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COMBINED SCIENCE

PAPER 2 3102/2

Wednesday **29 MAY 2024** 1:30 P.M.–3:00 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.

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 15 printed pages and 1 blank page.



The Periodic Table of the Elements

Group																		
I	II											III	IV	V	VI	VII	0	
1 H Hydrogen 2 He Helium																		
3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon	
11 Na Sodium	12 Mg Magnesium											13 Al Aluminium	14 Si Silicon	15 P Phosphorus	16 S Sulphur	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	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon	
87 Fr Francium	88 Ra Radium	89 Ac Actinium																

a

X

b

Key

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce Cerium	141 Pr Praseodymium	144 Nd Neodymium	150 Sm Samarium	152 Eu Europium	157 Gd Gadolinium	159 Tb Terbium	162 Dy Dysprosium	165 Ho Holmium	167 Er Erbium	169 Tm Thulium	173 Yb Ytterbium	175 Lu Lutetium	
232 Th Thorium	238 Pa Protactinium	238 U Uranium	238 Np Neptunium	238 Pu Plutonium	238 Am Americium	238 Cm Curium	238 Bk Berkelium	238 Cf Californium	238 Es Einsteinium	238 Fm Fermium	238 Md Mendelevium	238 No Nobelium	238 Lr Lawrencium

1. The diagrams in Fig. 1.1 show the arrangement of atoms in four substances labelled A–C.

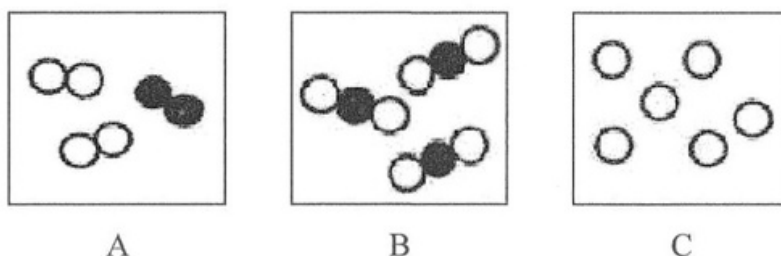


Fig. 1.1

- (a) Write the letter of the diagram that represents the substances shown and explain why.
- (i) A pure element _____
 Explanation _____ [2]
- (ii) A molecule _____
 Explanation _____ [2]
- (iii) A compound _____
 Explanation _____ [2]
- (b) (i) Write the letter of the diagram that represents a mixture.
 A mixture _____ [1]
- (ii) State three differences between a mixture and a compound.
- 1 _____

- 2 _____

- 3 _____
 _____ [3]

TOTAL MARKS [10]

[Turn over]



2. Fig. 2.1 shows the components of human blood.

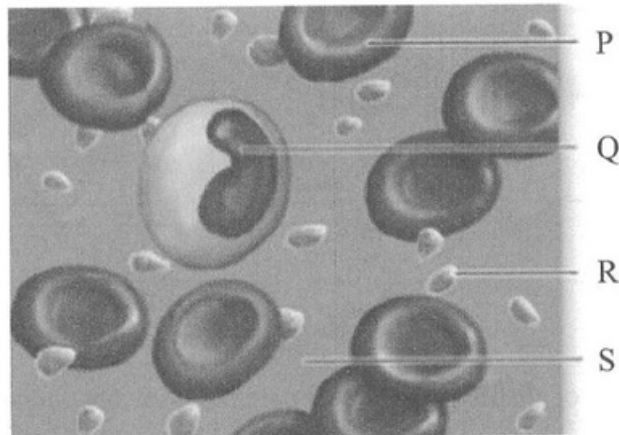


Fig. 2.1

- (a) State the names of the parts labelled:

P _____

Q _____

R _____

[3]

- (b) (i) Give the function of the structure labelled **P**

_____ [1]

- (ii) Describe the shape of **P** and explain how its shape helps it to carry out its function.

_____ [2]



- (c) Fig. 2.2 shows a part of a capillary network around some body cells.

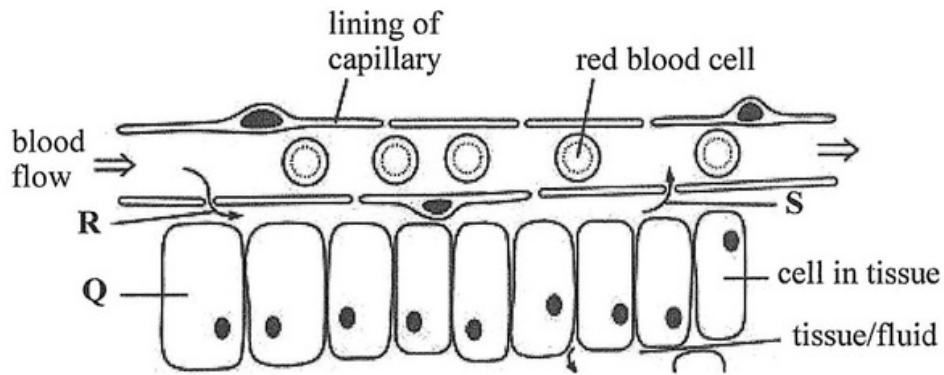


Fig. 2.2

- (i) State the structure and function of a capillary.

Structure: _____

Function: _____

[2]

- (ii) Fig. 2.2 shows tissue fluid surrounding the cells.

- Name two substances that pass from the capillary into the tissue fluid at R.

1 _____

2 _____

- Name two substances that pass out of the tissue fluid into the capillary at S.

1 _____

2 _____

[2]

TOTAL MARKS [10]

[Turn over]

3. This question is about electric charge and current.

(a) State the law of attraction of electric charges.

[1]

(b) When a positively charged rod is brought near a neutral electroscope but does not touch the electroscope, the leaves of the electroscope move apart, as shown in Fig. 3.1.

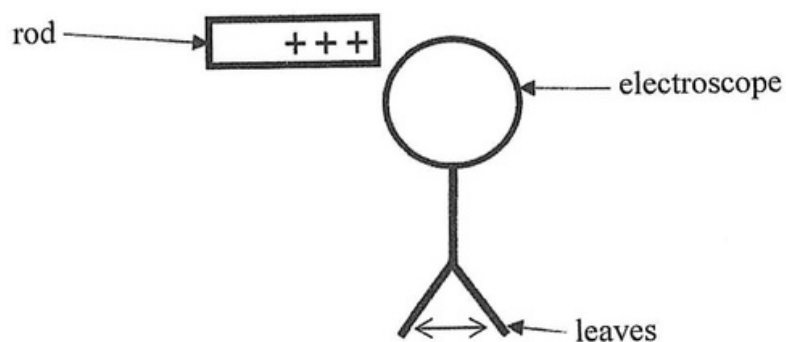


Fig. 3.1

(i) Explain why this happens.

[3]

(ii) During a long car journey, a driver can become electrostatically charged.

Explain what causes the driver to become charged.

[2]



- (c) An ammeter in an electric circuit displays the reading shown in Fig. 3.2.

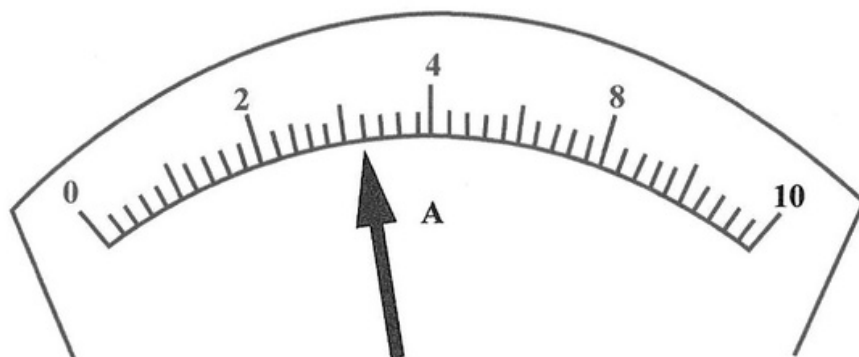


Fig. 3.2

- (i) State the reading on the ammeter.

_____ amps

[1]

- (ii) Calculate the amount of charge that flows through the circuit in 2 minutes.

State the formula used and give the units.

Show your working.

[3]

TOTAL MARKS [10]

4. Fig. 4.1 shows the carbon cycle. The concentration of carbon dioxide in the atmosphere is controlled by several processes.

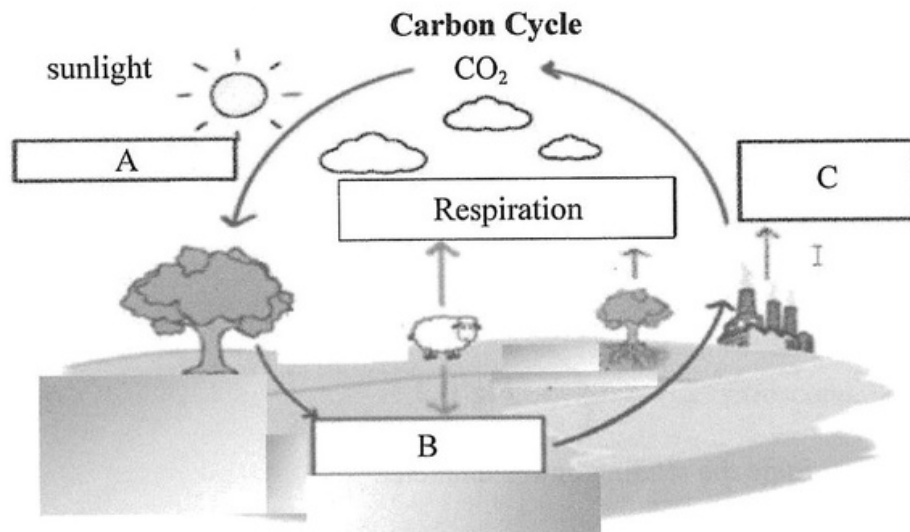


Fig. 4.1

- (a) Name the missing processes that are represented by the boxes labelled **A**, **B** and **C** in Fig. 4.1.

Process **A** _____

Process **B** _____

Process **C** _____ [3]

- (b) There are two kinds of respiration: aerobic and anaerobic.

Anaerobic respiration takes place in the brewing of alcoholic beverages or fermentation.

Write the word equation to show the reactants and products in fermentation.

_____ [2]

- (c) The gradual increase in carbon dioxide concentration in the atmosphere is a concern to the Government of The Bahamas.

- (i) Give **two** reasons why the concentration of carbon dioxide in the atmosphere is gradually increasing.

1 _____

2 _____

[2]



- (ii) Explain how the seas and oceans can decrease the concentration of carbon dioxide in the atmosphere.

[3]

TOTAL MARKS [10]



5. This question is about osmosis.

Fig. 5.1 shows what happens when a plant cell is placed in water.

Fig. 5.2 shows what happens when a plant cell is placed in a concentrated salt solution.

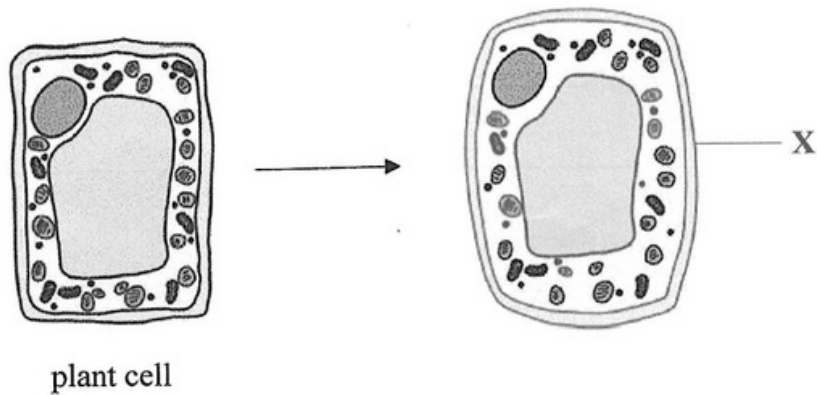


Fig. 5.1

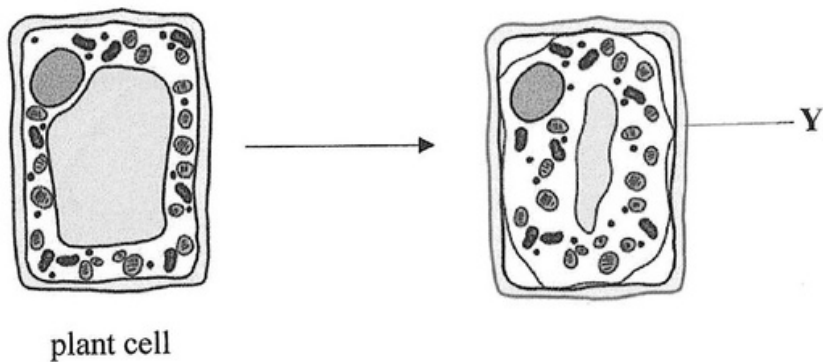


Fig. 5.2

- (a) (i) Name the process occurring in the diagrams.
_____ [1]
- (ii) State one characteristic of the cell that allows the process in (a) (i) to occur.
_____ [1]
- (iii) State the term that describes cell X in Fig. 5.1.
_____ [1]



- (iv) State the term that describes cell Y in Fig. 5.2.

_____ [1]

- (v) Describe the changes that occur as the plant cell is placed in concentrated salt solution as shown in Fig. 5.2.

_____ [2]

- (b) In an experiment, an animal cell is placed in water.

- (i) Describe what happens to the animal cell when it is placed in water.

_____ [2]

- (ii) A solution that is at the same concentration as the animal cell is described as isotonic.

Explain what would happen to the animal cell if it was placed in an isotonic solution.

_____ [2]

TOTAL MARKS [10]



6. In a ripple tank experiment, water waves are produced. Fig. 6.1 shows a water wave.

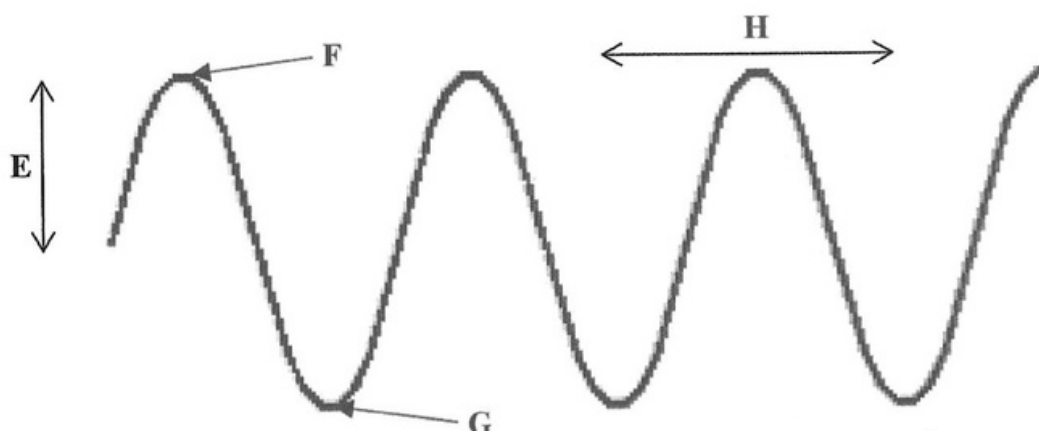


Fig. 6.1

- (a) Identify the properties of the wave labelled.
- (i) **E** _____ [1]
- (ii) **F** _____ [1]
- (iii) **G** _____ [1]
- (iv) **H** _____ [1]
- (b) A water wave is a transverse wave.
- (i) Give another example of a transverse wave.
_____ [1]
- (ii) Describe how transverse waves move.

_____ [2]
- (c) The speed of a wave is 340 m/s and the wavelength is 5 meters.
- Calculate the frequency of this wave.
- Show your working and include the unit.

[3]

TOTAL MARKS [10]



7. The table shows the causes of HIV infection among a group of individuals with AIDS.

Cause of HIV infection	Number of people with AIDS
Sexual intercourse	13500
Blood transfusion	1500
Mother to infant	788
Other	2300

- (a) (i) Give the meaning for the abbreviation 'HIV'.
_____ [1]
- (ii) Explain **two** ways how HIV can be passed from mother to infant.
1 _____
2 _____ [2]
- (iii) Suggest the likely cause of the HIV infection listed as other in the table.
_____ [1]
- (b) (i) Calculate the percentage of people that were infected with AIDS through sexual intercourse. (Show your working.)

_____ [2]
- (ii) State one method of contraception, that if used effectively will prevent the spread of AIDS via sexual intercourse.
_____ [1]
- (c) Gonorrhea is another disease that is transmitted during sexual intercourse.
- (i) Name the kind of organism that causes gonorrhea.
_____ [1]
- (ii) Identify **two** signs of gonorrhea.

_____ [2]

TOTAL MARKS [10]

[Turn over



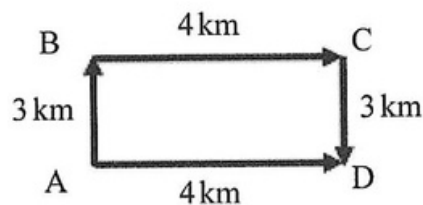
8. This question is about speed, velocity, and acceleration.

(a) Define velocity.

[2]

(b) A student takes a walk starting at point A and ending at point D.

Their path (A → B → C → D) is shown below.



Determine:

(i) the total distance travelled between A and D.

[1]

(ii) The student total time taken for the walk was 2 hours and 15 minutes.

Calculate the average speed of the student in meters per second (m/s).

[3]

(iii) The distance the student travels and the displacement are not the same.

Give the difference between distance and displacement.

[2]



- (c) A student investigates the speed of cars. They measure the time it takes to travel a distance of 80 m.

State two measuring instruments the student should use.

1 _____

2 _____

[2]

TOTAL MARKS [10]



End]

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