Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

COMBINED SCIENCE 4003/2

PAPER 2 Theory

NOVEMBER 2021 SESSION 2 hours

Additional materials:
Answer sheets
Calculator (Optional)
String

The Periodic Table is provided on page 13.

Time 2 hours

INSTRUCTIONS TO CANDIDATES

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

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.

For examiner's use	
Section A	
Section B	
Section C	
Section D	
TOTAL	

This question paper consists of 13 printed pages and 3 blank pages.

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Section A

Answer **all** the questions in this section in the spaces provided on the question paper.

1. **Fig.1.1** shows a pyramid of biomass.

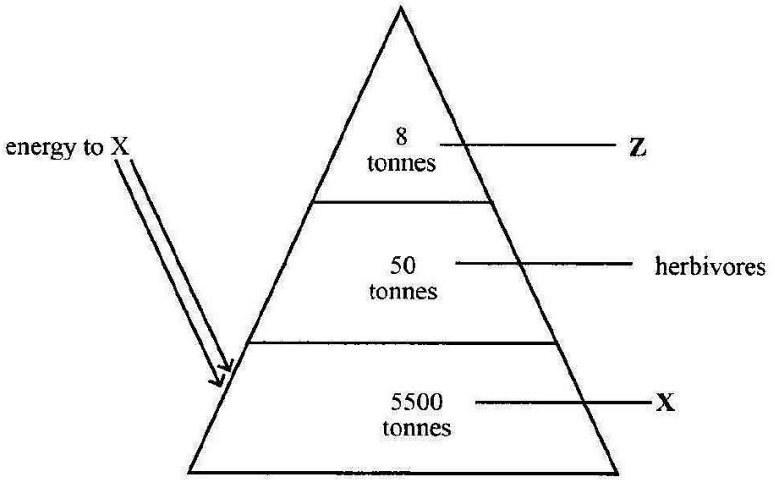


Fig.1.1

(a) Define the term *biomass*.

[1]

(b) **(i)** Identify the trophic level represented by **X**.

[1]

(ii) Explain the shape of the pyramid.

[2]

(iii) Name the form of energy received by **X**.

[1]

(iv) State, giving a reason, the effect of decreasing the biomass of **X** on **Z** .

For Examiner's Use

[2]

2. **(a)** Write a word equation for anaerobic respiration in mammals.

[2]

(b) Describe how plants are adapted to reduce water loss due to transpiration.

[2]

(c) Relate the structure of a blood capillary to its function.

[2]

3. **Fig.3.1** shows the electrolysis of molten lead (II) bromide.

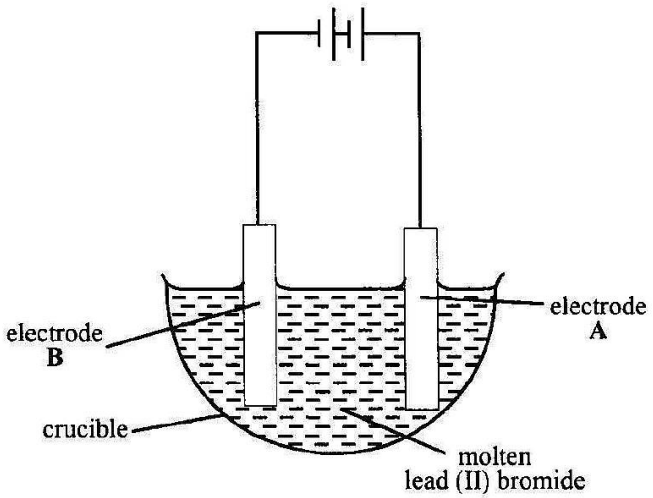


Fig.3.1

(a) **(i)** Define the term *electrolysis*.

.....

.....

[1]

(ii) State the product formed at each of the electrodes **A** and **B**.

A

B

[2]

(b) **(i)** Suggest the most suitable material which can be used as the electrodes.

[1]

(ii) Give **two** general properties of an electrode.

1

2

[2]

(c) State any **one** reason for plating iron.

[1]

For Examiner's Use

4. **(a)** Two reactions, A and B are shown below.

Reaction A
iron + sulphur $\longrightarrow$ iron sulphide

Reaction B
sugar + water $\longrightarrow$ sugar solution

(i) Name a process which can be used to obtain pure water from the sugar solution.

[1]

(ii) State the reaction, A or B, in which there is a physical change.

[1]

(iii) State any **two** factors that affect solubility.

1.

2.

[2]

(b) Describe the arrangement of particles in a gas.

[2]

5. **(a)** **(i)** State the law of conservation of energy.

[2]

(ii) Write the energy conversion in a stretched catapult.

[2]

(b) Describe the Hwange thermal power generation.

[3]

6. **(a)** **(i)** State the formula for calculating pressure in liquids.

[1]

(ii) Calculate the pressure exerted by a 1.5 m column of water given that its density is 1 200 kgm^{-3}.

[acceleration due to gravity = 10 ms^{-2}]

[2]

(b) **Fig.6.1** shows a model of a siphon being used to drain a liquid.

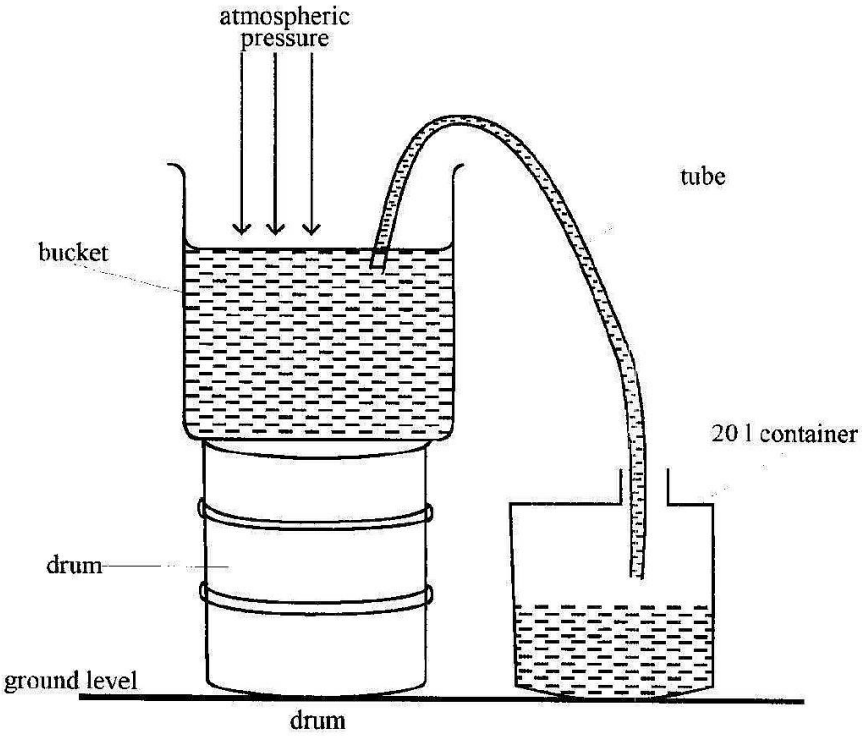


Fig.6.1

(i) Give **two** conditions that enable the siphon to work.

1

2

[2]

(ii) Describe how the siphon works.

[2]

Section B

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

For Examiner Use

7. **(a)** Describe any **three** ways that can be used to dispose household litter. [3]

(b) **(i)** Outline the importance of maintaining clean toilets at school. [3]

(ii) List any **three** materials or substances that can be used for cleaning the toilets. [3]

(c) Describe any **one** role of the Environmental Management Agency (EMA). [1]

8. **(a)** State the function of the

1. testes,

2. sperm duct,

3. prostate gland.

[3]

(b) **(i)** Describe the life cycle of the bilharzia parasite. [4]

(ii) State any **three** methods of preventing bilharzia. [3]

9. **(a)** **(i)** Define the term *balanced diet.* [1]

(ii) State any **one** function of fibre in the diet. [1]

(iii) Name any **two** sources of protein for a person who does not eat meat. [2]

(b) Plan a meal for a manual worker's lunch indicating the nutrients provided. [4]

(c) State **two** ways by which Ebola is transmitted in a community. [2]

Section C

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

10. The electronic configurations of three elements, **X**, **Y** and **Z** are:

X 2, 8, 6

Y 2, 1

Z 2, 6

(a) **(i)** State, using **X**, **Y** or **Z**, the **two** elements that are in the same group of the Periodic Table. [2]

(ii) Give a reason for the answer in **a(i)**. [1]

(iii) Identify, from **X**, **Y** and **Z**, the element that has the highest proton number. [1]

(iv) Name the type of bonding that can exist between **Y** and **Z**. [1]

(b) **(i)** **Z** is an isotope and it has eight neutrons.

Define the term *isotope*. [1]

(ii) State the nucleon number of **Z**. [1]

(c) Describe **three** differences in the physical properties of **Y** and **Z**. [3]

11. **(a)** **(i)** Define the term *fuel*. [1]

(ii) State any **two** uses of fuels. [2]

(iii) State any **three** alternative sources of energy other than fuels. [3]

(b) **(i)** Name the gas which causes global warming. [1]

(ii) State any **three** effects of global warming. [3]

12. **(a)** Define the term *neutralisation*. [2]

(b) State **two** formulae that may be used to calculate the concentration of a solution. [2]

(c) (i) Name the process of making soap. [1]

(ii) Describe how soap is produced from vegetable oil. [4]

(iii) State the second product of the process named in (i). [1]

For Examiner's Use

Section D

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

13. **(a)** **(i)** A 2 A electric heater was connected to a 110 V supply for 1 hour.

Calculate the cost of running the electric heater for 1 hour if one unit costs 50 cents. [4]

(ii) State **one** limitation of the Ohm's law. [1]

(iii) Name the **two** cables on a two pin plug. [2]

(b) **(i)** Outline how a lightning conductor should be installed for it to protect a building. [2]

(ii) State any **one** myth on lightning. [1]

14. **(a)** **(i)** Describe the operation of a direct current (d.c) motor. [5]

(ii) State any **three** factors that affect the speed of rotation of the coil. [3]

(b) State any **two** uses of solar systems. [2]

15. **(a)** A boy pushes a wheel barrow with a force of 25 N against a frictional force of 7 N.

(i) Define the term *friction*. [1]

(ii) Calculate the resultant force on the wheel barrow. [2]

(b) State any **two** applications of friction. [2]

(c) **Fig.15.1** shows a borehole which is operated by a lever. The load is 120 N.

For Examiner's Use

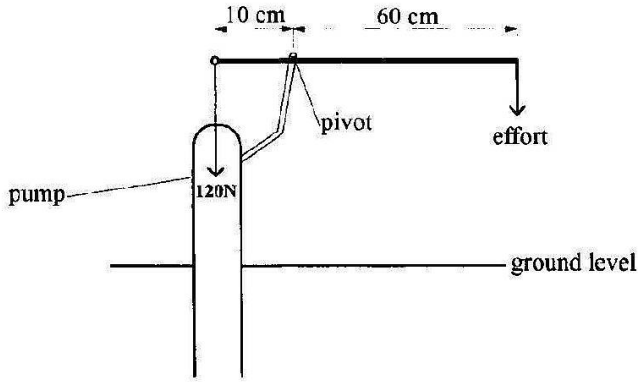


Fig.15.1

(i) State the principle of moments. [1]

(ii) Calculate the minimum effort required to operate the pump. [2]

(iii) State the effect of reducing the length of the effort arm. [1]

(iv) State how friction can be reduced in the pump. [1]

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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
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	98 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45
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
226 Fr Francium 87	227 Ra Radium 88	227 Ac Actinium † 89						

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
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
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

*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 dm^3 at room temperature and pressure (r.t.p.)

[Turn over