

This paper is in two sections: A and B. Answer Question 1 in Section A and any other three questions in Section B.

Answer all the questions in your answer booklet.

Credit will be given for clarity of expression and orderly presentation of material.

SECTION A
[40 marks]

Answer all the questions in this section

1. (a) Fig. 1(a) is an illustration of the longitudinal section of the mammalian heart. Study it carefully and answer the questions that follow.

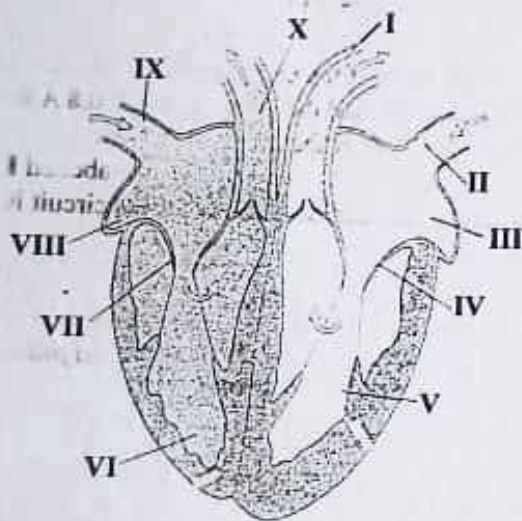


Fig. 1(a)

- (i) State **one** function for **each** of the parts labelled I, II, IX and X. [4 marks]
 - (ii) Explain **briefly** why the left lower part of the heart has a thicker muscle. [2 marks]
 - (iii) State **two** ways by which the flow of blood to and from the mammalian heart as shown in Fig. 1(a) can be kept at acceptable levels. [2 marks]
 - (iv) Name **two** parts of the heart where oxygenated blood can be found. [2 marks]
- (b) Fig. 1(b) is an illustration of three sets of plant parts labelled P (maize grains), Q (tomato seedlings) and R (cassava cutting). Study it carefully and answer the questions that follow.

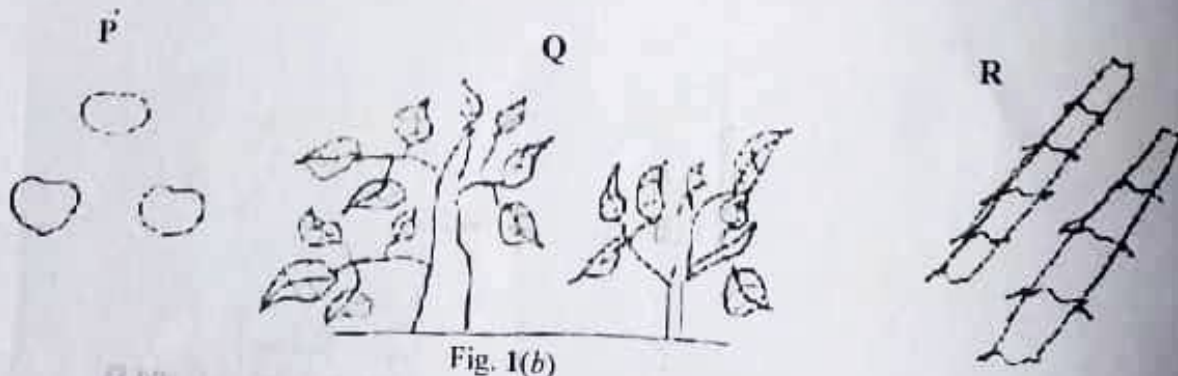


Fig. 1(b)

- (i) Describe **briefly** how **each** of the parts labelled P, Q and R are planted on seedbed. [6 marks]
- (ii) State **four** conditions under which R can be cultivated to produce high yield.

- (c) Fig. 1(c) is an electric circuit diagram. Study it carefully and answer the questions that follow.

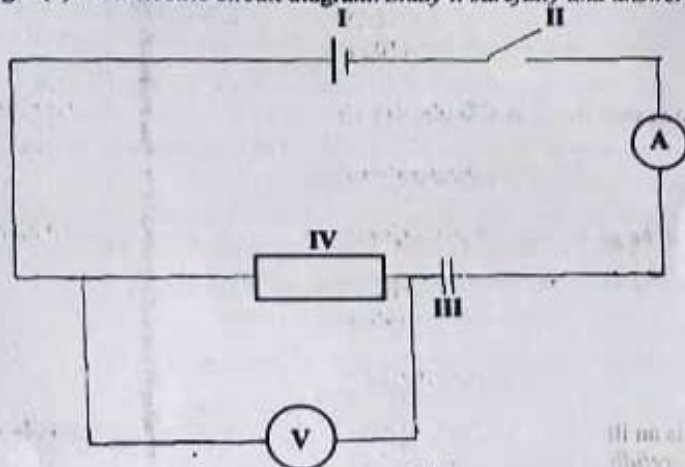


Fig. 1(c)

- (i) State one function for each of the parts labelled I, II, III and IV. [4 marks]
- (ii) If the voltmeter reads 2.4 V and the ammeter reads 0.8 A when the circuit is closed, calculate the value of the part labelled IV. [3 marks]
- (iii) State one way of conserving the value of the part labelled I in the circuit. [1 mark]
- (iv) State two observations that can be made when the circuit is closed. [2 marks]

- (d) Fig. 1(d) illustrates an experiment performed to separate the components of a mixture. Study it carefully and answer the questions that follow.

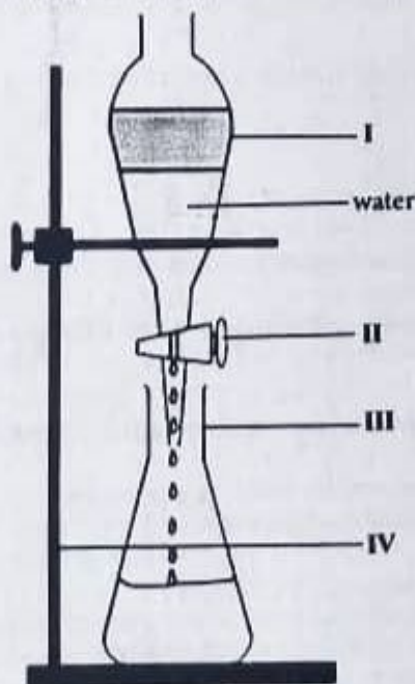
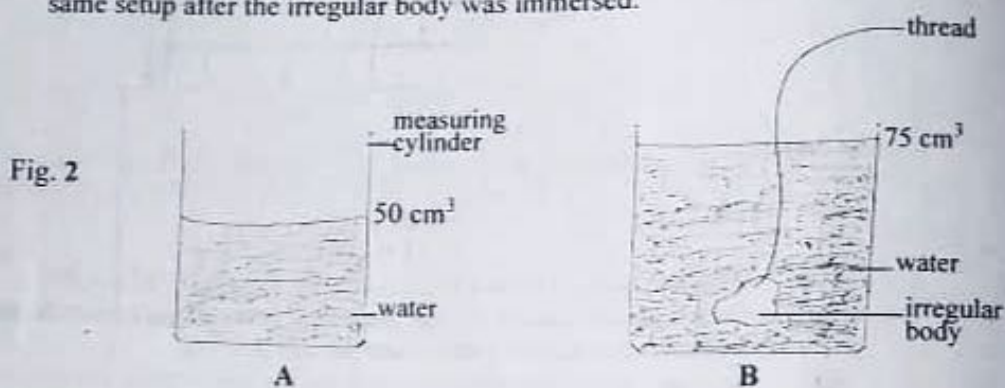


Fig. 1(d)

- (i) Describe briefly the process of this experiment. [6 marks]
- (ii) State one function for each of the parts labelled II and IV. [2 marks]
- (iii) State two precautions that should be taken to obtain reliable results when performing this experiment. [2 marks]

Answer three questions only from this section.

2. (a) (i) Given a flashlight, a tennis ball and a screen; draw a diagram to show how a shadow can be formed.
- (ii) A student seeking to determine the volume of an irregular body of mass 4 kg used a graduated cylinder in an experiment. Fig. 2 illustrates two key stages of the experiment where A indicates a setup before the irregular body was immersed and B indicates the same setup after the irregular body was immersed.



Determine the density of the irregular body.

- (iii) State **two** precautions that must be taken to obtain reliable results. [8 marks]
- (b) State **three** safety precautions to prevent accidents during the use of liquefied petroleum gas in the home. [3 marks]
- (c) Explain **briefly** the scientific principle underlying **each** of the following waste management practices:
- Composting;
 - Recycling;
 - Incineration.
- [6 marks]
- (d) The digestive system of two domestic animals were provided. One is that of a goat and the other is that of a rabbit. Outline **three** features that would help to differentiate between the two digestive systems. [3 marks]
3. (a) You have been given maize, cowpea, cassava and cabbage to cultivate on a piece of land using crop rotation system.
- Design a **4-year** rotational program using the given crops.
 - Give **two** reasons for the sequence given in 3(a)(i).
- (b) A student is suspected of having contracted COVID-19. [6 marks]
- Give **three** symptoms that the student may exhibit to confirm this suspicion.
 - Suggest **two** ways to prevent the spread of COVID-19 in the school.
 - Give **two** reasons why COVID-19 was declared as a pandemic.
- (c) The mass of a vehicle is 1000 kg and travels at 100 m s^{-1} . If the vehicle accelerates to 150 m s^{-1} in 10 s, calculate the: [7 marks]
- acceleration of the vehicle;
 - force that acts on the vehicle;
 - final momentum when the vehicle comes to a stop.

4. (a) A student who went to bed immediately after eating complained of stomach upset the next morning. A doctor prescribed a liver salt, whose major composition is NaHCO_3 , as the medication. Using a balanced chemical equation, explain how the liver salt would relieve the student from this discomfort. [4 marks]

- (b) Fig. 4 is an illustration of a body of mass 20 kg placed on top of a wall of height 10 m.

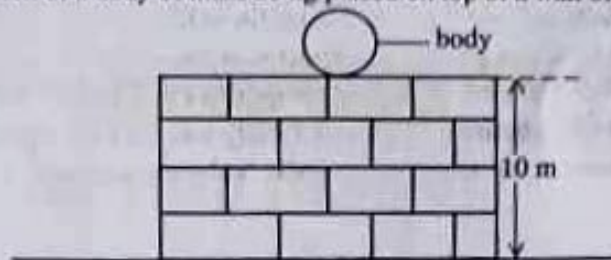


Fig. 4

Calculate the energy of the body.

[3 marks]

- (c) (i) Define the term *light emitting diode* (LED).
(ii) Mention **two** devices that use LED in their operation.

[4 marks]

- (d) A student was tasked to prepare a raised nursery bed for nursing tomato seeds:
(i) Suggest **two** simple tools that could be used in the nursery bed preparation;
(ii) State **one** function **each** of the tools listed in (d)(i).

[4 marks]

- (e) (i) State **three** observable features of an animal cell.
(ii) State **two** functions of a nerve cell.

[5 marks]

5. (a) Fig. 5 is an electrical circuit diagram. Study it and answer the questions that follow.

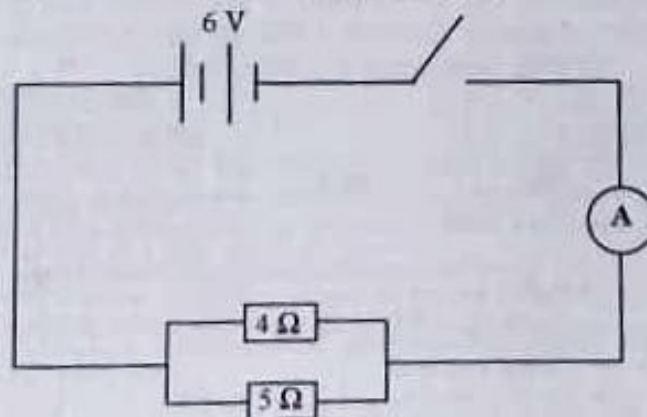


Fig. 5

Calculate the:

- (i) effective resistance in the circuit when it is closed;
(ii) current that will flow through the circuit when it is closed.

[6 marks]

- (b) (i) Differentiate between an *organic fertilizer* and an *inorganic fertilizer*.
(ii) Outline **briefly** the steps involved in preparing raised beds.

[4 marks]

- (c) (i) State **one** function **each** of the following components of blood:
(α) red blood cells;
(β) white blood cells;
(γ) blood plasma.
(ii) Explain **briefly** the impact of **each** of the following organisms on humans:
(α) housefly;
(β) grasshopper.

[7 marks]

- (d) Describe briefly the formation of an ammonia molecule after an interaction between H and N atoms. [3 marks]

END OF ESSAY TEST

Answer all the questions

Each question is followed by four options lettered A to D. Find the correct option for each question and shade in pencil on your answer sheet, the answer space which bears the same letter as the option you have chosen. Give only one answer to each question. An example is given below.

Which of the following substances is not an element?

- A. Aluminium
- B. Ammonia
- C. Oxygen
- D. Sodium

The correct answer is Ammonia, which is lettered B and therefore answer space B would be shaded.

A B C D

Think carefully before you shade the spaces; erase completely any answer you wish to change.

Do all rough work on this question paper.

Now answer the following questions.

1. A natural phenomenon that illustrates the dispersal of light is
 - A. an echo.
 - B. an eclipse.
 - C. a rainbow.
 - D. a rainfall.
2. Canned foods and drinks have expiry dates on them. The hazard involved in taking an expired drink is
 - A. food poisoning.
 - B. impaired hearing.
 - C. suffocation.
 - D. poor circulation of blood.
3. Which of the following sets of devices operate on the principle of magnetism?
 - A. Loudspeakers, compass, alarms
 - B. Loudspeakers, alarms, LCD TV
 - C. Compass, loudspeakers, LCD TV
 - D. Compass, alarms, LCD TV
4. A hunter experiences a backward force upon firing a gun. Which of the Newton's laws of motion is demonstrated in the situation?
 - A. First law
 - B. Second law
 - C. Law of inertia
 - D. Third law
5. A bowl of water on a gas stove was initially cold. It became warm after sometime. What was the mode of heat transfer in the water?
 - A. Conduction
 - B. Radiation
 - C. Convection
 - D. Emission

6. A livestock farmer wants to achieve good health for the animals being reared. Which of the following activities should be undertaken by the farmer?
- Have vaccination schedules for the animals
 - Provide balanced ration to the animals
 - Provide good sanitation for the animals
- A. I and II only
B. II and III only
C. I, II and III
D. I and III only
7. Grasshopper management is crucial because of all the following reasons **except**
- damage to crops.
 - incomplete metamorphosis.
 - livestock harm.
 - ecosystem disruption.
8. A student who complained of stomach upset was given first aid with $Mg(OH)_2$ boldly written on it. What could be the **common** name of the first aid the student was given?
- Milk of aluminium
 - Milk of magnesia
 - Martins liver salt
 - Trisilicate
9. An electric bulb is rated 0.5 A, 120 V. Determine the power produced when the bulb is turned on.
- 30 W
 - 60 W
 - 60 kW
 - 30 kW
10. The consequences of the greenhouse effect on humans include
- flooding of coastal cities,
 - desertification of fertile areas,
 - increased number of storms,
 - increased use of fossil fuels.
- A. I and II only
B. II and III only
C. I, II, III and IV
D. I, II and III only
11. The **simplest** way of making well water suitable for laundry is by
- adding chlorine.
 - filtering.
 - adding copper sulphate.
 - boiling.
12. Which of the following sources of energy is non-renewable?
- Coal
 - Solar
 - Wind
 - Uranium-236
- A. I, II and III only
B. II, III and IV only
C. II and III only
D. I and IV only

13. Oil from a mechanic workshop accidentally spilled into a pool of water which was breeding mosquitoes. After sometime, the pool of water was no longer breeding mosquitoes. Which control method may have been deployed?
- Biological control
 - Chemical control
 - Environmental control
 - Genetic control
14. The following devices work based on the principle of pressure in fluids **except**
- water pumps.
 - flutes.
 - siphons.
 - drinking straws.
15. Which of the following statements **best** describes the term *green economy*? It **includes**
- degrading the environment.
 - loss of biodiversity.
 - reduced ecological services.
 - reduced carbon emissions.
16. The energy transformation that occurs when sodium hydroxide is dissolved in water is
- heat to kinetic energy.
 - chemical to light energy.
 - heat to potential energy.
 - chemical to heat energy.
17. The **primary** purpose of respiration in man is to
- take in oxygen.
 - release carbon dioxide.
 - regulate body temperature.
- I and II only
 - I and III only
 - I, II and III
 - II and III only
18. A substance that could be used in large scale treatment of domestic water is
- Chlorine.
 - Hydrogen sulphide.
 - Nitrogen.
 - Carbon dioxide.
19. The following processes are chemical changes **except**
- rusting of iron.
 - burning of wood.
 - crumpling of paper.
 - mixing of an acid and a base.
20. Cockroaches in a cupboard were killed after an insecticide had been sprayed. The insecticide reached the cockroaches by the process of
- radiation.
 - absorption.
 - osmosis.
 - diffusion.
21. Chlorophyll helps plants absorb energy from the sun as they undergo the process of photosynthesis. It is located in a structure called
- nucleus.
 - mitochondrion.
 - chloroplast.

22. Which of the following natural cycles directly involves the sun?
- Carbon cycle
 - Water cycle
 - Nitrogen cycle
- I only
 - I and II only
 - I, II and III
 - II and III only
23. When a stick is dipped into a pool of water, it appears to
- bend towards the surface.
 - bend away from the surface.
 - be longer than its length.
 - be seen straight in the water.
24. The building block of a material with the smallest unit of matter that retains the properties of an element is
- an ion.
 - an atom.
 - a proton.
 - a molecule.
25. Digestion of rice in humans starts from the
- colon.
 - gullet.
 - stomach.
 - mouth
26. A mother took her child to the hospital and upon investigation, it was noticed that the child's diet was lacking in zinc. What could this result in?
- Decreased growth in the child
 - Anaemia and constipation
 - Inability of the body to fight infection
- I and II only
 - I and III only
 - I, II and III
 - II and III only
27. In making ornaments and jewellery, non-reactive metals are preferred because they
- are corrosive.
 - are attractive.
 - do not react with atmospheric oxygen.
 - do not retain their lustre.
28. A metallic laddle was left in a boiling soup. After sometime, the handle became hot. This is because the particles in the laddle
- circulate as a result of the temperature differences.
 - contain free electrons which are able to transfer heat energy.
 - undergo rapid, random motion.
 - are separated by large distances.

Which of the following elements has four electron shells?

- A. $_{19}K$
 B. $_{13}Al$
 C. $_{15}P$
 D. $_{5}B$

An electrical engineer was in your school to replace a 20 W bulb with a 50 W bulb.
 Use this information to answer questions 30 and 31.

The unit inscribed on the bulb measures its

- A. workdone.
 B. electricity.
 C. power.
 D. energy.

30. The 50 W bulb is likely to

- I. increase the brightness in the room.
 II. increase the amount of electricity consumed.
 III. destroy the habitat of pests.

- A. I and II only
 B. I and III only
 C. I, II and III
 D. II and III only

32. Two unknown solutions labelled A and B were brought to a JHS 3 class. It was observed that in solution A, red litmus paper changed colour to blue, while in solution B, red litmus paper retained its colour. What could be the content of solution A?

- A. Car battery fluid
 B. Salt solution
 C. Orange juice
 D. Baking soda

33. Which of the following nursery beds is suitable for a flood prone area?

- A. Flat bed
 B. Sunken bed
 C. Plain bed
 D. Raised bed

34. The portion of air which acts as a solvent is

- A. an inert gas.
 B. carbon (IV) oxide.
 C. oxygen.
 D. nitrogen.

35. Which of the following pairs of energy sources is environmentally friendly?

- A. Biogas and thermal energy
 B. Wind and biogas
 C. Coal and thermal energy
 D. Wind and coal

A poultry farmer observed that the layers were producing thin-shelled eggs.
Use this information to answer questions 36 and 37.

36. The defect identified is **mostly** caused by a deficiency in
- calcium.
 - phosphorus.
 - zinc.
 - magnesium.
37. What ingredient could be added to the feed to correct the defect?
- Oyster shell meal
 - Soya bean meal
 - Maize
 - Cowpea
38. A student is to measure 20 cm^3 of a sodium hydroxide solution. what instrument could be used?
- Hydrometer
 - Hygrometer
 - Measuring tape
 - Measuring cylinder
39. Which of the following electrical appliances can convert electrical energy to heat energy?
- Electric iron
 - Kettle
 - Water heater
- I and II only
 - I and III only
 - I, II and III
 - II and III only
40. Nitrogen deficiency in soils causes
- fruit drop.
 - yellowing of leaves.
 - poor seed formation.
 - purple colouration.

END OF PAPER