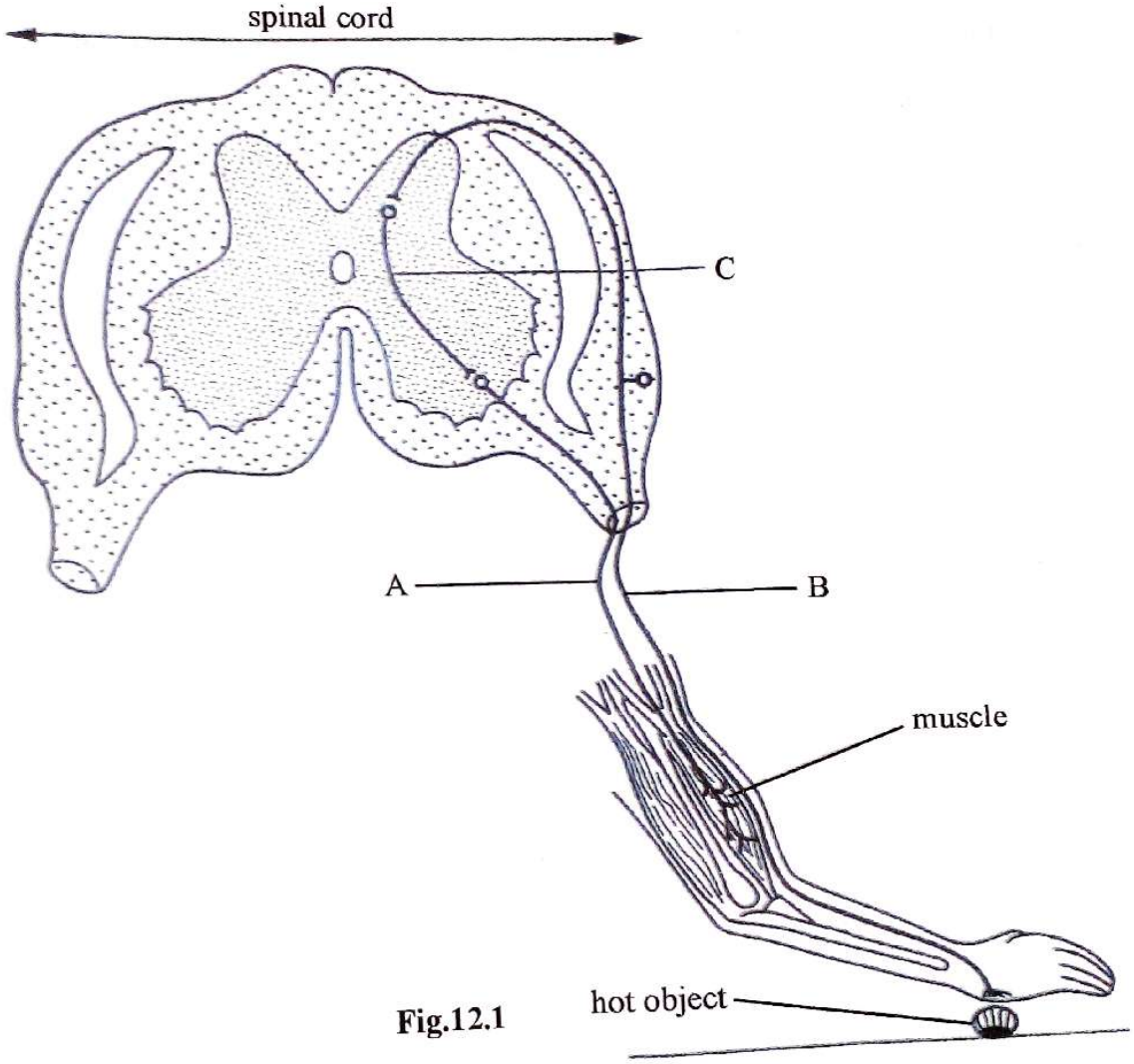


Fig.12.1

2 (a) Describe with reference to the parts labelled A, B, and C the actions taken to remove the hand from the hot object.

[6]

(b) Distinguish between the endocrine and the nervous system in the transmission of messages in the human body.

[4]

[Total:10]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS AND COMMENTS

NOVEMBER 2018

4025/02

BIOLOGY

[1]

1 (a) (i) red blood cell;

(ii) - flattened discs;

biconcave;

contain haemoglobin;

no nucleus;

elastic/flexible; [5 max 3]

Comment: In any picture of red blood cells, there appears a cup like depression in the middle which is helpful in identifying them. When stating any fact there is no need for descriptions or explanations.

[5 max 3]

(b) (i) light intensity;

carbon dioxide concentration;

temperature; [3]

(ii) Produces carbohydrates for consumers/ plants/respiration/energy;

Releases oxygen for respiration;

Absorbs carbon dioxide/reduce global warning; [3]

Comment: Relevance of photosynthesis to the ecosystem is in its products, viz oxygen and carbohydrates and its role as the only process which utilizes carbon dioxide.

2 (a) (i) A - enamel;

B - dentine;

C - pulp cavity; [3]

(ii) - molar/premolar; [1]

(b) (i) - chewing/grinding/crushing;

(ii) - large/flat surface area;

- cusps present;

- two roots; [3 max 2]

(c) - sugar/food remains/accumulates;
- forming plaque;
- bacteria respire anaerobically/ ferment sugar;
- forming acid;
- which corrodes enamel; [5 max 3]

Comment: Emphasis should be on how the acid is produced from fermentation of sugars and its action on the enamel.

3 (a) (i) A: lymphocyte; [1]

B: phagocyte; [1]

(b) A has an oval nucleus + B has a lobed nucleus;

B has less cytoplasm + B has more cytoplasm;

A is smaller + B is larger;

A has granules in cytoplasm + B has no granules in cytoplasm; [4 max 3]

(c) Plasma: mention of any substance transported by plasma dissolved in solution;

distributes heat; [2]

platelets: forming clots;

prevents bleeding;

prevents entry of pathogens; [3 max 2]

(d) plasma + proteins/ red blood cells; [1]

4 (a) ligament: - joins bone to bone;

cartilage: - prevents frictional force/cushions the joint;

tendon: - joins muscle to bone; [3]

(b) hinge; + one plane/180°;

or Ball and socket; + all planes/rotational/360°;

Comment: Link the joint to the movement it permits.

(c) - muscle attachment;
- provides movement/ locomotion;
- protection;
- for support/act as levers;

- production of blood cells; ® lymphocytes
- gives shape;

[6 max 5]

6

5 (a) (i)
- over feeding/over nourishment;
- under feeding/under nourishment;
- excess/lack of specific nutrient in diet; [3 max 2]

Comment: Definition should include all forms of malnutrition in general.

(ii) Kwashiokor
- reddish/brownish hair;
- underweight in children AW;
- swollen abdomen/ pot belly;
- very thin limbs;
- dry skin; [5 max 2]

Scurvy
- gum bleeding;
- poor wound healing;
- bleeding under skin; [3 max 2]

(b) (i) obesity; [1]

7

(ii) high blood pressure;

as heart pumps harder more blood to more tissues;

has more fat/cholesterol in blood;

plaque formation/fatty deposits in inner walls of coronary arteries;

narrowing of lumen of coronary arteries/atherosclerosis;

formation of clots;

coronary arteries blocked/thrombosis; [7 max 3]

Comment: An obese person is overweight and has more fat in the body.

Fats and cholesterol have a negative effect on coronary arteries which supply blood to heart muscle.

6 (a) differences in characteristics;

among organisms of the same species; [2]

(b) Type 1 : discontinuous;

Example: blood group/tongue rolling/sex;

(A) Correct examples [2]

Type 2: continuous;

Example: height/weight/intelligence; [2]

(A) correct examaples

(c) Type 1: graph showing distinct categories for a feature;

no intermediates between categories; [2]

Type 2: graph showing normal distribution curve;

with intermediate categories; [2]

Link (c) to (b)

Comment: For discontinuous variation, use bar graph while for continuous variation, use histogram or line graph.

7 (a) 1. Protein in nature:

made from amino acids/protein molecules;

2. substrate specific;

only catalyse a particular substrate;

3. sensitive to temperature;

work best at an optimum temperature/denatured by high temperature;

4. sensitive to pH;

work best at a particular pH/great changes in pH denature enzymes;

5. not used up in reactions they catalyse;

can be reused in more reactions;

6. remain chemically unchanged by reactions;

so maintain structure;

7. sensitive to concentration; rate of reaction increase with increase in concentration of enzyme/substrate/increase in concentration of products inhibit enzyme activity; [14 max 6]

Comment: Link property and explanation.

(b) - helps to support life processes;;
- increase efficiency in reactions;
- speed up metabolic reactions;

e.g. respiration/photosynthesis/digestion/protein synthesis;

(A) correct e.g. [4]

8 (a) one cotyledon;
fibrous root system;
parallel leaf venation;
store food in endosperm;
scattered vascular bundles;
no petiole/no leaf stalk/lanceolated;
flower parts in multiples of 3;
long/narrow leaves; [8 max 4]

Comment: It is recommended that one is also familiar with characteristics of dicotyledonous plant.

(b) thick/waxy cuticle;
sunken stomata;
fewer stomata;
hairy leaves;
shedding of leaves in dry season;
few leaves;
reduced leaf surface area/small leaves/leaves modified to thorns/spines; [7 max 6]

Comment: Knowledge in explaining how each of the above help to minimize transpiration is required.

9 (a)
- transport;
- named substance transported;
- homeostasis;
- distribution of heat;
- defence;
- blood clotting/phagocytosis/antibody production;

Comment: The syllabus specifies the function of blood as transport, defence and homeostasis. For each function a maximum of two descriptions of the function may be given. Candidates should not concentrate on one function.

(b)
- thick muscular layer;
- to withstand the high pressure
- narrow lumen; ® small
- maintain the high pressure;
- no valves;
- high pressure prevents blood flowing backwards;
- has elastic fibres;
- allow arteries to widen or narrow as blood flows in pulses/arteries recoil;

[8 max 4]

Comment: Link structures in arteries with explanation. Same question may be set on veins or capillaries.

10 (a)
- washing way/leaching of nitrates;
- into water bodies;
- algae/aquatic plants bloom/multiply;
- death of algae/aquatic plants;
- decomposition by bacteria which use dissolved oxygen;
- insufficient oxygen

- death of aquatic animals due to suffocation;
- causing eutrophication [8 max 6]

12

Comment: A detailed description of how nitrates end up in water bodies, increasing nutrients for aquatic plants which bloom leading to eutrophication is required.

(b)
- apply nitrogenous fertilizers; (A) correct e.g.
- add manure;
- which decompose into nitrates by action of fungi and bacteria;
- rotates crops with legumes, which fix nitrogen; [4]

Comment: Knowledge of the nitrogen cycle is quite helpful in answering the question.

11 (a)
- X is sepal;
- shrivels off;
- dry and fall;
- Y is ovary;
  develops into fruit;
- Z is ovule;
  develops into seed; [7 max 6]

(b) large brightly coloured petals + to attract insects;
nectaries + to produce nectar;
scented/have smell + to attract insects;
sticky/spiky pollen + to attach to bodies of insects;
sticky stigma + so that pollen sticks on its surface;
enclosed stamens/carpels + so that insects rub against them; [6 max 4]

Comment: Each adaptation should be explained.

12 (a) heat (of a hot object) stimulates nerve ending/heat reception;

impulse generated;

travels along the sensory neurone/B;

to relay neurone/C (in spinal cord);

impulse jumps across synapses;

impulses from relay neurone/C along motor neurone/A;

to the effector/biceps muscles;

which contract; [8 max 6]

(b)

Nervous system	Endocrine system
1. Electrical nerves impulses	+ Involves hormones/ chemical;
2. impulses transmitted along neurones	+ Transmitted by blood;
3. quick response/transmitted	+ Slow response/transmission;
4. response short lived	+ Short or long lived response;
5. voluntary or involuntary	+ Always involuntary;
6. usually localized effects	+ Wide spread/ affects;
7. pathway is specific	+ More than one pathway to (many) target organs/not specific;

[7 max 5]

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

4025/3

BIOLOGY

PAPER 3 Practical Test

NOVEMBER 2018 SESSION 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
As listed in Instructions to Supervisors
Electronic calculator
Pencil (B or HB is recommended)
Soft clean eraser
ruler (cm/mm)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.
Use a sharp pencil for your drawings.

Coloured pencils and crayons should **not** be used.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
1	
2	
TOTAL	

[Turn over

For Examiner's Use

1 (a) You are required to investigate properties of enzymes. You are provided with unboiled potato cubes labelled **A** and a boiled potato cube labelled **B**, hydrogen peroxide solution, boiling tubes labelled, **X**, **Y** and **Z**.

NB: Caution hydrogen peroxide is harmful to skin.

Pour hydrogen peroxide solution into boiling tubes **X** and **Y** to a depth of about 2 cm.

Carefully drop one potato cube **A** into boiling tube **X** and one potato cube **B** into boiling tube **Y**. Observe the boiling tubes.

(i) Record the observations in **Table 1.1**.

Table 1.1

tube	observations
X	
Y	

[2]

(ii) Suggest the purpose of tube **Y**.

_____ [1]

Pour hydrogen peroxide into boiling tube **Z**.

Add the other potato cube **A** into boiling tube **Z.**

Test the gas produced using a glowing splint.

1

1 (a) (iii) Describe the observations for the test.

For Examiner's Use

_____

_____ [1]

(iv) Identify the gas produced.

_____ [1]

(v) Draw a conclusion from the investigation.

_____

_____ [2]

(vi) Using a labelled diagram, show how you carried the test.

[3]

For Examiner's Use

1 (b) (i) Design a procedure to investigate the effect of pH on enzyme activity.

[6]

(ii) State any **two** possible sources of error in the procedure in **(b) (i).**

[2]

(iii) For **one** source of error stated in **(b) (ii)**, suggest a possible solution.

[1]

(iv) State any **one** method of presenting data from the procedure in **(b) (i).**

[1]
[Total:20]

2 You are to investigate the inheritance of a single trait in living organisms using a model. You are provided with five containers labelled P_1, P_2, **A**, **B** and **C**.

P_1 and P_2 contain a mixture of 25 white beads and 25 red beads each.

Shake containers P_1 and P_2 to mix the beads thoroughly.

Pick a bead from each of the containers P_1 and P_2 at the same time randomly.

If you pick both red, place them into container **A**, red and white place in container **B** and both white place in container **C**.

Record the results in **Table 2.1.**

NB: two beads picked represent an individual.

Repeat picking the beads randomly at the same time until all the beads in P_1 and P_2 are finished.

Table 2.1

beads pair/container	tally	number
red, red – **A**		
red, white – **B**		
white, white – **C**		

(a) **(i)** Complete **Table 2.1.** [6]

(ii) Suggest how it can be ensured that the picking of beads is random.

_____

_____ [1]

For Examiner's Use

(iii) State what each bead represents.

_____ [1]

(iv) Determine the ratio of the three genotypes.

_____ [1]

(v) Given that red is dominant, describe the genotypes represented by each of the three containers.

A _____

B _____

C _____ [3]

(vi) State the type of inheritance demonstrated in this investigation.

_____ [1]

(vii) The expected ratio, 1:2:1, of offspring genotypes may not be obtained.

Suggest a condition for this ratio to be obtained.

_____

_____ [1]

(b) You are provided with organism **T**.

Study organism **T** using a hand lens.

(i) Name organism **T**.

_____ [1]

For Examiner's Use

(ii) Deduce, with reasons, the kingdom to which organism **T** belongs.

[3]

(iii) State the roles of such organisms in the ecosystem.

[2]
[Total:20]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY 4025/3

PAPER 3 Practical Test

INSTRUCTIONS TO SUPERVISOR

NOVEMBER 2018 SESSION 1 hour 30 minutes

Great care should be taken that any confidential information given does not reach the candidates either directly or indirectly.

Prior to the examination, the Supervisor should ensure that all apparatus provided for the candidate, as listed in these instructions, are in good working condition.

No access to the Question Paper is allowed before the examination Date and Time.

The Supervisor is **NOT** allowed to access the question paper before the examination **Date** and **Time**.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and safety goggles should be used where necessary.

The Supervisor should supply results for question 1 on a spare copy of the question paper clearly labelled "Supervisor's Results", followed by the centre number.

[Turn over

Question 1

Each candidate should be provided with:

1 2 fresh potato cubes in a petri dish labelled **A**

1 boiled potato cube in a petri dish labelled **B** (boil until cooked)

20 cm^3 hydrogen peroxide solution in a labelled container

boiling tubes labelled **X**, **Y** and **Z**.

wooden splint

access to a lit burner

N.B: The fresh potato cubes must be prepared just before the examination and must be approximately 1 cm^3 in volume.

Safety

Facilitators are expected to instruct learners to take such precautions as laid down or advised by their Education Authority.

Question 2

Each candidate should be provided with:

(i) 5 containers labelled $\mathbf{P_1}$, $\mathbf{P_2}$, **A**, **B** and **C**

(ii) 25 red beads + 25 white beads in $\mathbf{P_1}$

(iii) 25 red beads + 25 white beads in $\mathbf{P_2}$

(iv) earthworm in a petri dish/ container labelled **T**

(v) hand lens

NB: Beads must be of roughly same size. Beads can be replaced by painted seeds of the same size and type.

SUPERVISOR'S REPORT

The Supervisor or Teacher responsible for the subject is asked to answer the following questions.

The completed report must be returned to ZIMSEC enclosed together with the candidates scripts.

1 Was any difficulty experienced in providing any necessary material? Give brief particulars.

2 Did the candidates experience any difficulty during the course of the examination? If so give brief particulars. Reference should be made to:

(a) difficult arising from faulty specimens/ materials/apparatus,

(b) any information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

Signed (in block capitals) _____

Signature _____ Date _____

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS AND COMMENTS

NOVEMBER 2018

4025/3

BIOLOGY

Question 1

(a) **(i)** X: bubbles/froth produced;
Y: no bubbles/no froth produced; [2]

(ii) control; [1]

(iii) glowing splint relights; [1]

(iv) oxygen; [1]

(v) enzyme speed up chemical reactions;
high temperatures denature enzyme; [2]

(vi) upright/slanted test tube with glowing splint inside test tube + above contents; **[1]**

Any two labels from test tube/boiling tube; A/fresh potato cube;
Glowing splint; hydrogen peroxide;
A/fresh potato cube; [4 max 2]

Comment: Living tissues like potatoes have the enzyme catalase which breaks down hydrogen peroxide to oxygen and water.

(b) (i) label three identical test tubes A, B and C;AW
place identical sized potato cubes in each of the test tubes;
add respectively equal volumes of acid, distilled water and alkali to the three test tubes, so that the potato cubes are covered;
Leave for five minutes at room temperature in a water bath at a given temperature (25 – 40°C);
Pour out the acid, distilled and alkali, so that only the potato cubes remain in the test tubes;
Add equal amount of hydrogen peroxide of same concentration to each test tube.
Observe the rate at which gas bubbles are produced; [7 max 6]

Comment: Candidates need to design the experiment preferably using the enzyme and substrate used in the examination experiment. The experiment must be practical indicating:

(i) varying pH
(ii) carrying out experiment at same temperature
(iii) use equal amounts of substrate at same concentration
(iv) use equal amounts of enzyme at same concentration;
(v) use of identical and correct apparatus
(vi) allowing same time for experiment
(vii) spelling out how you are going to compare

(ii) varying temperature;
varying volume/concentration of enzyme/substrate;
varying time;

(iii) temperature: use thermostatic water bath;
volume: using micropipette/graduated syringe;
time: use of stopwatch; [3 max 1]

(iv) table/graph/pie chart; (A) named graph; [1]

Question 2

(a) (i)

Beads per combination	tally	number
red, red – A	;	;
red, white – B	;	;
white, white – C	;	;

Comment: Correct tallying to be used, otherwise reject.

(ii) when picking close eyes/look aside; [1]

(iii) allele; [1]

(iv) ratio as per results in table; [1]

(v) A - homozygous dominant;
B - heterozygous/hybrid;
C - homozygous recessive; [3]

(vi) monohybrid; [1]

(vii) use a large sample/use large numbers of beads;

Comment: Candidate should do the practical rather than insert figures

(b) (i) earthworm/*Lumbricus terrestris*; [1]

(ii) Kingdom: Ammalia; (A)/Animal; [1]
reasons: move from one point to another;
show sensitivity to stimuli such as light;
feed on plants/do not photosynthesise; [3 max 2]

(iii) mix soil with organic matter;
improves soil fertility;
improves soil crumb structure;
improves soil aeration;
improves soil drainage; [5 max 2]

Comment: When studying classification, this should be more practical by observing examples of organisms in the different kingdoms.

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY

4025/1

PAPER 1 Multiple Choice

JUNE 2019 SESSION

1 hour

Additional materials:
- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)
- Mathematical tables/ Electronic calculator (optional)

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

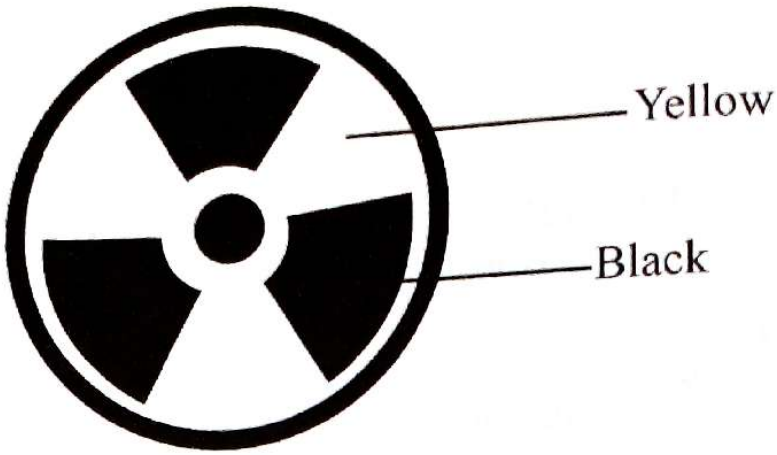
Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score **one** mark. A mark will **not** be deducted for a wrong answer. Any rough working should be done in this booklet.

[Turn over

1 The diagram shows a safety symbol used in a science laboratory.



The symbol is a warning against

A fires.

B smoke.

C radiation.

D fans.

2 Which branch of Biology involves the study of cells?

A botany

B anatomy

C ecology

D cytology

3 Which carbohydrate is a polysaccharide?

A glucose

B maltose

C starch

D sucrose

4 In photosynthesis, water is used as a

A coolant.

B catalyst.

C solvent.

D reagent.

5 The organelle that contributes to the osmotic properties of a plant cell is the

A cell wall.

B chloroplast.

C cytoplasm.

D vacuole.

6 Which feature of a red blood cell increases its surface area?

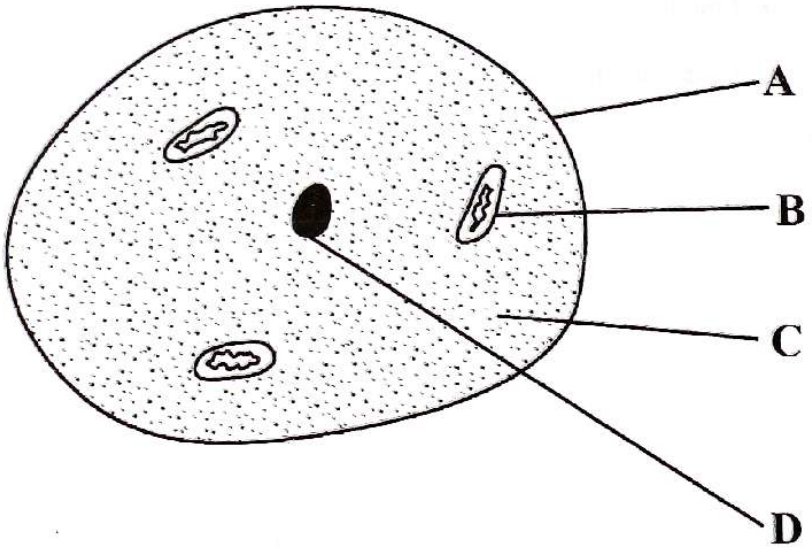
A presence of haemoglobin

B absence of a nucleus

C thin membrane

D thin cross section

7 The diagram shows an animal cell.
In which part, **A**, **B**, **C** or **D**, does aerobic respiration take place?



8 Which statement about enzymes is **not** true?

A they are biological catalysts

B they are used up during catalysis

C they are substrate specific

D they are protein in nature

9 Enzyme activity

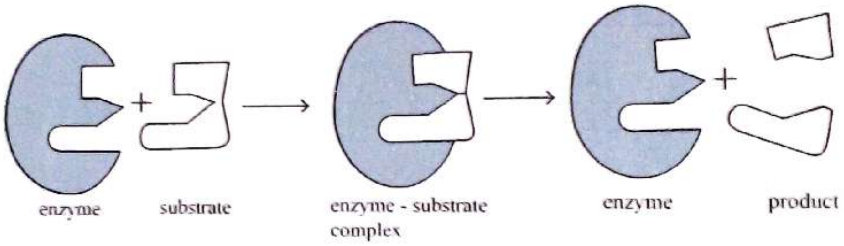
A increases with increase in pH then remains constant

B decreases with increase in pH then remains constant.

C increases with increase in pH then decreases.

D decreases with increase in pH then increases.

10 The diagram illustrates a mode of action of enzymes.



This mode of action is called

A activation and binding.

B activation and breakdown.

C lock and catalysis.

D lock and key.

11 Which factor is **not** necessary for the germination of seeds?

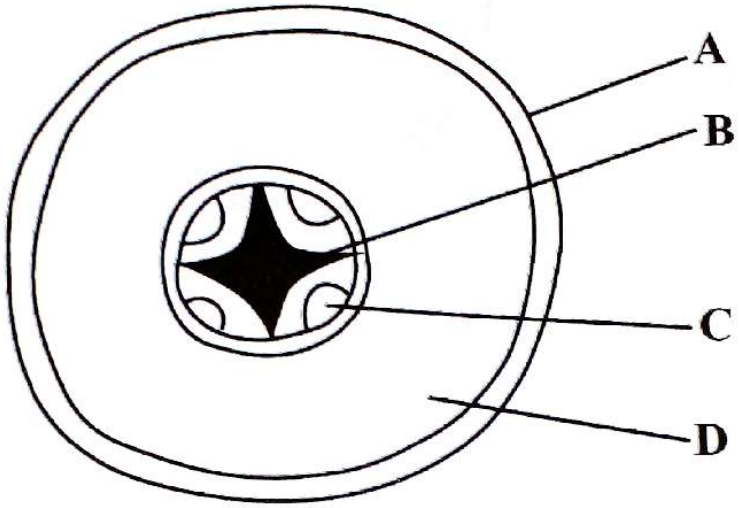
A light

B warmth

C oxygen

D moisture

12 The diagram shows a cross section of a dicotyledonous root.
Which part, **A**, **B**, **C** or **D**, is responsible for transporting organic molecules?



13 Which condition results in rapid transpiration?

A low humidity

B low light intensity

C low temperature

D low wind speed

14 Which one is an advantage of sexual reproduction?

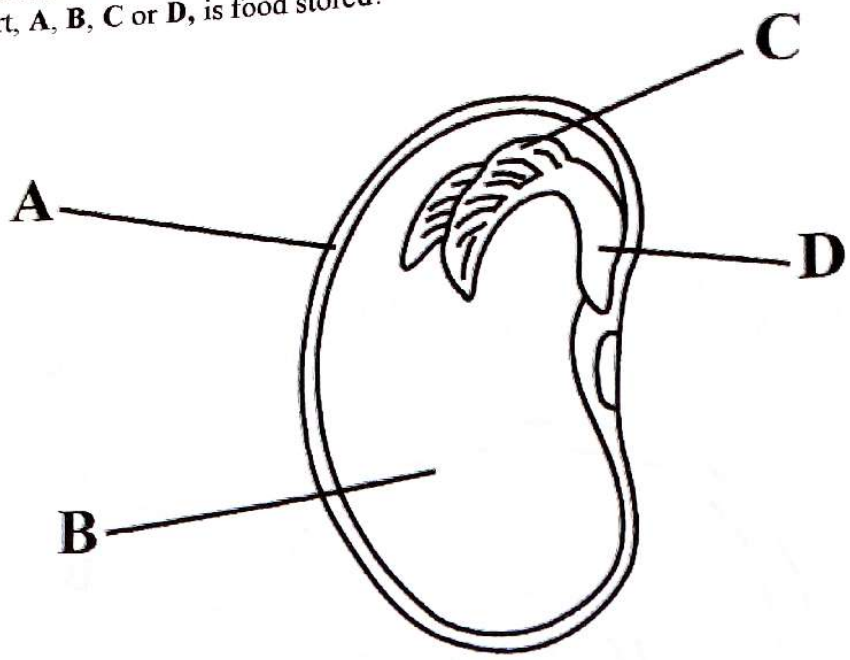
A increase in genetic variation

B maintenance of desirable characteristics

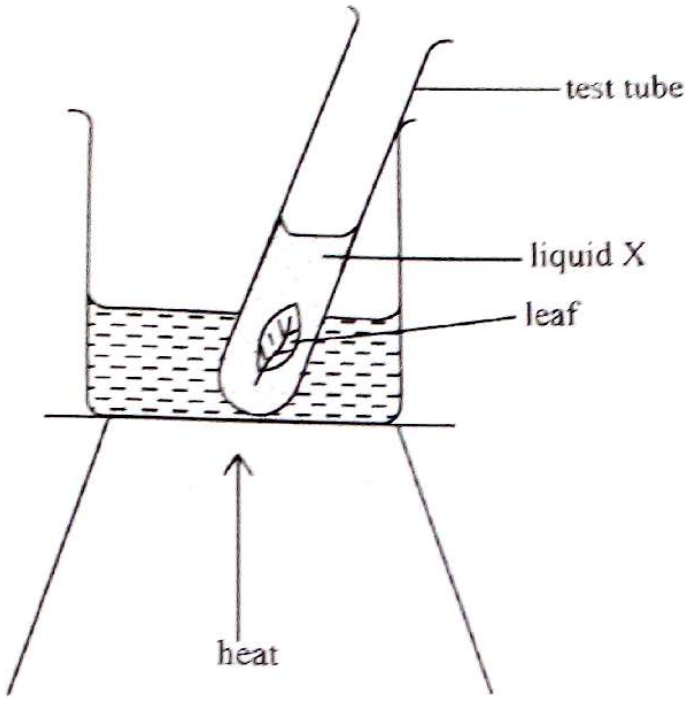
C intense colonisation of an area

D reduction in competition with other species

15 The diagram shows a bean seed cut in half.
In which part, **A**, **B**, **C** or **D**, is food stored?



16 The diagram shows one of the steps in testing a leaf for starch.



What is liquid **X**?

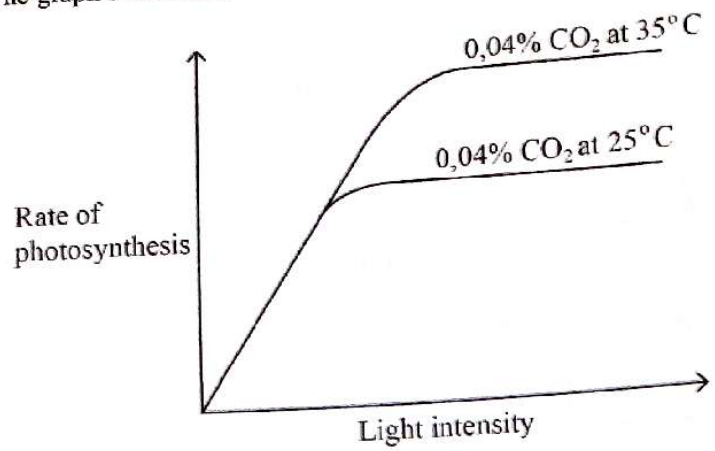
A water

B limewater

C alcohol

D iodine solution

17 The graph shows results of an investigation on factors affecting the rate of photosynthesis.



Which factor is limiting the rate of photosynthesis when the curves are flat?

A carbon dioxide

B temperature

C light

D water

18 A long term effect on smoking on the respiratory system is

A constriction of bronchioles.

B destruction of alveoli.

C increased mucus production.

D paralysis of cilia.

19 Memory, intelligence and consciousness in the brain is controlled by the

A cerebellum.

B cerebrum.

C hypothalamus.

D medulla oblangata.

20 Shortage of vitamin A in the diet leads to

A bleeding under the skin.

B formation of soft bones.

C poor healing of wounds.

D reduced resistance to disease.

21 Which type of immunity will be acquired through vaccination?

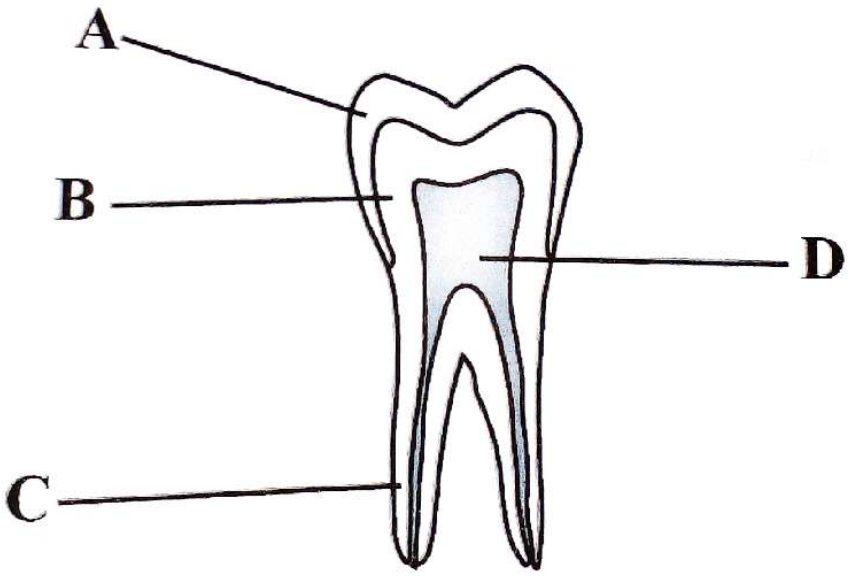
A natural active

B artificial active

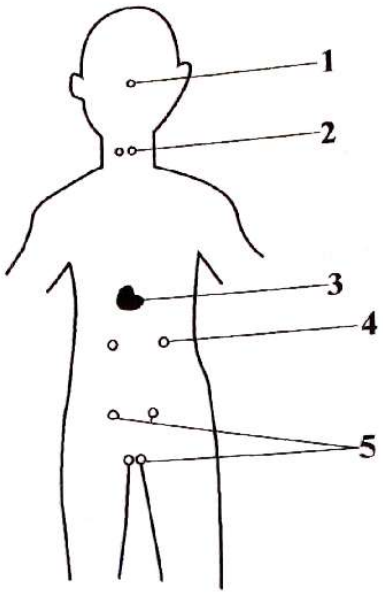
C natural passive

D artificial passive

22 The diagram shows the structure of a tooth.
Which part, **A**, **B**, **C** or **D**, is the hardest?



23 The diagram shows the positions of the human endocrine glands.



Which hormone is secreted by gland 3?

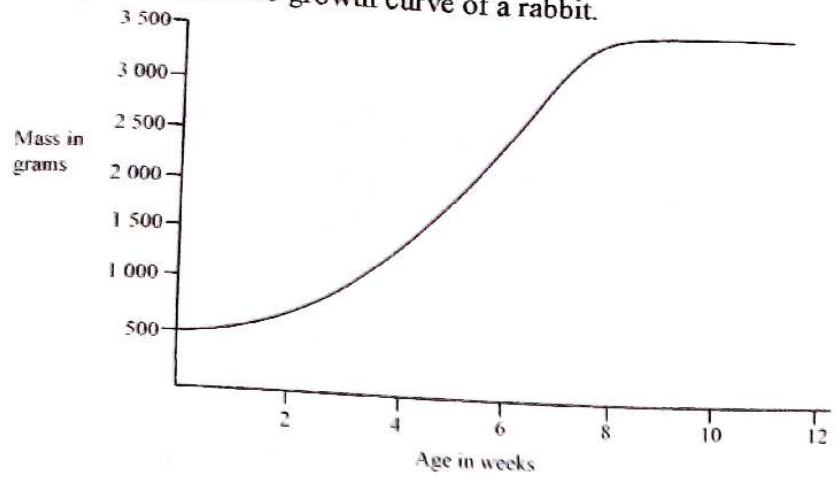
A thyroxine

B adrenaline

C testosterone

D glucagon

24 The diagram shows the growth curve of a rabbit.



Which is the best time to slaughter the rabbit?

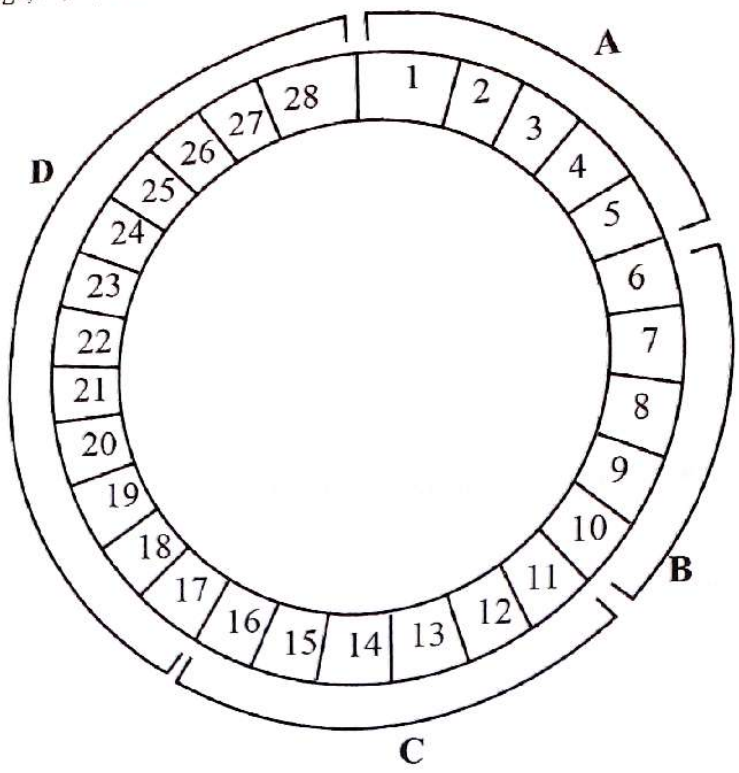
A 6 weeks

B 8 weeks

C 10 weeks

D 12 weeks

25 The diagram represents the menstrual cycle.
At which stage, **A**, **B**, **C** or **D**, is fertilisation most likely to occur?



26 Fungi are used in the production of

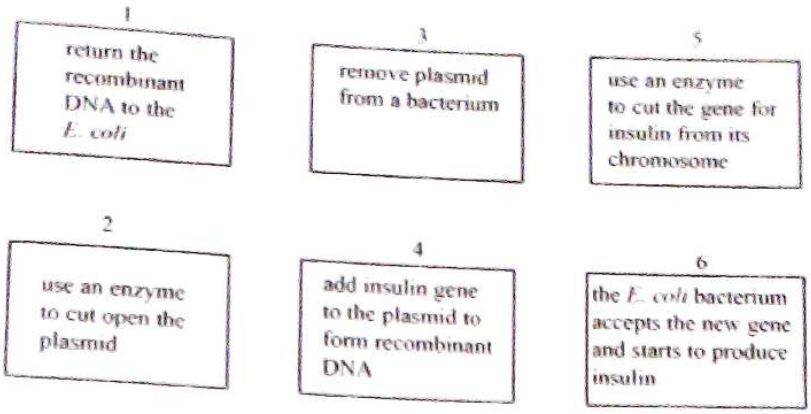
A yoghurt.

B penicillin.

C thyroxine.

D glucagon.

27 The diagram shows the stages in the production of insulin by gene technology in random order.



The correct order of the stages is

A 5 → 3 → 2 → 4 → 1 → 6.

B 1 → 2 → 3 → 4 → 5 → 6.

C 3 → 5 → 4 → 6 → 2 → 1.

D 2 → 4 → 6 → 5 → 1 → 3.

28. The approximate monohybrid ratio is

A 1:1.

B 2:1.

C 3:1.

D 4:1.

29 A new species arises from an existing species by

A evolution.

B reproduction.

C selection.

D variation.

30 An allele which expresses itself only when homozygous is

A dominant.

B homologous.

C recessive.

D codominant.

31 A man has blood group A and his wife has blood group B.

Which genotype **cannot** be inherited by any of their children?

A I^AI^A

B I^AI^B

C I^AI^O

D I^OI^O

32 In pea plants, the allele for red flowers is co-dominant with that for white flowers.

When heterozygote pea plants self pollinate, they produce,

A red flowered plants and white flowered plants in a ratio of 1:1.

B red flowered plants and no white flowered plants.

C white flowered plants and no red flowered plants.

D red flowered plants and white flowered plants in a ratio of 3:1.

33 A diagnostic feature for the kingdom plantae is the presence of

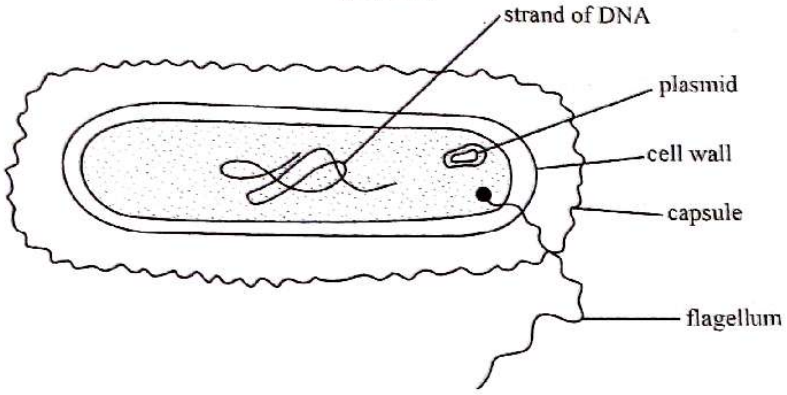
A cellulose.

B cytoplasm.

C mitochondria.

D nucleus.

34 The diagram shows the structure of an organism.



To which kingdom does the organism belong?

A fungi

B monera

C protista

D animalia

35 Which one helps improve soil fertility?

A locusts

B termites

C flukes

D caterpillars

36 One harmful human activity on the ecosystem is

A applying fertiliser just before it rains.

B adding organic matter to the soil.

C ploughing along contours.

D keeping ground cover.

37 Which food chain is correct?

A goat $\longrightarrow$ grass $\longrightarrow$ cow $\longrightarrow$ lion

B grass $\longrightarrow$ cow $\longrightarrow$ man $\longrightarrow$ lion

C cow $\longrightarrow$ man $\longrightarrow$ hyena $\longrightarrow$ lion

D hyena $\longrightarrow$ man $\longrightarrow$ lion $\longrightarrow$ vulture

38 Analgesic drugs are responsible for

A destroying fungi.

B killing bacteria.

C reducing anxiety.

D suppressing pain.

39 A degenerative disease is caused by

A malnutrition.

B genetic factors.

C infection.

D old age.

40 Which disease is non-infectious?

A cancer

B cholera

C tuberculosis

D typhoid

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

BIOLOGY PAPER 1 (4025/1) JUNE 2019

SUGGESTED ANSWERS AND COMMENTS

Question	Answer	Comment
1	C	The practical observation of safety symbols on labels of different chemical containers is necessary.
2	D	Link each branch of biology to its area of study.
3	C	Classification of carbohydrates and examples of each class is necessary.
4	D	Application of uses of water in biological processes.
5	D	
6	B	Red blood cells need a large surface area to absorb more oxygen which is enhanced by their shape and absence of a nucleus.
7	B	
8	B	Enzymes are not used up during metabolism.
9	C	Knowledge of the graph on the effect of pH on enzyme activity is helpful.
10	D	
11	A	Light is not necessary for germination as seeds do not photosynthesize.
12	C	Candidates should be able to identify parts of the transverse section dicotyledonous root and link the parts to a function of dicotyledonous root.
13	A	Rapid transpiration is caused by low humidity, high light intensity, high temperature and high wind speed.

14	A	
15	B	Identify from a diagram parts of a seed and link each part to a function.
16	C	The diagram shows the step when the leaf is boiled in alcohol to remove chlorophyll.
17	B	Light intensity is a limiting factor up to the point where the curves for 0.04% CO_2 at 25°C and 0.04% CO_2 at 35°C diverge and beyond this point, temperature becomes the limiting factor.
18	B	The others are short term effects of smoking.
19	B	
20	D	
21	B	A vaccine is administered, to stimulate production of antibodies. This is artificial active immunity.
22	A	
23	D	Organ 3 is the pancreas.
24	B	This is the time its growth levels off or stops.
25	C	Ovulation takes place between days 11 to 16 and when sexual intercourse occurs at this time, the ovum may be fertilised.
26	B	
27	A	The correct sequence is beneficial to the study of insulin production by gene technology.
28	C	
29	A	
30	C	
31	A	The mother can only pass the alleles 1^B and 1^O to the offspring and 1^A1^A has none of the alleles from the mother.
32	A	The cross produces homozygous plants and heterozygous plants the homozygous plant have red flowers and the other homozygous plants have white flowers. The heterozygous plants have an intermediate flower colour. These are produced in a ratio of 1:2:1. The homozygous plants are in a ratio of 1: 1.

33	A	The cellulose makes their cell walls.
34	B	The organism has naked DNA and is surrounded by a cell wall. Has no membrane bound cell organelles.
35	B	
36	A	The fertilisers will be washed by surface run off into water bodies where they cause eutrophication.
37	B	Every food chain must start with a producer.
38	D	
39	D	A degeneration disease is one in which tissues are wasted.
40	A	Non-infectious diseases are not caused by pathogens and are not transmissible.

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

4025/2

BIOLOGY

2 hours

PAPER 2 Theory

JUNE 2019 SESSION

Candidates answer on the question paper

Additional materials:
Electronic calculator
Pencil (type HB is recommended)

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed.

Time 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.
Write your centre number and candidate number in the box on the top right corner of every page of this paper.

Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question.

Section B
Answer any **four** questions.
Write your answers in the spaces provided on the question.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

Turn over

Section A

*Answer **all** questions in this section*

1 **(a)** State any **two** science laboratory rules.

1 .....

.....

2 .....

..... [2]

(b) Give any **two** possible causes of accidents in a science laboratory.

1 .....

2 ..... [2]

(c) Describe how a sand bucket is used to control fires in a science laboratory.

.....

..... [2]

(d) Suggest any **four** ways of taking good care of a microscope.

1 .....

2 .....

3 .....

4 ..... [4]

2. (a) Complete **Table 2.1** by naming the organelles.

Table 2.1

function	organelle
controls the activities of a cell	
site for aerobic respiration in a cell	
controls entry and exit of substances in a cell	
helps to maintain pressure within a cell	

[4]

(b) Explain why

(i) the sperm cell contains large amounts of mitochondria,

.....

..... [2]

(ii) red blood cells lack nuclei.

.....

..... [2]

(c) State any **two** differences between a plant cell and an animal cell.

1 .....

2 .....

[2]

3. **(a)** **(i)** Write word equations to show the action of enzymes on

fat, ...

.....

protein. .....

.....

..... [4]

(ii) Explain the use of enzymes in biological washing powders.

.....

..... [2]

(iii) Suggest, with a reason, the effect of using cold water on stain removal capacity of biological washing powders.

effect .....

reason ..... [2]

(b) Explain the effects of denaturation on enzyme activity.

.....

.....

.....

..... [2]

4. (a) **Table 4.1** shows incomplete information on the parts of an ear and their functions.

Complete **Table 4.1**.

Table 4.1

part of an ear	function
pinna	
	secretes wax to trap dust and pathogens.
semi circular canal	
	enabling hearing

[4]

(b) State any **three** possible causes of deafness.

.....

.....

..... [3]

(c) Explain why it is **not** advisable to listen to very loud music through earphones.

.....

.....

..... [3]

5 (a) (i) **Fig. 5.1 (a) and Fig. 5.1 (b)** show variation in two human characteristics.

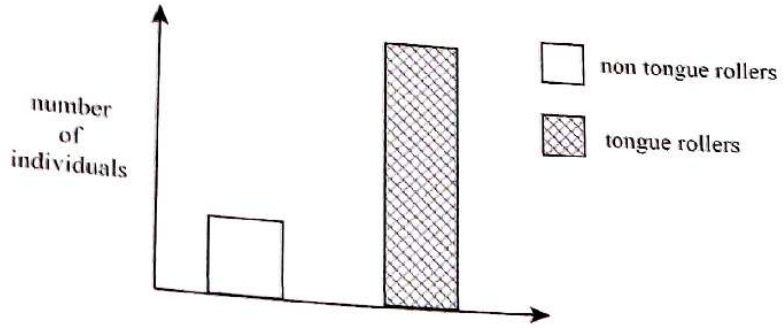


Fig. 5.1(a)

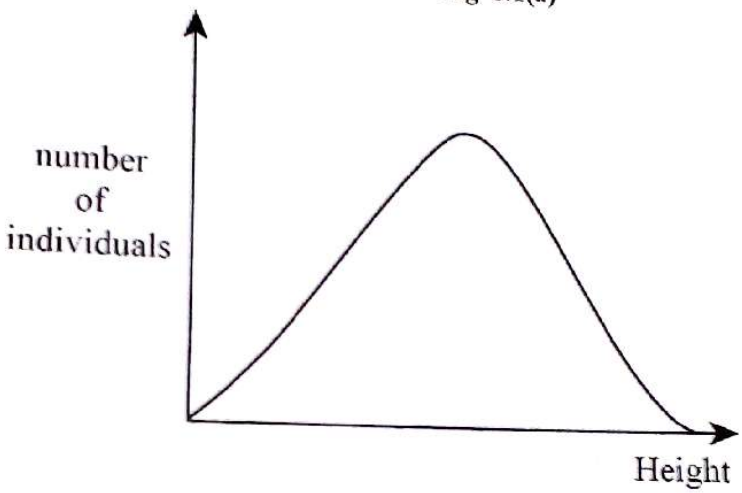


Fig. 5.1(b)

Identify the types of variation shown in:

Fig. 5.1 (a) .....

Fig. 5.1 (b) ..... [2]

(ii) State the **two** causes of variation.

1 .....

2 ..... [2]

(iii) Suggest **three** factors that may affect variation in **Fig. 5.1 (b)**.

1 .....

2 ..... [3]

3 .....

(b) Explain how artificial selection might be of economic importance to a farmer.

.....

.....

.....

.....

..... [3]

6. (a) State the **two** main components of a food chain.

1 .....

2 ..... [2]

(b) State any **three** features of savanna soils in Zimbabwe.

1 .....

2 .....

3 ..... [3]

(c) List any **two** disadvantages of an artificial ecosystem.

1 .....

2 .....

[2]

(d) Explain the importance of vegetative ground cover in an ecosystem.

.....

.....

.....

.....

[3]

Section B

*Answer any **four** questions from this section*

7 **(a)** Describe the functions of water in animals.

[6]

(b) Explain the importance of the high heat of vaporisation of water to living organisms.

[4]

8 **(a)** Outline the differences between monocotyledonous plants and dicotyledonous plants.

[6]

(b) Explain the importance of plants in human diet.

.....

.....

.....

.....

.....

..... [4]

.....

9 **(a)** Explain how climatic change is a threat to biodiversity.

.....

.....

.....

.....

.....

.....

.....

..... [6]

(b) Outline any **four** measures of conserving wildlife.

.....

.....

.....

.....

..... [4]

10 (a) Describe the risk of drinking alcohol during pregnancy.

.....

.....

.....

.....

.....

.....

.....

..... [6]

(b) Explain why antibiotics are ineffective in treating diseases caused by viruses and protozoa.

.....

.....

.....

.....

.....

.....

..... [4]

11 (a) Using examples, distinguish between infectious diseases and non-infectious diseases.

.....

.....

.....

.....

.....

.....

..... [6]

.....

(b) Suggest ways of reducing the spread of sexually transmitted infections in Zimbabwe.

.....

.....

.....

.....

.....

..... [4]

.....

12 **(a)** Describe how natural selection can lead to evolution.

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(b) Explain the need for animal breeding.

.....

.....

.....

.....

..... [4]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS AND COMMENTS

JUNE 2019

4025/2

BIOLOGY

Abbreviations

( )	accept
A.W	alternative wording
AVP	accept any valid point
@	reject
;	the two points make one marking point together
[illegible]	accept [illegible]
	alternative marking point
	marking point
( )	not necessary in answer even if omitted

1 (a) no eating/tasting/inhaling
no playing [illegible]
do not use/touch anything without permission
report any leaks/breakages/spillages
do not enter laboratory without permission [[illegible] max [illegible]]
AVP

(b) fire
electricity
fumes
strong acids/bases
improper handling of apparatus
not following instructions/unsupervised experiments [[illegible] max [illegible]]
AVP

(c) sand is spread over the fire
fire deprived of oxygen [[illegible] max [illegible]]
fire doused

(d) keep it covered when not in use/keep it free from dust/moisture
when carrying it place a hand under the base
clean it with a soft cloth after use
keep it on a flat surface [[illegible] max [illegible]]
regular servicing

Comment: Practical observation of laboratory safety rules and adhering to safety measures gives candidates a great advantage when answering the whole question.

Abbreviations

(A)	-	accept
AW	-	alternative wording
AVP	-	accept any valid point
®	-	reject
+	-	the two points make one marking point together
vv	-	accept vice-versa
/	-	alternative marking point
;	-	marking point
( )	-	not necessary in answer even if omitted

1. (a) no eating/tasting/inhaling;
no playing/AW;
do not use/touch anything without permission;
report any leaks/breakages/spillages;
do not enter laboratory without permission;
AVP [5 max 2]

(b) fire;
electricity;
fumes;
strong acids/bases;
improper handling of apparatus;
not following instructions/unsupervised experiments;
AVP [5 max 2]

(c) sand is spread over the fire;
fire deprived of oxygen
fire doused; [3 max 2]

(d) keep it covered when not in use/keep it free from dust/moisture;
when carrying it place a hand under the base;
clean it with a soft cloth after use;
keep it on a flat surface;
regular servicing; [5 max 4]

Comment: Practical observation of laboratory safety rules and adhering to safety measures, gives candidates a great advantage when answering the whole question

2 (a) nucleus;
mitochondria;
cell membrane;
vacuole;

[4]

(b) (i) produce energy;
required for motility of sperm/AW; [2]

(ii) more space for haemoglobin;
for more uptake of oxygen; [4 max 2]

(c)

Plant cell	**Animal cell**
has cell wall +	absence of cellulose cell wall;
large/permanent vacuole presence +	small/temporary vacuole;
regular shape +	irregular shape;
presence of chloroplast +	absence of chloroplast;
stores food as starch +	stores food as glycogen;
peripheral nucleus +	centrally located nucleus;

[6 max 2]

3 (a) (i) 1. fats + lipase; $\longrightarrow$ glycerol + fatty acids;
Or fat $\xrightarrow{lipase}$; fatty acids + glycerol; [2]

2. protein + protease; $\longrightarrow$ amino acids;
Or protein $\xrightarrow{protease}$; amino acids; [2]

® if line used instead of arrow reject second point.

(ii) most stains are made up of insoluble organic molecules;
enzymes breakdown the molecules into smaller soluble molecules;
which can be washed away using water; [3 max 2]

(iii) effect: reduced capacity;
reason: enzyme less active/inactive at low temperature; [2]

(b) activity reduced/stopped;
active site/3D shape of enzyme altered;
hydrogen bonds broken;
substrate cannot fit into active site; [4 max 2]

Comment: Candidates should know the relevance of properties of enzymes and their use in industrial technology. 6

4 (a) collect/focus sound waves into the auditory canal/ear;
auditory canal;
balance/posture;
cochlea; [4]

(b) - outer ear channel blocked by wax;
- rapture of eardrum;
- bone tissue growing the middle ear/AW;
- hereditary predisposition;
- cochlea not working properly;
- ageing; [6 max 3]

(c) - loud music has great vibrations;
- damages middle ear bones/ossicles;
- damages cochlea membrane;
- receptor cells damaged;
- cause deafness; [5 max 3]

Comment: This is application in life of the structure and function of parts of the ear.

5 (a) (i) Fig. 5.1 (a) - discontinuous;
Fig. 5.1 (b) - continuous; [2]

(ii) genetic/inherited factors; (A) mutations
environmental factors;

(iii) diet/nutrition;
genetic predisposition/inheritance;
effect of health/diseases; [3]

Comment: Fig. 5.1(b) is a graph on height. The question requires one to focus on factors that cause variation in height.

(b) - allow farmer to select the best/desired features;
- produce new varieties/breeds with desired features;
- e.g. resistance to diseases/tolerance to drought/early maturity;
- improves livestock /crop yields;
- meet market demands;
- more profit;

[6 max 3]

6 (a)
- producers/plants;
- consumers/animals;

[2]

(b)
- high temperatures;
- rapid denitrification/low nitrogen content;
- low fertility;
- fewer earthworms/high numbers of termites;

[4 max 3]

(c)
- limited species diversity;
- animals/crops are prone to pests/diseases;
- little recycling of nutrients;
- AVP

[3 max 2]

(d)
- roots hold soil particles together;
- reduces soil erosion/enhance top soil preservation;
- reduces surface run off/evaporation;
- allows water to percolate/more water retained in soil;
- creates microhabitats for organisms;
- increase humus content;

[6 max 3]

7 (a)
- solvent;
- component of body fluids/blood/tears/tissue fluid/digestive juices/mucus/saliva;
- transport medium;
- cooling/temperature regulation;
- osmoregulation;
- lubrication;
- reagent in reactions;
- AVP

[8 max 6]

(b)
- more energy required (to vaporise water);
- to break hydrogen bonds;
- evaporating water takes a lot of heat from the body;
- results in the body cooling;
- large amounts of heat lost with minimal water loss which prevents dehydration;
- help maintain constant internal temperature;
- AVP

[6 max 4]

Comment: Knowledge of properties and uses of water in biological systems helps to answer part (b).

8 (a)

Monocotyledous	**Dicotyledous**
- 1 cotyledon in seeds +	2 cotyledons;
- parallel leaf venation +	branched leaf venation;
- scattered vascular bundles in stem +	vascular bundles in stem arranged in a ring;
- fibrous / adventitious roots +	long tap with lateral roots;
- flower parts in threes +	flower parts arranged in fours or fives;
- no distinct petals and sepals +	distinct petals and sepals;
- wind pollinated + flowers	insect pollinated flowers;
no petiole/lanceolated +	distinct petiole;
Seed food store in endosperm +	| seed food store in cotyledon;

[9 max 6]

(b)
- source of proteins (e.g. legumes) + for body building/tissue repair;
- source of carbohydrates (e.g. cereals) + for energy;
- source of fats/lipids (e.g. nuts) + for energy/warmth/protection of delicate organs;
- source of vitamins (e.g. fruits) + for prevention of diseases/AW;
- source of mineral salts (e.g. citrus/vegetables) + for good health/AW;
- source of roughage (e.g. green mealies) + for smooth bowel movements/prevent constipation;
- source of water (e.g. water melons) + (A) correct use of water; [7 max 4]

Comment: Application of knowledge on importance of components of human diet.

9 (a)
- can lead to global warming;
- cause adverse weather conditions/drought/extreme high temperature/severe storms;
- cause heat stress to animals;
- death of animals/plants;
- habitat loss;
- results in forced migration of animals;
- reduced biodiversity; [7 max 6]

Comment: Candidates to be practical and focus on the effects of climate change to local environment.

(b)
- creating parks/game reserves/ sanctuaries for protecting wildlife;
- having legislation to discourage poaching;
- regulating the hunting of wildlife/use of plants/trees/flora;
- encouraging the use of alternative forms of energy;
- setting up bodies to protect the environment (e.g. EMA/National Parks);
- reduce wildlife – human conflict
- promoting environmental friendly practices when interacting with wildlife;
- AVP [6 max 4]

Comment: This is one of the current global topical issues. Candidates should familiarise themselves with current global trends and relevance of biological principles to global issues.

10 (a)
- alcohol can cross the placenta from maternal tissues and enter fetal tissues;
- intoxication of the fetus;
- results in feotal alcohol syndrome/FAS;
- retarded fetal growth;
- poor brain development of foetus;
- poor muscle tone;
- poorly developed cheek bones/flat face;
- long thin upper lip/short upturned nose;
- mother can have still birth/miscarriage;
- AVP [9 max6]

Comment: The effects of alcohol during pregnancy affect both the mother and the fetus. For the fetus this should be limited to its time inside the womb. There are short term and long term effects, some which will affect the baby after birth.

(b)
- most antibiotics target prokaryotic cell walls/membrane;
- cell wall is absent in viruses and protozoa;
- antibiotics target metabolism of pathogens;
- viruses lack own metabolism/multiply only in host cells;
- protozoa have complex metabolism as they are eukaryotes; [5 max 4]
- protozoa may have enzymes that breakdown antibiotics;

Comment: Most antibiotics are used for treatment of bacterial diseases. The antibiotics target bacterial cell wall and inhibit some simple metabolic processes. Viruses are non-cellular, bacteria are prokaryotes and protozoa.

11 (a)

Infectious	**Non infectious**
- caused by pathogens/viruses/ bacteria/protozoa/fungi +	- caused by environmental conditions/inheritance/ diet/pollutants/poisons (A) not caused by pathogens
- due to external factors +	- mainly due to internal factors
- can be transmitted AW;	- non transmissible.
- community hygiene/attitude can reduce occurance +	community hygiene/attitude cannot reduce occurance
- through contact/medium/nector	Transmission only in use of heredity
- e.g malaria/cholera/HIV/AIDS. (A) correct e.g. +	- e.g cancer/Downs Syndrome/kwashiorkor/marasmus. (A) correct e.g [6]

(b)
- encourages mutually faithful relationships;
- proper use of condoms/make condoms easily accessible;
- make treatment accessible to the infected/early treatment;
- contact tracing.
- educational awareness campaigns on STIs/sex education;
- PMTC/PEP. [6 max4]

Comment: The methods suggested should be applicable at community level

12 (a)
- variation amongst organism;
- each organism has potential to reproduce;
- competition for resources/reproductive partners;
- struggle for existence/survival of the fittest;
- the well adapted to the environment survive and reproduce;
- pass on alleles to the next generation;
- those not well adapted die and fail to reproduce;
- their alleles disappear;
- over a long period, a change in gene pool occurs;
- new species arise from existing ones; [8 max 6]

(b)
- improve quality of; e.g. meat/milk;
- improve quantity e.g. meat/milk/yields/productivity;
- to meet markets demands/increase profits;
- to improve resistance to pests and diseases;
- improve drought tolerance;

AVP 5 max 4]

Comment: Application of knowledge on artificial selection and impact to a farmer.

Candidate Name

Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY

4025/3

PAPER 3 Practical test

JUNE 2019 SESSION

1 hour 30 minutes

Candidates answer on the question paper

Additional materials:
As listed in Instructions to Supervisors
Electronic calculator
Pencil (B or HB is recommended)
Soft clean eraser
Ruler (cm/mm)

Time 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Use a sharp pencil for your drawings.

Coloured pencils and crayons should **not** be used.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
1	
2	
TOTAL	

1 (a) You are required to make a model of the human arm to demonstrate the role of muscles and bones in bending and straightening the arm.
You are provided with manila, a scissors, some string, paper glue and a mounted needle.

(i) Using the manila to represent bones and the string to represent muscles, make the model of the arm.
Paste the model in the bent position in the space provided

[4]

(ii) Label, on the model, the parts of the arm represented by each component. [4]

(iii) Explain how the model does **not** correctly represent the arm.

.....

.....

.....

..... [3]

(b) You are required to investigate how tooth decay occurs and how it can be prevented.
You are provided with two egg shells, dilute hydrochloric acid and hydrochloric acid-toothpaste mixture.
NB: Hydrochloric acid is corrosive, avoid skin contact.
Proceed as follows:
Put an egg shell into beaker **A**.
Add hydrochloric acid to cover the egg shell.
Put the other egg shell into beaker **B**.
Add hydrochloric acid-toothpaste mixture to cover the egg shell.
Leave the set up for five minutes.

(i) After five minutes, observe and record any changes in the egg shells from beakers **A** and **B**.

A .....

.....

B .....

..... [4]

(ii) Explain any differences observed between the egg shell from beaker **A** and the egg shell from beaker **B**.

.....

.....

..... [2]

(iii) Draw a conclusion from the observations made.

.....

.....

..... [2]

(iv) Suggest a substitute for toothpaste.

..... [1]

2 **(a)** You are required to investigate the distribution of stomata on leaves.
You are provided with hot water and two fresh leaves, **A** and **B**.
Dip leaf **A** into hot water in a beaker.
Observe the upper and lower surface of the leaf while it is still dipped in water.

(i) Record and explain the observations made for the upper surface and lower surface of the leaf.

observation .....

.....

explanation .....

..... [2]

(ii) Explain the significance of the observation in **(a)(i)** to a plant.

.....

..... [2]

(b) **(i)** Draw a labelled diagram of leaf **B**.

[6]

(ii) Measure and record the length of leaf **B** and the drawing of leaf **B**.

mm [1]

length of leaf **B** .....

length of drawing ..... mm [1]

(iii) Calculate the magnification of the drawing.

magnification ..... [2]

(iv) Design an experiment to test a leaf for starch.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(v) Suggest any **one** precaution taken when carrying out the experiment in **(b) (iv)**.

..... [1]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY

4025/3

PAPER 3 Practical Test

JUNE 2019 SESSION 1 hour 30 minutes

INSTRUCTIONS TO THE SUPERVISOR

Great care should be taken that any confidential information given does not reach the candidates either directly or indirectly.

Prior to the examination, the Supervisor should ensure that all apparatus provided for the candidate, as listed in these instructions, are in good working condition.

No access to the Question Paper is allowed before the examination Date and Time.

The Supervisor is **NOT** allowed to access the question paper before the examination **Date** and **Time**.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and safety goggles should be used where necessary.

The Supervisor should supply Supervisor's Results using an extra copy of the question paper clearly labelled with the centre number, marked "Supervisor's Results" and enclosed with the scripts.

Instructions to supervisor

Each candidate should be provided with:

- 1 x A5 sheet of manila
- 30 cm length of string
- mounted needle
- paper glue
- pair of scissors
- 2 egg shells of roughly equal size
- 1M hydrochloric acid in a container labelled **hydrochloric acid**
- two small beakers/containers or petri dishes that can hold 30 cm^3 of liquid labelled **A** and **B**
- dilute hydrochloric acid-toothpaste mixture labelled **acid-toothpaste mixture**

Any brand of white toothpaste is suitable

The mixture should be prepared before the examination as follow:

Squeeze out 3 cm^3 of toothpaste into a beaker and add 50 cm^3 distilled water. Mix thoroughly to produce a suspension. Neutralise dilute hydrochloric acid using the suspension. Use litmus paper to verify the pH.

NB: Adjust quantities depending on the number of candidates.

Each candidate should be provided with the following:

- 2 fresh dicotyledonous leaves from the same plant labelled **A** and **B** respectively.
- hot water in a beaker (about 90 ^{o}C)
- a pair of forceps

SUPERVISOR'S REPORT

The Supervisor or Teacher responsible for the subject is asked to answer the following questions.

The completed report must be returned to ZIMSEC enclosed together with the candidates' scripts.

1 Was any difficulty experienced in providing any necessary material?

Give brief particulars.

2 Did the candidates experience any difficulty during the course of the examination?

If so, give brief particulars. Reference should be made to:

(a) difficult arising from faulty specimens/material/apparatus,

(b) any information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

Signed (in block capitals) _____

Signature_____ **Date**_____

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS AND COMMENTS

JUNE 2019

4025/3

BIOLOGY

Question 1

(a) (i) humerus represented;
radius represented;
ulna represented;
muscles represented; [4]

(ii) labelling the following humerus;
ulna;
radius;
muscles; (A) names of
individual muscles; [4]

(iii) string does not contract or relax;
ligaments are not shown;
tendons are not shown;
hinge joint does not lock;
AVP [5 max 3]

Comment: Biological processes and structures can be represented by models. Analysis of the limitations of models is necessary.

(b) (i) A - bubbles produced;
egg shall corroded/eroded AW;

B - no bubbles produced;
egg shell not corroded/eroded AW; [4]

(ii) A - acid dissolves/corrodes egg shell;
B - toothpaste neutralizes acid preventing corrosion of the egg shell; [2]

(iii) acids cause tooth decay;
toothpaste neutralizes acid;
prevents tooth decay; [3 max 2]

Comment: Conclusion answers the aim of the investigation.

(iv) bicarbonate of soda/wood ash;

Question 2

Observation

(a) (i) more bubbles on the lower surface than upper surface;

Conclusion: More stomata on the lower surface than upper surface; [2]

(ii) (more) stomata on lower surface are in the shade/away from light source;
minimize water loss through stomata; [2]

(b) (i) Diagram

- use of continuous lines;
- diagram occupies more than half of the space;
- net venation, visible;
- petiole visible; [4 max 3]

Labels:
any three from: petiole;
midrib/vein;
lamina;
apex/edge; [4 max 3]

(ii) length of leaf in mm;
length of drawing in mm; [2]
® lengths with decimal places;

(iii) magnification = $\frac{actual\ length\ of\ drawing}{actual\ length\ of\ leaf}$;

= X value;

® answer with units or without X/times

Comment: Biological diagrams should have continuous lines, proportional and take up more than half of the given space. No shading is allowed. Measurements must be realistic with degree of accuracy depending on measuring instrument used. Magnification should be calculated using correct formula and has no units. Indicate magnification with an X or times sign before the numerical value.

(iv) boil the leaf in water for about three minutes;
boil the leaf in alcohol;
using a water bath;
dip the leaf in hot water;
spread the leaf on a white tile;
cover the leaf with iodine solution; [6 max 5]

(v) extinguish burner when boiling leaf in alcohol/use water bath to boil leaf in alcohol unless asked for;

Comment: When designing an experiment, justification of procedures is not necessary unless asked for.

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY

PAPER 1 Multiple Choice

4025/1

NOVEMBER 2019 SESSION

1 hour

Additional materials:
Multiple Choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score **one** mark. A mark will **not** be deducted for a wrong answer.

Any rough working should be done in this booklet.

1 Productivity in farming can be improved by

A cytology.
B ecology.
C biotechnology.
D microbiology.

2 Cytology is a branch of Biology which deals with

A modification of genes.
B cell structure and function.
C classification of animals.
D parts of the body and their function.

3 Ice protects aquatic life by

A allowing light to pass through.
B acting as a conductor of heat.
C insulating the water below.
D keeping predators out.

4 The sub units of genetic molecules are

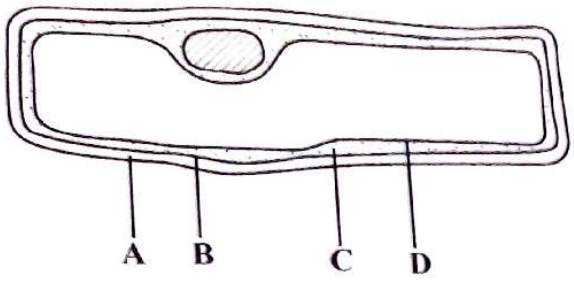
A amino acids.
B fatty acids.
C glucose.
D nucleotides.

5 The part of a eukaryotic cell that contains DNA is the

A cytoplasm.
B membrane.
C nucleus.
D vacuole.

6 The diagram shows a plant cell.

Which part, **A**, **B**, **C** or **D**, controls the turgidity of the cell?

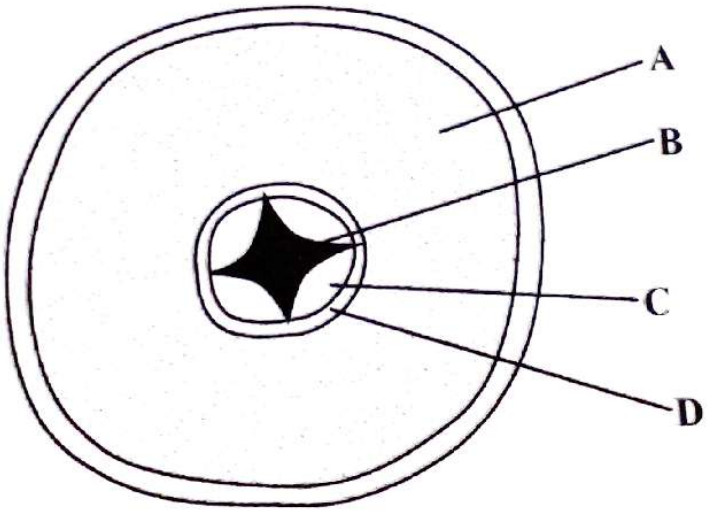


7. The sub units of sucrose are

A galactose and fructose.
B galactose and glucose.
C glucose and ribose.
D glucose and fructose.

8. The diagram shows a transverse section of a dicotyledonous root.

Which tissue, **A**, **B**, **C** or **D**, is the cortex?



9. In plants, carbohydrates are translocated in the form of

A maltose.
B glucose.
C fructose.
D sucrose.

10 Different sized pustules on plant organs are caused by

A bacterial wilt.
B fungal rust.
C sap-sucking pests.
D tissue-eating pests.

11 Which mineral element is deficient in plants showing poor flowering and fruiting?

A magnesium
B nitrogen
C phosphorus
D potassium

12. Which pair of factors reduces the rate of water loss in plants?

A low humidity and high wind speed
B high humidity and low temperature
C high temperature and high wind speed
D low humidity and high light intensity

13 Which one is an artificial method of vegetative propagation?

A cuttings
B rhizomes
C suckers
D tubers

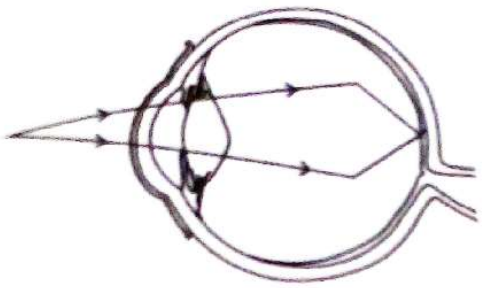
14 A characteristic of insect pollinated flowers is

A dull petals.
B feathery stigma.
C production of rough pollen grains.
D production of large amounts of pollen.

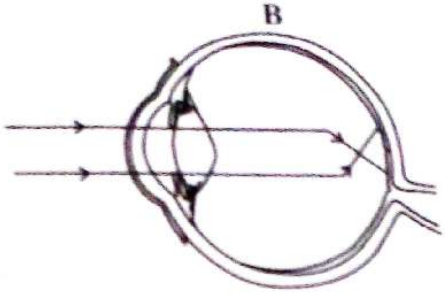
15 The diagrams show the accommodation of light in the eye.

Which diagram, **A**, **B**, **C** or **D**, shows how light from a near object falls on the back of the eye to form a clear image?

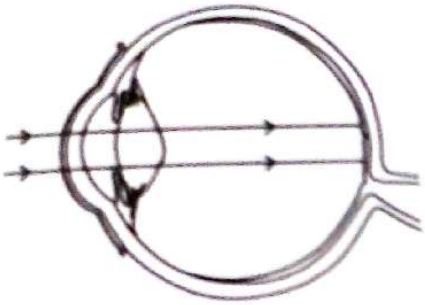
A



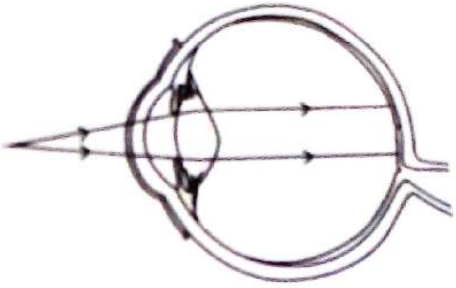
B



C



D



16 During inhalation,

A chest pressure increases.
B chest volume increases.
C the rib cage is lowered.
D the diaphragm relaxes.

17 Which animal parasite is controlled by dipping?

A tape worm
B round worm
C tick
D fluke

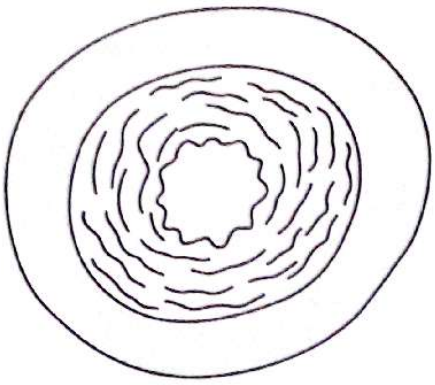
18 Which hormone is released when an animal is frightened?

A thyroxine
B insulin
C glucagon
D adrenaline

19 Which one is the site of anaerobic respiration in a living cell?

A chloroplast
B cytoplasm
C mitochondrion
D nucleus

20 The diagram shows the cross section of a mammalian vessel.



The vessel is

A a capillary.
B an artery.
C a vein.
D a lymph vessel.

21 What is the action of the extensor and flexor muscles when stretching the arm?

A extensor contracts and flexor contracts
B extensor relaxes and flexor relaxes
C extensor contracts and flexor relaxes
D extensor relaxes and flexor contracts

22 Which two bones form a ball and socket joint?

A femur and scapula
B humerus and scapula
C pelvis and humerus
D pelvis and tibia

23. Which bone is part of the hind limb of a mammal?

A femur
B humerus
C radius
D scapula

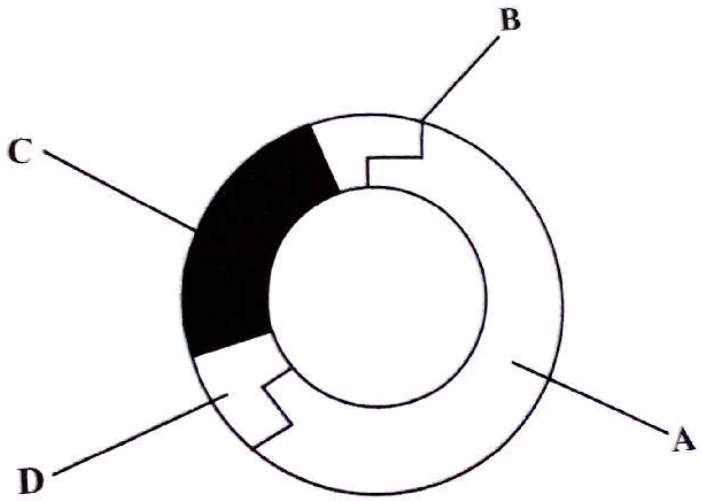
24 Immunity can be acquired by transmission of antibodies from mother to foetus.

This type of immunity is

A natural active.
B natural passive.
C artificial active.
D artificial passive.

25 The diagram shows recombinant DNA.

Which part, **A**, **B**, **C** or **D**, represents the vector?



26 Bacteria is used in the production of

A alcohol.
B bread.
C penicillin.
D yoghurt.

27 Viruses can be classified as living organisms because they

A excrete.
B feed.
C reproduce.
D respire.

28 The full set of genes in an organism is its

A genotype.
B genome.
C phenotype.
D alleles.

29 Which condition is a result of chromosomal mutation?

A albinism
B Down's syndrome
C haemophilia
D sickle cell anaemia

30 An allele is

A a section of DNA coding for a single characteristic.
B the set of genes in the nucleus of an individual.
C the external appearance of an organism.
D the alternative form of a gene.

31 In certain plants, red petals is dominant over white petals. When two heterozygous plants were crossed, 85 of the plants produced had white petals.

How many plants had red petals?

A 21
B 64
C 85
D 255

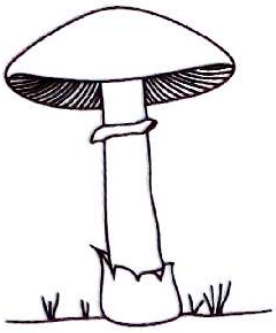
32 The allele which influences the appearance of the phenotype even in the presence of an alternative allele is

A dominant.
B heterozygous.
C homozygous.
D recessive.

33 Which one is a balanced ecosystem?

A orchard
B forest
C garden
D pond

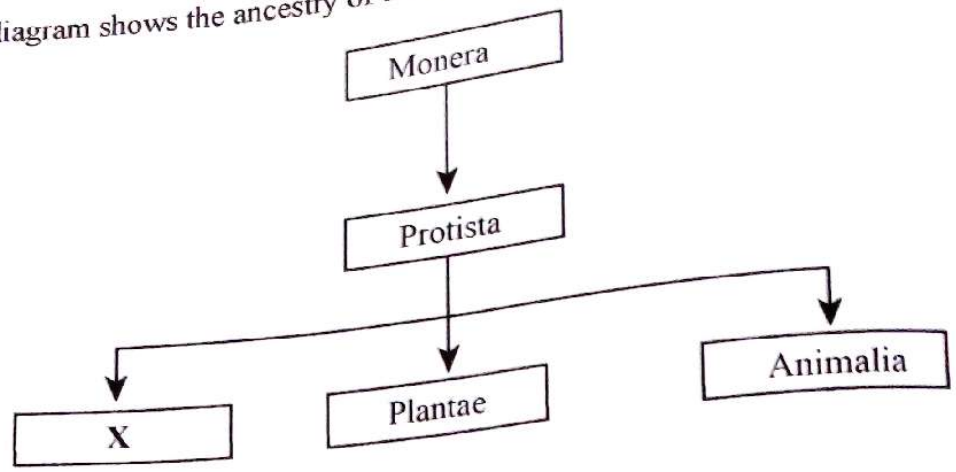
34 The diagram shows an organism.



The organism belongs to kingdom

A animalia.
B fungi
C plantae.
D protista.

35 The diagram shows the ancestry of the five kingdoms.



An example of an organism in kingdom **X** is

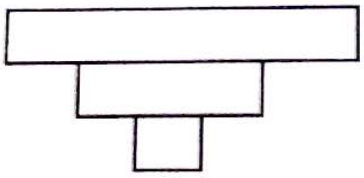
A *E. coli.*
B *Penicillium.*
C *Plasmodium.*
D *Vibrio cholerae.*

36 Three living organisms in an ecosystem are represented by the food chain:

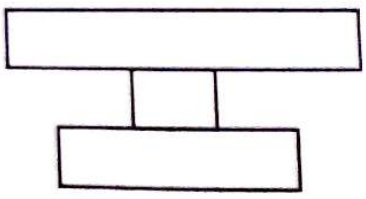
grass ⟶ caterpillars ⟶ birds

Which pyramid of biomass represents this food chain?

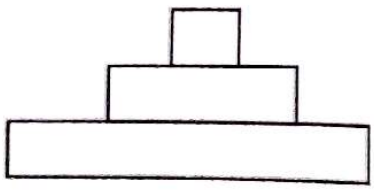
A



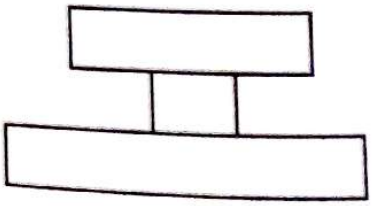
B



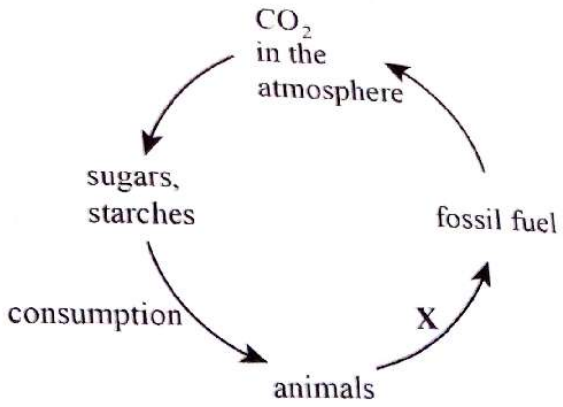
C



D



37 The diagram shows the carbon cycle.



What is process **X**?

A respiration
B transpiration
C decomposition
D digestion

38 Which disease is caused by a worm?

A bilharzia
B cholera
C syphilis
D typhoid

39 Which one is a short term effect of drinking alcohol?

A heart disease
B liver cirrhosis
C damaged blood vessels
D increased reaction time

40 Drugs used to treat bacterial illnesses are

A antibiotics.
B analgesics.
C prophylactics.
D diuretics.

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

BIOLOGY PAPER 1 (4025/1) NOVEMBER 2019

SUGGESTED ANSWERS AND COMMENTS

Question	Answer	Comment
1	C	Knowledge of branches of Biology and the benefits of biotechnology.
2	B	
3	C	Understanding of the anomalous density properties of water needed. Ice is less dense than liquid water.
4	D	Sub units of chemicals of life are proteins – amino acids, fats/lipids – fatty acids + glycerol, carbohydrates – monosaccharides.
5	C	In prokaryotic cells DNA is found in cytoplasm.
6	D	Water accumulates in vacuole causing the vacuolar membrane/tonoplasm to exert pressure on cell wall. Cell becomes turgid.
7	D	Other disaccharides are maltose formed from two glucose units and lactose formed from glucose and galactose.
8	A	Knowledge of the structure of the cross section of a dicotyledonous root.
9	D	Glucose made during photosynthesis is converted to sucrose for translocation.
10	B	
11	D	
12	B	Rate of transpiration reduced by high humidity, low temperatures, low wind speed and low light intensity.

13	A	
14	C	
15	A	The image is formed on the retina.
16	B	During inhalation, diaphragm flattens/contracts, intercostal muscles contract, pulling ribs upwards and outwards. The chest volume increases and pressure decreases. Air moves in, inflating the lungs.
17	C	Dipping controls external parasites and not internal parasite.
18	D	Thyroxine controls metabolism while insulin and glucagon control blood glucose levels.
19	B	Anaerobic respiration takes place in cytoplasm while aerobic respiration occurs in mitochondria.
20	B	Artery is identified by thick muscular wall and small lumen while vein is identified by thin walls and a large lumen.
21	C	In the arm, the flexor is the biceps and extensor is the triceps and their action is antagonistic.
22	B	
23	A	
24	B	
25	A	A, the plasmid, is the vector, B and D are the sticky ends and C is the inserted gene. The inserted gene is always smaller than the vector.
26	D	Alcohol, bread and penicillin are produced by fungi.
27	C	Reproduction is the only characteristic of living organisms exhibited by viruses.
28	B	
29	B	
30	D	
31	D	Use genetic diagram to get the phenotypic ratio which is 3 red as to 1 white, and then multiply 3 by 85 which is equal to 255.
32	A	
33	B	Natural ecosystem is balanced.

34	B	The diagram shows a mushroom which is a fungus.
35	B	X belongs to Kingdom Fungi and the example in the list is *Penicillium*.
36	C	The biomass decreases as you move up a pyramid of biomass.
37	C	
38	A	
39	D	
40	A	

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY

PAPER 2 Theory Structured

4025/2

NOVEMBER 2019 SESSION

2 hours

Candidates answer on the question paper.

Additional materials:

Electronic calculator
Pencil (type HB is recommended)

Allow candidates 5 minutes to count pages before the examination.

TIME: 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page and your centre number and candidate number on the top right hand corner of every page of this paper.

Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **four** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The intended number of marks is given in brackets [ ] at the end of each question or part question.

[Turn over

Section A

Answer **all** questions in this section

1. **(a)** **(i)** **Fig. 1.1** illustrates the lock and key hypothesis of enzyme activity.

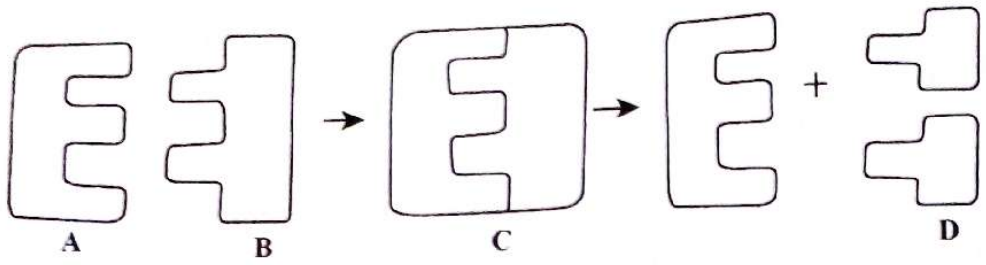


Fig. 1.1

Identify, with a reason, **C** and **D**.

C.....

reason.....

D.....

reason.....

[4]

(ii) State the type of reaction shown.

.....

.....

[1]

(iii) Suggest the property of enzymes that allows formation of **C**.

.....

[1]

(iv) Explain why enzymes are efficient in small quantities.

.....

[1]

(b) (i) Write a word equation for the digestion of fats.

[2]

(ii) State any **one** reagent used when testing for fats.

.....

[1]

[Total: 10]

2. (a) Define the term *geotropism*.

.....

.....

[2]

(b) Describe the effect of gravity stimuli to a horizontal

(i) root of a plant,

.....

.....

.....

.....

[3]

(ii) shoot of a plant.

.....

.....

.....

[2]

(c) Explain the importance of geotropism to plants.

.....

.....

.....

.....

.....

[3]

[Total: 10]

3. (a) **Fig. 3.1** shows the structure of a human ovum.

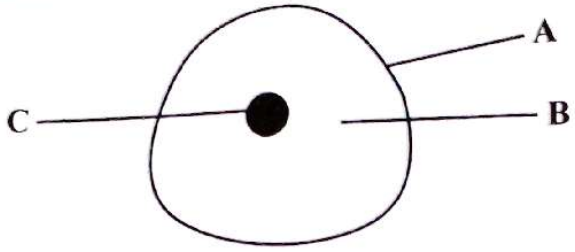


Fig. 3.1

Identify parts **A**, **B** and **C**.

A .....

B .....

C .....

[3]

(b) Relate the structure of an ovum to its function.

.....

.....

.....

.....

[4]

(c) State any **three** differences between an ovum and a palisade cell.

.....

.....

.....

.....

[3]

[Total: 10]

4. (a) (i) Name the causative agent of bilharzia.

.....

[1]

(ii) State the mode of transmission of bilharzia.

.....

[1]

(b) Describe the signs and symptoms of bilharzia.

.....

.....

.....

.....

[4]

(c) Outline measures taken to reduce the spread of bilharzia.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4]

[Total: 10]

5. **(a)** **(i)** **Fig. 5.1(a)** and **Fig. 5.1(b)** show the structure of a virus and a bacterium respectively.

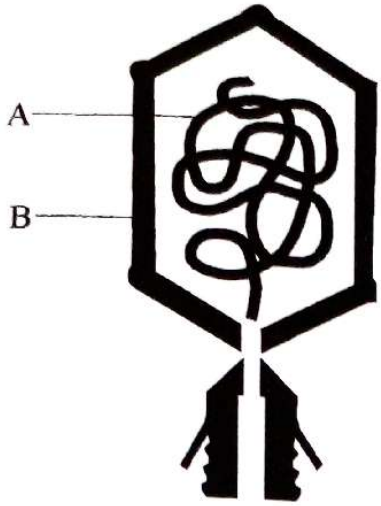


Fig. 5.1(a)

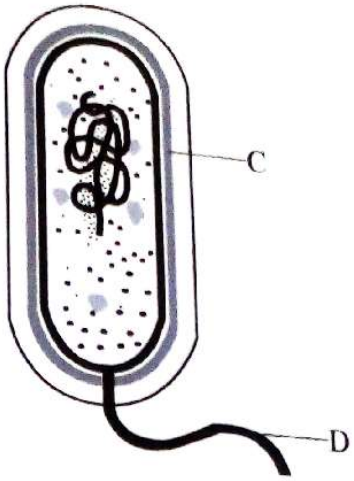


Fig. 5.1(b)

Identify parts A, B, C and D.

A .....

B .....

C .....

D .....

[4]

(ii) Name the major chemical constituent of part C.

.....

[1]

(iii) Give a function for part D.

.....

[1]

(b) Explain why viruses **do not** belong to any kingdom.

.....

.....

.....

.....

.....

[4]

[Total: 10]

(a) **(i)** **Fig. 6.1** is a drawing of an organism found in the soil.

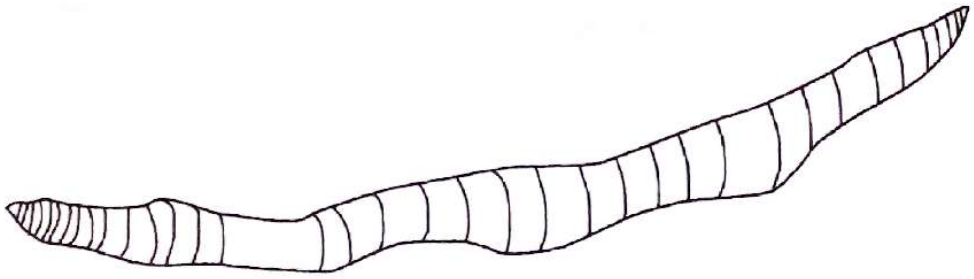


Fig. 6.1

Identify the organism.

.....

[1]

(ii) State any **three** roles of the organism in the soil.

1.....

2.....

3.....

[3]

(iii) State any **two** other biological components of soil.

1.....

2.....

[2]

(b) Suggest solutions to soil erosion at an abandoned mine site

.....

.....

.....

.....

.....

[Total

Section B

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

7. **(a)** Describe the differences between plant cells and animal cells.

.....

.....

.....

.....

.....

.....

[4]

(b) Relate the structure of the sperm cell to its function.

.....

.....

.....

.....

.....

.....

.....

.....

[6]

[Total: 10]

8. **(a)** Describe the importance of vegetative propagation to a market gardener.

.....

.....

.....

.....

.....

.....

.....

.....

[6]

(b) Explain the economic importance of plants to humans.

.....

.....

.....

.....

.....

.....

[4]

[Total: 10]

9. **(a)** Outline the functions of the liver.

.....

.....

.....

.....

.....

.....

.....

.....

[6]

(b) Explain the effect of blockage of the bile duct on lipid digestion.

.....

.....

.....

.....

.....

.....

[4]

[Total: 10]

10. (a) Describe how insulin is produced by recombinant DNA technology.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6]

(b) Explain the benefits of recombinant DNA technology.

.....

.....

.....

.....

.....

.....

[4]

[Total: 10]

11. **(a)** Differentiate, using named examples, between continuous variation and discontinuous variation.

.....

.....

.....

.....

.....

.....

.....

.....

[6]

(b) Explain how variation leads to natural selection.

.....

.....

.....

.....

.....

.....

[4]

[Total: 10]

12. (a) Describe the role of micro organisms in the nitrogen cycle.

.....

.....

.....

.....

.....

.....

.....

.....

[6]

(b) Compare natural ecosystems and artificial ecosystems.

.....

.....

.....

.....

.....

.....

[4]

[Total: 10]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS AND COMMENTS

NOVEMBER 2019

BIOLOGY

4025/2

Abbreviations

(A)	-	accept
AW	-	alternative wording
AVP	-	accept any valid point
®	-	reject
+	-	the two points make one marking point together
vv	-	accept vice-versa
/	-	alternative marking point
.	-	marking point
( )	-	not necessary in answer even if omitted

1 **(a)** **(i)** C: Enzyme substrate complex; [1]
Reason: substrate fitted into A/enzyme; [1]

D: Products;
Reason: different from B/formed from breaking down of B; [1]

Comment: Identification of A as an enzyme is key to candidates being able to identify C and D.

(ii) Catabolic; (A) hydrolysis/lysis; [1]

Comment: Identification of B being broken down to two products labelled D.

(iii) (Substrate) specificity/shape of active site complementing to that of substrate; [1]

(iv) Can be reused/not used up during reaction/AW; [1]

(b) **(i)** Fats + lipase; → fatty acids + glycerol;
Or fats $\xrightarrow{\text{lipase}}$; fatty acids + glycerol; [2]
® second marking point if line instead of arrow is used.

(ii) Alcohol/water; (A) ethanol/methylated spirit; [1]

2 **(a)** growth response of a plant to gravity;
where roots grow downwards (in the direction of gravitational pull);
and shoots grow upwards against gravitational pull; [3 max 2]

Comments: Include effect of positive and negative geotropism in the definition
Alternatively including examples in definitions help in scoring
more marks

(b) **(i)** auxin accumulate at the upper side of the root/root tip.
upper side elongate/grows faster.
cause root to grow/curve downwards/towards gravity.
(root is) positively geotropic. [4 max 3]

(ii) auxin accumulate at the lower side (of shoot/tip).
lower side elongate/grows faster
cause shoot to grow upwards/against gravity.
(shoot is) negatively geotropic. [4 max 2]

Comment: Roots are positively geotropic and shoots are negative geotropic. Auxins cause cell elongation on the side they accumulate

(c) cause roots to grow downwards into soil,
to anchor plants,
ensure roots are in contact with water/mineral salts,
enabling roots to absorb water/mineral salts,
necessary for photosynthesis/plant growth,
ensures shoots grow upwards,
towards light. [7 max 3]

Comments: Candidates to explain importance of positive and negative geotropism.

3 **(a)** A - cell membrane;
B - cytoplasm;
C - nucleus; [3]

Comment: An ovum is an animal cell

(b) large in size/more cytoplasm;
to accommodate sperm nucleus/store more food AW;
haploid nucleus/23 chromosomes/half genetic material;
to maintain number of chromosomes after fertilization;
AVP [4]

Comment: Theoretical knowledge of linking structure and function required

(c) Ovum has no cell wall + palisade cell has cell wall;
Ovum is spherical/ovoid in shape + palisade cell is cylindrical/column shaped;
Ovum has small/temporary/no vacuole + palisade cell has large/permanent vacuole;
Ovum has no chloroplasts + palisade cell has chloroplasts;
Nucleus of ovum is at the centre + nucleus of palisade cell is peripheral;
Ovum nucleus is haploid + palisade cell nucleus is diploid;
Ovum specialized for fertilization/reproduction + palisade cell specialized for photosynthesis;
[7 max 3]

Comment: Full marks awarded for indicating both sides' characteristics. Typically a comparison of animal and plant cells;

4 (a) **(i)** *Schistosoma*/flat worm/blood fluke; [1]

(ii) Waterborne; [1]

(b) fever /high temperature;
vomiting;
abdominal pain;
body weakness/tiredness;
blood in urine/faeces;
liver/spleen enlargement;
AVP [6 max 4]

(c) awareness campaigns/education;
use treated water/avoid swimming/bath in rivers/dams;
early) treatment for infected people;
take prophylactic drugs;
eliminating water snails;
avoid urinating/defeacating in water bodies/AW;
AVP [6 max 4]

5 (a) **(i)** A – genetic material/DNA/RNA;
B – protein coat/capsid;;
C – cell wall; ® cellulose cell wall
D – flagellum; [4]

(ii) murein; (A) peptidoglycan [1]

(iii) locomotion/movement/propulsion; [1]

Comment: Knowledge that viral capsid is made of protein, bacterial cell wall is made of murein, fungal cell wall is made of chitin and plant cell is made of cellulose is a requirement.

(b) lack cellular structure/no organelles;
no metabolism/AW, (A) correct life process except reproduction
only replicate/AW inside host cells/AW;
made of only two molecules/protein and nucleic acids;
can be crystalised; [5 max 4]

6 **(a)** **(i)** earthworm/*Lumbricus terrestris*; [1]

(ii) increases soil fertility AW;
controls pH of the soil;
improve soils aeration;
improve soils crumb structure;
improve soils drainage; [5 max 3]

(iii) litter/humus/organic matter;
micro organisms/bacteria/fungi;
living plants/roots
small animals; (A) termites/ants/correct examples
® earthworms;

(b) afforestation;
gulley reclamation;
bio remediation/detoxification of the soil;
add lime to soil/humus to the soil to improve soil crumb structure;

Comment: Methods of soil conservation applicable in answering question.

7 **(a)**

Plant cell	Animal cell
- cellulose cell wall present	+ lacks cellulose cell wall;
- large permanent vacuole;	+ small temporary vacuole;
- presence of chloroplast	+ absence of chloroplast;
- regular shape	+ irregular shape;
- peripheral nucleus	+ central nucleus;
- store starch	+ store glycogen;

[6 max 4]

(b) acrosome,
to breakdown AW cell membrane of ovum/penetrate ovum;
haploid nucleus/23 chromosomes/half genetic material;
maintain number of chromosomes after fertilization;
presence of numerous mitochondria (in middle portion);
produce energy required for swimming/movement;
presence of flagellum;
for swimming/movement;
small in size;
for faster movement; [10 max 6]

Comment: Detailed structure of a sperm is required.

8 **(a)** no genetic variation/crops are all similar;
desirable characteristics maintained; (A) correct example
therefore more attractive to customers;
plants grow quickly/rapid colonization of new areas;
more yield;
to meet market demands; [6]
AVP

Comment: Knowledge of the advantages of vegetative propagation required

(b) source of food;
provide oxygen;
provide medicines
source of fuel/energy; (A) firewood/charcoal
source of raw materials; (A) timber/rubber/gum/cotton
source of income/employment; [6 max 4]

Comment: Critical thinking skills are necessary.

9 **(a)** production of bile from the breakdown of haemoglobin;
deamination of excess amino acids to produce carbohydrates;
storage of glycogen/iron/vitamin A/D;
production of urea;
synthesis of plasma proteins;
generation of body heat;
detoxification/breakdown alcohol; [8 max 6]
removes fats/cholesterol from blood;

(b) bile no longer reaches duodenum;
no emulsification of fats/AW;
acid from stomach not neutralized/pH unsuitable for enzyme;
slow lipid digestion by enzyme lipase; [4]

Comment: Application of the knowledge of the function of bile in emulsification and raising the pH required.

10 **(a)** DNA with insulin gene obtained from pancreas/donor;
restriction enzyme used to cut DNA to separate insulin gene;
some restriction enzyme used to cut plasmid/vector;
plasmid and insulin gene joined by enzyme ligase;
to form recombinant DNA;
recombinant DNA placed in bacteria;
transformed bacteria cloned/multiplied;
transformed bacteria taken to industrial fermenters;
insulin extracted and purified; [9 max 6]

Comment: A basic outline showing main stages is required at 'O' level.

(b) production of medicines to treat disorders/diseases;
production of crops that have better qualities/characteristics; (A) named characteristics
improved yields;
ensure food security;
improved quality of life;
improved life expectancy;
AVP [6 max 4]

Comment: Knowledge of benefits of recombinant DNA technology required.

11 **(a)**

Continuous variation	**Discontinuous variation**
- e.g. height/mass in humans (A) correct e.g.	+ blood groups in humans (A) correct e.g;
- no clear cut differences	+ distinct differences
- intermediate traits AW	+ no intermediate traits
- quantitative/measurable	+ qualitative/descriptive;
- influenced by genes and environment	+ influenced by genes only;
- normal distribution	+ random distribution;

[6]

(b) - variation is the difference between organisms of same species;
- can be phenotypic/genetic;
- organisms compete for resources; (A) named resource;
- allow struggle for existence to occur/survival of the fittest;
- well adapted organisms live and produce;
- their favourable traits are maintained;
- the weak/not adapted organisms die and fail to reproduce; [7 max 4]

Comment: Knowledge of how natural selection leads to evolution is helpful in answering question.

12 (a) nitrogen - fixing bacteria;
convert atmospheric nitrogen to nitrates;
denitrifying bacteria;
convert nitrates in the soil to nitrogen gas;
decomposers/ammonifying bacteria;
breakdown proteins/amino acids to ammonium compounds;
nitrifying bacteria;
convert ammonium compounds to nitrites;
and then nitrites to nitrates; [9 max 6]

(b)

Artificial ecosystem	**Natural ecosystem**
- influenced by man+	no human influence;
- low biodiversity +	higher biodiversity;
- organisms more susceptible to pests/diseases +	organisms less susceptible to pests/diseases;
- reduced recycling of nutrients +	higher recycling of nutrients;
- production meant for human consumption+	food/nutrient circulate in the ecosystem;
- less stable+	more stable;

[6 max 4]

AVP

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY

4025/3

PAPER 3 Practical Test

NOVEMBER 2019 SESSION

1 hour 30 minutes

Candidates answer on the question paper

Additional materials:

As listed in Instructions to Supervisors
Electronic calculator
Pencil (B or HB is recommended)
Soft clean eraser
Ruler (cm/mm)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Use a sharp pencil for your drawings.

Coloured pencils and crayons should **not** be used.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
1	
2	
TOTAL	

[Turn over

1. (a) You are required to investigate a property of water.

You are provided with two samples of water, **S1** and **S2**, at different temperatures.

1. Label two beakers **A** and **B**.
2. Measure the temperature of **S1** and record the temperature in **Table 1.1**.
3. Measure the mass of beaker **A** and record the mass in **Table 1.1**.
4. Measure 20 cm^3 of **S1** and place it into the beaker labelled **A**.
5. Measure the mass of **S1** and beaker **A** and record the mass in **Table 1.1**.

   Complete **Table 1.1** by calculating the mass of **S1**.
6. Repeat using **S2** and beaker **B**.

(i) **Table 1.1**

	S1	**S2**
temperature / ^{o}C		
mass of beaker and water/g		
mass of beaker/g		
mass of water /g		

[8]

(ii) Calculate the density of **S1** and **S2**.

S1

S2

[4]

(iii) Name the property of water investigated.

..... [1]

(iv) Explain how living organisms benefit from this property of water.

.....

.....

..... [3]

(b) Describe a method to demonstrate the capillary action of water.

.....

.....

.....

.....

..... [4]

[Total: 20]

2. **(a)** You are provided with two specimens, **A** and **B**, of plant reproductive organs. Examine the two specimens.

1. Cut specimen **A** longitudinally.
2. Examine the cut specimen **A** using a hand lens.
   Make a labelled drawing of specimen **A**.
3. Examine specimen **B** with hand lens.
   Make a labelled drawing of specimen **B**.

(i) Drawing of specimen **A**.

Drawing of specimen **B**.

[8]

(ii) State the type of reproduction by specimen **A** and specimen **B**.

A .....

B ..... [2]

(iii) Complete **Table 2.1** by stating the functions of any **two** labelled parts of each diagram.

Table 2.1

	name of part	**function**
specimen **A**	1	
	2	
specimen **B**	1	
	2	

[4]

(iv) Describe any **two** structural differences between specimen **A** and specimen **B**.

1 .....

2 ..... [2]

(v) State any **four** advantages of reproduction using specimen **B**

1 .....

2 .....

3 .....

4 ..... [4]

[Total: 20]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

BIOLOGY 4025/3

PAPER 3 Practical Test

NOVEMBER 2019 SESSION **1 hour 30 minutes**

INSTRUCTIONS TO SUPERVISORS

Great care should be taken that any confidential information given does not reach the candidates either directly or indirectly.

Prior to the examination, the Supervisor should ensure that all apparatus provided for the candidate as listed in these instructions, are in good working condition.

No access to the Question Paper is allowed before the examination Date and Time.

The Supervisor is NOT allowed to access the Question paper before the examination Date and Time.

On the day of the examination, the supervisor is asked to perform the experiment in questions 1 and to record the results on a spare copy of the question paper clearly labelled "Supervisor's Results", followed by the Centre Number. This must be enclosed with the scripts. Unless this is done, candidates may be unavoidably penalised.

In large centres where scripts are despatched in more than one envelope, a copy of the "Supervisor's Results" should be sent with the scripts for each group.

1. Each candidate should be provided with:

$50\ cm^3$ ice cold water at less than $4\ ^{\circ}C$ labelled **S1**
$50\ cm^3$ warm water at around $70 - 80\ ^{\circ}C$ labelled **S2**
Measuring cylinder/syringe to measure at least $20cm^3$
Thermometer $-10\ ^{\circ}C$ to $110\ ^{\circ}C$
Access to a balance
2 small beakers/containers to hold $20\ cm^3$ (petri dishes can serve the same purpose)

2. Each candidate should be provided with:

an insect pollinated flower labelled specimen **A**
runner grass rhizome with roots labelled specimen **B**
a scapel or blade
hand lens

This form must be completed and returned with the scripts.

REPORT ON THE BIOLOGY PRACTICAL EXAMINATION

1. Please submit details of the results obtained by the Supervisor for the specified questions on a spare copy of question paper clearly marked 'Supervisor's Results' and showing the Centre number.

2. The Supervisor is asked to give the following details using the space provided on page 6 where necessary.

   (a) Experiment results of the supervisor recorded on a spare copy of the question paper. It is to be clearly labelled "Supervisor's Results" with the centre number.

   (b) Any help given to a candidate.

   (c) Any general difficulties encountered in preparing the apparatus.

   (d) Any difficulties experienced by particular candidates. This should include reference to difficulties due to faulty apparatus or materials and accidental damage to apparatus or materials. Candidates should be identified by name and candidate number.

3. Other cases of hardship, such as disability or illness, should be reported to ZIMSEC **in the normal way**.

4. The Supervisor is asked to provide a plan of the work benches, giving details by candidate numbers of the places occupied by the candidates for each session. The plan should be enclosed with the question papers.

5. Declaration to be signed by the Supervisor

The preparation for this practical examination has been carried out so as to fully maintain the security of the examination.

Signed _____

Name (block capitals) _____

Centre number _____

Centre name _____

This form must be completed and returned with the scripts.

Report on any difficulties by candidates

Signature _____ Date _____

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS AND COMMENTS

NOVEMBER 2019

BIOLOGY 4025/3

Question 1

(a) **Comment:** Samples S1 and S2 were to be supplied on demand so that they maintain the temperature detailed in the instructions.

NB: Great innovation is required on the part of the supervisor to supply candidates with materials which can produce desired results.

	S1	S2
Temperature/°C	0 – 3;	70 – 80;
mass of beaker and water/g	mass recorded; greater than mass of beaker;	mass recorded; greater than mass of beaker;
mass of beaker/g	mass recorded;	mass recorded;
mass of water/g	difference of the two masses;	difference of the two masses;

Comment: Digital balances are more ideal for measuring mass as they give masses correct to one decimal place.

Mass of 20 cm^3 of S1 is expected to be less than that of 20 cm^3 of S2.

(ii) Working for S1

Density = $\frac{Mass}{Volume}$/correct substitution; c.f.e

= answer with units (g/cm^3)

® answer with no units

Working for S2

$Density_{=} \frac{Mass}{Volume}$/correct substitution; c.f.e.

= answer with units (g/cm^3);

® answer with no units [4]

(iii) freezing/density property,

(iv) freezing water/ice floats on the surfaces;
insulates liquid water below;
protecting organisms from freezing;
cold water near ice sinks/warm water rises to the top/ref to convection;
allow mixing of water;
to distribute nutrients/oxygen; [6 max 3]

(b)
- fill a beaker/container with (coloured)water;
- place a capillary tube in the water;
- mark the initial level of water;
- observe and mark the new level of water after a given time; [4]

Comment: Schools with no capillary tubes can use drinking straws or narrow glass tubes.

Question 2

Comment: For specimen A centres should provide flowers in which the stamens and carpels are easy to distinguish.

(a) (i) Drawings of specimen A:

continuous lines;
proportion;
reasonable size filling more than half of space; [3 max 2]

Any 2 correct labels from petals/sepals/stigma/style/ovary/anther/ filament/ovules;; [max 2]

Drawing of specimen B

Marking points same as for specimen A; [3 max 2]

Any 2 labels: nodes/roots/shoots;; [max 2]

(ii) A - sexual reproduction;
B - vegetative/asexual reproduction; [2]

(iii)

	Name of Part		Function
Specimen A	petals	+	attract insects;
	sepals	+	protect flower bud;
	stigma	+	receives pollen;
	style	+	holds/supports the stigma;
	ovary	+	produce ovules;
	ovules	+	female sex cells/fertilization;
	anther	+	produce pollen;
	filament	+	support anther; [max 2]
Specimen B	nodes	+	produce new roots/shoots;
	roots	+	absorb water/mineral salts;
	shoots	+	has leaves for photosynthesis; [max 2]

(iv) Any two observed differences related to labelled parts, size, colour and shape;;

(v) only one parent required;
maintains favourable characteristics;
faster growth/propagation;
greater chances of survival of offspring as they get food from parent plant; [4]