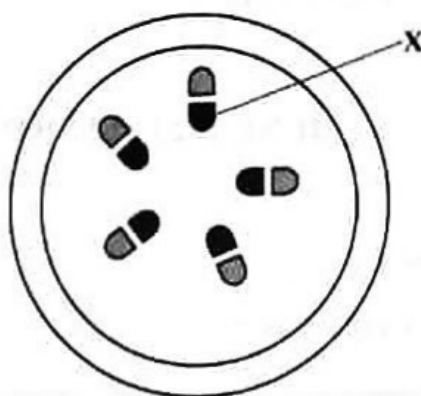


1 Which part of a cell is found in both plant and animal cells?

- A cell membrane
- B vacuole
- C cell sap
- D cell wall

2 The diagram shows the internal structure of the root of a dicotyledonous plant.



Part X is the

- A cortex.
- B xylem.
- C phloem.
- D epidermis.

3 A manual worker's diet must contain a higher proportion of

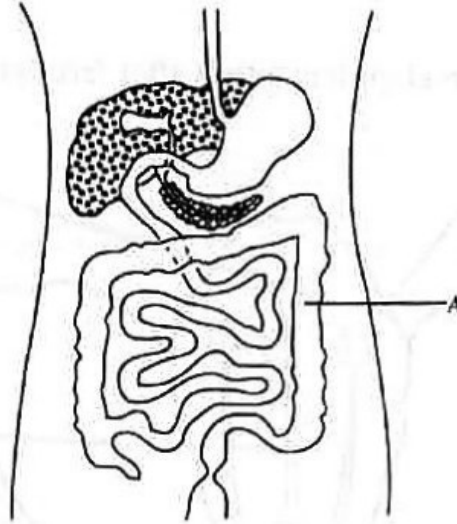
- A fibre.
- B iodine.
- C vitamin D.
- D carbohydrates.

4 In an ecosystem, a zebra feeds on grass, a lion feeds on the zebra and a vulture feeds on the lion.

The lion is a

- A producer.
- B primary consumer.
- C secondary consumer.
- D tertiary consumer.

- 5 The diagram shows part of the human digestive system.

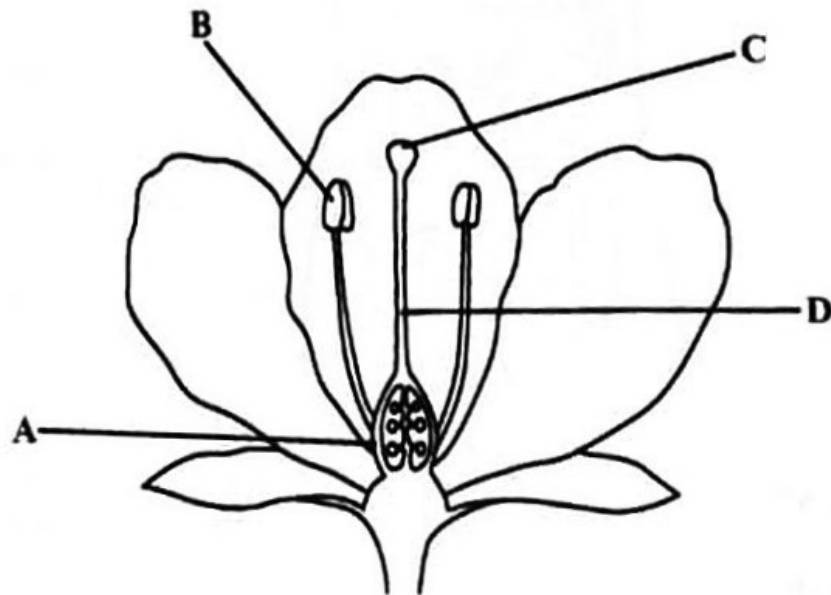


What is labelled A?

- A the stomach
 - B the pancreas
 - C the large intestine
 - D the small intestine
- 6 The rate of transpiration is measured by a
- A barometer.
 - B manometer.
 - C micrometer.
 - D potometer.

7 The diagram shows a flower.

Which part, A, B, C or D, develops into a fruit after fertilisation?



8. A farmer planted 30 bean seeds and 12 seeds did not germinate.

What was the percentage germination?

- A 18%
- B 40%
- C 42%
- D 60%

$\frac{18}{30} \times 100$
 $\frac{18}{30} = \frac{3}{5}$
 $\frac{3}{5} \times 100 = 60\%$

9 Which characteristic, in humans, shows continuous variation?

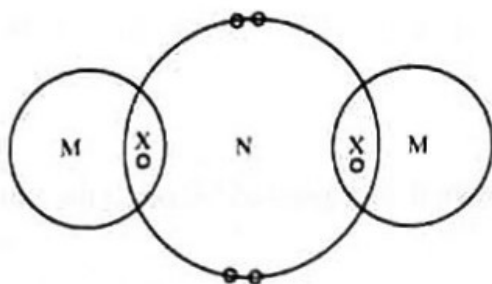
- A sex
- B height
- C tongue rolling
- D left or right handedness

10 Which part of the male reproductive system carries urine and semen out of the body through the penis?

- A scrotum.
- B urethra.
- C sperm duct.
- D epididymis.

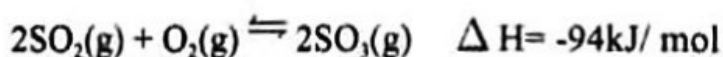
- 11 Which organism causes genital herpes?
- A fungi
 - B virus
 - C bacterium
 - D protozoan
- 12 Which blood vessel transports deoxygenated blood to the lungs?
- A vena cava
 - B pulmonary artery
 - C pulmonary vein
 - D aorta
- 13 Aerobic respiration takes place in the
- A nucleus.
 - B vacuole.
 - C chloroplast.
 - D mitochondria.
- 14 A food sample was mixed with Benedict's solution in a test tube. The test tube was placed into a hot water bath. The solution changed from blue to brick-red.
- The food sample contained
- A starch.
 - B glucose.
 - C protein.
 - D maltose.
- 15 Which method is used to separate an insoluble solid from a liquid?
- A filtration
 - B magnetism
 - C distillation
 - D evaporation
- 16 The the mass number and the proton number of an element X is shown below.
- $${}_{35}^{81}\text{X}$$
- How many neutrons are there in an atom of element X?
- A 35
 - B 46
 - C 81
 - D 116

- 17 The diagram shows bonding in a compound formed between elements M and N.



In which Group of the Periodic Table is element N found?

- A I
 B II
 C VI
 D VIII
- 18 How many moles are present in 6 grams of carbon?
 [mass number of carbon = 12; atomic number of carbon = 6]
- A 0.5
 B 1.0
 C 12.0
 D 6.0×10^{23}
- 19 A metal reacts with steam to produce hydrogen and a
- A metal oxide.
 B metal salt.
 C metal chloride.
 D metal hydroxide.
- 20 A stage in the manufacture of sulphuric acid is shown by the equation:



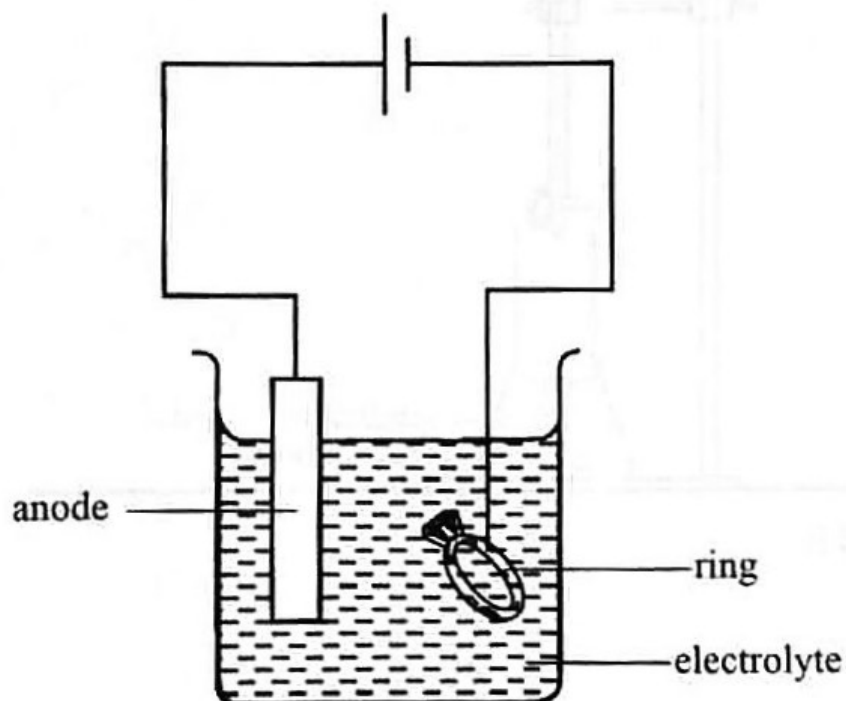
The sign \rightleftharpoons shows that the reaction is

- A an endothermic reaction.
 B a reversible reaction.
 C an exothermic reaction.
 D an oxidation reaction.

21 Oxygen is separated from nitrogen by fractional distillation because

- A nitrogen makes 78% of the air.
- B oxygen is denser than nitrogen.
- C nitrogen is an inert element.
- D of their different boiling points.

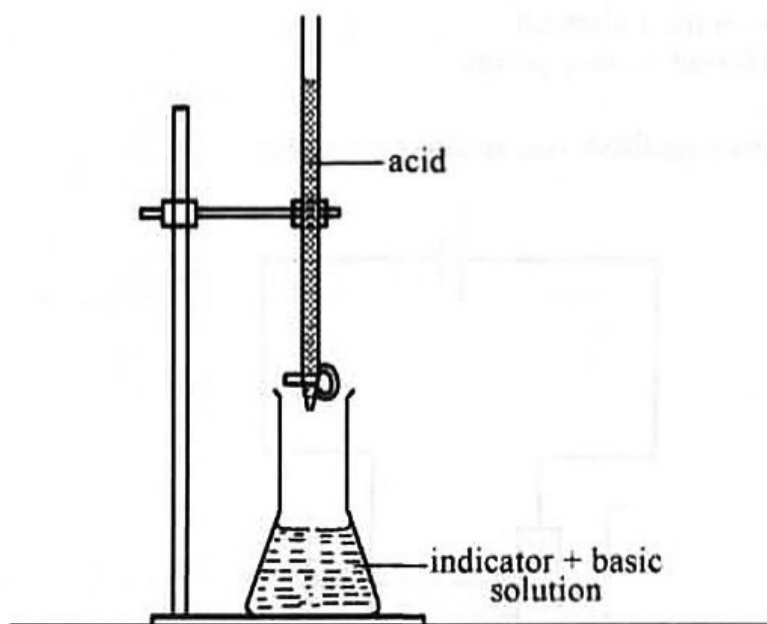
22 The diagram shows a method used to decorate a ring.



The method used is

- A alloying.
- B painting.
- C galvanising.
- D electroplating.

- 23 A salt can be prepared by adding an acid slowly using a burette to a conical flask which contains an indicator and sodium hydroxide.

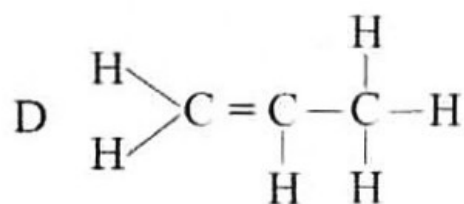
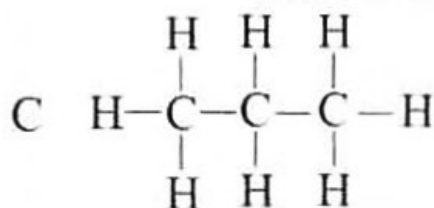
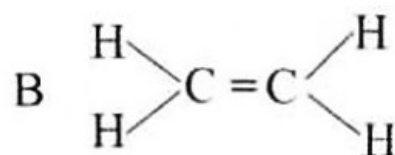
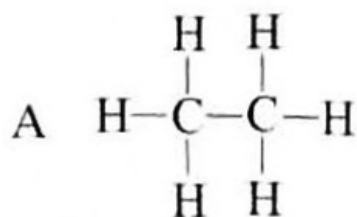


The method used is

- A titration.
 - B filtration.
 - C distillation.
 - D fractional distillation.
- 24 Which reaction, in the blast furnace, shows the formation of slag?

- A $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$
- B $\text{CO}_2 + \text{C} \longrightarrow 2\text{CO}$
- C $\text{Fe}_2\text{O}_3 + 3\text{C} \longrightarrow 2\text{Fe} + 3\text{CO}$
- D $\text{CaO} + \text{SiO}_2 \longrightarrow \text{CaSiO}_3$

25. Which diagram, A, B, C or D, shows the structure of ethene?



26. Which statement, about halogens, is correct?

- A They are all gases.
- B They are poor oxidising agents.
- C Their reactivity increases down the Group.
- D They have seven electrons in the outer shell.

27. Which process is used to produce the hydrogen gas needed for the Haber process?

- A roasting
- B reduction
- C electrolysis
- D fractional distillation

28. The SI unit of mass is the

- A metre.
- B gram.
- C newton.
- D kilogram.

- 29 The relationship between mass (m), volume (V) and density (ρ) of a substance is expressed as

A $\rho = \frac{V}{m}$

B $\rho = \frac{m}{V}$

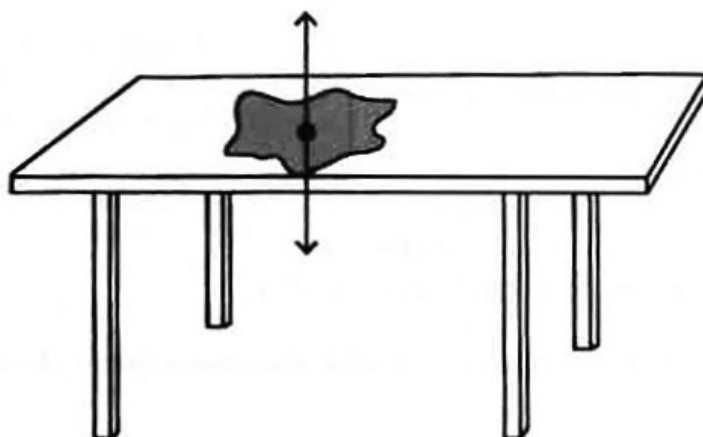
C $\rho = m - V$

D $\rho = V - m$

- 30 Which pair of physical quantities correctly defines weight and mass?

	weight	mass
A	scalar	vector
B	vector	vector
C	vector	scalar
D	scalar	scalar

- 31 The diagram shows a stone resting on a table.



Which principle of Newton's laws of motion is shown by the diagram?

- A weight is equivalent to mass and velocity
 B action and reaction are equal and opposite
 C a body remains at rest or in motion unless acted upon by an external force
 D acceleration of a mass is proportional to the force provided the mass is constant

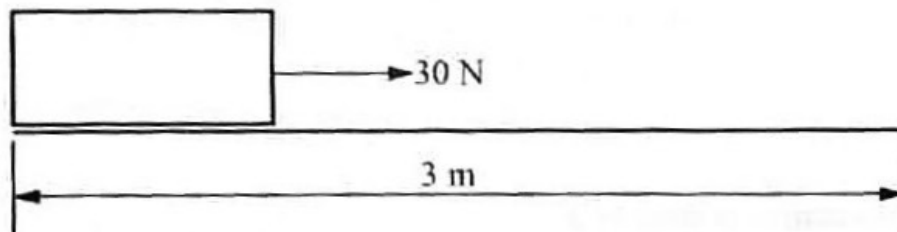
32 Shiny surfaces are

- A poor absorbers of heat .
- B poor reflectors of heat .
- C good emitters of heat .
- D good absorbers of heat .

33 Which row one, A, B, C or D, correctly describes the events for the compression stroke of a four stroke engine?

	piston direction	inlet valve	exhaust valve
A	up	closed	closed
B	down	open	open
C	up	open	open
D	down	closed	closed

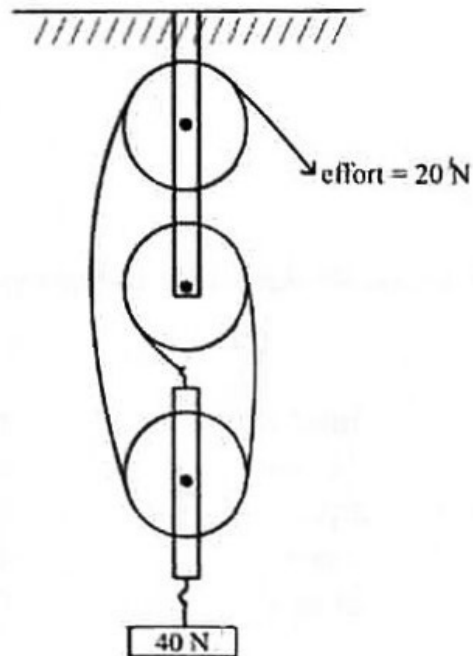
34 The diagram shows an object pulled along a 3 m horizontal surface.



What is the energy used?

- A 0.1 J
- B 10.0 J
- C 33.0 J
- D 90.0 J

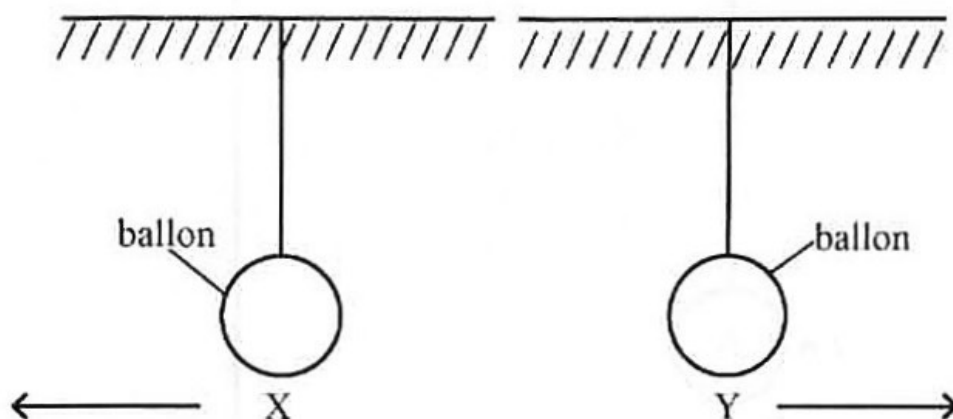
- 35 The diagram shows a simple machine.



What is the mechanical advantage of the machine?

- A 0.5
B 2.0
C 20.0
D 60.0
- 36 Decoding of information is done by a
- A cable.
B sender.
C receiver.
D transmission media.
- 37 Fluid pressure is measured by a
- A voltmeter.
B manometer.
C micrometer.
D a photometer.

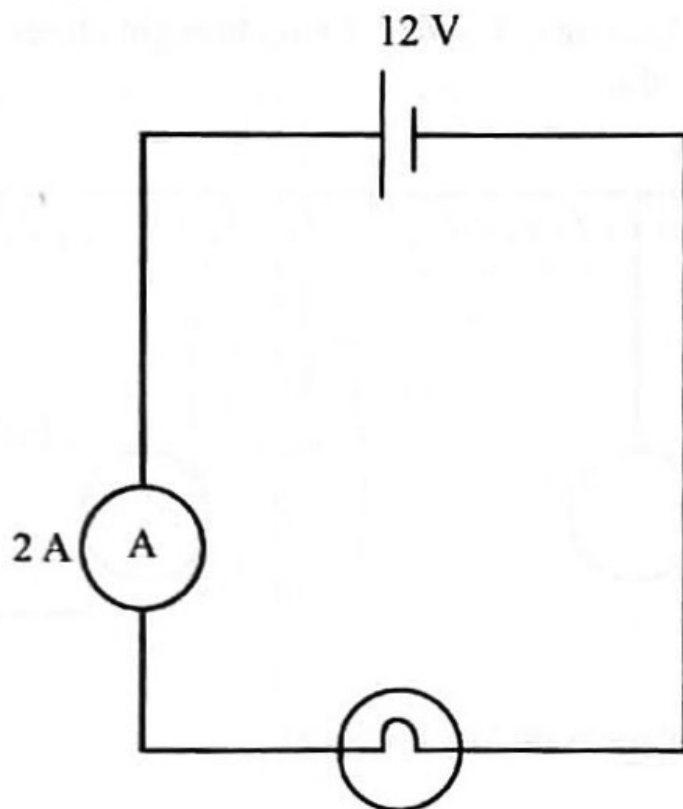
- 38 The diagram shows two balloons, X and Y, being brought closer to each other. The balloons repel each other.



Which are the possible charges on the balloons?

- A both are neutral
 - B both are positively charged
 - C X is positively charged and Y is negatively charged
 - D X is negatively charged and Y is positively charged
- 39 Which factor affects the rotation of a coil in an electric motor?
- A direction of coil
 - B direction of motion of coil
 - C strength of the magnetic field
 - D number of coils

- 40 The diagram shows an electric circuit.



What is the resistance of the circuit?

- A** 2.0Ω
- B** 6.0Ω
- C** 12.0Ω
- D** 24.0Ω

Candidate Name

Centre Number

Candidate Number



For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

COMBINED SCIENCE

4003/2

PAPER 2 Theory

JUNE 2023 SESSION

2 hours

Additional materials:
 Calculator (Optional)
 Answer sheets
 String

The Periodic Table is provided on page 14.

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 sheets provided.

Section D

Answer any **two** questions.

Write your answers on the separate answer sheets provided.

FOR EXAMINER'S USE

Section A	
Section B	
Section C	
Section D	
TOTAL	

INFORMATION FOR CANDIDATES

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

This question paper consists of 14 printed pages and 2 blank pages.

Copyright: Zimbabwe School Examinations Council, J2023.

- 1 (a) Parts of a dicotyledonous plant's stem include the phloem and the cambium.

State the function of the

- (i) phloem,

[1]

- (ii) cambium.

[1]

- (b) Describe the method of water movement from the root hair cells across the cortex.

[2]

- (c) Blood is made up of different components.

- (i) Identify the liquid component of blood.

[1]

- (ii) State any one function of the component named in (c)(i).

[1]

- (d) State one other function of blood.

[1]

- 2 (a) (i) Name a gas produced during respiration.

_____ [1]

- (ii) Describe a test for the gas stated in (a)(i).

 _____ [2]

- (b) Fig.2.1 shows the human respiratory system.

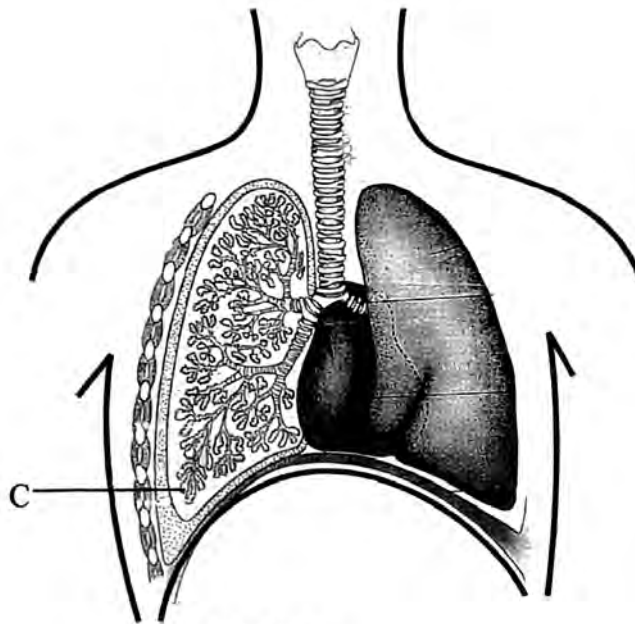


Fig.2.1

- (i) Name part C.

_____ [1]

- (ii) State the function of part C.

_____ [1]

- (iii) Describe any **two** adaptations of part C for its function.

 _____ [2]

3 The symbol of an element **X** is ${}_{12}^{24}\text{X}$.

(a) **(i)** State the number of electrons in an atom of element **X**.

_____ [1]

(ii) Write the electronic configuration for element **X**.

_____ [1]

(iii) State the type of bonding formed when element **X** reacts with chlorine.

_____ [1]

(iv) Give any **one** physical property of the compound formed when element **X** reacts with chlorine.

_____ [1]

(b) The relative molecular mass of a compound is 94.
47 g of the compound was dissolved in 0.50 dm^3 of water.

Calculate the concentration of the solution formed in mol/dm^3 .

- 4 (a) Fig.4.1 shows an electrolytic cell.

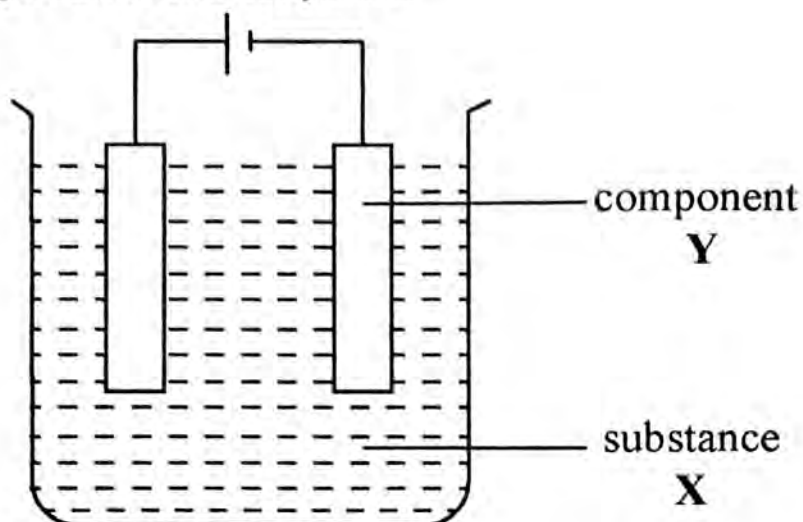


Fig.4.1

- (i) State the term used to describe

1. substance X,

2. component Y.

[2]

- (ii) Write the energy change that occurs in an electrolytic cell.

[2]

- (b) An iron nail is electroplated with copper.

State the material or item that is connected to the

- (i) positive terminal,

- (ii) negative terminal.

[2]

5 (a) (i) State the instrument used to measure

1. current,

2. voltage.

[2]

(ii) State any formula which is used to calculate electrical power.

[1]

(b) Two balloons were rubbed with a woollen material.

(i) State the charge formed on the balloons.

[1]

(ii) Explain how each material got charged during the rubbing process.

[2]

- 6 (a) Fig.6.1 shows a pulley system used to lift a load.

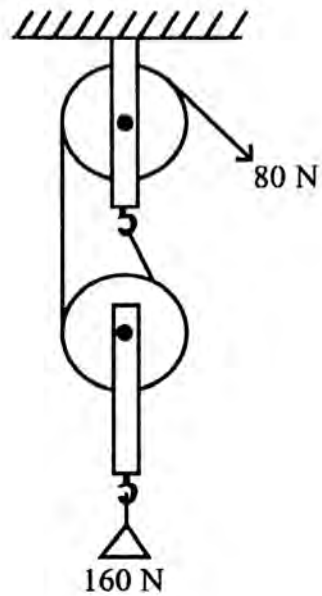


Fig.6.1

- (i) State the velocity ratio of the pulley system.

[1]

- (ii) Calculate the mechanical advantage of the pulley system.

[2]

- (iii) Calculate the efficiency of the pulley system.

[2]

(iv) Give any one reason why efficiency of the pulley system is not 100%.

[1]

(b) State any one other example of a machine.

[1]

For
Examiner
Use

Section B

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

For
Examiner
Use

- 7 (a) Name a part of the alimentary canal where bile is produced. [1]
- (b) Describe the importance, in digestion, of
- (i) saliva, [2]
- (ii) bile, [2]
- (iii) pancreatic juice. [2]
- (c) Outline the importance of oral hygiene. [3]
- 8 (a) A person infected with HIV/AIDS may become infected with opportunistic diseases.
- (i) Explain what is meant by the term *opportunistic diseases*. [2]
- (ii) Give any **two** examples of opportunistic diseases. [2]
- (b) (i) Describe any **two** methods of mother to child transmission of HIV. [4]
- (ii) State any **two** ways of reducing mother to child transmission of HIV. [2]
- 9 (a) A woman's menstrual cycle runs from day 1 to day 28.
- (i) Describe the process that takes place in the uterus between days 1 – 4 for a woman who is **not** pregnant. [1]
- (ii) Identify the process that takes place in the ovary around the 14th day for the woman. [1]
- (iii) State any **two** female hormones. [2]
- (iv) State any **one** function of each of the hormones stated in (a)(iii). [2]
- (v) Describe the events that take place within one month after an ovum has been fertilised. [4]

Section C

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

- 10** In a titration experiment, a learner found out that 50.0 cm^3 of 1.0 mol/dm^3 sodium hydroxide (NaOH) solution was titrated with 25.0 cm^3 of dilute sulphuric acid (H_2SO_4).
- (a) State the reagent that should be used during the reaction to make the end point visible. [1]
 - (b) State the products for the reaction between sodium hydroxide and sulphuric acid. [2]
 - (c) State a method of separating the products. [1]
 - (d) State the pH of any one of the products. [1]
 - (e) Calculate the concentration of the sulphuric acid used given that 1 mole of H_2SO_4 reacts with 2 moles of sodium hydroxide. [5]
- 11**
- (a) Nitrogen gas and oxygen gas, which are used in industrial processes, can be obtained from atmospheric air.
 - (i) Describe how atmospheric air is liquified. [4]
 - (ii) State any **one** component of air which is removed during the process. [1]
 - (b)
 - (i) Name the method used to separate components of liquid air. [1]
 - (ii) State any **one** use of nitrogen and any **one** use of oxygen. [2]
 - (c) Describe a positive test for oxygen gas. [2]

- 12 (a) Fig.12.1 shows displayed structural formulae of two organic molecules, A and B.

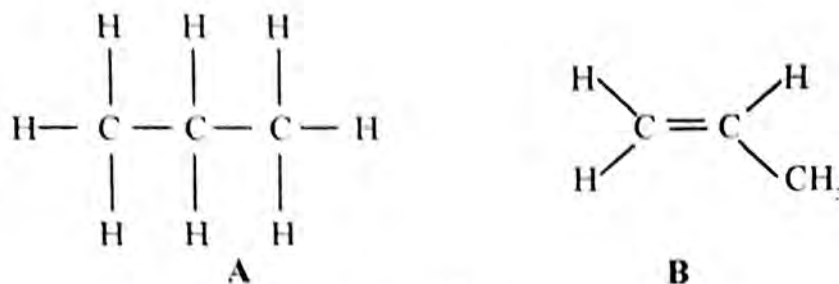


Fig.12.1

- (i) Name the organic molecules A and B. [2]
- (ii) Give any **two** differences between the two organic molecules. [2]
- (iii) State the **two** products of the complete combustion of compound A other than heat energy. [2]
- (b) A hydrocarbon, C, contains 86 % carbon and 14 % hydrogen by mass. Calculate the empirical formula of C. [4]

Section D

For
Examiner
Use

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

- 13 (a) (i)** Name the source of energy used by a solar cooker. [1]
- (ii)** State **two** methods through which heat is transferred from the surface of the cooker to the water in the pot. [2]
- (iii)** Describe the appearance of the surface of the solar cooker. [3]
- (iv)** Explain how the solar cooker works. [3]
- (b)** State the name given to a material that is a poor conductor of heat. [1]
- 14 (a)** Fig.14.1 shows one of the four strokes of an engine.

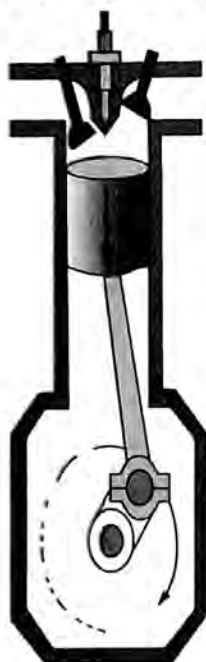


Fig.14.1

- (i)** Identify, giving **two** reasons, the stroke shown. [3]
- (ii)** Name the type of the engine that consists of the stroke shown in Fig.14.1. [1]
- (iii)** Give a reason for the answer in (ii). [1]
- (iv)** State **one** advantage and **one** disadvantage of the engine stated in (ii). [2]

- (b) Explain how a car braking system works. [3]
- 15 (a) (i) Suggest an instrument that can be used to measure the external diameter of a very thin object. [1]
- (ii) Name an instrument that can be used to measure the length of a building. [1]
- (iii) Express the newton (N) in its base units. [2]
- (b) Fig.15.1 shows a concrete block of mass 2600 kg resting on its biggest face.

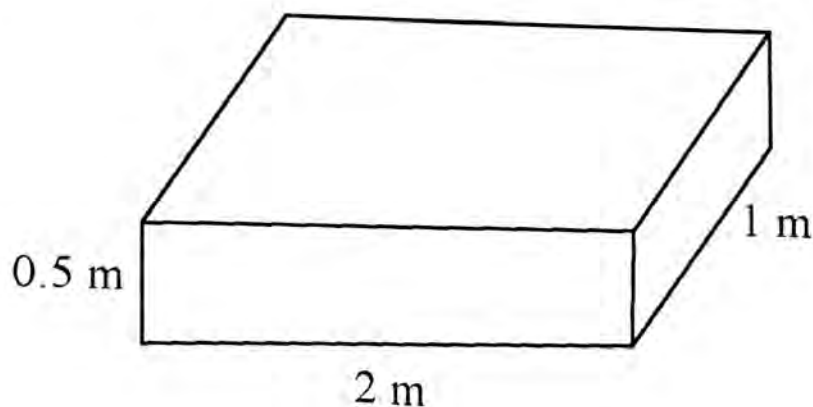


Fig.15.1

- (i) Calculate the pressure exerted by the block. [4]
[Take g as 10 N/m^2]
- (ii) Explain how the pressure exerted by the block changes if it is rested on one of the smallest faces. [2]

DATA SHEET

The Periodic Table of the Elements

		Group															
I	II											III	IV	V	VI	VII	O
		1 H Hydrogen															
7 Li Lithium	8 Be Beryllium											11 B Boron	12 C Carbon	14 N Nitrogen	16 O Oxygen	18 F Fluorine	20 Ne Neon
9 Na Sodium	10 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Cesium	56 Ba Barium	57 La Lanthanum	58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium	
87 Fr Francium	88 Ra Radium	89 Ac Actinium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium	

*59-71 Lanthanoid series
90-103 Actinoid series

Key
X X = atomic symbol
Z = atomic number

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

Candidate Name — — — —

Centre Number

Candidate Number



For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

COMBINED SCIENCE

4003/3

PAPER 3 Practical Test

JUNE 2023 SESSION

1 hour 30 minutes

Candidates answer on the question paper.

Additional materials:
As listed in instructions to Supervisors
Calculator (optional)

INSTRUCTIONS TO CANDIDATES

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

Answer **both** questions.

Write your answers in the spaces provided on the question paper.

Use a sharp pencil for your drawings. Coloured pencils or crayons should **not** be used.

You should show the essential steps in any calculation and record all experimental results in the spaces provided in the question paper.

INFORMATION FOR CANDIDATES

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

FOR EXAMINER'S USE	
1	
2	
TOTAL	

This question paper consists of 7 printed pages and 1 blank page.

Copyright: Zimbabwe School Examinations Council, J2023.



- 1** You are required to identify the nutritional value in a nutrient solution A.
You are provided with a test tube labelled T₁, a syringe, access to nutrient solution A, access to solution S, access to solution P, access to iodine solution, two droppers and white paper.

- (a) (i)** Carry out the tests which are described in **Table 1.1**.
Record the observations in **Table 1.1**.
Write conclusions in **Table 1.1**.

Table 1.1

test	observation(s)	conclusion(s)
<p>1. Add, using a syringe, 2.0 cm³ of the nutrient solution A into test tube T₁.</p> <p>Thoroughly rinse the syringe.</p> <p>Draw 2.0 cm³ of solution S and add it to test tube T₁.</p> <p>Use a dropper to add one drop of solution P to the mixture in test tube T₁ and shake.</p> <p>Continue to add one drop of Solution P and shaking until a change is noticed.</p> <p>Throw away the contents of test tube T₁ and thoroughly rinse the test tube.</p>		

<p>2. Add₃ using a syringe, 2.0 cm³ of the nutrient solution A into test tube T₁.</p> <p>Thoroughly rinse the syringe.</p> <p>Then add about 1 cm³ of iodine solution and shake.</p>		
<p>3. Use a dropper to add one drop of the nutrient solution A to a white sheet of paper.</p> <p>Gently wave the paper in the air.</p>		

[11]

(ii) Identify solution S.

[1]

(iii) Suggest the identity of solution P.

[1]

(b) State, giving a reason, **one** precaution that should be taken during the experiment.

[2]



(c) (i) Explain any one nutritional deficiency of the nutrient solution A.

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

(ii) Explain any one nutritional advantage of the nutrient solution A.

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

(iii) State a deficiency disease in children that may be controlled through drinking the nutrient solution A regularly.

..... [1]

2 You are required to determine the mechanical advantage (MA), velocity ratio (VR) and efficiency of a simple machine.

You are provided with a flat bar with marked positions of the pivot, A and B. You are also provided with masses and a pivot.

(a) (i) Set up the apparatus as shown in Fig.2.1.

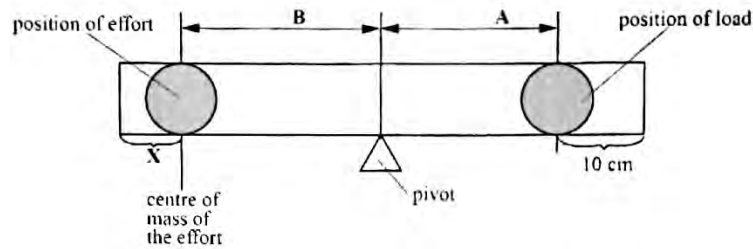


Fig.2.1

The centre of the load should be 10 cm from the end of the flat bar. Measure and record the distances A and B from the pivot

[3]

- (ii) Place a load of 100 g on the position marked A as shown in Fig. 2.1 Place masses (effort) at the position marked B (as shown in Fig.2.1) until the load is just lifted. Record, in Table 2.1, the total mass that just lifted the load. Repeat the experiment two more times, recording the masses in Table 2.1. Complete Table 2.1 by converting the load and effort to newtons.

Table 2.1

experiment	load/g	load/N	effort/g	effort/N
1				
2				
3				

[6]



(iii) Calculate the average effort applied in newtons.

[2]

(b) (i) Calculate the mechanical advantage (MA) of the machine.

[2]

(ii) Calculate the velocity ratio (VR) of the machine.

[2]

(iii) Calculate the efficiency of the machine.

[2]



(iv) Comment on the value of the efficiency obtained in (b)(iii).

[2]

(v) State **one** way of increasing the efficiency of the machine.

[1]