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COMBINED SCIENCE

PAPER 2 3102/2

Thursday **17 JUNE 2021** 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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

This question paper consists of 16 printed pages.



The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H Hydrogen 1																	
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Li Lithium	Be Beryllium	B Boron	C Carbon	N Nitrogen	O Oxygen	F Fluorine	Ne Neon	Na Sodium	Mg Magnesium	Al Aluminum	Si Silicon	P Phosphorus	S Sulphur	Cl Chlorine	Ar Argon	K Potassium	Ca Calcium
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Sc Scandium	Ti Titanium	V Vanadium	Cr Chromium	Mn Manganese	Fe Iron	Co Cobalt	Ni Nickel	Cu Copper	Zn Zinc	Ga Gallium	Ge Germanium	As Arsenic	Se Selenium	Br Bromine	Kr Krypton	Rb Rubidium	Sr Strontium
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
La Lanthanum	Ce Cerium	Pr Praseodymium	Nd Neodymium	Pm Promethium	Sm Samarium	Eu Europium	Gd Gadolinium	Tb Terbium	Dy Dysprosium	Ho Holmium	Er Erbium	Tm Thulium	Yb Ytterbium	Lu Lutetium	107	108	109
137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
Ba Barium	La Lanthanum	Ce Cerium	Pr Praseodymium	Nd Neodymium	Pm Promethium	Sm Samarium	Eu Europium	Gd Gadolinium	Tb Terbium	Dy Dysprosium	Ho Holmium	Er Erbium	Tm Thulium	Yb Ytterbium	Lu Lutetium	155	156
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104
Fr Francium	Ra Radium	Ac Actinium	Th Thorium	Pa Protactinium	U Uranium	Np Neptunium	Pu Plutonium	Am Americium	Cm Curium	Bk Berkelium	Cf Californium	Es Einsteinium	Fm Fermium	Md Mendelevium	No Nobelium	Lr Lawrencium	105

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

Key

a

X

b

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

1. Atoms can form charged particles called ions.

- (a) Describe what happens to metal atoms and non-metal atoms as they form ions (include information about the charge of the ions formed).

Metal atoms _____ [2]

Non-metal atoms _____

_____ [2]

Oppositely charged ions form ionic compounds.

- (b) (i) Write the chemical formula of the compound formed when potassium bonds with oxygen.

_____ [1]

- (ii) Explain in terms of electron transfer what happens when potassium bonds with oxygen.

_____ [2]

- (c) One property of the compound formed when potassium bonds with oxygen is a high melting and boiling point.

- (i) Explain in terms of bonding why the potassium compound formed has a high melting and boiling point.

_____ [2]

- (ii) Give **ANOTHER** property of the potassium compound formed.

_____ [1]

TOTAL MARKS [10]



2. A survey to show the effectiveness of the various birth control methods was conducted in New Providence. The effectiveness of each contraceptive method was assessed for 100 women. The results are presented in the table below.

Method of contraception	Pregnancies per 100 woman
Rhythm (safe period)	38
Condom	15
Diaphragm with spermicide	12
Withdrawal of penis before ejaculation	36
Spermicidal cream only	25
Intrauterine devices (IUD)	2
Contraceptive pill	1
Tubal ligation	0
Vasectomy	0

- (a) What is the total number of women surveyed in New Providence?

_____ [1]

- (b) (i) Identify **TWO** methods considered to be the least reliable method of contraception.

Method 1 _____

Method 2 _____ [2]

- (ii) For each method named in (b)(i) state **ONE** reason why it may be considered unreliable.

Method 1 _____

_____ [1]

Method 2 _____

_____ [1]



- (c) State how the pill prevents pregnancy.

[1]

- (d) Using the information in the table, state **ONE** mechanical contraceptive method.

[1]

- (e) (i) What is tubal ligation?

[1]

- (ii) State **ONE** disadvantage of tubal ligation.

[1]

- (f) Apart from being a contraceptive, the condom also effectively serves another function. Give the other function of the condom.

[1]

TOTAL MARKS [10]



3. (a) Give the SI units of force.

_____ [1]

- (b) A bathroom scale reads 500N when a student stands on it at rest.

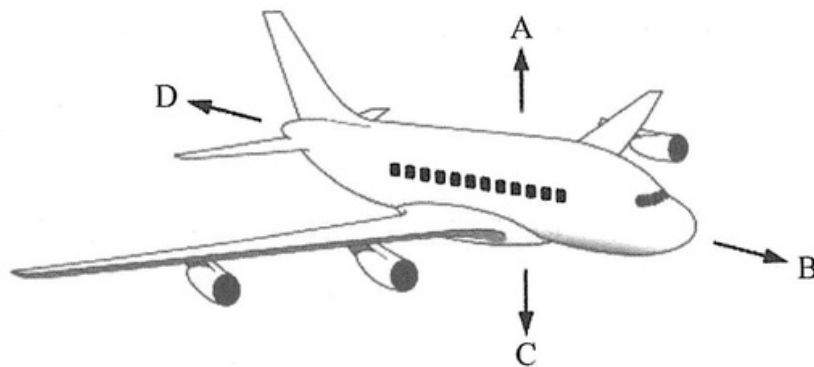
- (i) State the size and direction of the force of the student on the scale.

_____ [1]

- (ii) Determine the size and direction of the force of the scale on the student.

_____ [1]

- (c) The diagram below shows the forces acting on an airplane flying at constant velocity.



- (i) Name the forces acting on the plane at:

A _____

B _____

C _____

D _____ [4]



- (ii) Explain the relationship between forces B and D, when the airplane is moving at constant velocity and constant height.

[1]

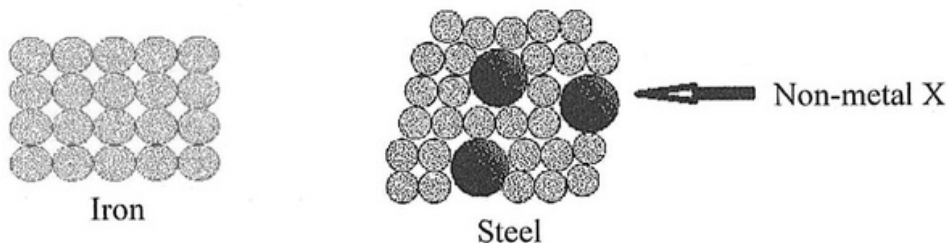
- (d) Explain the relationship between forces at A and C when the airplane is about to land.

[2]

TOTAL MARKS [10]



4. Many everyday substances are made up of an alloy. An example of an alloy is steel. Particle diagrams of iron and steel are shown.



- (a) Define the term 'alloy'.
- _____ [1]
- (b) (i) Name the non-metal **X** in the diagram which is used to make steel.
- _____ [1]
- (ii) State the effect of the addition of non-metal **X** on the melting point of steel.
- _____ [1]
- (c) Iron is malleable because the layer of atoms can slide over each other when a force is applied. Use the diagram to suggest a reason why steel is less malleable and stronger than iron.
- _____ [2]
- (d) Give another advantage, other than strength, for making objects from steel instead of iron.
- _____ [1]



- (e) (i) Complete the following table by filling in the blanks.

Name of Alloy	Main elements making up alloy
Solder	_____ and _____
_____	Copper and Zinc

[3]

- (ii) Give a use for solder.

_____ [1]

TOTAL MARKS [10]

5. (a) State what is meant by the terms fruit and seed.

Fruit _____

Seed _____

_____ [2]

- (b) Fruits and seeds can be carried many distances away from their parent plant by various methods.

Explain fully **TWO** advantages of seed dispersal.

1. _____

2. _____

_____ [4]

- (c) In the table below identify **TWO** methods of seed dispersal and name the seed dispersed using that method.

Method of seed dispersal	Name of seed

[4]

TOTAL MARKS [10]

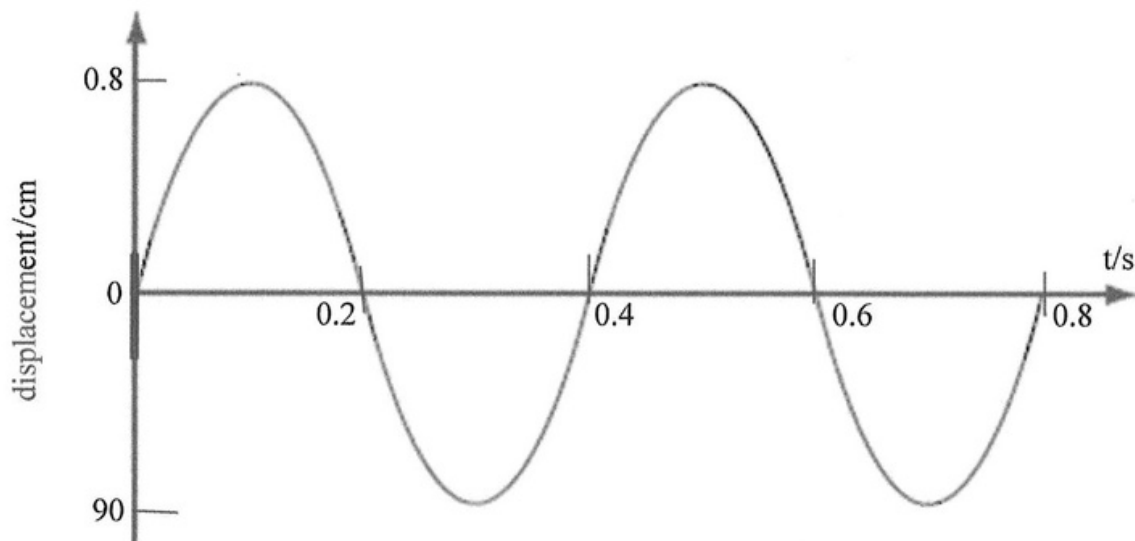


6. (a) Define the following terms:

(i) Wavelength: _____
_____ [1]

(ii) Frequency: _____
_____ [1]

(b) The diagram below shows the displacement-time graph of a transverse wave:



(i) On the diagram label the amplitude. [1]

(ii) Using the information on the graph:

State the number of waves shown in the diagram.

_____ [1]



- (iii) Calculate the frequency of the wave.

[3]

- (iv) Calculate the speed of the wave if its wave length is 1.5 cm.

[3]

TOTAL MARKS [10]



7. Some materials are poor conductors of heat and can be used as insulators.

A student has two ice cubes, both made from pure water. The student places one ice cube into a plastic cup and the other into a Styrofoam cup. The time taken for each ice cube to completely turn into water was recorded. The following results were obtained.

Type of Cup	Time taken for ice to become water (min)
Plastic	10
Styrofoam	25

- (a) Suggest **ONE** factor that should be kept the same in both experiments.
- _____
- _____ [1]
- (b) State which cup was made from the better insulator. Give a reason for your answer.
- _____
- _____ [2]
- (c) Describe what would happen if a rubber stopper is fitted over the two cups.
- _____ [1]
- (d) (i) What would be the temperature reading when the ice cube turned into water?
- Give your answer in degrees Fahrenheit.
- _____ [1]
- (ii) Which molecules have the greater kinetic energy – molecules in ice or molecules in water?
- _____ [1]

- (iii) Using the kinetic theory, explain how the ice cube changed into water.

[2]

- (e) In the experiment, the mass of the ice cube was 10g.

The density of ice at 0°C is 0.92g/cm^3 and the density of water is 1.00g/cm^3 .

Calculate the volume of the ice cube and the volume of the water.

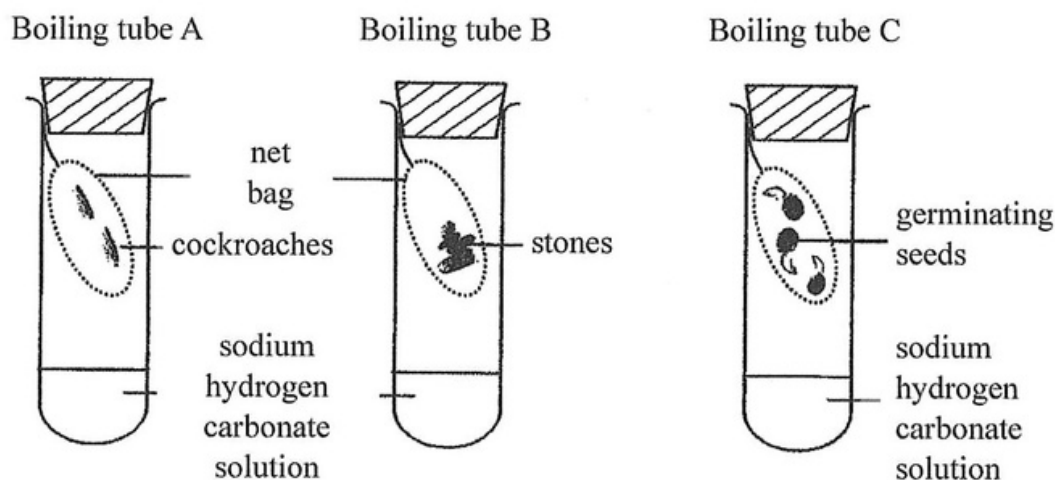
Volume of ice cube _____
_____ [1]

Volume of water _____
_____ [1]

TOTAL MARKS [10]



8. An experiment was set up as shown below to demonstrate that living organisms produce carbon dioxide. The experiment was left undisturbed for ONE hour, after which observations were made.



The boiling tubes were thoroughly disinfected before the start of the experiment.

- (a) Sodium hydrogen carbonate solution is coloured reddish brown. It turns yellow in the presence of carbon dioxide.

- (i) Describe the expected observations in Boiling tube A and give an explanation for your response.

Expected observations _____

Explanation _____

_____ [2]

- (ii) Describe the expected observations in Boiling tube B and give an explanation for your response.

Expected observations _____

Reason _____

_____ [2]

- (iii) Explain why germinating seeds were used in the experiment instead of a green leaf.

_____ [2]

- (b) (i) Name the process by the which living organisms produce carbon dioxide.

_____ [1]

- (ii) State why this process is important to living organisms.

_____ [1]

- (iii) Give the word equation for the process named in (b)(i).

_____ [2]

TOTAL MARKS [10]

