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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

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

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	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

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

Group

Key

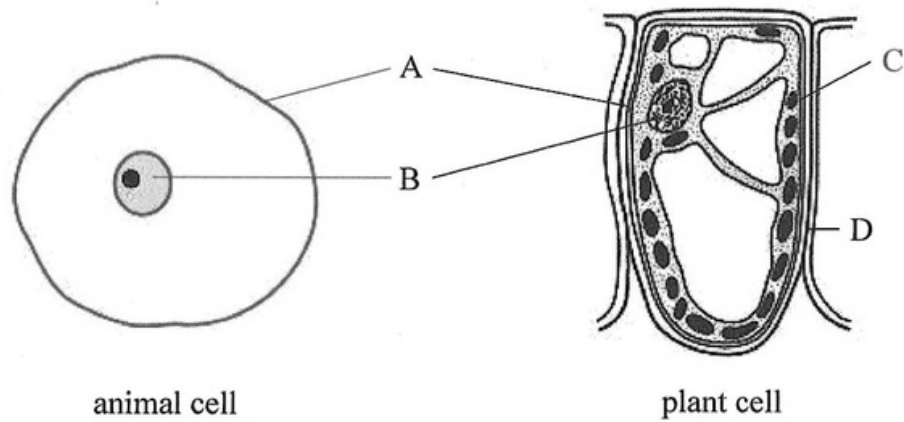
a	X
----------	----------

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

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1. The diagrams show an animal cell and a 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]

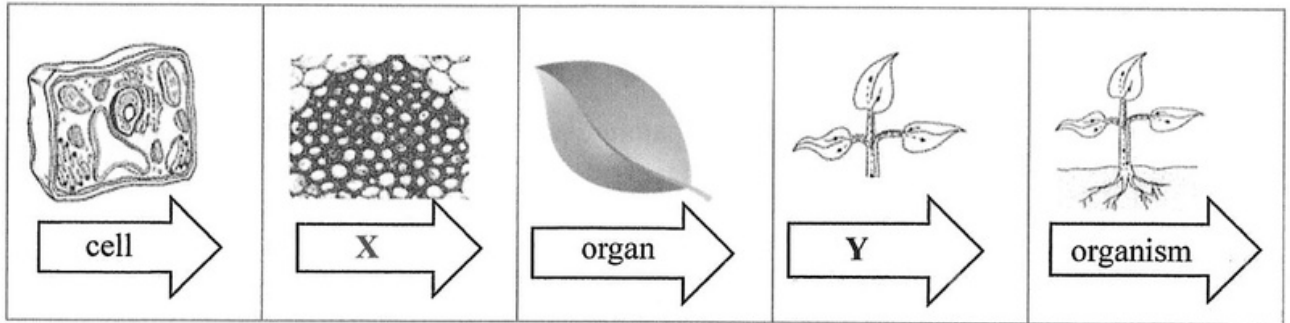


- (c) The diagram shows different levels of organisation of an organism. X and Y are the missing parts of the diagram .

- (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.

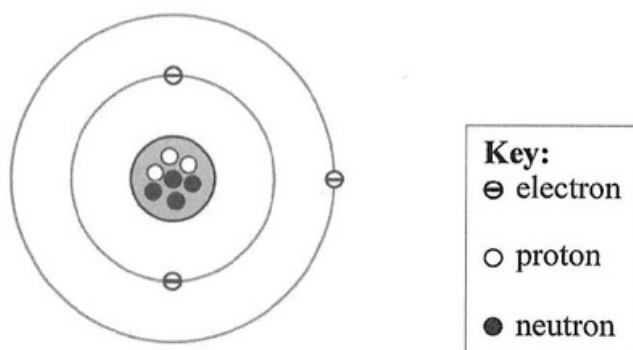
[2]

- (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.

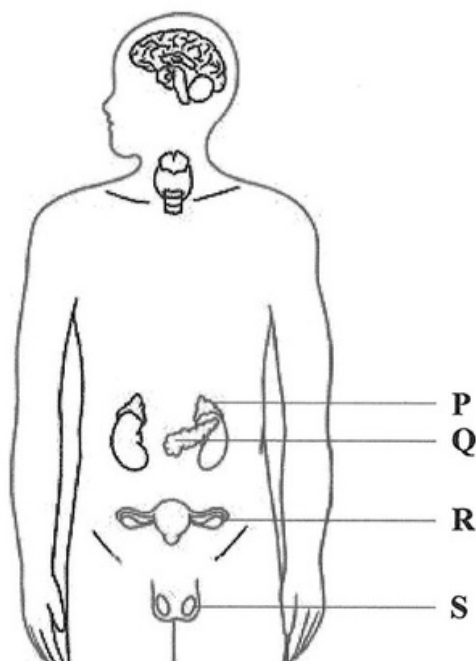
Energy transfers take place when the leaf blower is being used.

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]

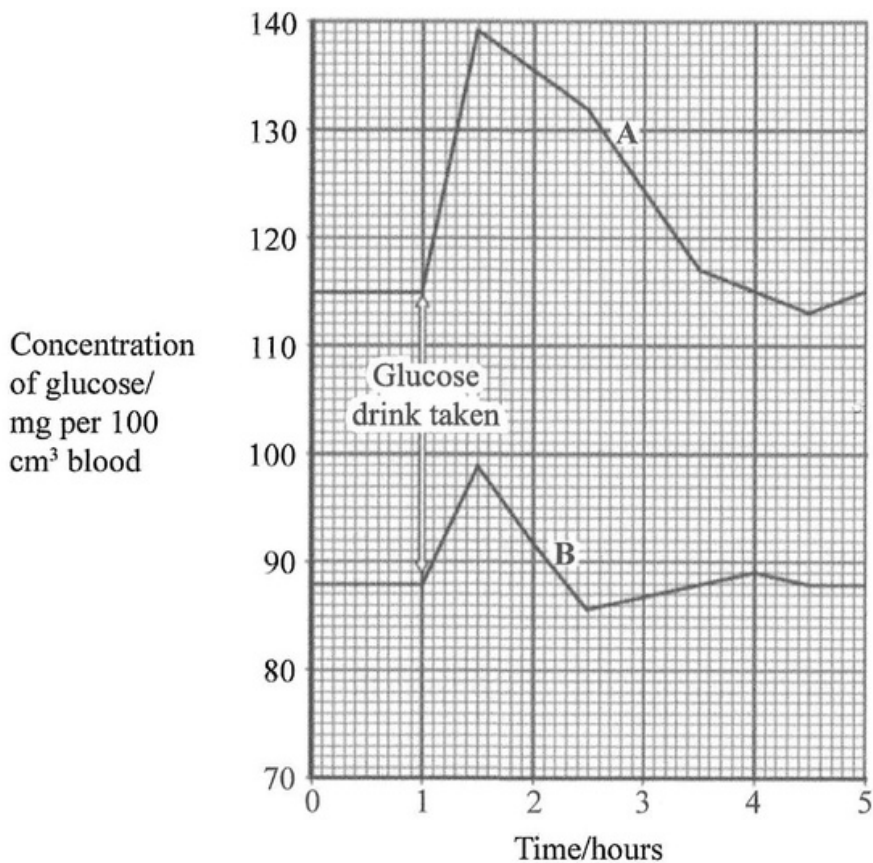
- (ii) Name organ **Q**.

_____ [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 cm³ [2]

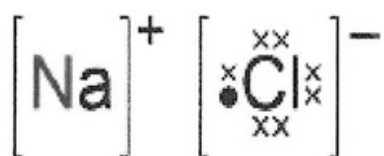
- (ii) A doctor suggests that patient **A** has diabetes. Give **one** piece of evidence from the graph to support this suggestion.

_____ [1]

TOTAL MARKS [10]

[Turn over

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 (HCl) molecules.

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

[2]

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

[2]

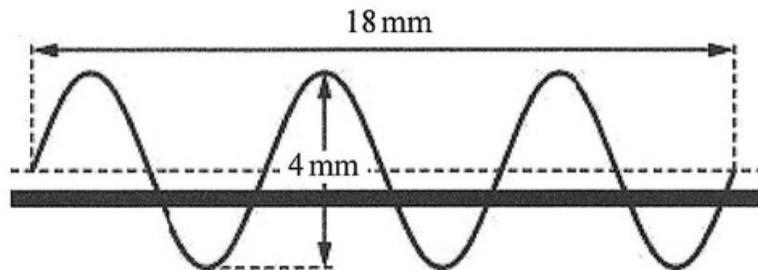
TOTAL MARKS [10]



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:



- (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:



- (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 _____

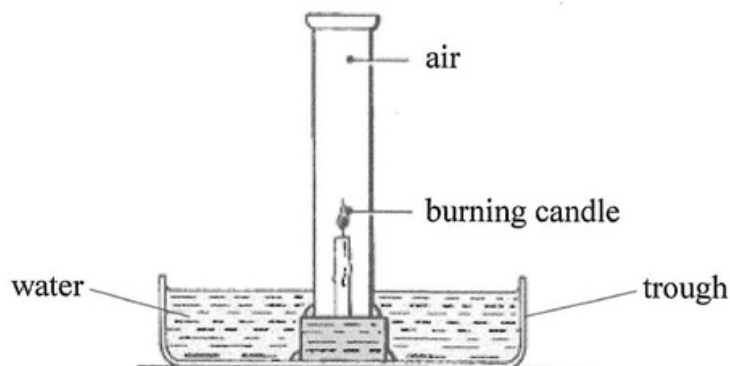
% composition of carbon dioxide _____ [1]

- (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).

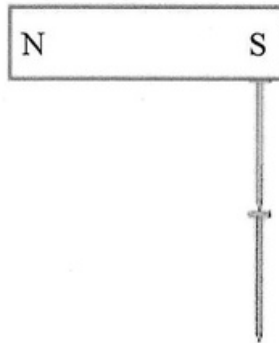
_____ cm³ [1]

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 _____

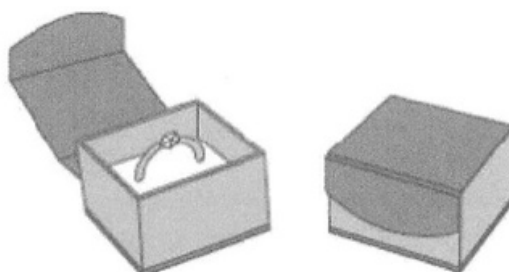
3 _____ [3]



- (b) Magnets are used in everyday life.

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

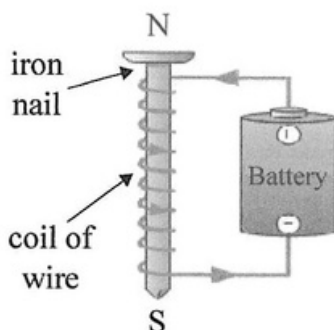
- The box stays shut when it is closed due to the forces between two small magnets.
- The magnets in the magnetic closure box must not have two North facing poles.



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]

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