ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

COMBINED SCIENCE   4003/1
PAPER 1 Multiple Choice

JUNE 2020 SESSION   1 hour

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

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.

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.

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 provided.

Which one is a physical component of an ecosystem?

A air

B fungi

C humus

D bacteria

What is the function of the vacuole in a plant cell?

A stores salts and sugars

B controls the activities of the cell

C produces food by photosynthesis

D controls movement of substances in and out of the cell

The equation for anaerobic respiration in muscle cells is given below:

$$glucose \longrightarrow energy + Q$$
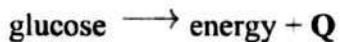
What is **Q**?

A carbon dioxide

B lactic acid

C alcohol

D water

4.   **The diagram shows part of teeth on the upper jaw of a human being.**
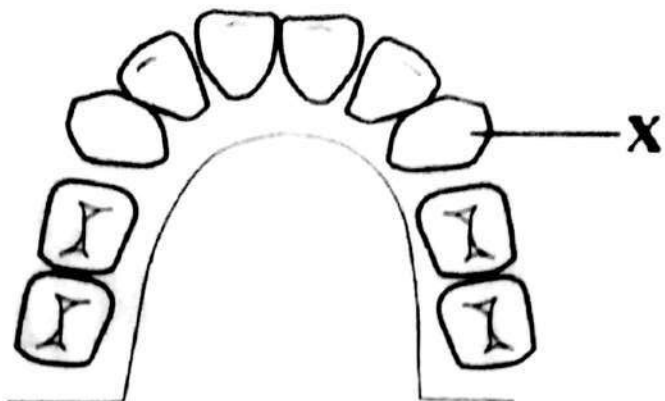
The tooth labelled **X** is

A   a molar.

B   a canine.

C   an incisor.

D   a premolar.

5.

The diagram shows a stage in the process of testing a leaf for starch.
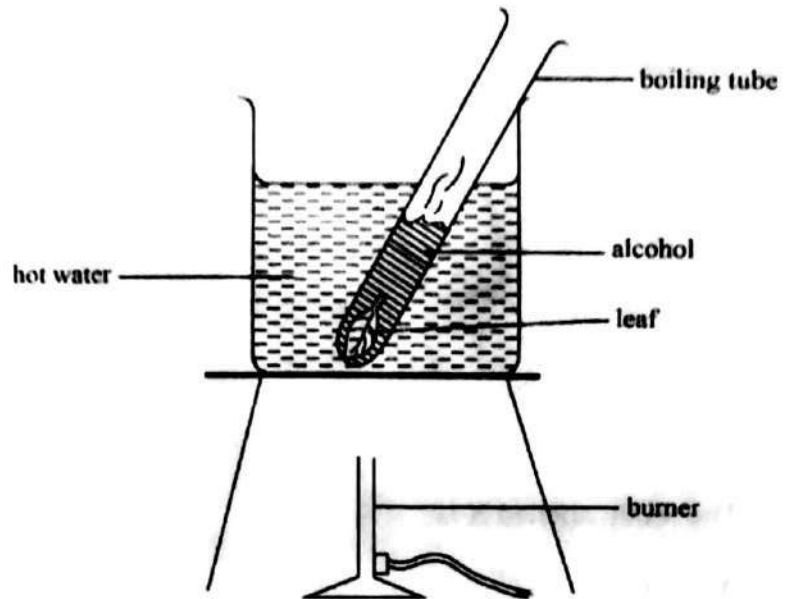
Why is the stage shown important?

A   to soften the leaf

B   to make the leaf brittle

C   to kill and open up the leaf cells

D   to remove chlorophyll from the leaf

6. An experiment on germination was carried out by planting 80 seeds and 50 seeds germinated.

What was **the percentage** germination?

A $\dfrac{30}{80} \times \dfrac{100}{1}$

B $\dfrac{50}{80} \times \dfrac{100}{1}$

C $\dfrac{30}{100} \times \dfrac{80}{1}$

D $\dfrac{50}{100} \times \dfrac{80}{1}$

7. Where does gaseous **exchange** occur?

A in the bronchiole

B in the bronchus

C in the trachea

D in the alveoli

8. Which one is **not** a function carried out by the blood?

A defence

B excretion

C transport

D homeostasis

[Turn over

9.   Why is transpiration good for a plant?

A   It helps the plant to take up water and mineral salts.

B   It helps to transport sugars around the plant.

C   It maintains a balance of starch.

D   It keeps the plant cells turgid.

10.   The diagram shows the double blood circulation system in humans.
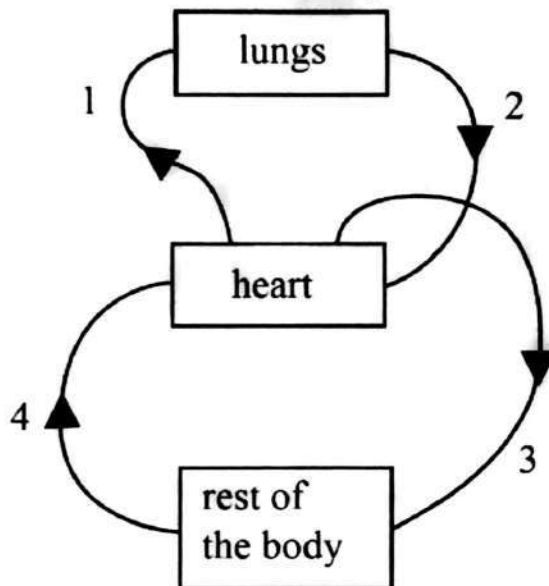
Which blood vessels are thick walled?

A   1 and 2

B   1 and 3

C   2 and 4

D   3 and 4

11.   The diagram shows the structure of a wind pollinated flower.

Which part produces pollen grains?
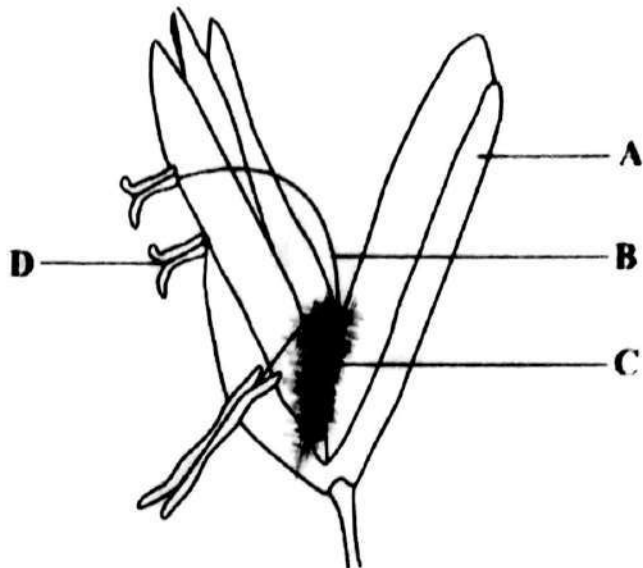
12.   The diagram shows the transfer of a substance between the placenta and the uterine wall in a pregnant woman.
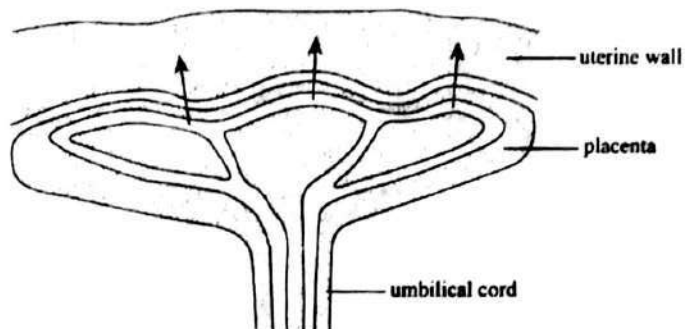
The substance carried in the direction of the arrows is

A   urea.

B   oxygen.

C   glucose.

D   an antibody.

[Turn over

13.   The diagram shows the life cycle of the anopheles mosquito.
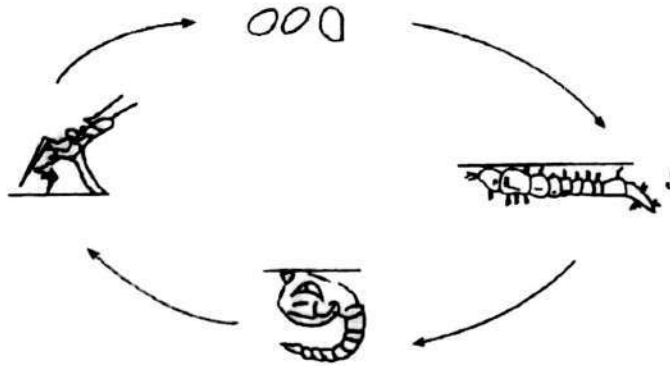
Which method can effectively control the mosquito at stage J?

A   spraying with insecticide

B   using mosquito repellents

C   covering water ponds with oil

D   cutting grass around the home

14.   Active immunity may be developed by

A   suffering and recovering from a disease.

B   breast feeding for at least six months.

C   avoiding contact with sick people.

D   being injected with antibodies.

15.   The Avogadro's number is the number of

A   particles in one mole of a substance.

B   protons in one mole of a substance.

C   electrons in one mole of a substance.

D   neutrons in one mole of a substance.

16. The two types of sub-atomic particles found in the nucleus are the

A   electron and proton.

B   electron and neutron

C   proton and neutron.

D   nucleon and electron.

17. The symbol $^{16}_{8}O$ represents an atom of oxygen

How many neutrons does the atom have?

A   8

B   10

C   18

D   26

18. What is the relative molecular mass of water(H_2O)?
[Ar of H is 1.   Ar of O is 16]

A   14

B   17

C   18

D   32

19.   The diagram shows the type of bonding in a compound, X Y
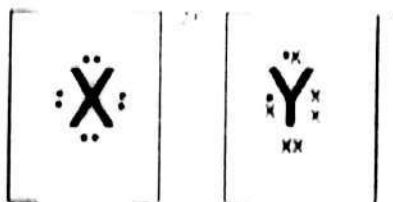
XY has

A   hydrogen bonding.

B   metallic bonding.

C   covalent bonding.

D   ionic bonding.

20.   Which product is formed when a metal reacts with air?

A   a salt

B   an oxide

C   a carbonate

D   a hydroxide

21.   The best method of separating a mixture of liquids of different boiling points is

A   filtration.

B   evaporation.

C   simple distillation.

D   fractional distillation.

22.   A solution has a pH of 6.
       The solution is a

       A   strong acid.

       B   weak acid.

       C   strong base.

       D   weak base.

23.   A neutralisation reaction occurs when

       A   a salt only is formed.

       B   water only is formed.

       C   oxidation only occurs.

       D   water and a salt are formed.

24.   The production of ammonia requires

       A   pressure of 200 atm to 300 atm.

       B   temperature of 200 °C to 250 °C.

       C   vanadium (V) oxide catalyst.

       D   sulphur dioxide and oxygen.

25.   What type of a reaction occurs when carbon monoxide reacts with iron (III) oxide?

       A   oxidation only

       B   reduction only

       C   decomposition only

       D   oxidation and reduction

26.   Which fuel is a hydrocarbon?

    A   hydrogen

    B   coal gas

    C   butane

    D   ethanol

27.   The diagram shows an organic molecule.
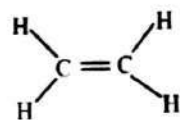
The molecule is

    A   ethane.

    B   ethene.

    C   ethanol.

    D   propene.

28.   A possible unit of density is

    A cm^3/g.

    B cm/g^3.

    C g/cm^3.

    D g^3/cm.

9. The diagram shows a simple machine

Which type of a simple machine is shown in the diagram?

A gear

B lever

C pulley

D inclined plane

10. An effort of 150 N raises a load of 600 N through a distance of 2 m. The effort moves a distance of 10 m.

What is the efficiency of the system?

A 20%

B 25%

C 75%

D 80%

11. Hydraulic systems are based on the fact that

A liquids cannot be compressed.

B liquids flow cannot be stopped.

C pressure in liquids increases with depth.

D liquids transmit equal forces in all directions.

[**Turn over**

32.   Convection takes place in

A   gases and solids.

B   gases and liquids.

C   liquids and solids.

D   gases, liquids and solids.

33.   What is the purpose of the curved surface of a solar cooker?

A   to absorb maximum energy from the sun

B   to focus energy from the sun to the pot

C   to reflect heat away from the pot

D   to absorb heat from the pot

34.   The diagram shows a carburettor.

Which part controls the amount of air that mixes with **petrol**?
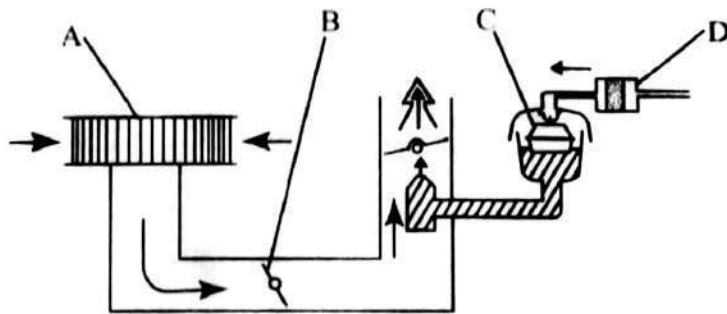
35.   Air, with a pressure of 400 Pa, acts on a wall of area 5 m^2.

What is the force exerted by the air?

A   80 N

B   395 N

C   405 N

D   2000 N

36. The energy change that happens to information before transmission in a cell phone is

A sound to light.

B light to sound.

C electrical to sound.

D sound to electrical.

37. An electrical appliance with double insulation does **not** have

A a neutral wire.

B an earth wire.

C a live wire.

D insulation.

38. Which material is used to make a core of an electromagnet?

A iron

B steel

C copper

D aluminium

[Turn over

39. The diagram shows an alternating current generator.

Which component allows current to change direction?
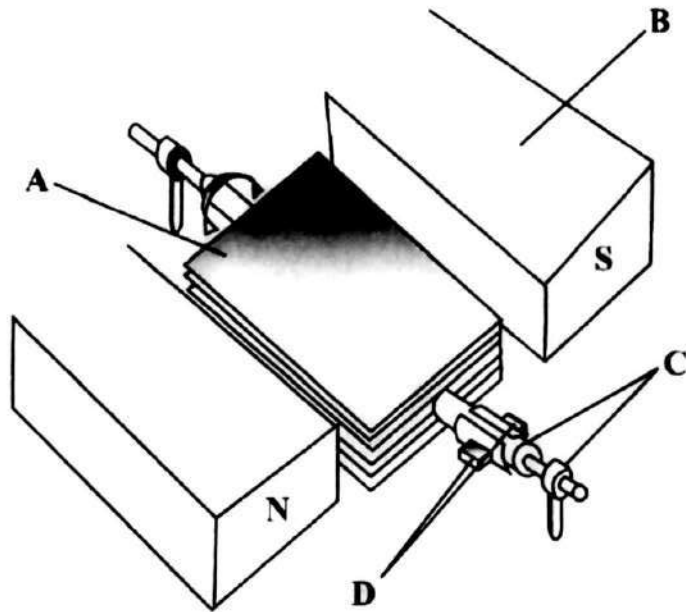
40. Which graph shows the relationship between voltage (V) and current (I) in a pure metal?
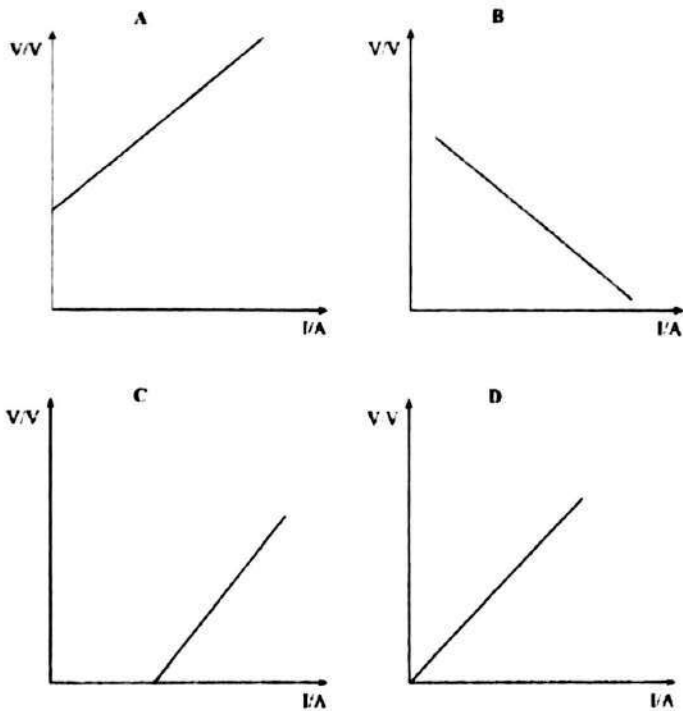
Surname	Forename(s)	Centre Number	Candidate Number

Candidates answer on the question paper

Additional materials: Calculator (Optional)

Allow candidates 5 minutes to count pages before the examination.

The Periodic Table is provided on page 16.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top.
Ask the invigilator for a replacement if there are missing pages.
Write your answers in the spaces provided on the question paper.

Section A
Answer **all** questions.

Section B
Answer any **two** questions.

Section C
Answer any **two** questions.

Section D
Answer any **two** questions.

FOR EXAMINER USE	
SECTION A	
B7	
B8	
B9	
C10	
C11	
C12	
D13	
D14	
D15	
TOTAL	

INFORMATION FOR CANDIDATES

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

Section A

*Answer **all** the questions in this section in the spaces provided.*

1. **(a)**   **Fig. 1.1** shows a human tooth.

Fig. 1.1

   (i)   Name the tooth shown.

   ....

   [1]

   ii)   State the function of the tooth.

   ....
   ....
   [1]

(b)   Explain the importance of mechanical digestion.

   ....
   ....
   ....
   [2]

(c)   State the end product(s) of the digestion of

   (i)   proteins,

   ....
   [1]

   (ii)   fats.

   1 ....
   2 ....
   [2]

2. **(a)** State any **one** natural method of contraception.

....
....
....
[1]

(b) Describe how the pill prevents pregnancy.

....
....
....
....
[3]

(c) State any **two** signs/symptoms of chancroid in males.

....
....
....
[2]

3. **Fig 3.1** shows the blast furnace used in the extraction of iron.
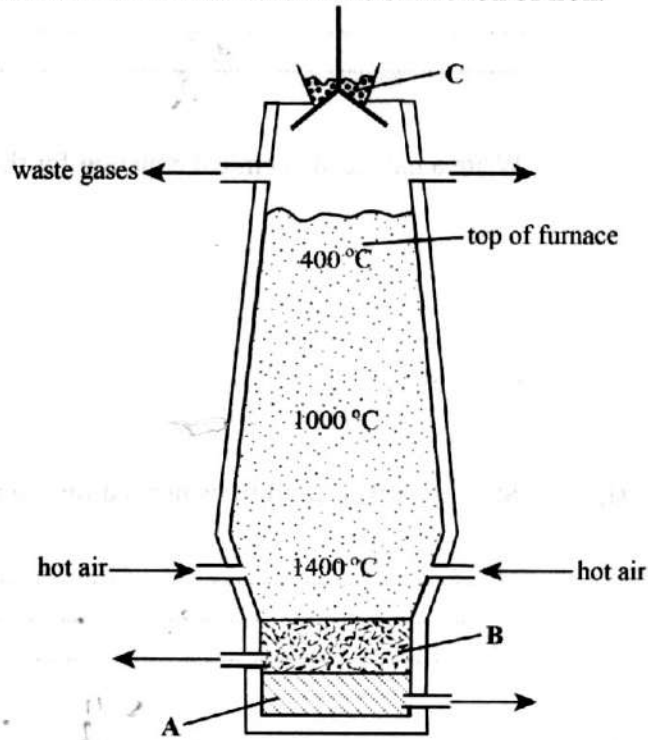
Fig 3.1

(a) **(i)** Identify substances **A** and **B.**

A ....

B ....
[2]

[Turn over

(ii) C is a mixture of three raw materials.

State any **one** raw material in the mixture.

.... [1]

(b) Describe the reaction which occurs near the top of the furnace.

....

....

....

.... [3]

4. Nitrogen gas and hydrogen gas react in a reversible reaction to produce ammonia gas.

(a) Define the term *reversible reaction*.

....

....

.... [2]

(b) Write a balanced chemical equation for the production of ammonia gas.

[2]

(c) **(i)** State the **three** conditions needed for the maximum yield of ammonia.

1 ....

2 ....

3 .... [3]

(ii) Explain how any **one** of the conditions named in (i) leads to an increase in the yield of ammonia.

....

....

.... [1]

5. **(a)**   Define the term

    (i)   *momentum,*

    ....

    ....

                                                                                              [1]

    (ii)   *inertia.*

    ....

    ....

                                                                                              [1]

    (b)   State the difference between mass and weight.

    ....

    ....

                                                                                              [1]

    (c)   State Newton's first law of motion.

    ....

    ....

    ....

                                                                                              [1]

    (d)   A ball of mass 0.4 kg accelerates uniformly at 2 m/s^2.

    Calculate the force of the ball.

                                                                                              [3]

                                                                                   [Turn over

6. **(a)** Fig.6.1 shows power demand between 6 am and 4 pm at a boarding school which uses only electricity as its source of energy.
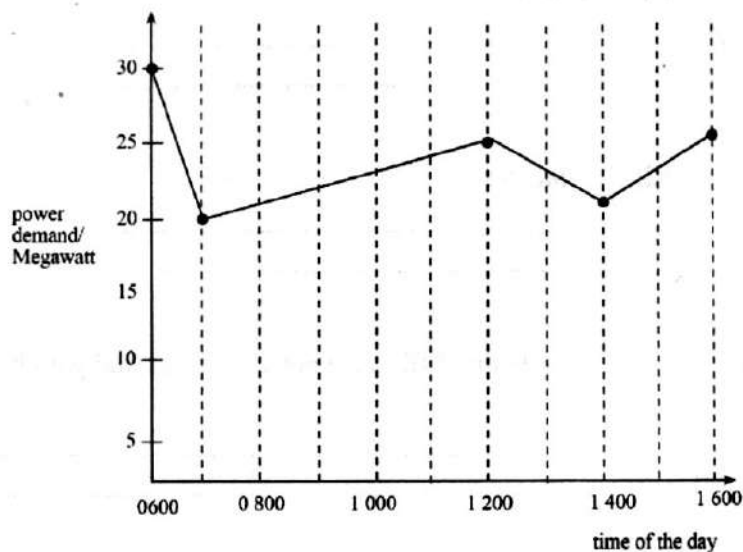
Fig.6.1

(i) Use **Fig.6.1** to identify the time of the day with the highest power demand.

....

[1]

(ii) The meal times for the boarding school are:

breakfast at 0700
lunch at 1300
supper at 1700

Explain why there is a high power demand at 1200.

....
....
....
....

[2]

(iii) Describe how the school may reduce the amount of electricity they use per day.

....
....

[1]

(b) State the SI unit of mass and power.

mass ....

power ....

[2]

Section B

*Answer any **two** questions in this section in the spaces provided.*

7. **(a)** Write a word equation for photosynthesis.

[4]

(b) State **one** use for each of the products of photosynthesis.

....
....
....
....

[2]

(c) **Fig.7.1** shows the internal section of a leaf.
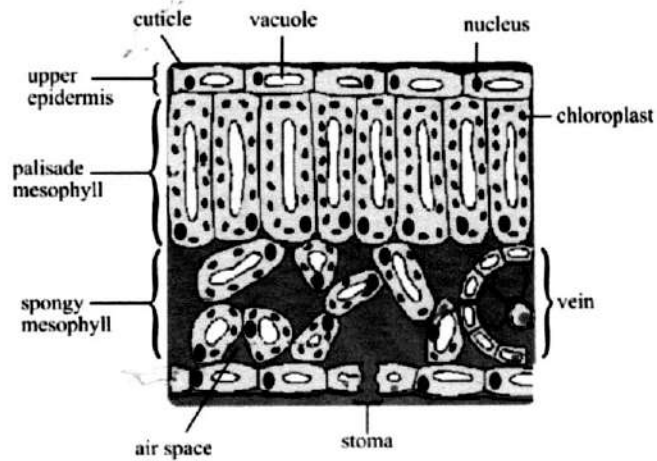
Fig.7.1

Explain how the leaf is adapted to maximise the rate of photosynthesis.

....
....
....
....
....
....

[4]

8. **(a)** Define *aerobic respiration.*

....

....

....

[3]

(b) A boy developed muscle fatigue while taking part in a soccer match.

Explain what caused the muscle fatigue.

....

....

....

....

[4]

(c) Give any **three** examples of artificial ecosystems.

....

....

....

[3]

9. **(a)** Name any **two** body fluids through which the HIV virus can be transmitted.

....

....

[2]

(b) Describe how the mosquito can be destroyed at any **two** stages of its life cycle.

....

....

....

....

....

....

[4]

(c) **(i)** Describe any **two** signs/symptoms of cholera.

....

....

[2]

(ii) Explain any **one** method used in the treatment of cholera.

....

....

[2]

[Turn over

Section C

*Answer any **two** questions in this section in the spaces provided.*

10. **(a)** **(i)** State the type of bonding in magnesium oxide (MgO).

.... [1]

(ii) Describe how magnesium oxide can be prepared.

....

.... [2]

(b) Describe, giving a reason, why magnesium oxide does **not** react with copper.

....

....

[2]

(c) **(i)** Calculate the molecular mass of magnesium oxide.

[2]

(ii) Calculate the percentage of oxygen in magnesium oxide.

[3]

11. **(a)** Calcium sulphate can be formed from the reaction between calcium carbonate and solution **X**.

Two other substances are produced during the reaction.

(i) Name solution **X**.

.... [1]

(ii) Give the other **two** products.
1 ....
2 ....

[2]

(iii) Name the type of reaction that occurs between calcium carbonate and solution **X**.

....

[1]

(iv) To prepare a pure sample of calcium sulphate, excess calcium carbonate has to be added to the solution **X**.
Explain why the calcium carbonate should be in excess.

....

....

[1]

(v) Name the process that is used to separate the excess calcium carbonate from the calcium sulphate solution.

....

[1]

(b) The strength of an acid or a base can be determined using the pH scale.

(i) State the pH values on the pH scale.

....

[1]

(ii) Give the pH value that represents a neutral substance.

....

[1]

(c) List any **two** properties of alkaline substances.

1..

....

2..

....

[2]

[Turn over

12. **(a)** Dyes in black ink are separated using a strip of a filter paper and a solvent. The ink is placed on the filter paper and the position of the ink is marked in pencil. The filter paper strip is dipped into the solvent, ensuring that the solvent is just below the ink.

(i) Name the process used to separate the dyes in the black ink.

....

[1]

(ii) Suggest, with a reason, a suitable solvent.

solvent ....

reason ....

[2]

(iii) Explain why the position of the ink is marked in pencil and **not** in ink.

....

....

[2]

(iv) State **two** properties of dyes which make it possible to separate them.

....

....

[2]

(v) Name the force that enables the solvent to move up the filter paper.

....

[1]

(b) State a method which can be used to separate

(i) ethanol from water,

....

[1]

(ii) iron filings from sulphur.

....

[1]

Section D

*Answer any **two** questions in this section in the spaces provided.*

13. **(a)** A polythene rod can be charged negatively by rubbing it with a woolen cloth.

Describe how the rod becomes negatively charged through the rubbing done.

....

....

.... [3]

(b) A man drags a 60 kg bag up an inclined plane of length 4.5 m and height 1.5 m to load it into a lorry.

(i) Calculate the velocity ratio, VR, of the inclined plane.

[2]

(ii) State the effect, on the velocity ratio of the inclined plane, of increasing the height.

.... [1]

(c) State, giving a reason, the method by which heat is transferred from the sun to the earth.

....

....

.... [3]

(d) The heat from the sun can be used for heating using a solar cooker.
State any **one** feature of the cooker which ensures that maximum heat is focussed on one point (where the pot is placed).

.... [1]

14. **(a)** Table 14.1 shows Tobias' record of electricity use for two appliances used in one month.

Table 14.1

appliance	casing material	power rating/W	total time switched on/hour
radio	plastic	500	60
hot plate	metal	2000	30

(i) State, giving a reason, which one of the two appliances has a two-pin plug.

....
....
[2]

(ii) Electricity costs 10 c per unit.

Calculate the cost of using the hot plate for the month.

[3]

(b) State any **three** precautions which should be observed when using electricity.

....
....
....
[3]

(c) Give any **two** ways of saving electricity.

....
....
[2]

15. **(a)** Telecommunication messages can be transmitted in a variety of ways by a wide range of devices which include cell phones.

   (i) Name any other **one** device that can be used to send messages apart from a cell phone.

   ....

   ....
   [1]

   (ii) State the energy conversion that occurs in the device named in **(i)**.

   ....

   ....
   [2]

   (iii) State any **two** types of information that can be transmitted by a cell phone.
   1 ....
   2 ....
   [2]

(b) **(i)** Coaxial cables are one type of media for signal transmission.
State any other **two** types of media for signal transmission.

   1 ....
   2 ....
   [2]

   (ii) Describe how signal is transmitted by coaxial cables.

   ....

   ....

   ....

   ....
   [3]

DATA SHEET
The Periodic Table of the Elements

Group

I	II		III	IV	V	VI	VII	0

| | | | | | | | | 1 H Hydrogen 1 | | | | | | | 4 He Helium 2 |

| 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 19 F Fluorine 9 | 20 Ne Neon 10 |

| 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulphur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 |

| 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 59 Co Cobalt 27 | 59 Ni Nickel 28 | 64 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 |

| 85 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | 101 Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 |

| 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La* Lanthanum 57* | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 192 Ir Iridium 77 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 |

| 226 Fr Francium 87 | 226 Ra Radium 88 | 227 Ac† Actinium 89† | | | | | | | | | | | | | | | |

*58-71 Lanthanoid series
†90-103 Actinoid series

| 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 162 Dy Dysprosium 66 | Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 |

| 232 Th Thorium 90 | Pa Protactinium 91 | 238 U Uranium 92 | Np Neptunium 93 | Pu Plutonium 94 | Am Americium 95 | Cm Curium 96 | Bk Berkelium 97 | Cf Californium 98 | Es Einsteinium 99 | Fm Fermium 100 | Md Mendelevium 101 | No Nobelium 102 | Lr Lawrencium 103 |

Key

```
 a
 X
 b
```

a = relative atomic mass
X = atomic symbol
b = proton (atomic) Number

The volume of one mole of any gas is 28 dm³ at room temperature and pressure (r.t.p.)

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

COMBINED SCIENCE 4003/1
PAPER 1   Multiple Choice

NOVEMBER 2020   SESSION   1 hour

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

INSTRUCTIONS TO CANDIDATES

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INFORMATION FOR CANDIDATES

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[Turn over

1. Which one is a biological component of an ecosystem?

   A   air

   B   soil

   C   water

   D   humus

2. The diagram shows some stages in the nitrogen cycle.

   Which arrow, **A**, **B**, **C** or **D**, represents the action of decomposers?
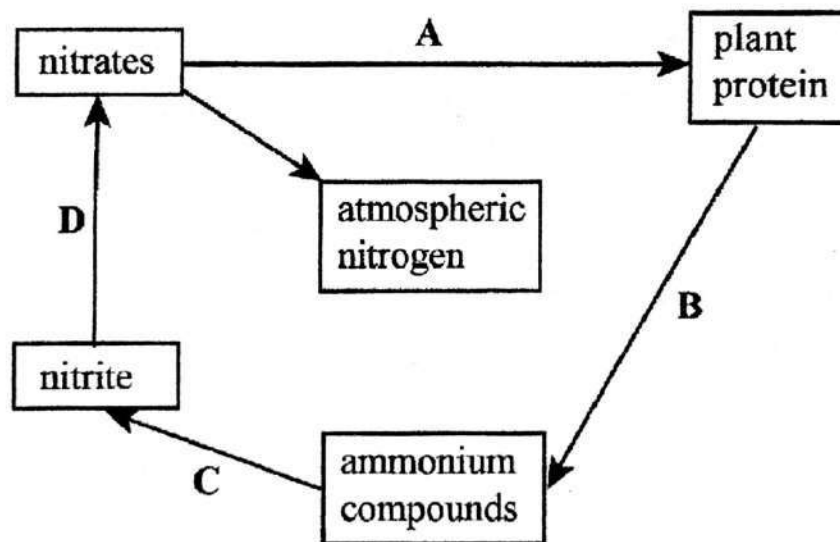
3. Which equation shows the process of anaerobic respiration in humans?

   A   glucose $\longrightarrow$ lactic acid + energy

   B   glucose + $\longrightarrow$ ethanol + energy

   C   glucose $\longrightarrow$ lactic acid + carbon dioxide + energy

   D   glucose + oxygen $\longrightarrow$ ethanol + carbon dioxide + energy

4. During germination, the seed coat breaks due to the uptake of

   A carbon dioxide.

   B mineral salts.

   C oxygen.

   D water.

5. Which organ produces bile?

   A liver

   B stomach

   C pancreas

   D gall bladder

6. Plasmolysis causes the

   A cell membrane to move away from the cell wall.

   B cell membrane to move towards the cell wall.

   C turgor pressure inside the cell to increase.

   D water molecules to move into the cell.

7. Which factor decreases the rate of transpiration in a plant?

   A large leaf surface area

   B high light intensity

   C high temperature

   D high humidity

8. The diagram shows a model of the human alimentary canal.

Which part, **A, B, C** or **D**, represents where ingestion takes place?
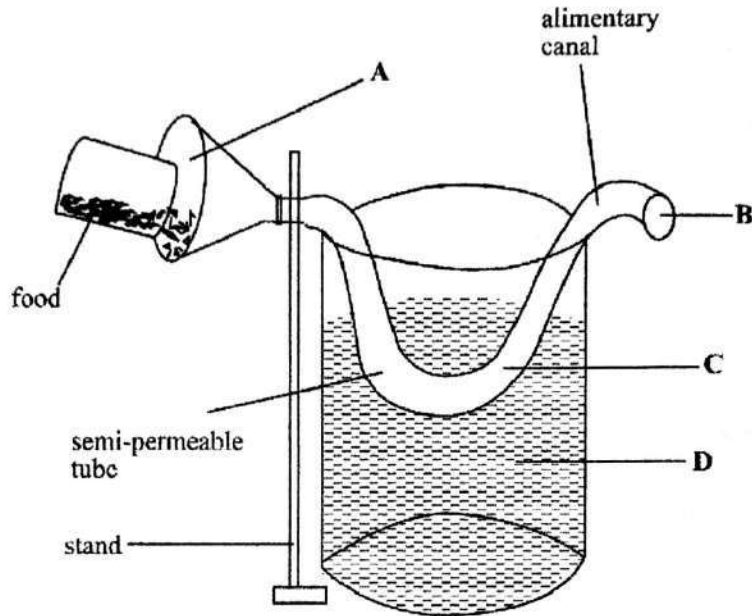
9. Which type(s) of blood vessels contain(s) valves?

A veins and capillaries

B capillaries

C arteries

D veins

10. Which statement about asexual reproduction is true?

A Offspring are resistant to diseases that affect parents.

B Offspring grow far away from parents.

C Many new plants are obtained from seeds.

D Offspring are genetically identical to their parents.

4003/1 N2020

11. The diagram shows the female reproductive system.

Where does fertilisation take place?
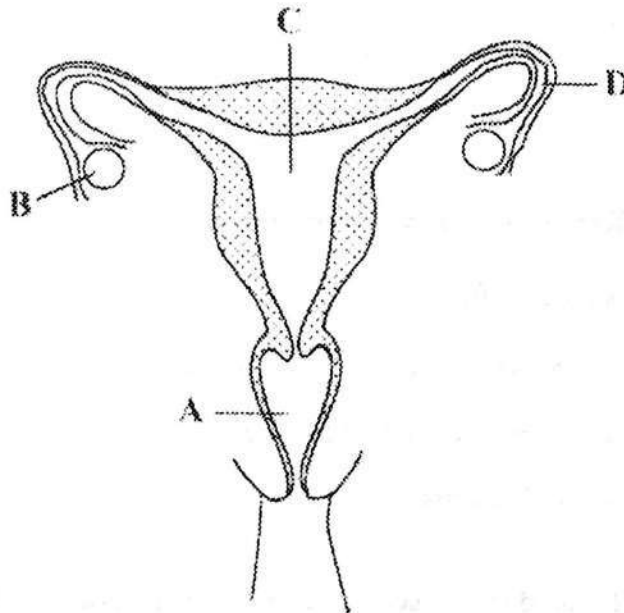
12. The diagram shows an embryo attached to the placenta.

Which arrow, **A, B, C or D**, shows the movement of nutrients?

[Turn over
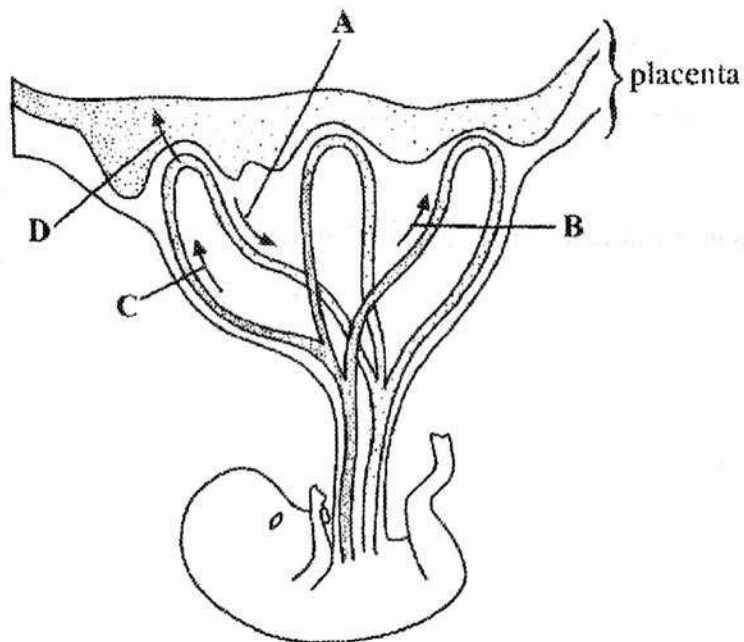
13.   Hormones that are found in the contraceptive pill work by

    A preventing maturing of the egg.

    B killing sperm cells in the oviduct.

    C preventing fertilisation of the egg.

    D preventing implantation of the embryo.

14.   What is the effect of HIV on the human body?

    A HIV makes it easier for pathogens to invade cells.

    B HIV reduces the body's resistance to infection.

    C HIV reduces the number of red blood cells.

    D HIV destroys all body tissues.

15.   Which method is used to produce concentrated ethanol from a dilute ethanol solution?

    A filtration

    B decanting

    C simple distillation

    D fractional distillation

16.   What is the electronic configuration of nitrogen, $^{14}_{7}N$?

    A 2, 5

    B 2, 2, 3

    C 2, 8, 4

    D 2, 2, 8, 2

17. Which one is an Isotope of $^{16}_{8}O$?

   A $^{16}_{6}O$
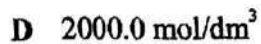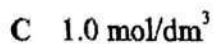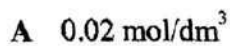
   B $^{18}_{6}O$

   C $^{18}_{8}O$

   D $^{8}_{16}O$
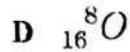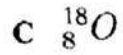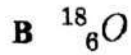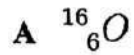
18. Element X has the electronic structure 2, 8, 2.

   What is the formula of its chloride?

   A XCl

   B XCl_2

   C X_2Cl

   D X_2Cl_2
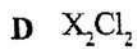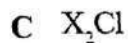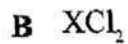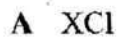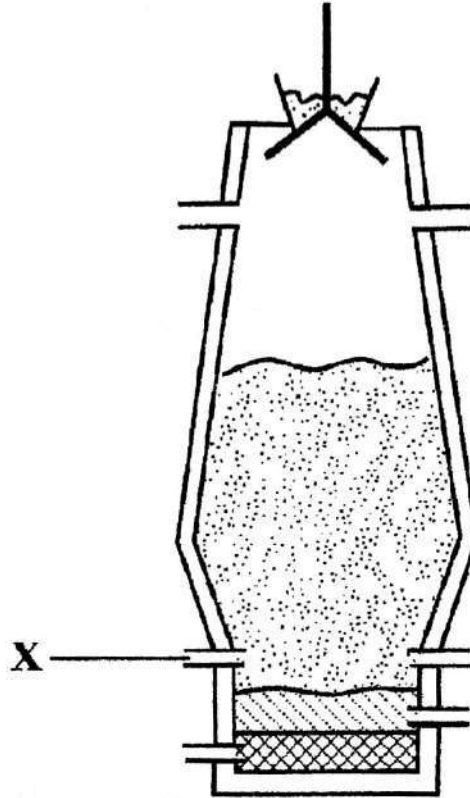
19. What is the concentration of sodium hydroxide solution which is prepared by dissolving 40 g of sodium hydroxide pellets in 50 dm^3 of distilled water? [Molecular mass of NaOH is 40 g]

   A 0.02 mol/dm^3

   B 0.8 mol/dm^3

   C 1.0 mol/dm^3

   D 2000.0 mol/dm^3

[Turn over
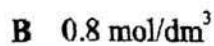
**20.** The diagram shows a blast furnace.

What is the function of the opening labelled **X**?

A to remove slag

B to remove iron

C to allow hot air in

D to allow raw materials in

21. Which industrial gas, produced from the electrolysis of water, is used in hospitals?

A ammonia

B hydrogen

C nitrogen

D oxygen

22. Which one is **not** a use of chlorine?

   A sterilising water

   B as an electrolyte

   C making domestic bleaches

   D manufacture of plastics

23. The diagram shows incomplete apparatus needed for the electrolysis of water.
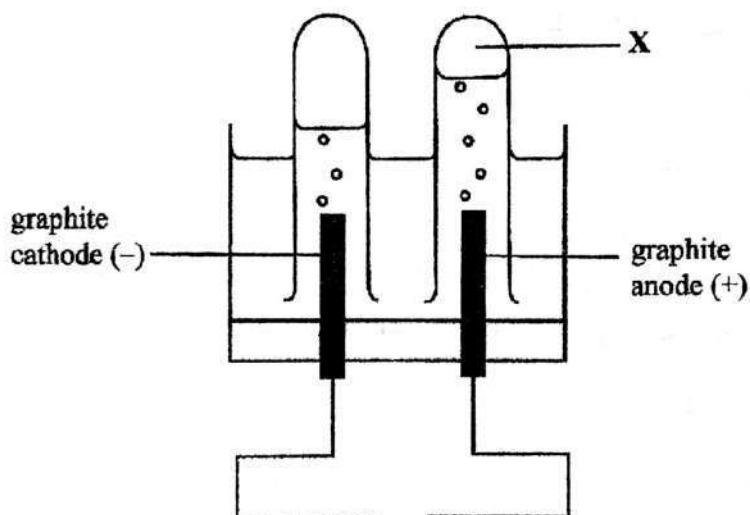
What is gas **X**?

   A chlorine

   B hydrogen

   C nitrogen

   D oxygen

24. During the electroplating of an iron nail with copper,

   A hydrogen gas is produced at the cathode.

   B the copper sulphate solution turns green.

   C the cathode increases in mass.

   D the anode increases in mass.

[Turn over

25.   Which catalyst is used in the production of ammonia?

    A   iron

    B   rhodium

    C   platinum

    D   vanadium (V) oxide

26.   Global warming is caused by

    A   combustion of fuels.

    B   formation of ice.

    C   rise in sea level.

    D   reforestation.

27.   To which homologous series does ethanol belong?

    A   alkanes

    B   alkenes

    C   alkynes

    D   alcohols

28.   What is the S.I unit of volume?

    A cm^2

    B cm^3

    C m^2

    D m^3 '

29. The sketch graph shows temperature changes during a day.
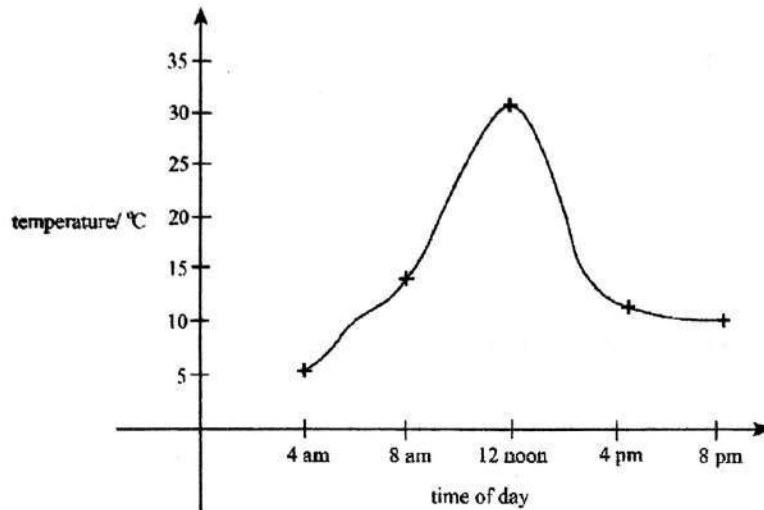
What is the approximate temperature difference between the hottest and coldest time of the day?

A   5 °C

B   26 °C

C   30 °C

D   35 °C

30. A beaker of water is heated at the base.

Why does the water at the base rise?

A   It contracts and becomes less dense.

B   It contracts and becomes more dense.

C   It expands and becomes less dense.

D   It expands and becomes more dense.

31. A hot iron bar and a cold iron bar are placed next to each other as shown by the diagram.

<div align="center">
hot
iron bar   cold
iron bar
</div>
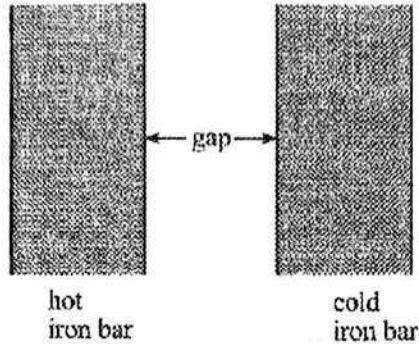
Which material can be used to fill up the gap so that heat can be transmitted the fastest?

A   metal

B   wood

C   water

D   air

32. A negatively charged sphere is suspended by a thread.
What happens to the sphere when a negatively charged rod is brought near it?

A   the sphere is attracted to the rod

B   the sphere is repelled by the rod

C   the sphere reduces in size

D   the sphere increases in size

33. What is the function of a petrol filter in a carburetor?

A   to compress the fuel-air mixture

B   to mix the fuel and air

C   to clean the fuel

D   to clean the air

34. The diagram below shows the magnetic field pattern in a solenoid.
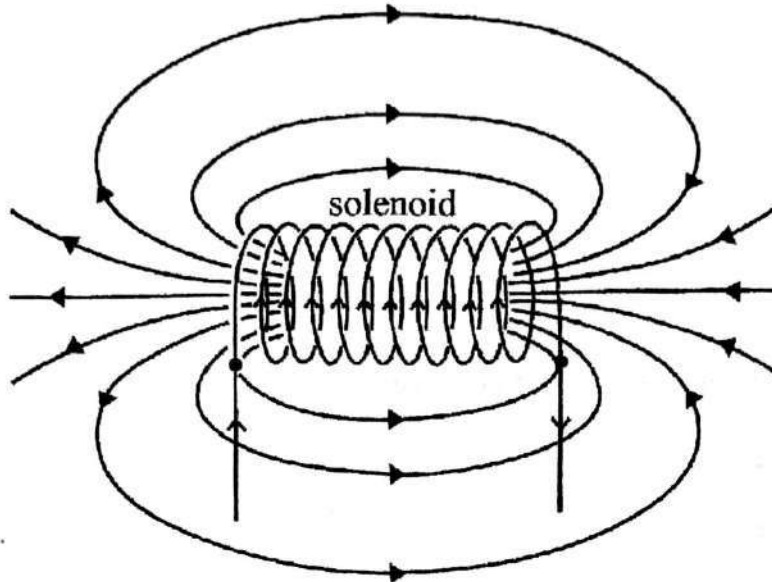
The magnetic field strength is increased by

A reducing the current in the solenoid.

B increasing the current in the solenoid.

C increasing the diameter of the solenoid.

D reducing the number of turns in the solenoid.

35. The diagram shows a battery connected to two 6 Ω resistors.

6.0 Ω   6.0 Ω
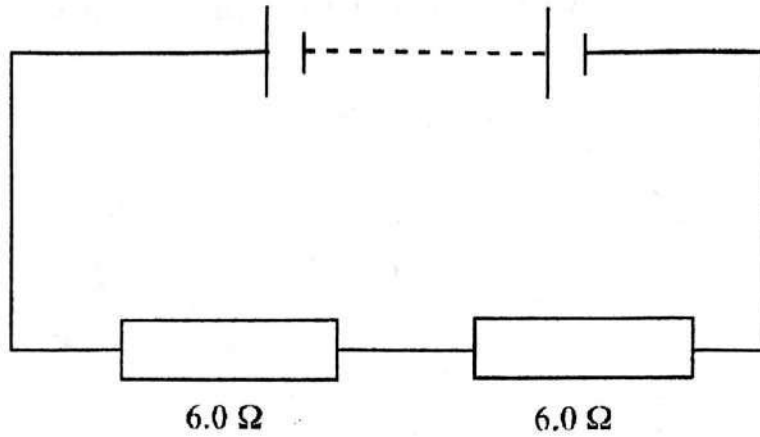
What is the total resistance of the circuit?

A   0.33 Ω

B   3.00 Ω

C   6.00 Ω

D   12.00 Ω

36. What is pressure exerted on a 2 m^2 surface when a force of 20 N is applied on it?

A   0.1 Pa

B   10.0 Pa

C   38.0 Pa

D   40.0 Pa

37. The diagram shows a machine lifting a load.
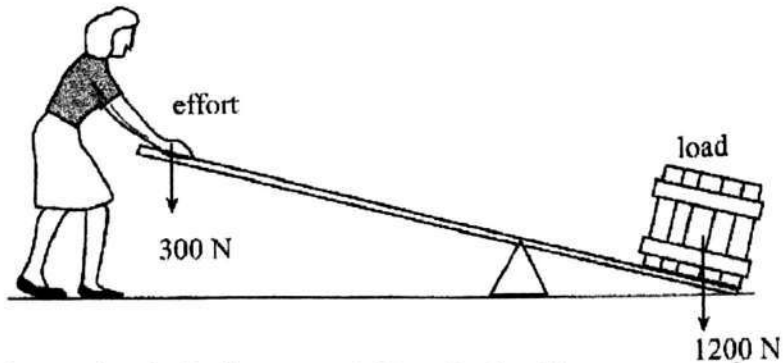
How is the mechanical advantage, MA, calculated?

A   300 N × 1200 N

B   300 N ÷ 1200 N

C   1200 N − 300 N

D   1200 N ÷ 300 N

38. A cellphone is described as

A   a demodulator.

B   a modulator.

C   an amplifier.

D   a transceiver.

39. The flow chart shows part of the processing of a signal.

receiver   ⟶   decoder   ⟶   human
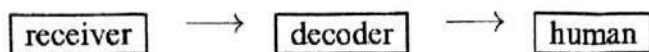
What is the function of the decoder?

A   to amplify the signal

B   to shorten the wave

C   to mix the sound wave with the carrier wave

D   to separate the sound wave from the carrier wave

40.   The diagram shows a 3-pin plug.

At which position, **A, B, C** or **D**, is the live wire connected?
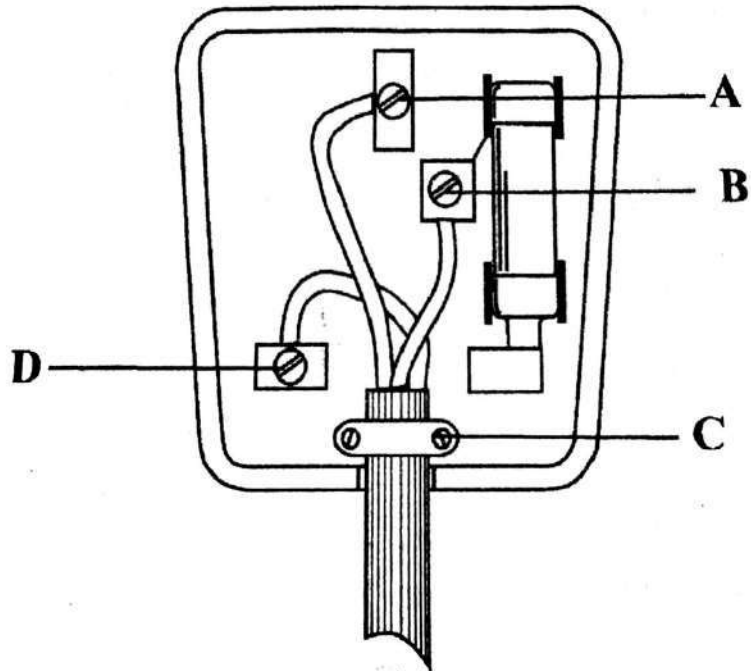
ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

COMBINED SCIENCE 4003/2

PAPER 2 Theory

SPECIMEN PAPER N2020   2 hours

Additional materials:
Answer sheets
 Calculator (Optional)
String
Graph paper (as per candidate's request)

The Periodic Table is provided on page 15.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top.
Check if the booklet has all the pages and ask the invigilator for a replacement if
it has missing pages.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.
Section B
Answer any **two** questions.
Write your answers on the separate answer sheets provided.
Section C
Answer any **two** questions.
Write your answers on the separate answer sheets provided.
Section D
Answer any **two** questions.
Write your answers on the separate answer sheets provided.

INFORMATION FOR CANDIDATES
The number of marks is given in brackets [ ] at the end of each question.

This question paper consists of 16 printed pages.
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Section A

*Answer **all** the questions in the spaces provided.*

1. (a) State any **two** differences between inhaled and exhaled air.

1 ....
....
2 ....
....

[2]

(b) Transpiration is the loss of water through plant leaves.

(i) State any **one** advantage of transpiration to the plant.

....
....

[1]

(ii) State **one** disadvantage of excessive transpiration.

....
....

[1]

(iii) State any **two** factors which increase the rate of transpiration.

1 ....
....
2 ....
....

[2]

2. **(a)** Describe a natural ecosystem.

....

....

....

[2]

(b) **(i)** Define the term *balanced diet*.

....

....

....

[2]

(ii) Describe the importance of calcium to a pregnant woman.

....

....

....

[2]

(iii) State the advantage of eating liver.

....

....

....

[1]

3. **(a)** Chlorine gas has two types of atoms as shown:

$$^{35}_{17}Cl \quad and \quad ^{37}_{17}Cl$$

(i) State the name given to the two types of the chlorine atoms.

....

[1]

(ii) Calculate the number of neutrons in $^{35}_{17}Cl$.

....

[1]

(b) Chlorine reacts with sodium to form sodium chloride, NaC*l*.

[Turn over

(i) Name the type of bonding in sodium chloride.

....

[1]

(ii) Draw a dot and cross diagram to show the bonding in sodium chloride.

[2]

c) State any **two** physical properties of sodium chloride.

1 ....

2 ....

[2]

4. **(a)** Indigestion is caused by too much dilute hydrochloric acid in the stomach. It is cured by ingesting anti-acid tablets.

State, with a reason, the acid-base nature of the chemical present in the anti-acid tablets.

acid-base nature ....

reason ....

....

[2]

(b) **(i)** Iron is extracted from an iron compound found in haematite.

Name the iron compound in haematite.

....

[1]

(c) Two other solid raw materials are fed into the blast furnace together with haematite. Name the **two** raw materials and state a function for each of these materials.

raw material ....
function ....
raw material ....
function ....

[4]

5. **(a)** **Fig.5.1** shows a stroke in the operation of an engine.
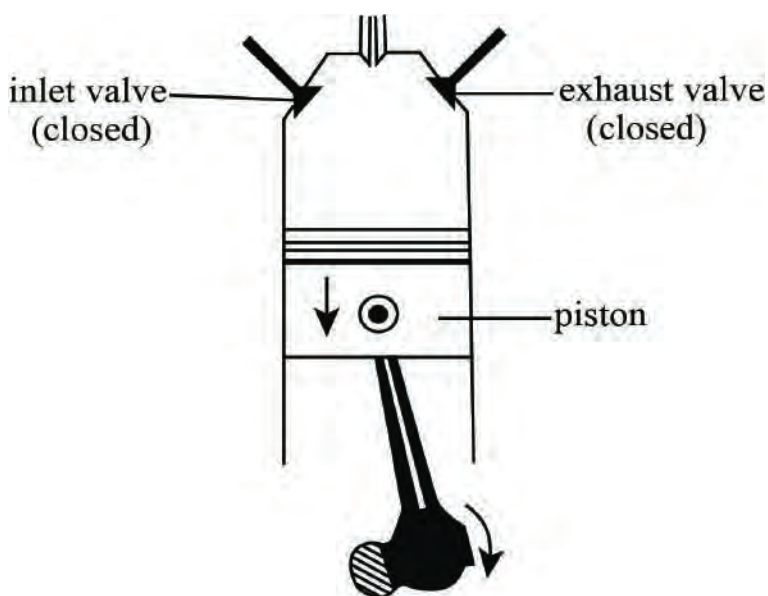
Fig.5.1

(i) Identify, giving **two** reasons, the stroke shown.

stroke ....
reasons: 1 ....

....
2 ....

....

[3]

[Turn over

(b) State the role of a fuel injector in a petrol engine.

....

....

....

[1]

(ii) State the role of a carburettor.

....

....

[1]

(iii) Explain the advantage of a fuel injector over a carburettor.

....

....

....

[2]

6. **Fig.6.1** shows part of the design of a solar water heater.

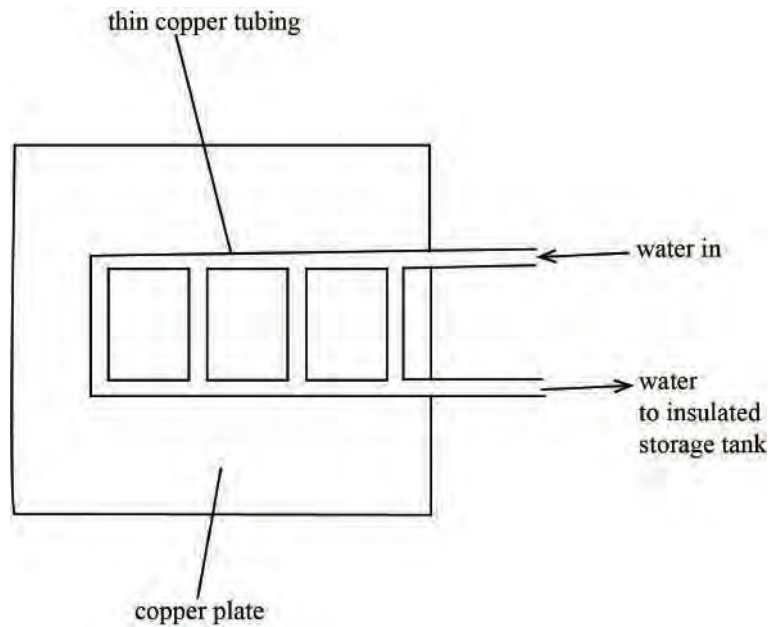**Fig.6.1**

(a) State, with a reason, the most suitable place for placing the solar water heater for best results.

place ....

reason ....

....

[2]

(b) State, with a reason, the paint colour on the copper plate.

colour ....

reason ....

[2]

(c) Explain why

(i) a thin copper tubing is used, ...

....

(ii) the storage tank is insulated. ....

....

[2]

[Turn over

Section B

*Answer any **two** questions on the separate answer sheets provided.*

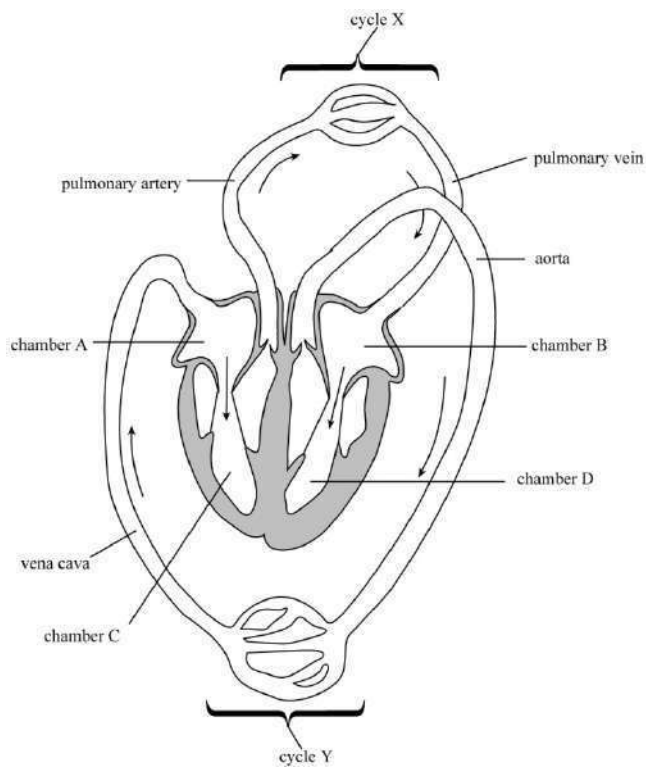7. (a) **Fig.7.1** shows a sketch diagram to represent double circulation in mammals.

Fig.7.1

(i) Deduce the types of circulation represented by cycles X and Y. [2]

(ii) Suggest the reason for differences in the thickness of the walls of chambers C and D. [2]

(iii) State any **three** symptoms of malaria. [3]

(iv) State a symptom of ebola which is different from symptoms of malaria. [1]

(v) State any **two** effects of inhaling glue. [2]

8. **(a)** **Fig.8.1** shows a child suffering from a deficiency disease.

Fig.8.1

(i) Name the deficiency disease which the child is suffering from. [1]

(ii) Describe how the disease named in **(i)** could be prevented. [2]

(b) Describe the route of the sperm from the testis to the oviduct. [4]

(c) State **one** advantage of using condoms during sexual intercourse. [1]

(d) Define the term *fertilisation.* [2]

[Turn over

9. **(a)** **Fig.9.1** shows gaseous exchange in the alveolus of a mammal.
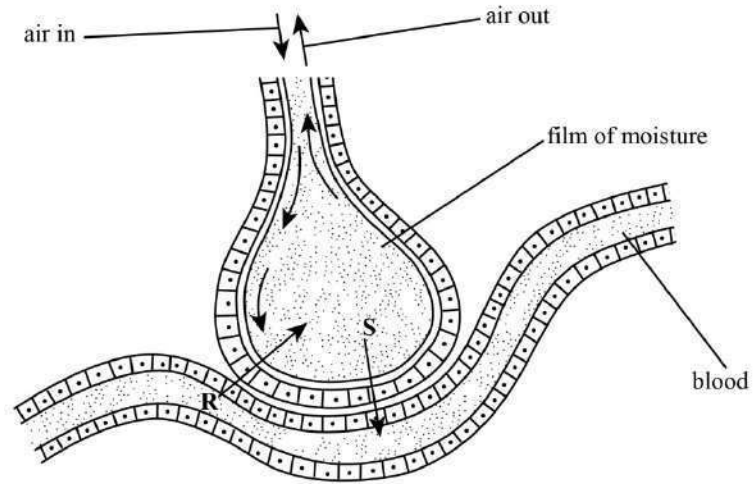

Fig.9.1

      (i) Name the gases moving in the directions shown by the arrows **R** and **S**. [2]

      (ii) Describe and explain how the alveolus is adapted for gaseous exchange. [4]

(b) Define the terms *plasmolysis* and *turgidity*. 4]

Section C

*Answer any **two** questions on the separate answer sheets provided.*

10. **(a)** **(i)** Define the term *atom*. [1]

(ii) State the **two** sub-atomic particles found in the nucleus of an atom. [2]

(b) Determine the empirical formula of a compound made up of 75% by mass carbon and 25% by mass hydrogen. [4]

(c) Sodium hydroxide solution reacts with dilute nitric acid acid to form a salt and water.

(i) State the type of reaction that occurs. [1]

(ii) Determine the chemical formula of the salt. [2]

11. **(a)** Outline the stages involved in the extraction of nitrogen from liquid air. [4]

(b) Oxygen can be obtained from the electrolysis of acidified water.

(i) Name the acid used to acidify the water. [1]

(ii) Explain why the water is acidified. [2]

(iii) Explain why the volume of oxygen obtained during the electrolysis process is half that of hydrogen. [2]

(iv) State any **one** use of oxygen. [1]

[Turn over

12. **Fig.12.1**shows the production of sulphuric acid by the contact process.
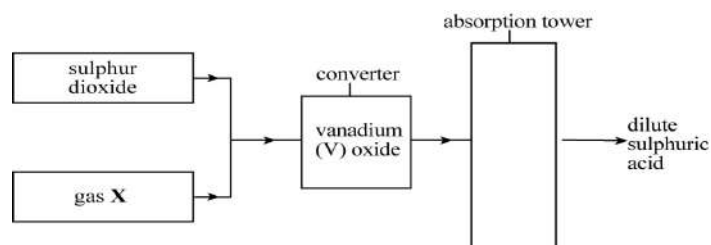
Fig.12.1

(a)   (i)   Name gas **X**.   [1]

(ii)   State the role of vanadium (V) oxide.   [1]

(iii)   Explain why sulphur trioxide is **not** directly added to water.   [2]

(iv)   Define the terms *exothermic* and *reversible*.   [2]

(v)   Name the substance which is formed in the absorption tower.   [1]

(b)   Ammonium sulphate, $(NH_4)_2SO_4$, is a fertilizer produced from sulphuric acid.
Calculate the percentage composition by mass of nitrogen in ammonium sulphate. [3]

Section D

*Answer any **two** questions on the separate answer sheets provided.*

13. **(a)** **Fig.13.1** shows an alternating current (a.c) generator.

direction of rotation of coil

fixed magnet

N   S

A   B
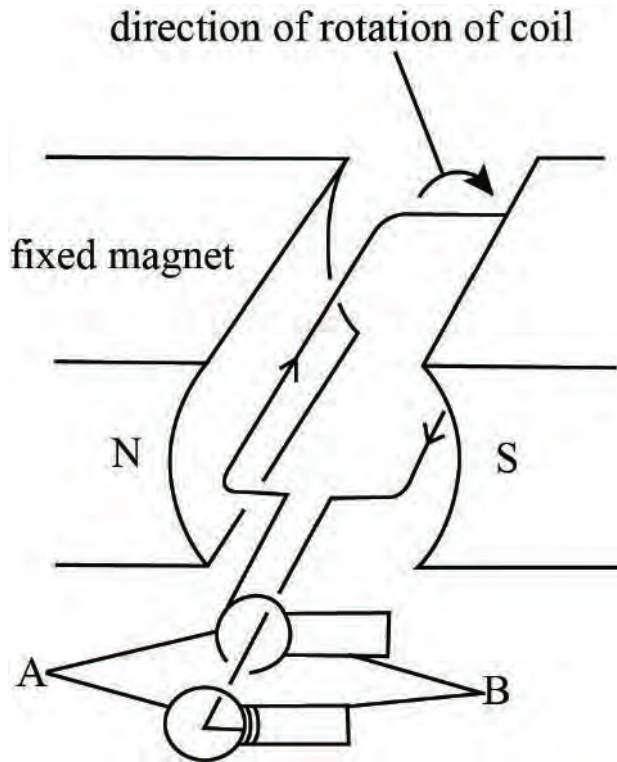
Fig.13.1

   (i) Name the parts labelled **A** and **B.** [2]

   (ii) Describe how the a.c. generator produces electricity. [4]

   (iii) Sketch a graph of output voltage of the generator against time. [2]

(b) Explain the effect of using stronger magnets on the magnitude of the output voltage. [2]

[Turn over

14. (a) A gear system has ten teeth in the driving gear and thirty teeth in the driven gear.

   (i) Calculate the velocity ratio, VR, of the gear system. [2]

   (ii) Determine the efficiency of the system if its mechanical advantage, MA, is 2. [2]

   (iii) Give any **two** reasons why the efficiency of a machine is always less than 100 %. [2]

   (iv) State any **two** ways by which the efficiency of a machine can be improved. [2]

(b) State any **two** types of machines apart from gears. [2]

15. (a) Describe how electricity is generated at a thermal power station. [4]

(b) State any **two** disadvantages of using coal as a source of fuel for a thermal power station. [2]

(c) Give the main difference between a thermal power station and a hydroelectric power station. [2]

(d) State the type of energy possessed by water which is in a dam. [1]

(e) State the Standard International (S.I) unit of energy. [1]

DATA SHEET
The Periodic Table of the Elements

Group

I	II		III	IV	V	VI	VII	O

1
H
Hydrogen
1

| | | | | | | | | 4 **He** Helium 2 |

| 7 **Li** Lithium 3 | 9 **Be** Beryllium 4 | | 11 **B** Boron 5 | 12 **C** Carbon 6 | 14 **N** Nitrogen 7 | 16 **O** Oxygen 8 | 19 **F** Fluorine 9 | 20 **Ne** Neon 10 |

| 23 **Na** Sodium 11 | 24 **Mg** Magnesium 12 | | 27 **Al** Aluminium 13 | 28 **Si** Silicon 14 | 31 **P** Phosphorus 15 | 32 **S** Sulphur 16 | 35.5 **Cl** Chlorine 17 | 40 **Ar** Argon 18 |

| 39 **K** Potassium 19 | 40 **Ca** Calcium 20 | 45 **Sc** Scandium 21 | 48 **Ti** Titanium 22 | 51 **V** Vanadium 23 | 52 **Cr** Chromium 24 | 55 **Mn** Manganese 25 | 56 **Fe** Iron 26 | 59 **Co** Cobalt 27 | 59 **Ni** Nickel 28 | 64 **Cu** Copper 29 | 65 **Zn** Zinc 30 | 70 **Ga** Gallium 31 | 73 **Ge** Germanium 32 | 75 **As** Arsenic 33 | 79 **Se** Selenium 34 | 80 **Br** Bromine 35 | 84 **Kr** Krypton 36 |

| 85 **Rb** Rubidium 37 | 88 **Sr** Strontium 38 | 89 **Y** Yttrium 39 | 91 **Zr** Zirconium 40 | 93 **Nb** Niobium 41 | 96 **Mo** Molybdenum 42 | **Tc** Technetium 43 | 101 **Ru** Ruthenium 44 | 103 **Rh** Rhodium 45 | 106 **Pd** Palladium 46 | 108 **Ag** Silver 47 | 112 **Cd** Cadmium 48 | 115 **In** Indium 49 | 119 **Sn** Tin 50 | 122 **Sb** Antimony 51 | 128 **Te** Tellurium 52 | 127 **I** Iodine 53 | 131 **Xe** Xenon 54 |

| 133 **Cs** Caesium 55 | 137 **Ba** Barium 56 | 139 **La** Lanthanum 57 * | 178 **Hf** Hafnium 72 | 181 **Ta** Tantalum 73 | 184 **W** Tungsten 74 | 186 **Re** Rhenium 75 | 190 **Os** Osmium 76 | 192 **Ir** Iridium 77 | 195 **Pt** Platinum 78 | 197 **Au** Gold 79 | 201 **Hg** Mercury 80 | 204 **Tl** Thallium 81 | 207 **Pb** Lead 82 | 209 **Bi** Bismuth 83 | **Po** Polonium 84 | **At** Astatine 85 | **Rn** Radon 86 |

| **Fr** Francium 87 | 226 **Ra** Radium 88 | 227 **Ac** Actinium 89 † | | | | | | |

*58-71 Lanthanoid series
†90-103 Actinoid series

| 140 **Ce** Cerium 58 | 141 **Pr** Praseodymium 59 | 144 **Nd** Neodymium 60 | **Pm** Promethium 61 | 150 **Sm** Samarium 62 | 152 **Eu** Europium 63 | 157 **Gd** Gadolinium 64 | 159 **Tb** Terbium 65 | 162 **Dy** Dysprosium 66 | 165 **Ho** Holmium 67 | 167 **Er** Erbium 68 | 169 **Tm** Thulium 69 | 173 **Yb** Ytterbium 70 | 175 **Lu** Lutetium 71 |

| 232 **Th** Thorium 90 | **Pa** Protactinium 91 | 238 **U** Uranium 92 | **Np** Neptunium 93 | **Pu** Plutonium 94 | **Am** Americium 95 | **Cm** Curium 96 | **Bk** Berkelium 97 | **Cf** Californium 98 | **Es** Einsteinium 99 | **Fm** Fermium 100 | **Md** Mendelevium 101 | **No** Nobelium 102 | **Lr** Lawrencium 103 |

Key

	a
X	
	b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) Number

The volume of one mole of any gas is 28 dm³ at room temperature and pressure (r.t.p.)

[Turn over

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