Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

COMBINED SCIENCE 4003/2

PAPER 2 Theory

NOVEMBER 2020 SESSION 2 hours

Additional materials:
Answer sheets
Calculator (Optional)
String

The Periodic Table is provided on page 15.

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 paper provided.

Section C
Answer any **two** questions.
Write your answers on the separate 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	

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Section A

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

1. **(a)** Define the term *ecosystem.*

.....

.....

.....

[2]

(b) State any **two** physical components of an ecosystem.

1 .....

2 .....

[2]

(c) Draw a food chain, with three trophic levels, involving **named** organisms

[3]

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2. **Fig.2.1** shows a cell membrane separating water and sugar solution.

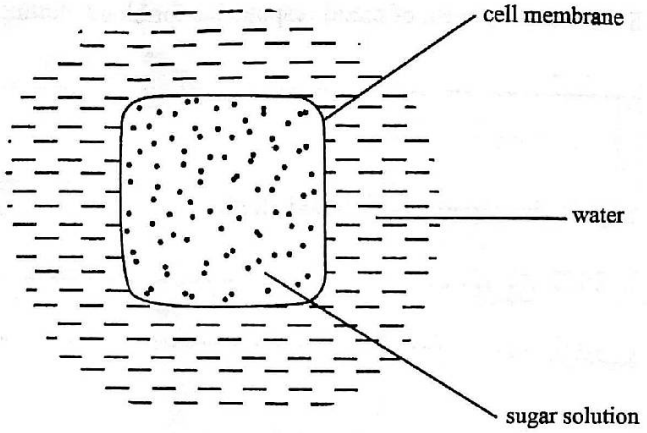


Fig.2.1

(a) **(i)** Explain how osmosis occurs.

.....

.....

.....

[2]

(ii) Define the term *diffusion*.

.....

.....

[1]

(b) Blood circulating around the body has plasma, water, platelets, glucose, red blood cells, carbon dioxide, oxygen and white blood cells.

(i) Select **two** substances that are needed by respiring cells.

1 .....

2 .....

[2]

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(ii) State the component of blood responsible for blood clotting.

.....

[1]

(c) Explain the importance of blood clotting.

.....

.....

[1]

3. Sulphur dioxide (SO_2) reacts with oxygen (O_2) to form sulphur trioxide (SO_3) during the manufacture of sulphuric acid as shown in the equation:

$$2SO_2 + O_2 \rightleftharpoons 2SO_3 + \text{heat}$$

(a) State the oxidation state of sulphur in sulphur trioxide.

.....

[1]

(b) State the meaning of the symbol $\rightleftharpoons$.

.....

[1]

(c) Write an equation to show the formation of oleum.

.....

[2]

(d) State any **two** industrial uses of sulphuric acid.

.....

.....

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[2]

4 **Fig.4.1** shows the stages involved in the extraction of gases A and B from air.

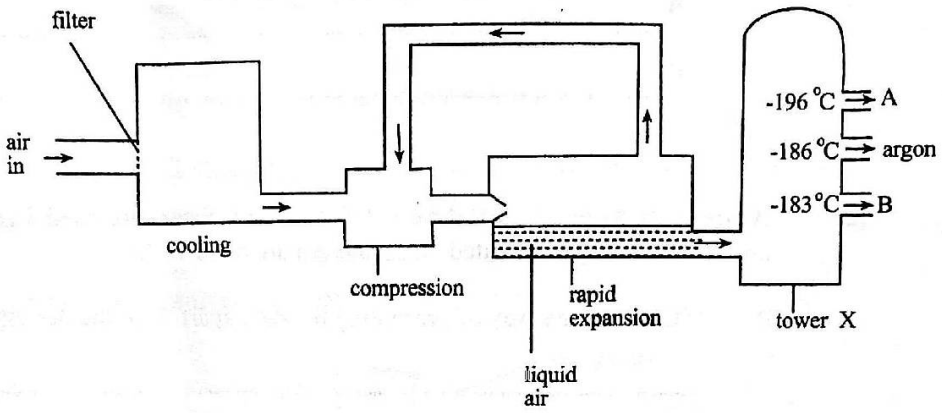


Fig.4.1

(a) Name the component that is removed during filtration.

.....

[1]

(b) **(i)** Identify the process that occurs in tower X.

.....

[1]

(ii) Explain why the air is compressed and expanded rapidly and repeatedly.

.....

.....

.....

[2]

(c) Explain why gas A is collected first.

.....

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[1]

(d) Identify the gases A and B.

A .....

B .....

[2]

5. **(a)** A box contains resistors of different sizes. Ten resistors are rated 5 Ω, twelve are rated 8 Ω, eight are rated 10 Ω and ten are rated 15 Ω.

(i) State any **one** way of presenting the data apart from the description.

.....

[1]

(ii) Calculate the percentage of the resistors rated 15 Ω.

[2]

(b) One side of a cube measures 6.0 cm.

Calculate the volume of the cube.

[2]

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(c) Give the most suitable instrument for measuring

(i) the internal diameter of a test tube,

.....

(ii) the external diameter of a wire.

.....

[2]

6. **Fig.6.1** shows a simple solar cooker.

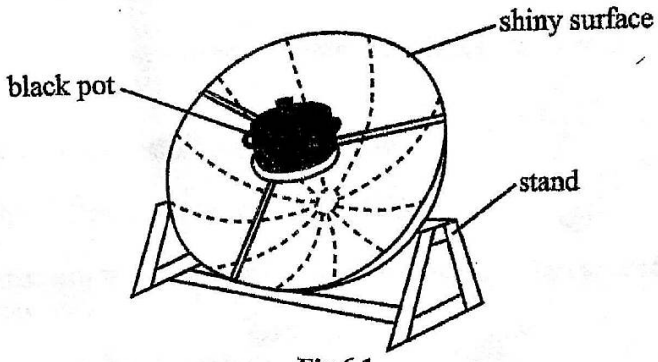


Fig.6.1

(a) (i) Explain the function of the shiny curved surface.

.....

.....

.....

.....

[2]

(ii) Explain why the pot is painted black.

.....

.....

[1]

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(b) **(i)** Give a reason why solar energy is called a renewable source of energy.

.....

[1]

(ii) Explain how solar energy is indirectly used to produce electricity.

.....

.....

[2]

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Section B

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

7. (a) (i) State any **three** methods of contraception. [3]

(ii) Describe how each method stated in **(i)** prevents fertilisation. [3]

(b) (i) Define the term *rhizome*. [1]

(ii) State any **three** advantages of reproducing plants by means of rhizomes. [3]

8. (a) (i) State any **two** components of a balanced diet and state **one** function for each. [4]

(ii) Explain the term *deficiency disease*. [1]

(iii) Give any **three** deficiency diseases. [3]

(b) State **any two** processes through which energy is lost in food chains and food webs. [2]

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

(ii) State the **two** methods by which infants acquire immunity. [2]

(b) Describe the process of vaccination. [4]

(c) Describe any **three** methods of controlling mosquitoes. [3]

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Section C

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

10. **(a)** The reaction between copper oxide (CuO) and hydrogen (H_2) involves oxidation and reduction.

$$CuO + H_2 \rightarrow Cu + H_2O$$

(i) Define the term oxidation. [1]

(ii) Identify the reducing agent in the reaction between copper oxide and hydrogen. [1]

(b) Iron is extracted from iron(III) oxide in the blast furnace.

(i) Name any **two** raw materials that are fed into the furnace from the top. [2]

(ii) Write a chemical equation for the reaction that produces iron. [2]

(c) **(i)** Describe, with the help of equations, how slag (calcium silicate) is formed in the blast furnace. [3]

(ii) State any **one** metal which is added to iron to make stainless steel. [1]

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11. (a) **Fig.11.1** represents an incomplete electrolytic cell that can be used for copper plating an iron object.

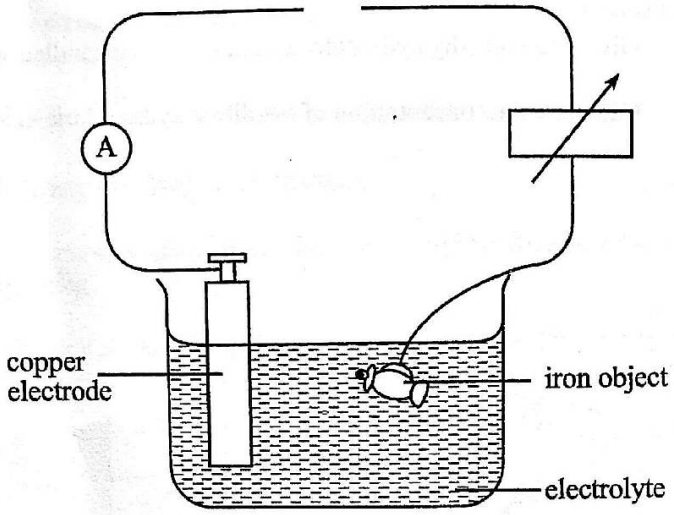


Fig.11.1

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

(ii) Name the electrolyte used in the process. [1]

(iii) Identify the missing apparatus. [1]

(b) State **one** change which occurs at the

(i) copper electrode, [1]

(ii) iron object. [1]

(c) State **two** reasons for electroplating iron objects. [2]

(d) Write the half equation for the copper electrode. [3]

12. A volume of 0.025 dm^3 of 0.1 mol/dm^3 sodium hydroxide (NaOH) solution was put into a flask and a few drops of phenolphthalein indicator were added. A volume of 0.020 dm^3 of dilute hydrochloric acid (HC*l*) was used to completely neutralise sodium hydroxide solution.

(a) Name the method of neutralisation used. [1]

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(b) Explain the purpose of adding phenolphthalein indicator. [1]

(c) Write a chemical equation for the reaction between sodium hydroxide and hydrochloric acid. [2]

(d) Give a reason why hydrochloric acid should be handled with care. [1]

(e) Calculate the concentration of the dilute hydrochloric acid. [5]

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Section D

Answer any two questions on the separate answer sheets provided.

13. **(a)** Explain how a positively charged gold leaf electroscope can be used to test the charge on a charged rod. [4]

(b) **(i)** Describe how a house is protected by a lightning conductor. [3]

(ii) State any **two** dangers of lightning. [2]

(iii) State any **one** safety precaution that should be taken against lightning. [1]

14. **(a)** **Fig.14.1** shows a model of a hydroelectric power station designed by a student.

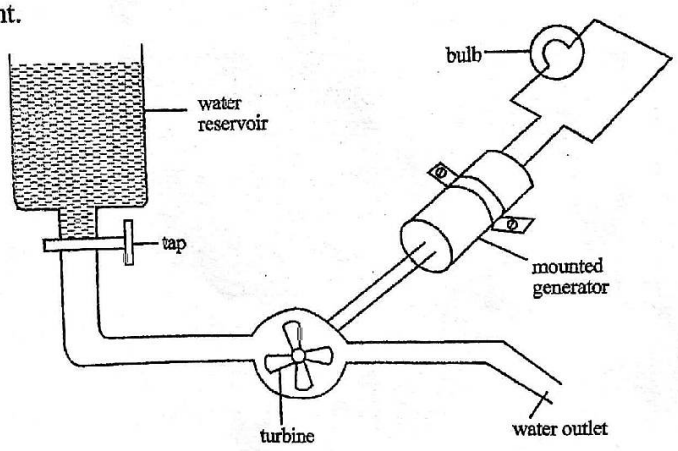


Fig.14.1

(i) Describe, using energy changes, how the bulb in the model lights. [3]

(ii) Explain why using a hydroelectric power station is better than using a thermal power station. [2]

(b) **(i)** State the relationship between voltage and current. [1]

(ii) State any **two** factors that affect resistance of an electrical conductor. [2]

(iii) Calculate the current flowing in a circuit if the potential difference across a 2 Ω resistor is 6 V. [2]

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15. **(a)** A pot with water is placed on an electric stove and the water is heated until it boils.

(i) State the modes of heat transfer involved. [2]

(ii) Describe the modes of heat transfer stated in **(a)(i)**. [3]

(b) The electric stove is marked 2 000 W.

(i) Define the terms *electrical power* and *electrical energy*. [2]

(ii) The water in the pot boils after 8 minutes.

Calculate the energy supplied by the electric stove. [3]

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DATA SHEET
The Periodic Table of the Elements

Group I	Group II												Group III	Group IV	Group V	Group VI	Group VII	Group O
																		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	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
†90-103 Actinoid series	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 = 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.)

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[Turn over