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COMBINED SCIENCE

PAPER 2 3102/2

Tuesday **26 MAY 2020** 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 17 printed pages and 3 blank pages.

The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H Hydrogen 1																	
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	101 Ru Ruthenium 44	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	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86
87 Fr Francium	88 Ra Radium	89 Ac Actinium															

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	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	238 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103

a

X

b

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

1. The table below shows the comparison between different organisms.

Name of organism	Features			
	Legs	Wings	Feathers/Fur	Scales
Yellow tail butterfly	✓	✓	✗	✗
Snapper	✗	✗	✗	✓
Tree frog	✓	✗	✗	✗
Iguana	✓	✗	✗	✓
Bahama parrot	✓	✓	✓	✓
Dog	✓	✗	✓	✗
Turtle	✓	✗	✗	✓

- (a) (i) The organisms can be broken down into the following classes: Amphibian, Bird, Fish, Insect, Mammal and Reptile. Classify these organisms into their Classes.

Organism	Class
Yellow tail butterfly	Insects
Snapper	
Tree frog	
Iguana	
Bahama parrot	
Dog	
Turtle	

[4]

- (ii) Which **TWO** organisms belong to the same class?

Organisms _____ [1]

- (iii) Give **TWO** reasons for your answer. Your answer should not include any of the features listed in the table.

Reason 1 _____

Reason 2 _____ [2]

- (b) Give **THREE** differences between a plant and an animal cell.

_____ [3]

TOTAL MARKS [10]



2. Some people suffer from acid indigestion when their stomach produces excess stomach acid which is hydrochloric acid (HCl). They take indigestion medicine to relieve the symptoms.

The label on a brand of indigestion medicine says that it contains magnesium carbonate.

- (a) (i) Suggest a possible pH value for hydrochloric acid.

_____ [1]

- (ii) Magnesium carbonate is mixed with water. What is the colour of this mixture after universal indicator is added to it?

_____ [1]

The instructions on the label recommend that two (2) tablets should be chewed as needed.

- (b) (i) Explain why the instructions recommend that the tablets be chewed when taken.

_____ [2]

- (ii) What name is given to the reaction between the excess stomach acid and the magnesium carbonate?

_____ [1]

- (iii) Give the name of the metal compound and the colourless gas formed when the acid in the stomach reacts with magnesium carbonate.

Metal compound _____ [1]

Colourless gas _____ [1]



- (c) A **purple liquid** extracted from the red cabbage can be used as an indicator. It will change colour when placed in an acid or a base.

The table below shows the colour of purple cabbage indicator at different pH values.

Purple Cabbage pH Indicator Colours

pH	2	4	6	8	10	12
Colour	Red	Light Pink	Pinkish Purple	Blue	Blue-Green	Greenish Yellow

- (i) What colour will be observed when purple cabbage indicator is added to the following:

Sulfuric acid _____ [1]

A solution of table salt _____ [1]

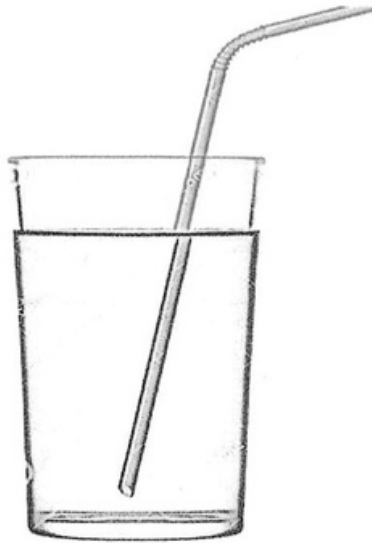
- (ii) What is the general name given to solutions that will change the purple cabbage indicator greenish yellow?

_____ [1]

TOTAL MARKS [10]

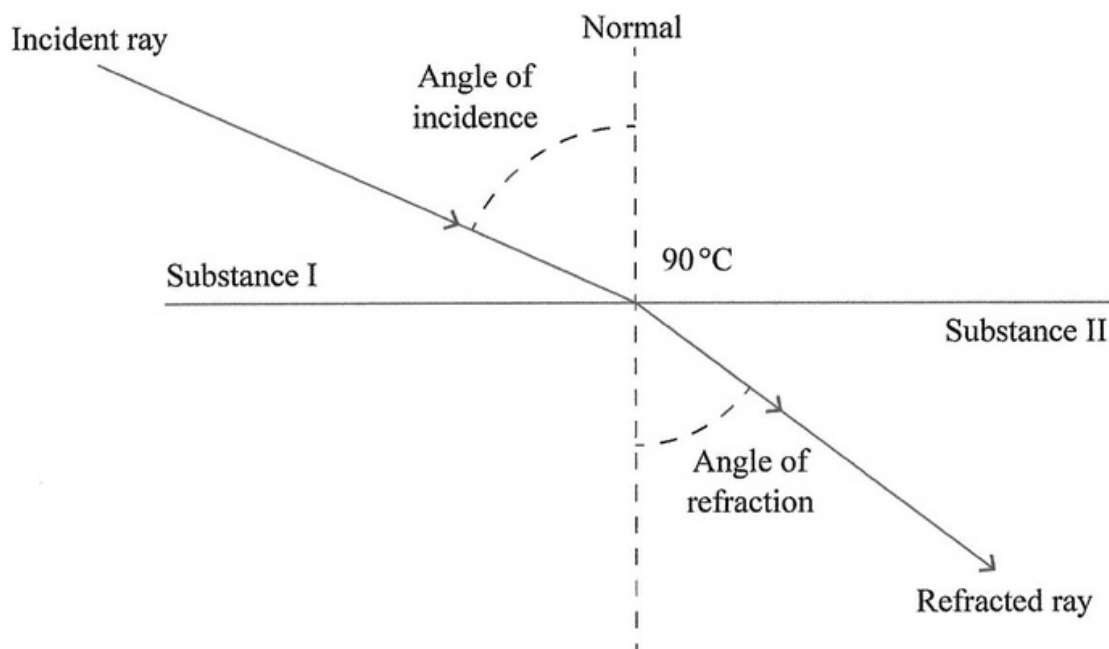


3. The diagram below shows a straw in a glass of liquid with an apparent break in the straw.



- (a) (i) Name and define the term that describes the illusion in the diagram above.
- _____
- _____ [2]
- (ii) Explain why light bends as it travels between two transparent substances.
- _____
- _____ [2]
- (iii) Name an object that makes use of this effect.
- _____ [1]

- (b) The diagram below shows a ray of light entering a substance II from substance I.

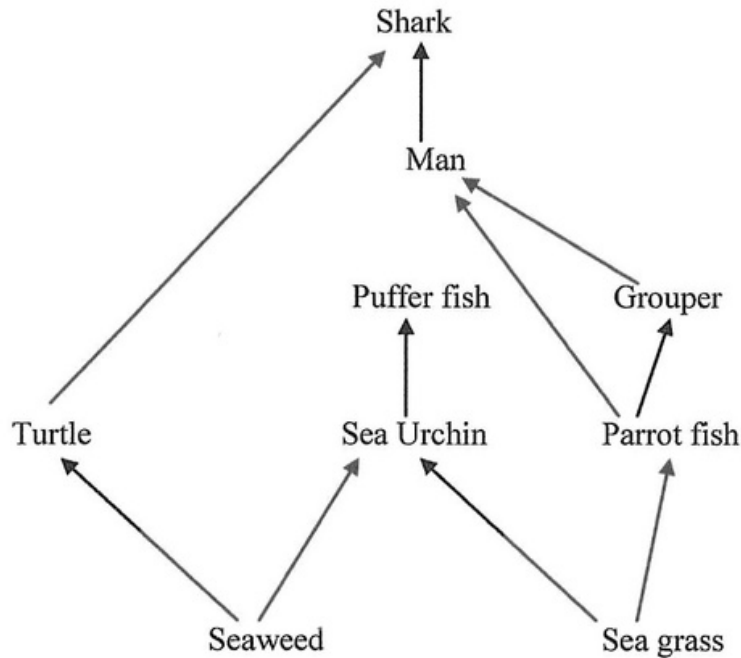


- (i) Which of the two media is less dense. [1]
- _____
- (ii) How would this difference in density affect the speed of the light travelling from substance I to substance II? [2]
- _____
- _____
- _____
- (iii) Draw on the diagram the path of a ray with a greater angle of incidence. [1]
- (iv) Explain the speed of light before it enters the glass and after it comes out of the glass. [1]
- _____

TOTAL MARKS [10]



4. The diagram below shows a food web on a sandy shore in Andros.



- (a) (i) Name the type of energy entering the food web.
_____ [1]
- (ii) What is the role of the Seaweed and Sea grass in this food web?
_____ [1]
- (iii) Identify an organism that is both a secondary and tertiary consumer.
_____ [1]
- (b) From the food web above, construct a food chain consisting of 4 different organisms.
_____ [2]
- (c) (i) Consumers and producers are included in the food web above. Name another group of organisms which are part of every food web but are not shown.
_____ [1]
- (ii) Explain the importance of this group of organisms.

_____ [2]

- (d) The population of the parrot fish was reduced by overfishing.

Suggest how the overfishing of parrot fish affects the population of groupers.

Effect on population _____

Explanation _____

_____ [2]

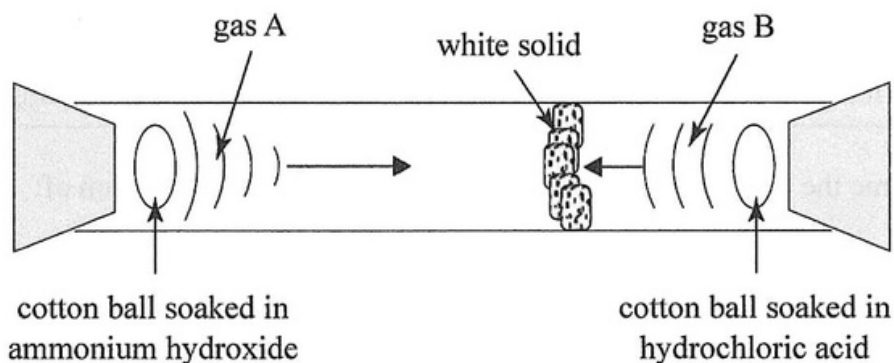
TOTAL MARKS [10]



5. Substances in nature undergo a number of changes. These changes can be placed into two categories: Physical changes and Chemical changes.

A student carries out two experiments to investigate types of changes.

Experiment 1 – The student uses apparatus set up below.



- (a) Name the type of change that results in the formation of:
- (i) gases from their solutions _____ [1]
 - (ii) a white solid from the two gases _____ [1]
- (b) Write the **formulae** of Gas A and Gas B.
- Gas A _____ [1]
- Gas B _____ [1]
- (c) (i) Name the process which causes the formation of the gases from their solutions.
- _____ [1]
- (ii) How would a decrease in temperature affect the formation of the gases from their solutions?
- _____ [1]

Experiment 2 – The student uses iron and records the following observations

EXPERIMENT	OBSERVATION
Heats powdered iron (grey solid) and carbon (black solid) strongly in the same container and leaves to cool	Black solid formed
Exposes a small piece of iron to moisture and water for 7 days	A orange–brown solid formed on the iron which flaked off upon rubbing with sand paper

(d) Name the type of change that results in the formation/production of:

(i) black solid _____ [1]

(ii) orange–brown solid _____ [1]

(e) State **TWO** ways that a physical change differs from a chemical change.

1. _____
_____ [1]

2. _____
_____ [1]

TOTAL MARKS [10]



6. (a) Distinguish between a conductor and an insulator.

[2]

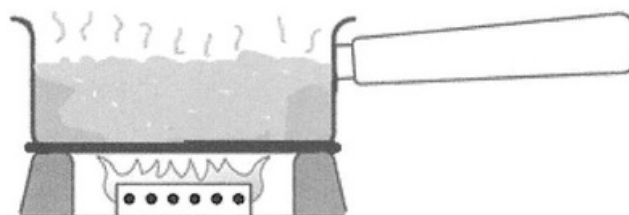
- (b) Using the list below classify them as conductors and insulators:

LIST	an iron nail, a plastic spoon, a graphite rod, a piece of rubber
-------------	--

Conductors: _____ [2]

Insulators: _____ [2]

- (c) The diagram below shows a pot of hot water.



What are the properties of the pot's materials that would allow the following?

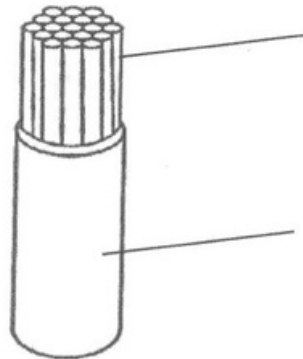
- (i) The water to get hot;

[1]

- (ii) Someone to lift the pot with their bare hand;

[1]

- (d) The electrical wire below is made up of two parts.



On the diagram label the part that would be the:

- | | | |
|------|-----------|-----|
| (i) | Insulator | [1] |
| (ii) | Conductor | [1] |

TOTAL MARKS [10]



7. The following table shows the volume of urine excreted by a man after he drinks 1 litre of water.

Time after drinking water (minutes)	Volume of urine (cm ³)
0	0
30	40
60	350
90	500
120	250
150	75
180	80
210	50
240	40

- (a) Use the data from the table to calculate the average volume of urine produced per hour over these four hours.

(Show your working)

[2]

- (b) (i) Explain how the body causes this increase in urine excretion.

[2]



- (ii) State and explain **ONE** effect on the body of drinking too much water.

_____ [2]

- (c) Name the main nitrogenous substance found in urine.

_____ [1]

- (d) After excessive sweating on a hot day with a reduced water intake, how does the **colour and amount** of urine change?

Colour _____

Amount _____ [2]

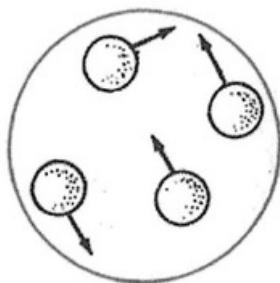
- (e) Give **ONE** use of water in the human body.

_____ [1]

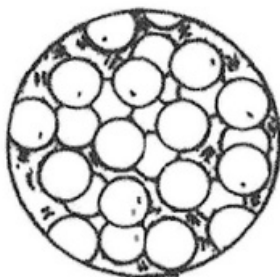
TOTAL MARKS [10]



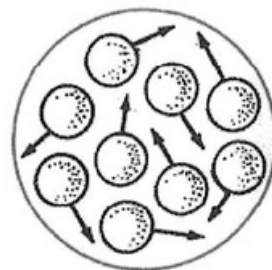
8. The diagrams below shows three states of matter that substance X can exist in.



A



B



C

- (a) Complete the gaps in the table below by using diagrams A, B and C.

	States of Matter	Force between particles	Particle movement
A		Weak	
B			
C		Moderately strong	Move over and around each other

[6]

- (b) (i) Name the process that occurs when the substance changes from state C to state B

_____ [1]

- (ii) Use the kinetic theory to explain how the change of state identified in (b) (i) occurred.

 _____ [2]

- (iii) A liquid was heated and boiled at 100°C . Give the name of this liquid.

_____ [1]

TOTAL MARKS [10]

End]



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