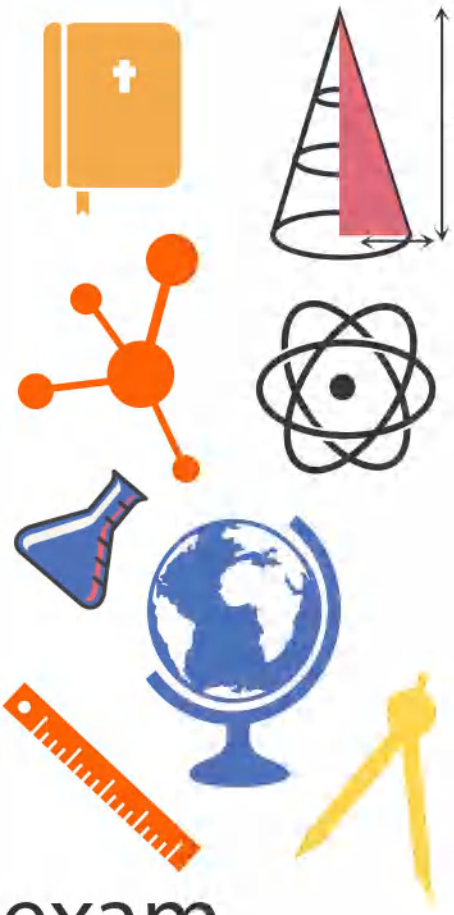


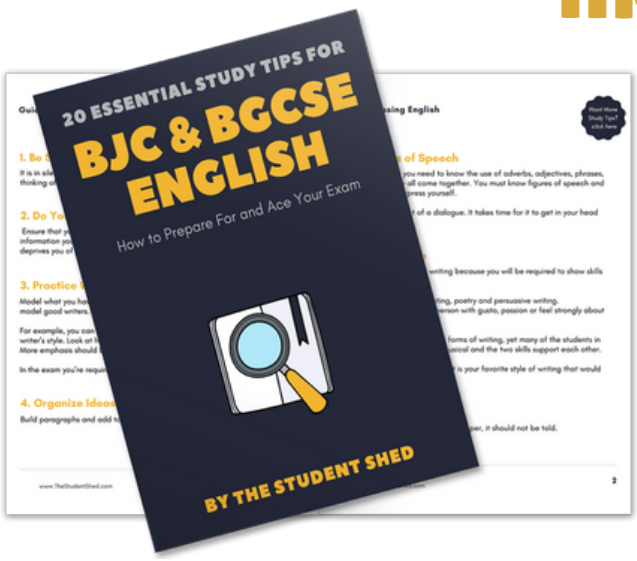
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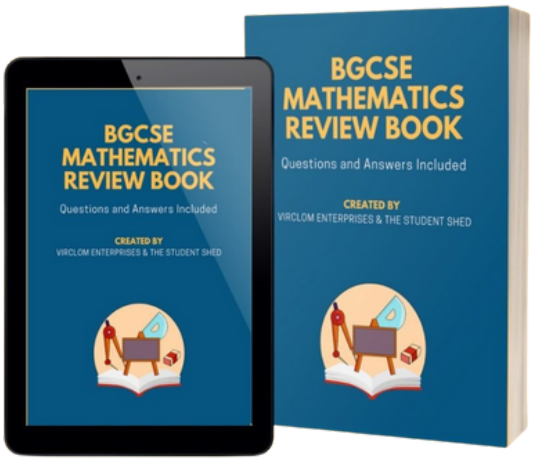
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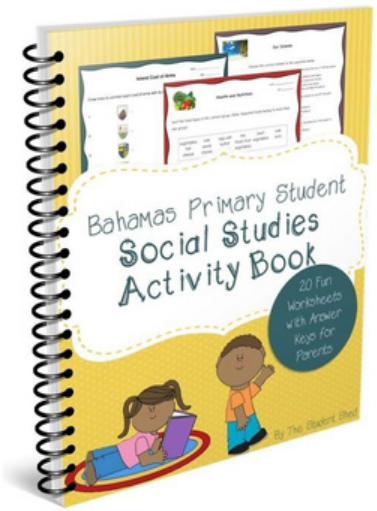
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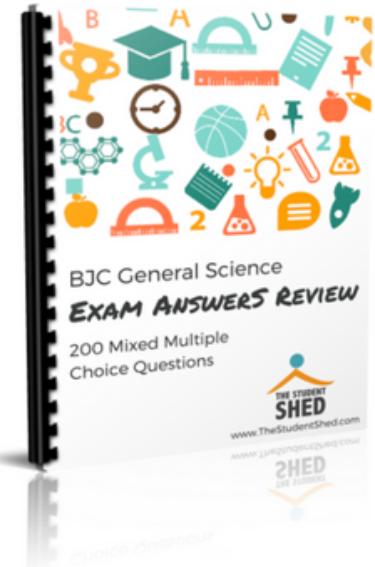
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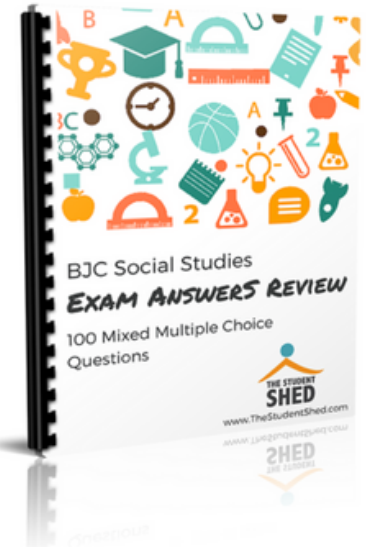
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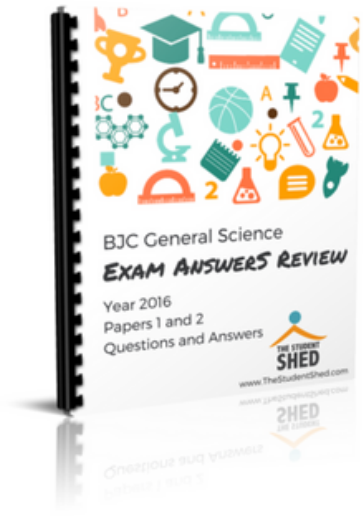
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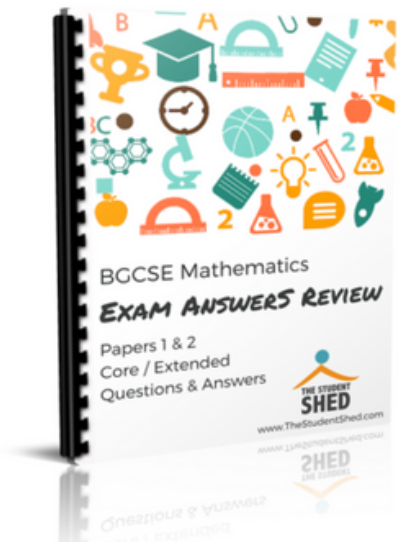
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3102/1 **BGCSE**

School Number	Candidate Number
Surname and Initials	

COMBINED SCIENCE

PAPER 1 3102/1

Friday 26 MAY 2023 12:00 NOON–1:15 P.M.

No additional materials required.

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS FOR CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided on this question booklet.

There are **FIFTY** questions on this paper.

Attempt **ALL** questions.

For each question, there are **FOUR** possible answers labelled **A**, **B**, **C** and **D**. Choose the **ONE** you consider correct and record your choice by circling the LETTER next to the answer of your choice in the booklet.

A copy of the Periodic Table is printed on page 2.

Calculators are permitted, however **NO** graphing calculators are allowed.

FOR EXAMINER'S USE ONLY	
Total Marks	

This question paper consists of 18 printed pages and 2 blank pages.

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[Turn over

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	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 †															

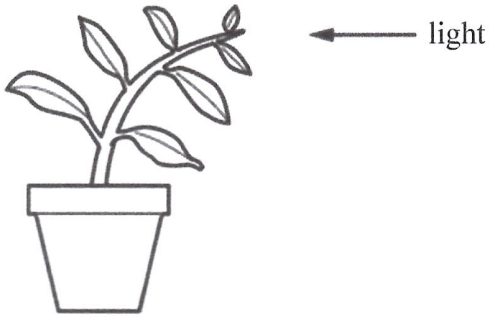
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 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

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

Key

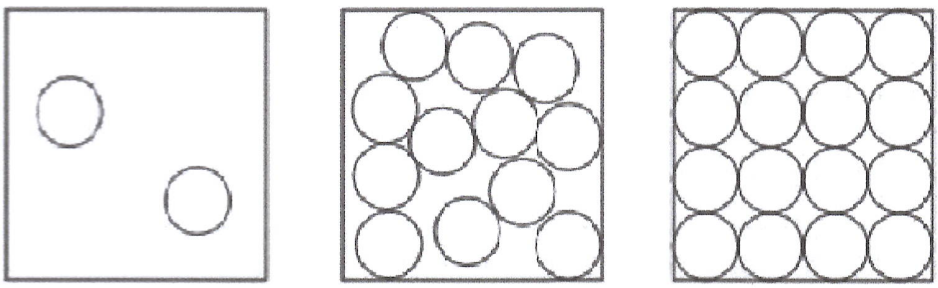
a	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

1. Which characteristic of living organisms is being shown in the diagram?



A. excretion
B. reproduction
C. respiration
D. sensitivity

2. Diagrams **X**, **Y** and **Z** represent the three states of matter.

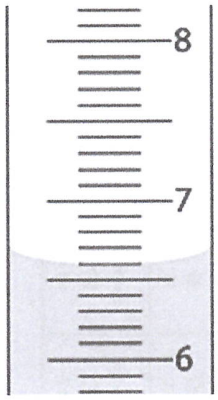


X **Y** **Z**

Which change occurs when solid iodine changes to iodine gas?

A. X to Z
B. Y to X
C. Z to X
D. Z to Y

3. The diagram shows the level of a liquid in a measuring cylinder.

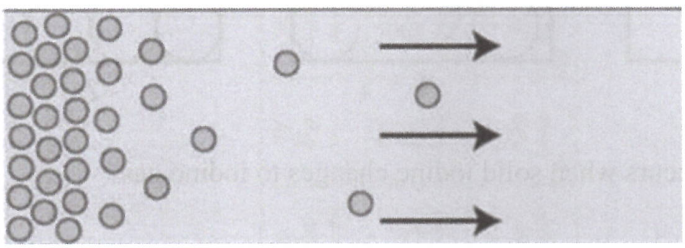


What is the volume of the liquid?

A. 6.5 cm^3
B. 6.6 cm^3
C. 6.7 cm^3
D. 6.8 cm^3

4. The diagram shows how particles move and spread from one place to another.

What is the name of the process shown?



A. active transport
B. diffusion
C. evaporation
D. osmosis

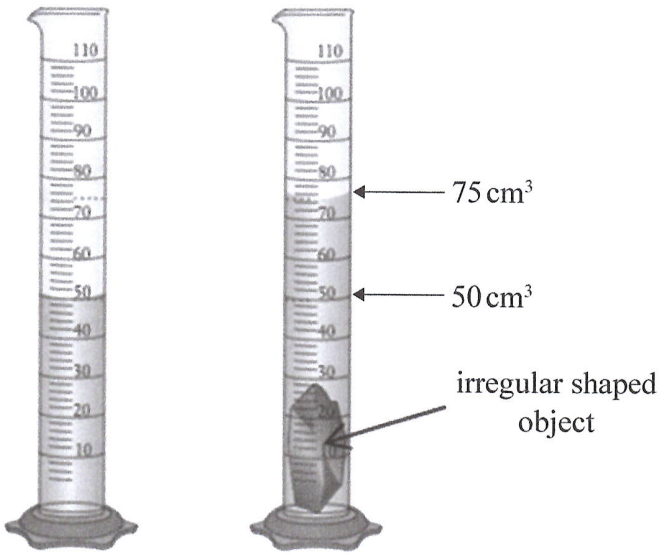
5. The atomic symbol for lithium is

$^{7}_{3}Li$

Which row shows the number of protons, neutrons and electrons found in a lithium atom?

	Protons	**Neutrons**	**Electrons**
A.	3	4	3
B.	3	4	4
C.	4	3	3
D.	4	3	4

6. A stone is lowered into a graduated cylinder holding a volume of water equal to 50 cm^3. The height of the water rose to 75 cm^3.



The mass of the stone is 27g. Calculate the density of the stone.

A. 0.92 g/cm^3
B. 1.08 g/cm^3
C. 1.85 g/cm^3
D. 2.78 g/cm^3

7. A plant root cell absorbs water from the soil.

Which term best describes the process by which water moves from the soil into the cell?

A. active transport
B. diffusion
C. evaporation
D. osmosis

8. Which substance contains atoms which are all alike?

A. compound
B. element
C. mixture
D. solution

9. A biker rides west for 50 miles from his starting position, then turns and bikes back east for 80 miles.

What is his net displacement?

A. 30 miles east
B. 30 miles west
C. 130 miles north east
D. 130 miles north west

10. What type of substance acts as a catalyst to speed up chemical reactions in the body?

A. antibody
B. enzyme
C. hormone
D. vitamin

11. Which change occurs when an atom forms a positive ion?

A. It gains electrons.
B. It gains protons.
C. It loses electrons.
D. It loses protons.



12. Which piece of apparatus is used to measure the mass of an object?

A. beaker
B. beam balance
C. conical flask
D. thermometer

13. Which nutrient helps with growth and repair of body tissues?

A. carbohydrates
B. fats
C. proteins
D. water

14. Which formula is **not** correct for the compound given?

	Compound	**Formula**
A.	ammonia	NH_3
B.	calcium hydroxide	$Ca(OH)_2$
C.	magnesium chloride	$MgCl_2$
D.	magnesium oxide	MgO_2

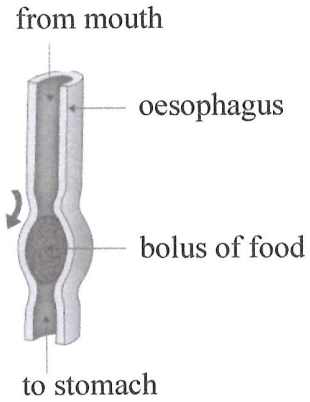
15. Why does convection take place in a liquid when it is heated?

A. Liquids expand when they are heated.
B. Liquids start to bubble when they get close to boiling point.
C. Molecules in the liquid with more kinetic energy move and transfer heat.
D. Molecules near to the surface of the liquid escape into the air.



16. The diagram shows a bolus of food passing from the mouth to the stomach through the oesophagus.

What is the name of the process occurring in the diagram?



A. assimilation
B. diffusion
C. metabolism
D. peristalsis

17. Which statement about alloys is **not** correct?

Alloys are....

A. good conductors of electricity.
B. mixtures of different metals.
C. good conductors of heat.
D. not as strong as the metals from which they are made.

18. When building sidewalks, gaps are left between concrete slabs.

What does this compensate for?

A. lower temperatures
B. radiation
C. thermal contraction
D. thermal expansion

19. What is the optimum pH for digestion in the stomach?

A. pH2
B. pH7
C. pH9
D. pH12

20. Which is the most acidic household chemical?

	Household chemical	pH
A.	baking soda	9
B.	vinegar	4
C.	milk	6
D.	dishwashing liquid	8

21. A force may produce a change in the characteristics of an object.

What is the set of characteristics that can be changed by a force?

A. mass and size
B. mass and volume
C. shape and mass
D. size and shape

22. Which activity can best aid in preventing a possible heart attack?

A. eating too much
B. moderate exercise
C. overexertion
D. smoking

23. Which physical property determines the separation technique used to separate a mixture of ethanol and water?

A. boiling point
B. density
C. melting point
D. solubility

24. Which is the equation used to calculate power?

A. energy × time
B. force × acceleration
C. work ÷ time
D. time ÷ energy

25. Which is the major blood vessel that takes deoxygenated blood to the heart from the body?

A. aorta
B. coronary artery
C. pulmonary vein
D. vena cava

26. Which is an example of a physical change?

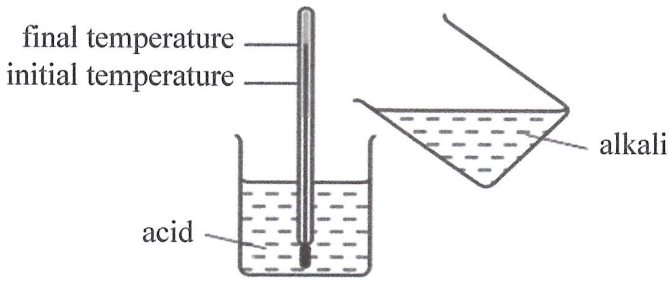
A. silver jewellery becoming tarnished
B. a metal fence rusting
C. iron being heated until it melts
D. hydrochloric acid breaking down metal

27. Which process converts the products of digestion into energy for cells?

A. absorption
B. assimilation
C. photosynthesis
D. respiration

28. An acid and an alkali are mixed as shown in the diagram.

A reaction occurs and the temperature change is measured.

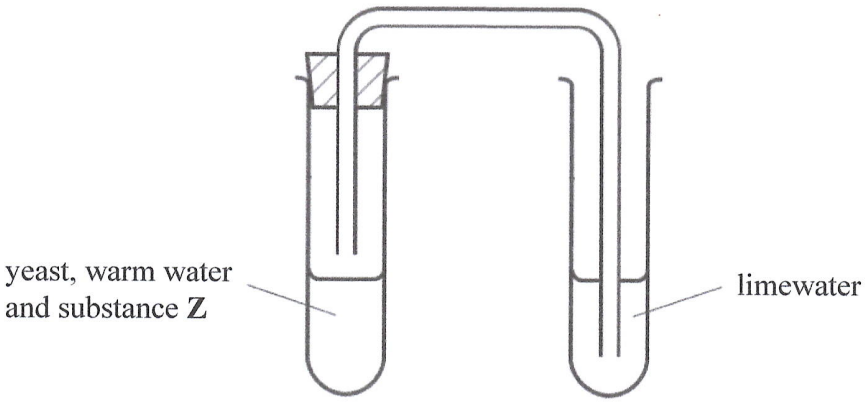


Which statement best describes the reaction?

A. The reaction is endothermic, the temperature decreases.
B. The reaction is endothermic, the temperature increases.
C. The reaction is exothermic, the temperature decreases.
D. The reaction is exothermic, the temperature increases.

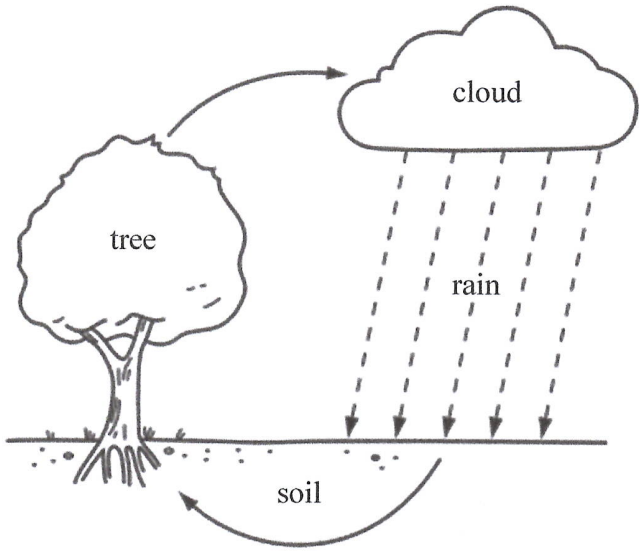
29. Yeast, warm water and the substance **Z** were put into a test-tube. The apparatus was set up as shown. After a while, the limewater forms a white precipitate.

What is substance **Z**?



A. alcohol
B. carbon dioxide
C. glucose
D. oxygen

30. The diagram shows a simple water cycle.



What is responsible for water loss from a tree?

A. evaporation
B. photosynthesis
C. respiration
D. translocation

31. How do sound waves travel in air?

A. changes in air pressure
B. electromagnetic waves
C. infrared waves
D. vibrations in wires or string

32. Which organ is mainly responsible for the removal of urea from the body?

A. heart
B. lungs
C. kidney
D. stomach

33. The table lists the melting points and the boiling points of four different substances.

Which substance is a liquid at 0 °C?

	Melting point /°C	Boiling point /°C
A.	– 219	– 183
B.	– 7	58
C.	98	890
D.	1083	2582

34. Which sensory organ has the ability to detect heat when you touch a hot pan?

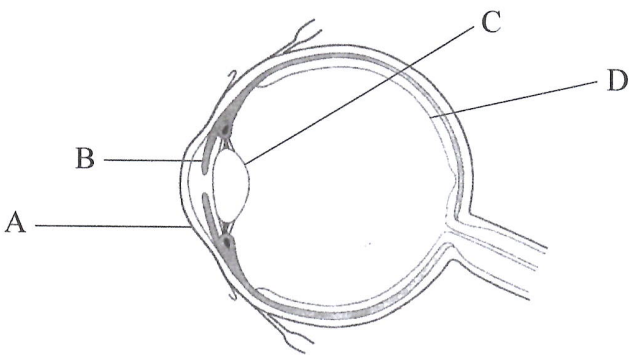
A. ear
B. eye
C. nose
D. skin

35. Which term is used to indicate the flow of electrons through a conductor?

A. current electricity
B. resistance
C. static electricity
D. voltage

36. The diagram shows a section through the human eye.

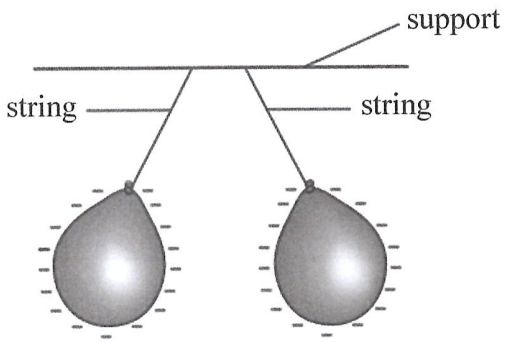
Which structure controls the size of the pupil?



37. A student ties two balloons to a support with some string.

Each balloon was rubbed with a dry cloth which gave them a negative charge.

The diagram represents what has happened to the balloons after they were rubbed.



What causes the balloons to be charged like this?

A. They gained electrons.
B. They lost electrons.
C. They gained protons.
D. They lost protons.

38. Which connective tissue attaches bones to each other at a moveable joint?

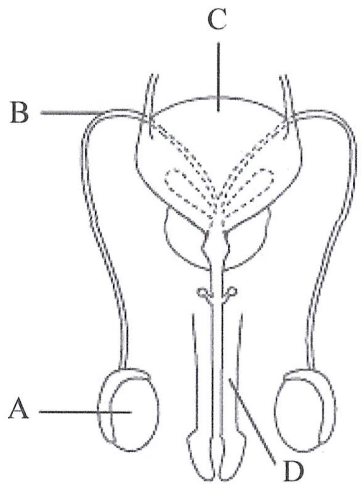
A. cartilage
B. ligament
C. muscle
D. tendon

39. Which is the SI unit for potential difference?

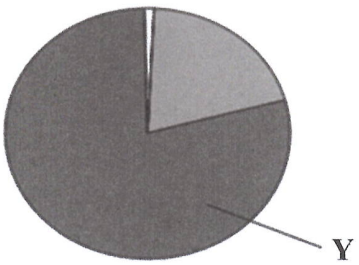
A. kilogram
B. pascal
C. joule
D. volt

40. The diagram shown represents the human male reproductive system.

Which labelled structure produces the male gametes?



41. The diagram shows the percentage composition of gases found in the air.



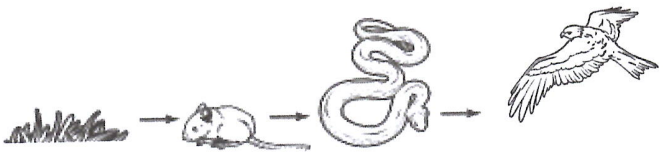
Which component of air is **Y**?

A. carbon dioxide
B. oxygen
C. argon
D. nitrogen

42. Which is a unit of resistance?

A. ampere
B. ohm
C. volt
D. watt

43. Which organism is the secondary consumer in this food chain?



A. grass
B. kite
C. mouse
D. snake

44. The test results for a colourless liquid are shown.

- Boiling point = 100 °C
- White anhydrous copper(II) sulphate turns blue

What is the colourless liquid?

A. ethanol
B. hydrochloric acid
C. pure water
D. sodium chloride solution

45. The plug for an electric lamp contains a 3A fuse. The fuse's job is to protect the lamp if too much current flows.

What will happen when the fuse does its job?

A. The fuse burns and catches on fire.
B. The fuse directs the current back to its source.
C. The fuse reduces the current to 3A.
D. The fuse wire melts and breaks the circuit.

46. Which human activity can cause eutrophication of lakes?

A. release of carbon dioxide
B. release of sulphur dioxide
C. use of fertilisers
D. use of pesticides

47. After some building work in a house, a bare (uninsulated) wire is left protruding from a wall.

What is the greatest hazard posed by the bare (uninsulated) wire?

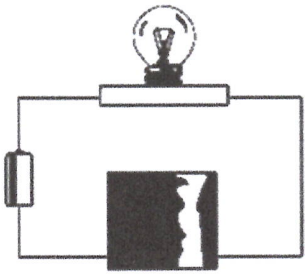
A. A fuse may blow.
B. A fire may start.
C. No current flows.
D. The neutral wire is grounded.

48. Why is it important to conserve natural resources?

A. It does not take very long to make them again.
B. They can be replaced when used up.
C. They can decrease pollution.
D. They cannot be replaced once used up.

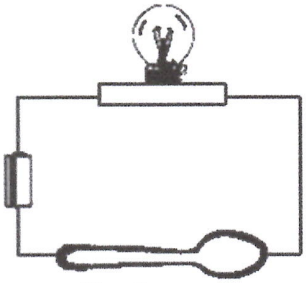
49. Study the following diagrams.

bulb 1



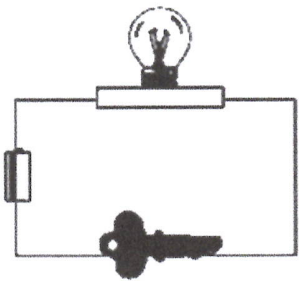
Aluminium foil

bulb 2



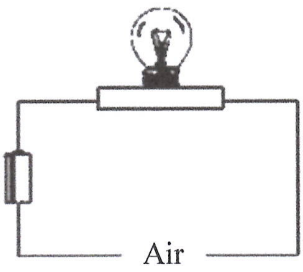
Plastic spoon

bulb 3



Key

bulb 4



Air

Which bulbs would light up?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 3 and 4 only

50. Which is **not** an economic benefit of biotechnology?

A. increased crop yield
B. increased production of medicines
C. increased use of pesticides
D. producing vaccines to fight diseases



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School Number	Candidate Number
Surname and Initials	

COMBINED SCIENCE

PAPER 2 3102/2

Friday 26 MAY 2023 1:30 P.M.–3:00 P.M.

No additional materials required.

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

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INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided on this question booklet.

Answer **ALL** questions on this paper in the spaces provided in this question booklet.

Read each question carefully and make sure you know what you have been asked to do before starting your answer.

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

A copy of the Periodic Table is printed on page 2.

Calculators are permitted, however **NO** graphing calculators are allowed.

For Examiner's Use	
1	
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TOTAL	

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The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	0
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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 †															

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

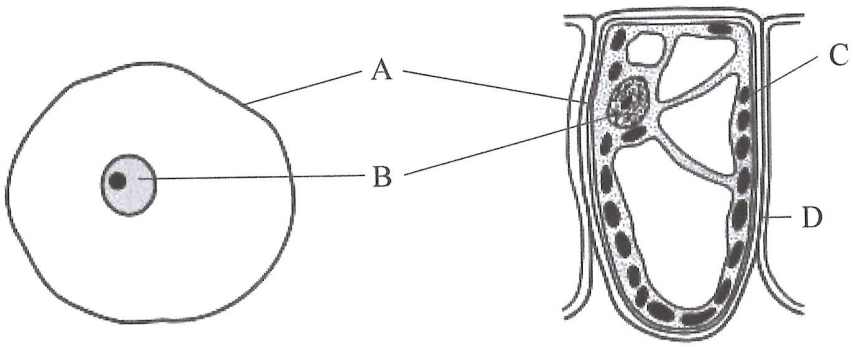
*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a
X
b

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

1. The diagrams show an animal cell and a plant cell.



animal cell plant cell

(a) Name the parts labelled:

A _____

C _____ [2]

(b) (i) State the function of parts **B** and **D**.

B _____

D _____ [2]

(ii) Name the thick fluid that fills the inside of the cell.

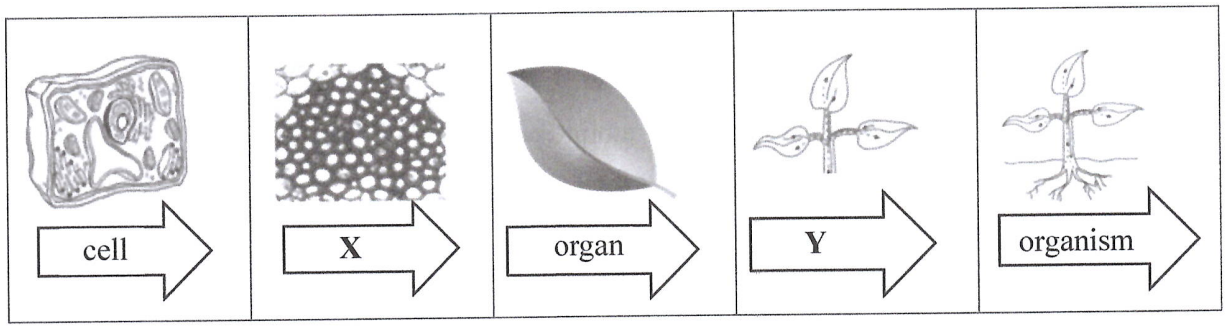
_____ [1]

(c) The diagram shows different levels of organisation of an organism. **X** and **Y** are the missing parts of the diagram .

(i) Identify the missing levels **X** and **Y**.

X _____

Y _____ [2]



(ii) The diagram shows the leaf which is an organ in a plant. The leaf produces food for the plant by the process of photosynthesis.

Write the word equation for photosynthesis.

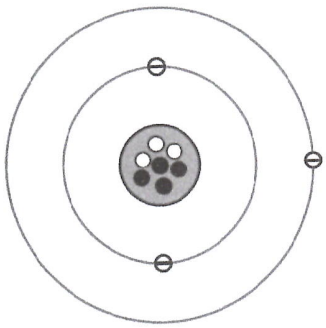
[2]

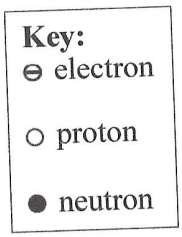
(iii) Identify another organ in the plant.

_____ [1]

TOTAL MARKS [10]

2. The diagram shows the structure of an atom of an element.





(a) The key shows the three sub-atomic particles found in the atom.

Identify the particle that has:

(i) the smallest relative mass.

_____ [1]

(ii) a neutral charge.

_____ [1]

(b) The overall charge of an atom is zero.

Explain why the charge of an atom is zero.

_____

_____

_____

_____ [3]

(c) (i) State the atomic number of the atom in the diagram.

_____ [1]

(ii) Determine the atomic mass of the atom in the diagram. Give a reason for your answer.

Atomic mass _____ [1]

Reason _____

_____ [2]

(iii) Using the Periodic Table, name the element in the diagram.

_____ [1]

TOTAL MARKS [10]

3. (a) (i) Define the term energy.

_____

_____ [1]

(ii) Name the principal source of energy for biological systems.

_____ [1]

(b) The Law of Conservation of Energy states that energy can never be created or destroyed. It can only be changed from one form to another.

(i) Use this principle to state **two** ways in which energy is used in your body.

1 _____

2 _____ [2]

(ii) State **one** way that energy can be lost from your body.

_____ [1]

(iii) Suggest reasons why a wind-up toy slows down and eventually stops.

_____

_____

_____ [2]

(c) The image shows a man using a leaf blower to move some leaves.



The leaf blower is powered by an electric motor connected to a battery.

Energy transfers take place when the leaf blower is being used.

Complete each sentence to show how energy is transferred through the leaf blower.

(1) The battery stores _____ energy which is transferred into electrical energy.

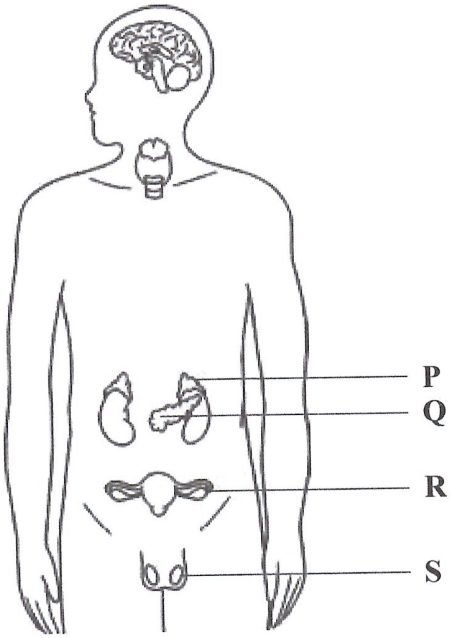
(2) The electric motor transfers electrical energy usefully into

_____ energy.

(3) The motor loses energy as _____ energy. [3]

TOTAL MARKS [10]

4. The diagram shows the endocrine system.



(a) Define the term hormone.

_____

_____ [2]

(b) (i) Name **one** hormone that is secreted by the organ labelled **P** in the diagram.

_____ [1]

(ii) State **two** effects that the hormone secreted by **P** has on the body.

1. _____

2. _____ [2]

(c) (i) Name **one** hormone that is secreted by the organ labelled **Q** in the diagram.

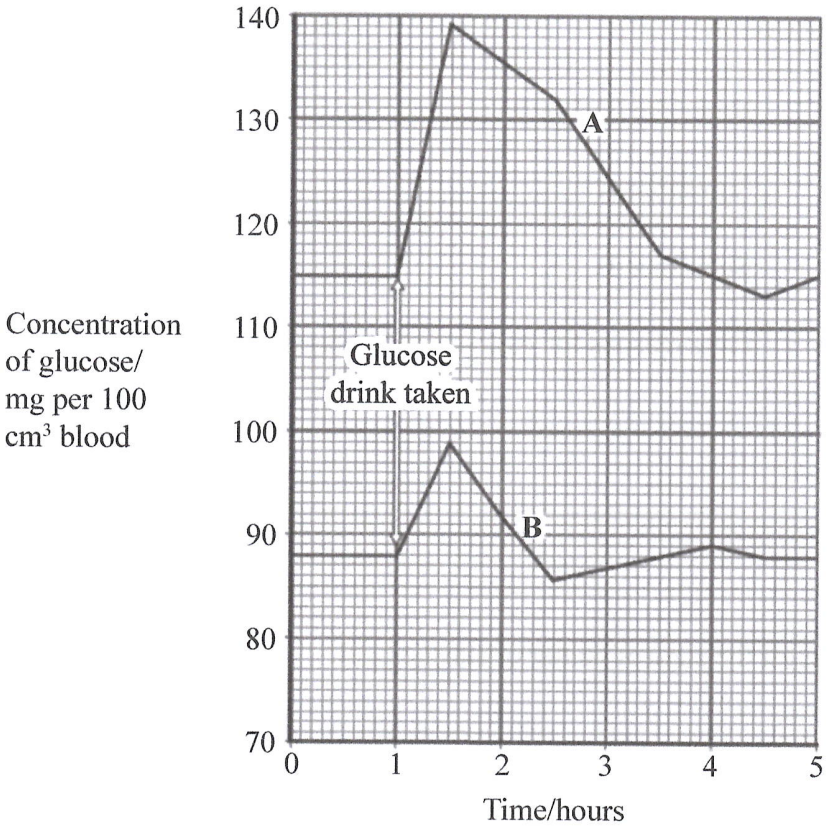
_____ [1]

(ii) Name organ **Q**.

_____ [1]

(d) The concentration of glucose in blood of two persons, **A** and **B**, is measured every half an hour.

One hour after the start, both persons drink a solution containing glucose. The graph shows the result.



(i) Use the graph to calculate the maximum increase in blood glucose concentration in person **B** after drinking the glucose drink. Show working.

_____ mg per 100 cm^3 [2]

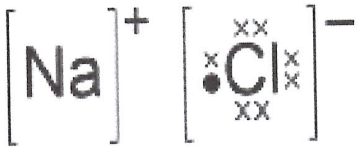
(ii) A doctor suggests that patient **A** has diabetes. Give **one** piece of evidence from the graph to support this suggestion.

_____

_____ [1]

TOTAL MARKS [10]

5. The diagrams illustrate bonding between the atoms in substances **A** and **B**.



Substance **A**



Substance **B**

(a) (i) Name the type of bond illustrated in substances **A** and **B**.

Substance **A** _____

Substance **B** _____ [1]

(ii) Give reasons for your answer to (a) (i).

_____

_____

_____ [2]

(b) Suggest the state of matter of substance **B**.

_____ [1]

(c) Explain how the bond is formed between the Na^+ and Cl^- ions in diagram **A**.

_____

_____

_____ [2]

(d) Hydrogen is a non-metallic element found in Group I of the Periodic Table.

Chlorine is a non-metallic element found in Group VII of the Periodic Table.

Hydrogen reacts with chlorine to form hydrogen chloride (HC*l*) molecules.

(i) Construct a dot-and-cross diagram to show the bonding in the hydrogen chloride (HC*l*) molecule, using only outer shell electrons.

[2]

(ii) Explain how the hydrogen and chlorine atoms are bonded together in the hydrogen chloride molecule.

_____

_____

_____

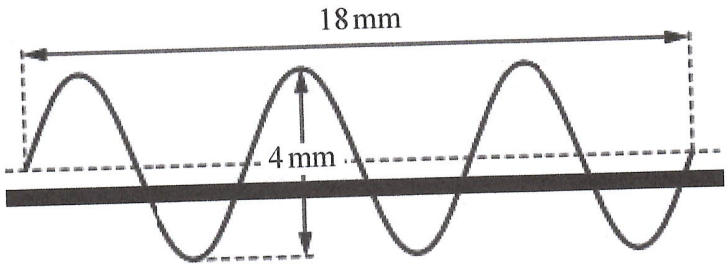
_____ [2]

TOTAL MARKS [10]

6. Some students are investigating waves.

The students drop a pebble in a ripple tank of water to produce water waves. A digital recording of the waves is made.

The diagram shows the waves over a distance of 18 mm.



(a) (i) State the number of wavelengths shown in the diagram.

Number of wavelengths _____ [1]

(ii) Calculate the amplitude of this wave.

Amplitude _____ mm [1]

(iii) Calculate the wavelength of the waves in mm.

Wavelength _____ mm [2]

(b) The students produce a different wave.

This wave has a frequency of 1.7 Hz and a wavelength of 8.0 cm.

Calculate the speed of this wave.

Speed of wave = _____ cm/s [2]

(c) (i) Sound waves are longitudinal waves. Explain how longitudinal waves travel.

_____

_____

_____ [2]

(ii) State **two** other properties of sound.

_____

_____ [2]

TOTAL MARKS [10]

7. Two separate experiments are carried out to prepare a sample of oxygen and carbon dioxide gas.

Experiment 1: The decomposition of hydrogen peroxide is used to prepare a sample of oxygen gas.

The equation for the reaction is:

hydrogen peroxide $\longrightarrow$ water + oxygen

(a) The students test the gas produced to show that it is oxygen.

(i) Name the test used. _____ [1]

(ii) State the positive result. _____ [1]

Experiment 2: Calcium carbonate and dilute hydrochloric acid is used to prepare a sample of carbon dioxide gas.

The equation for the reaction is:

calcium carbonate + hydrochloric acid $\longrightarrow$ calcium chloride + water + carbon dioxide

(b) Describe the test, using limewater, that the students use to identify the carbon dioxide gas collected and state the positive result.

(i) Test description: _____

_____ [1]

(ii) Positive result: _____ [1]

(c) State the percentage composition of oxygen and carbon dioxide in unpolluted air.

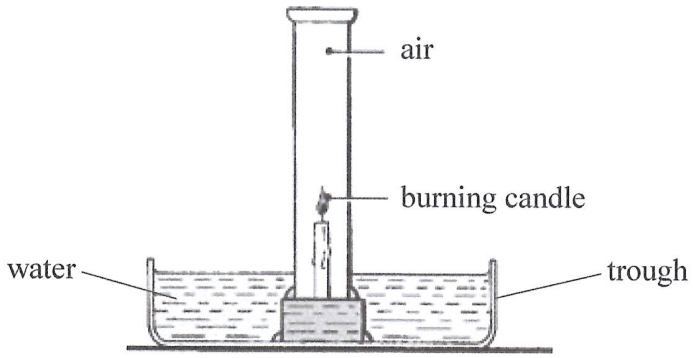
% composition of oxygen _____

% composition of carbon dioxide _____ [1]

(d) Suggest a gas that is a common pollutant of the air.

_____ [1]

(e) In an experiment to investigate air and combustion, students use the apparatus set-up shown in the diagram. The gas jar placed over the burning candle is filled with air. Observations are made after 3 minutes.



(i) Suggest **one** observation you expect the students to make after 3 minutes. Give a reason for your answer.

Observation _____

Reason _____ [2]

(ii) Identify the gas in the gas jar that increases in percentage by volume after the 3 minutes.

_____ [1]

(f) The volume of air in the gas jar at the start and end of the experiment is shown in the table.

Total volume of air in gas jar at start/cm^3	200
Total volume of air in gas jar at the end/cm^3	158
Change in volume of air/cm^3	_____

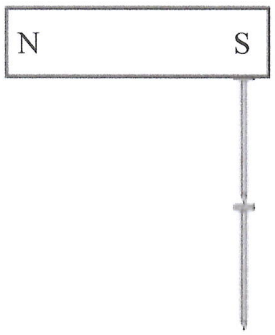
Use the information in the table to calculate the change in the volume of air in the gas jar. (Show working).

_____ cm^3 [1]

TOTAL MARKS [10]

8. The diagram shows two iron nails hanging from a bar magnet,

(a) The iron nails which were unmagnetised are now magnetised.



(i) Name the type of magnetism shown when nails, like those in the diagram, attract other nails.

_____ [1]

(ii) Name a material that is considered to be a natural magnet.

_____ [1]

(iii) State **three** ways a permanent magnet can lose its magnetism.

1 _____

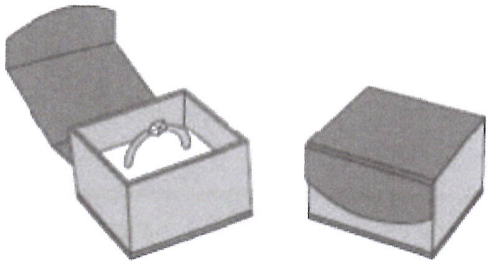
2 _____

3 _____ [3]

(b) Magnets are used in everyday life.

The diagram shows a magnetic closure box when open and shut.

- The box stays shut when it is closed due to the forces between two small magnets.
- The magnets in the magnetic closure box must not have two North facing poles.

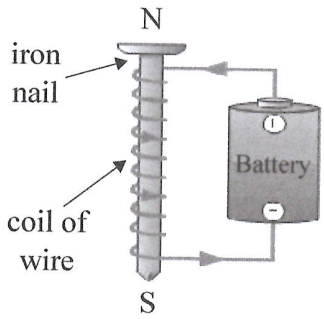


Explain why the box must not have two North-facing poles.

_____

_____ [2]

(c) Magnets can also be made using electricity and a metal core wrapped with a coil of wire.



(i) State what happens when both ends of the wire are attached to the battery.

_____ [1]

(ii) State **two** ways the strength of this magnet can be increased.

1 _____

2 _____ [2]

TOTAL MARKS [10]

End]

School Number	Candidate Number
Surname and Initials	

COMBINED SCIENCE

PAPER 3 3102/3

Tuesday 6 JUNE 2023 9:00 A.M.–10:30 A.M.

Additional materials:
Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION FOR CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided on this question booklet.

Answer **ALL** questions in **Section A** (1 – 4) in the spaces provided.

Answer **ANY** two (2) out of the three [3] questions from **Section B** on the lined pages provided in this booklet.

Candidates are advised to spend no more than 35 minutes on **Section A**.

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

A copy of the Periodic Table is printed on page 2.

Calculators are permitted, however, **NO** graphing calculators are allowed.

For Examiner's Use	
SECTION A	
1	
2	
3	
4	
SECTION B	
5	
6	
7	
TOTAL	

This question paper consists of 15 printed pages, 4 lined pages and 1 blank page.

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The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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	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
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*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

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SECTION A

Answer **ALL** questions in this Section.

1. The diagrams shows a type of white blood cell defending the human body against an infection.

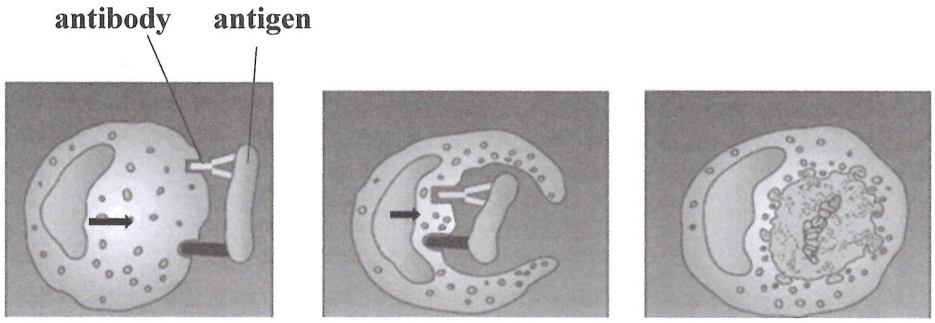


Fig. 1.1

(a) Name the type of white blood cell shown in the diagrams.

_____ [1]

(b) The diagrams show an **antigen** interacting with an **antibody**.

Define the terms **antigen** and **antibody**.

antigen _____

_____ [1]

antibody _____

_____ [1]

(c) Describe the process occurring in each diagram.

I _____

_____

II _____

_____

III _____

_____

[3]

(d) Describe how the production of antibodies results in immunity.

_____

_____

_____ [2]

(e) Explain why patients who have had an organ transplant, need to be continuously treated with immunosuppressant drugs.

_____

_____

_____ [2]

TOTAL MARKS [10]

2. A student investigates the reaction between excess zinc powder and dilute hydrochloric acid. The volume of the gas produced is measured at intervals and recorded in the table shown.

Time/s	0	10	20	30	40	50	60
Volume of hydrogen gas/cm^3	0	18	38	60	74	80	80

(a) (i) The word equation for this reaction is:

zinc + hydrochloric acid → zinc chloride + hydrogen

Write the balanced symbol equation for this reaction.

_____ [2]

(ii) Describe the test and the positive result that show that the gas produced is hydrogen.

Test: _____

Positive result: _____

_____ [2]

(iii) Explain why it is better to use zinc powder and not lumps of zinc in the experiment.

_____

_____

_____ [2]

(iv) Explain why the last two gas readings remain constant.

_____

_____ [1]

(b) The student also investigates the effect of concentration on the rate of reaction. Different concentrations of acid are used and the time taken for the reaction to complete is recorded. The results obtained are plotted in the graph.

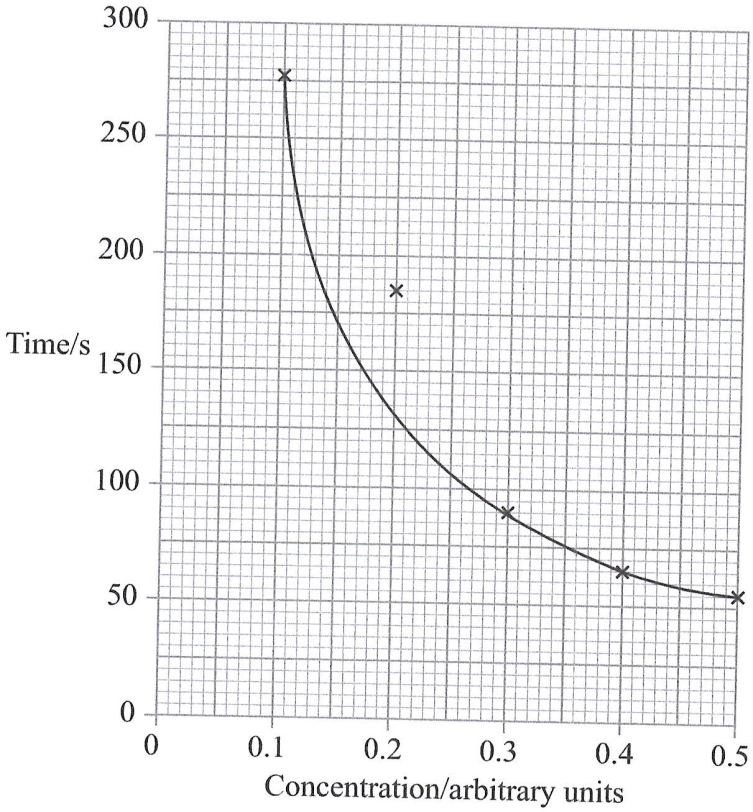


Fig. 2.1

(i) One of the times obtained is an anomalous result. The acid is in excess in this reaction. The temperature and the size and mass of zinc remain constant in the investigation.

Suggest **one** possible error that the student may have made to produce this anomalous result.

_____

_____ [1]

(ii) Describe the effect of increasing acid concentration on the rate of this reaction.

_____

_____

_____ [2]

TOTAL MARKS [10]

[Turn over

3. The diagram shows an electrical circuit.

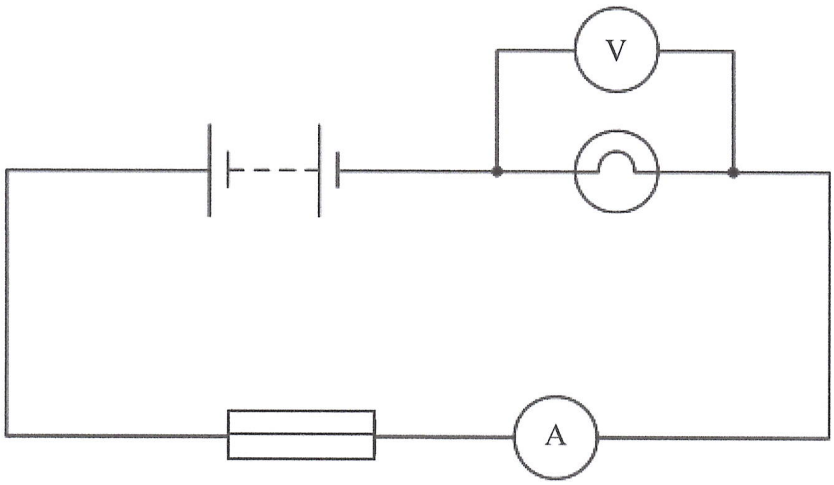
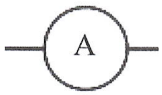


Fig. 3.1

(a) Give the name and function of the electrical symbols shown in the table.

component	name	function
		
		
		
		

[4]

The diagram shows an electrical circuit.

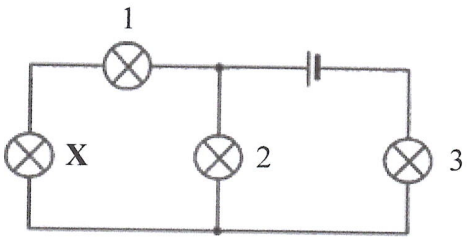


Fig. 3.2

(b) (i) Name the type of circuit shown.

_____ [1]

(ii) Lamp **X** blows and breaks the circuit.

Describe what happens to lamps 1, 2 and 3.

Lamp 1 _____

Lamp 2 _____

Lamp 3 _____ [3]

(c) Calculate the current flowing through a 10Ω resistor when 5V is applied across it.
Show your working.

[2]

TOTAL MARKS [10]

4. The diagram shows a section through a flower.

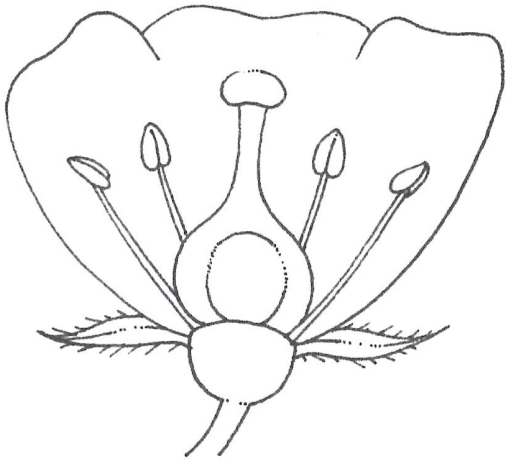


Fig. 4.1

(a) Define the term pollination.

_____

_____ [1]

(b) (i) On the diagram draw a line to show where pollination takes place and label the line **Y**. [1]

(ii) Describe the difference between cross-pollination and self-pollination.

_____

_____

_____

_____ [2]

(iii) Name the structure in the flower that produces the male gametes.

_____ [1]

(c) (i) List **two** agents of pollination.

1 _____

2 _____

[2]

(ii) State the most likely agent of pollination for this flower in **Fig. 4.1**.

_____ [1]

(iii) Using the diagram, state **two** features that indicate the agent of pollination for the flower in **Fig. 4.1**.

1 _____

2 _____

[2]

TOTAL MARKS [10]

SECTION B

Answer any **TWO** questions in this section.

5. This question is about the Earth's crust, extraction and use of metals.

The table shows the percentage abundance of some elements in the Earth's crust.

Name of Element	Symbol of Element	Percentage abundance (%)
Oxygen	O	46.1
Silicon	Si	28.2
Aluminium	Al	8.0
Iron	Fe	5.0
Calcium	Ca	3.6
Sodium	Na	3.0
Magnesium	Mg	2.1
Potassium	K	2.0
Titanium	Ti	0.5
Hydrogen	H	0.5
Other elements		_____

(a) Using the information given in the table:

(i) determine the percentage abundance of the **other elements** present in the Earth's crust. (Show working.) [2]

(ii) construct a bar chart of the percent composition of elements in the earth's crust. [4]

(b) Brass is an alloy of copper and zinc. Suggest **two** reasons why brass is used in preference to copper. [2]

(c) Aluminium is extracted from its ore using electrolysis.

Suggest why electrolysis is used for the extraction of aluminium from its ore and not the blast furnace. [1]

(d) State **two** reasons why aluminium is used in the manufacture of airplanes. [2]

(e) Iron is extracted from iron ore using the blast furnace.

Chemical reactions occurring in the blast furnace result in the formation of carbon dioxide, carbon monoxide and iron.

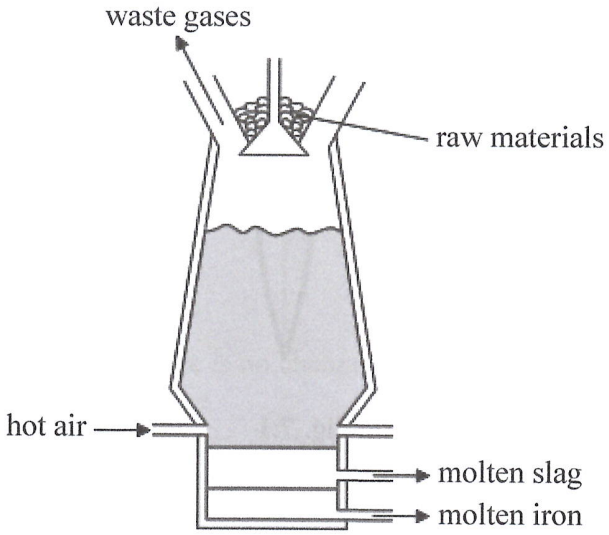


Fig. 6.1

(i) State the chemical name of the iron ore. [1]

(ii) Name **two** other raw materials needed for the extraction process. [2]

(iii) Suggest why hot air is blown into the furnace. [1]

(iv) Identify the impurity in the extraction process. [1]

(v) Use the diagram to:

- explain how carbon monoxide forms in the extraction process. [2]
- describe how iron forms from the iron ore in the extraction process. [2]

TOTAL MARKS [20]

6. (a) **Fig. 7.1** shows the lens, the object and the two principal focuses F_1 and F_2

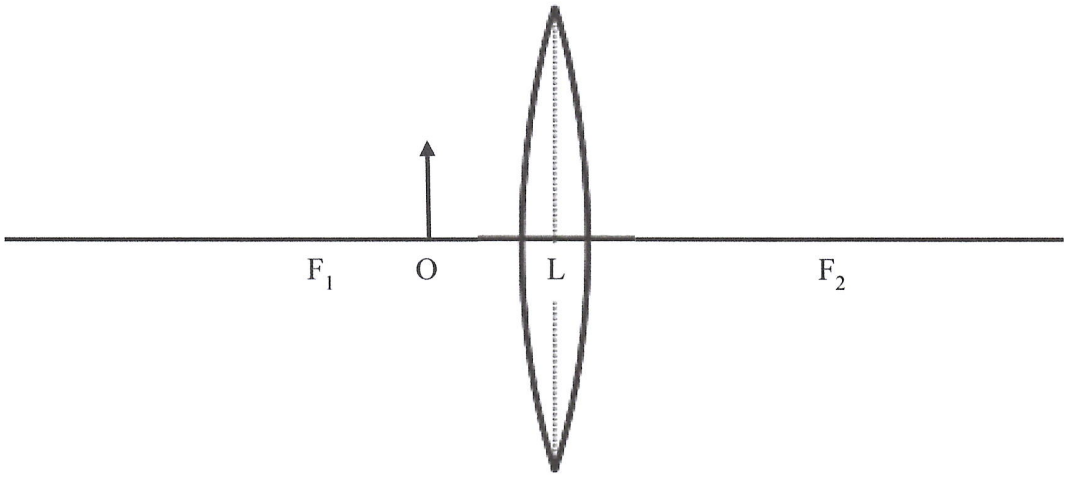


Fig. 7.1

(i) Identify the type of lens shown in the diagram. [1]

(ii) Name the line drawn on the diagram that includes points F_1, F_2, O and L. [1]

(iii) On the diagram, use a ruler to accurately construct the position of the image.

Show how you construct your ray diagram and how light appears to come from this image to produce a refracted ray. [5]

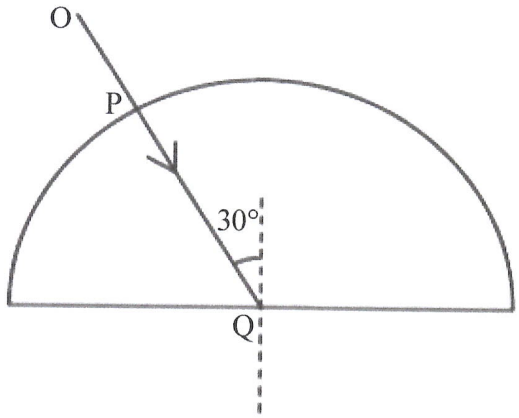
(iv) The image is virtual. Describe a virtual image. [1]

(v) Name the optical instrument that produces this kind of refracted ray. [1]

(vi) Give **two** characteristics of the image that is formed by the lens in the human eye. [2]

(vii) Describe how the object and the lens are positioned to produce a real image which is smaller than the object. [2]

(b) The diagram shows a light ray **OPQ** passing through a semi-circular glass block.



(i) Explain why there is no change in the direction of the ray at **P**. [1]

(ii) Describe the changes, if any that occur to the **speed**, **wavelength** and **frequency** of the light as it enters the glass block. [3]

(c) A person has an eye defect called short-sightedness.

(i) Explain what happens in the eye when a person is shortsighted. [1]

(ii) Identify the lens used to correct for this defect and briefly describe how the lens works to correct the defect. [2]

TOTAL MARKS [20]

7. The diagram represents a type of wetland ecosystem found in The Bahamas.

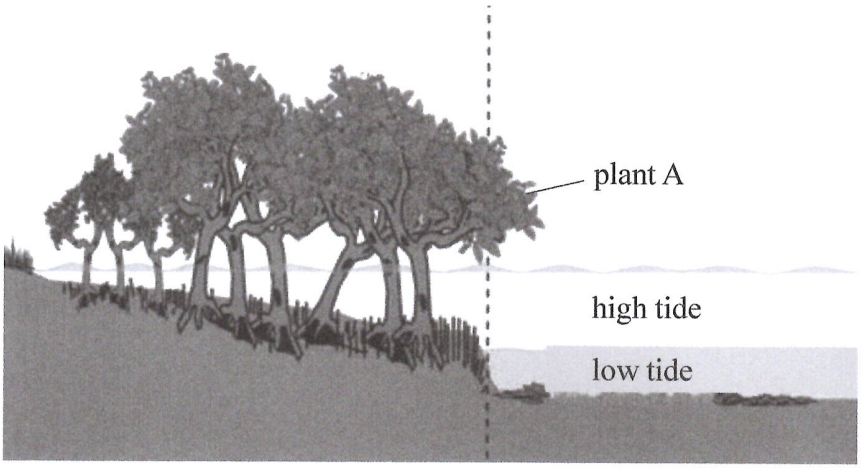


Fig. 5.1

(a) Define the term ecosystem. [2]

(b) (i) Name the ecosystem shown in the diagram and describe **three** ways in which this ecosystem is important to the Bahamian environment. [4]

(ii) Describe **three** activities of man which can damage and destroy this ecosystem. [3]

(c) (i) Name plant A. [1]

(ii) Describe the roots of this plant and explain how they adapt the plant to this ecosystem. [2]

(iii) Name **two** other plants that are found in this ecosystem. Describe **two** adaptations for **each** plant. [6]

(iv) State **two** abiotic environmental conditions that affect organisms living in this ecosystem. [2]

TOTAL MARKS [20]

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