THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

033/1 **BIOLOGY PAPER 1**

Time : 3 Hours **ANSWERS** **Year : 1996**

Instructions

1. This paper consists of section A, B and C.
2. Answer **all** questions in section A and B and **one (1)** questions from section C.
3. Communication devices and any unauthorised materials are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).

(i) Which of the following cells has a strong contractile ability?

A. Muscle cell

B. Amoeba

C. Xylem vessel cell

D. Glandular cell

Answer: A. Muscle cell

Reason: Specialized for contraction using actin and myosin.

(ii) The operculum in fish serves as

A. an entrance for water

B. an exit for waste products

C. a protective device for the gills

D. a protective device for the eyes

Answer: C. a protective device for the gills

Reason: It covers and protects the gills.

(iii) Which of the following characteristics could not be used to distinguish monocotyledons from dicotyledons?

A. Pattern of veins on the leaves

B. The structure of the seeds

C. Size and arrangement of roots

D. The number of flowers

Answer: C. Size and arrangement of roots

Reason: Roots vary with environment, not classification.

(iv) The experimental set up shown in Fig.1 can be used to investigate the process of photosynthesis. If the experiment was left in the light for four (4) hours

A. leaf B would form starch

B. leaf A would form starch

C. both leaves A & B would form starch

D. none of the leaves would form starch

Answer: B. leaf A would form starch

Reason: Leaf B has sodium hydroxide absorbing CO_2, so only A can photosynthesize.

(v) During a vigorous exercise, the body temperature rises to above normal. This is because of the increased

A. rate of heart beat

B. rate of breathing

C. increased digestion

D. production of energy

Answer: D. production of energy

Reason: Energy production releases heat.

(vi) Which of the following mammalian blood vessels contains blood full of oxygen at low pressure?

A. Pulmonary artery

B. Pulmonary vein

C. Aorta

D. Vena cava

Answer: B. Pulmonary vein

Reason: It carries oxygenated blood from lungs to heart at low pressure.

(vii) If clay is added to a sandy soil, which of the following will increase?

A. Permeability to water

B. Aeration

C. Water holding capacity

D. Bacterial activity

Answer: C. Water holding capacity

Reason: Clay retains more water.

(viii) Myopia (nearsightedness) is a condition

A. which can be corrected by using a concave lens in front of the eyes

B. which can be corrected by using a convex lens in front of the eyes

C. caused by irregularly shaped cornea

D. caused by light rays converging behind the retina

Answer: A. which can be corrected by using a concave lens in front of the eyes

Reason: A concave lens diverges light rays so they focus properly on the retina.

(ix) In a certain variety of beans, yellow colour is dominant to green. If a homozygous yellow plant is crossed with a green plant, the expected phenotypic ratios of the offspring would be

A. 75% yellow : 25% green

B. 75% green : 25% yellow

C. all green

D. all yellow

Answer: D. all yellow

Reason: Homozygous yellow (YY) crossed with green (yy) gives all Yy (yellow).

(x) The term used to describe the process whereby communities of living organisms in a location replace each other is known as

A. ecological pyramid

B. ecological succession

C. competition

D. food chain

Answer: B. ecological succession

Reason: It refers to gradual replacement of one community by another.

2. The following are matching items. Match the terms, statements or phrases in list A with those in list B by writing the correct letter of the term, statement or phrase in list B beside the corresponding item number in list A as shown in the worked out example.

List A

(i) detoxifies poisons

(ii) deficiency of vitamin C

(iii) complete oxidation of sugar

(iv) necessary for the clotting of blood

(v) shows in L.S. of a dicotyledonous stem

(vi) part of the excretory system of a female mammal

(vii) holds together joints

(viii) high concentrations of auxins

(ix) example of a false fruit

(x) correct order of development in a cockroach

List B

A. serum

B. fibrinogen

C. uterus

D. urethra

E. ligament

F. tendon

G. slows down root growth

H. encourages root growth

I. maize grain

J. pineapple

K. egg → nymph → pupa → adult

L. egg → nymph → adult

M. aerobic respiration

N. anaerobic respiration

O. bleeding gums

P. anaemia

Q. liver

R. spleen

Answers:

(i) Q, (ii) O, (iii) M, (iv) B, (v) I, (vi) C, (vii) E, (viii) H, (ix) J, (x) L

3. (a) Explain the functions of the following parts of a compound microscope (i) Stage (ii) Eyepiece.

(i) Stage: The stage holds the specimen slide firmly in position for viewing. It may have clips to prevent the slide from moving.

(ii) Eyepiece: The eyepiece magnifies the image formed by the objective lens, allowing the user to see the specimen clearly.

(b) Name four types of cells found in (i) a plant body (ii) an animal body.

(i) Plant body: Parenchyma cells, collenchyma cells, sclerenchyma cells, xylem/phloem cells.

(ii) Animal body: Muscle cells, nerve cells, epithelial cells, blood cells.

4. (a) Give two distinctive features of each of the following groups of organisms (i) Protozoa (ii) Fungi.

(i) Protozoa: They are unicellular eukaryotes, and most move using cilia, flagella, or pseudopodia.

(ii) Fungi: They lack chlorophyll and feed by saprophytic or parasitic nutrition, and their body is made up of threadlike hyphae forming mycelium.

(b) (i) Draw and label a Protozoan which has both plant and animal characteristics.

Example: *Euglena*. (It has chloroplasts for photosynthesis like plants, and a flagellum for movement like animals).

(ii) Give two distinguishing features of the class to which the organism you have drawn in (b)(i) belongs.

- Members have chlorophyll and can photosynthesize in sunlight.
- They can also feed heterotrophically in darkness, showing dual nutrition.

5. The graph (Fig.4) shows the rate of photosynthesis in a certain pondweed under different carbon dioxide concentrations and light intensities. Refer to the graph and answer the following questions:

(a)(i) Describe the effects of low and high light intensities on the rate of photosynthesis.
At low light intensity, the rate of photosynthesis remains low and increases slowly with increase in carbon dioxide concentration. At high light intensity, the rate of photosynthesis is much higher and increases steeply with increase in carbon dioxide concentration.

(ii) What would be the effect of increasing the carbon dioxide concentration above 0.12% at high light intensity?
The rate of photosynthesis would level off, showing no further increase because another factor becomes limiting.

(b) At low light intensity:
(i) What is the effect of increase of carbon dioxide?
The rate of photosynthesis increases slightly but remains low because light is the limiting factor.

(ii) What is the concentration of carbon dioxide at which the rate of photosynthesis is at its maximum? What can be said about light intensity at this point?

The maximum rate is at about 0.12% carbon dioxide concentration. At this point, high light intensity is no longer limiting and carbon dioxide is the main factor influencing the maximum rate.

6. (a) (i) Animal fat is a rich source of certain vitamins in the diet of human beings. Name two vitamins found in animal fat.

Vitamin A and Vitamin D.

(ii) Give one function and one deficiency disease in humans of each of the two vitamins you have mentioned in (a)(i).

Vitamin A: Function – maintains good vision, especially in dim light. Deficiency disease – night blindness.

Vitamin D: Function – helps in absorption and utilization of calcium for bone formation. Deficiency disease – rickets.

(b) (i) State one rich source of iron in the diet of humans, one function performed by iron and one disease caused by iron deficiency in the body.

Source – liver.

Function – formation of hemoglobin in red blood cells.

Deficiency disease – anemia.

(ii) Why do women normally require more iron than men?

Because they lose blood during menstruation and also need extra iron during pregnancy for the developing fetus.

7. The diagram below, Fig.5, shows a developing foetus inside the uterus of a mammal.

(a) (i) Name Q, R, S and T.

Q – Amniotic sac

R – Placenta

S – Umbilical cord

T – Uterine wall

(ii) Give two functions of T.

It provides protection and support to the developing foetus.

It supplies blood vessels that bring nutrients and oxygen to the placenta.

(b) What two materials pass along S

(i) From the mother to the foetus? Oxygen and nutrients (like glucose, amino acids).

(ii) From the foetus to the mother? Carbon dioxide and urea.

8. (a) A black rabbit homozygous for coat colour was crossed with a white rabbit of unknown genotype. The offspring were all black. By means of a diagram and symbols find the genotype of the parents and offspring.

Let black = B, white = b.

Parent genotypes: BB × bb.

Gametes: B, B × b, b.

Offspring: all Bb (black).

(b) (i) What is a sex-linked characteristic?

It is a trait whose gene is located on a sex chromosome, usually the X chromosome.

(ii) If coat colour in rabbits (0.8(a)) is a sex-linked characteristic, what would be the phenotypes and genotypes of offspring produced from a cross between a black male and a white female?

Black male (X^BY), white female (X^bX^b).

Offspring:

X^BX^b (black female), X^bY (white male).

So, 50% black females and 50% white males.

9. Briefly explain two roles of the skin of a human in

(a) Conserving heat.

Blood vessels constrict to reduce heat loss (vasoconstriction).

Hairs stand erect to trap air and reduce heat loss.

(b) Loosing heat.

Sweat glands produce sweat which evaporates, cooling the body.

Blood vessels dilate to increase heat loss (vasodilation).

10. Fig.6 below illustrates a feeding relationship in an ecosystem. The arrow → means "eaten by".

(a) (i) What name is given to the feeding relationship in Fig.6?

It is called a food web.

(ii) Which important group of organisms should be included in the diagram to make the ecosystem balanced?

Decomposers (e.g. bacteria and fungi).

(iii) Of what importance is the missing group named in (a)(ii) above, to the feeding relationship?

They break down dead organisms into nutrients that return to the soil, supporting plant growth.

(b) Giving reasons, identify one organism in Fig.6 which is

(i) A primary consumer – Grasshopper, because it feeds directly on grass.

(ii) A secondary consumer – Lizard, because it feeds on grasshoppers.

(iii) Both a prey and predator – Human, because it eats goat or hen but is preyed upon by vulture.

(iv) In the first trophic level – Grass, because it is a producer.

11. Write an essay on EITHER Dysentery OR Typhoid using the following outline: (i) cause (ii) transmission (iii) symptoms (iv) prevention (v) treatment

Dysentery is caused by infection of the intestines either by bacteria such as *Shigella* or by amoeba such as *Entamoeba histolytica*. The organisms damage the lining of the intestine and lead to irritation and inflammation.

Transmission of dysentery occurs mainly through consumption of contaminated water or food. Flies also play a role by transferring the pathogens from fecal matter to uncovered food. Poor sanitation and lack of personal hygiene increase the risk of spread.

The major symptoms of dysentery include frequent passing of watery stools mixed with blood and mucus. The patient may also experience abdominal pain, fever, and dehydration. In severe cases, weakness and loss of body weight may occur.

Prevention of dysentery involves proper sanitation and hygiene. People should use clean toilets and wash their hands after visiting the toilet. Drinking boiled or treated water, covering food, and controlling flies are also important preventive measures.

Treatment of dysentery depends on the cause. Amoebic dysentery is treated using anti-amoebic drugs such as metronidazole, while bacterial dysentery requires antibiotics. Oral rehydration salts are used to replace lost fluids and prevent dehydration. In severe cases, intravenous fluids may be necessary.

12. Discuss the various ways by which sandy soils can be made suitable for crop production.

Sandy soils can be improved by adding organic manure. Organic matter increases the ability of sandy soil to hold water and nutrients, which are otherwise lost quickly due to high drainage. This makes the soil more fertile and supportive for crops.

Irrigation is another way to make sandy soils suitable for crop production. Since sandy soils dry out quickly, supplying water at regular intervals ensures that crops do not suffer from drought stress and can grow well.

Application of fertilizers is also important because sandy soils have low nutrient content. Fertilizers add essential minerals such as nitrogen, phosphorus, and potassium that are required for healthy crop growth.

Mulching helps to reduce evaporation of water from the soil surface. By covering the sandy soil with plant residues or grass, moisture is conserved, and soil temperature is regulated, which benefits crops.

Crop rotation and intercropping can also improve sandy soils. Certain crops such as legumes add nitrogen to the soil, improving fertility and enabling the sandy soil to support higher yields in the following seasons.

13. (a) Draw a large and neat vertical section (V.S.) of a human heart. Label it fully and include all the major blood vessels associated with it.
(Diagram required: Human heart showing atria, ventricles, vena cava, pulmonary artery, pulmonary veins, and aorta).

(b) Using arrows indicate on your diagram the path taken by the blood as it enters, passes through, and leaves the heart. Blood enters through the vena cava into the right atrium, moves into the right ventricle, and is pumped to the lungs through the pulmonary artery. From the lungs, oxygenated blood returns via pulmonary veins into the left atrium, then into the left ventricle, and is pumped out to the body through the aorta.

(c) Blood entering the heart differs from that leaving it. Blood entering from the vena cava is deoxygenated and rich in carbon dioxide, while blood leaving through the aorta is oxygenated and rich in nutrients.

(d) Animals cannot survive without blood because blood transports oxygen and nutrients to tissues and removes waste products. Blood also distributes hormones, regulates body temperature, and provides immunity against diseases. Without blood, essential life processes would stop, leading to death.

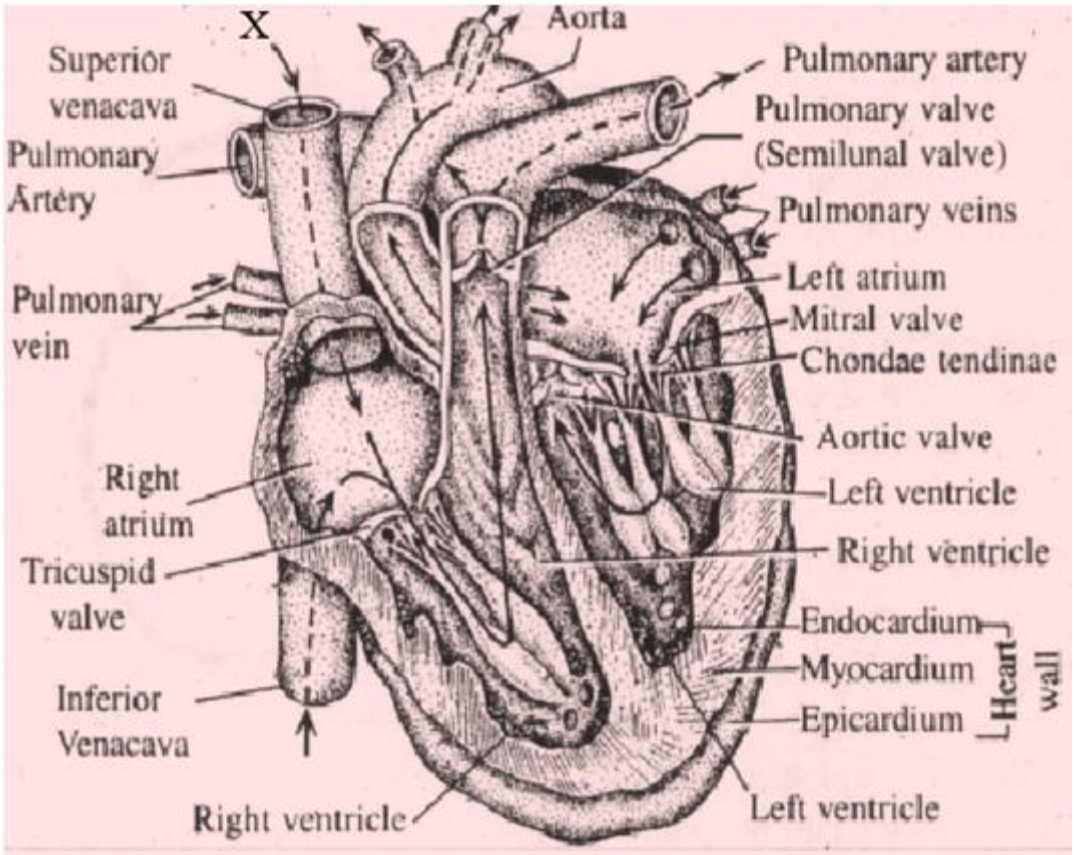

Fig: Diagram of longitudinal section of human heart