3102/2

BGCSE

School Number	Candidate Number
Surname and Initials	

COMBINED SCIENCE

PAPER 2 3102/2

Wednesday 27 MAY 2015 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 space provided on this question booklet.

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

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.

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The Periodic Table of the Elements

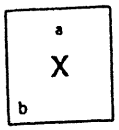
Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
																	4 He Helium 2
							1 H Hydrogen 1										
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 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	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 = relative atomic mass

X = atomic symbol

b = proton (atomic) number

1. The particles of matter are in constant, random motion.

(a) Some red candies were placed in a glass of warm water.

(i) Suggest what would be observed after one hour.

_____

_____ [1]

(ii) Explain this observation in (a)(ii).

_____

_____

_____ [2]

(iii) State what happens if cold water is used.

_____

_____ [1]

(b) The table shows some gases and their relative molecular mass (r.m.m)

name of gas	formula	r.m.m
ammonia	NH_3	17
carbon dioxide	CO_2	44
nitrogen	N_2	28
oxygen	O_2	32

(i) Arrange the gases in order of rate of diffusion from fastest to slowest.

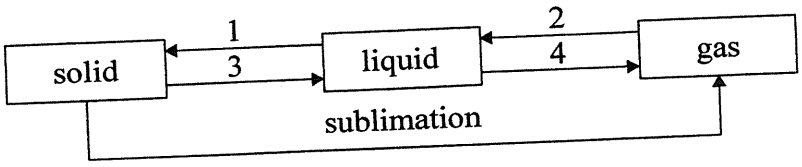
fastest _____ _____ _____ _____ **slowest** [1]

(ii) Explain the order of diffusion of the gases given in (b)(i).

_____

_____ [1]

(c) The chart shows the basic changes in the states of matter.



Use the Kinetic Theory to explain the changes in state shown by arrows **1** and **4**.

1 _____

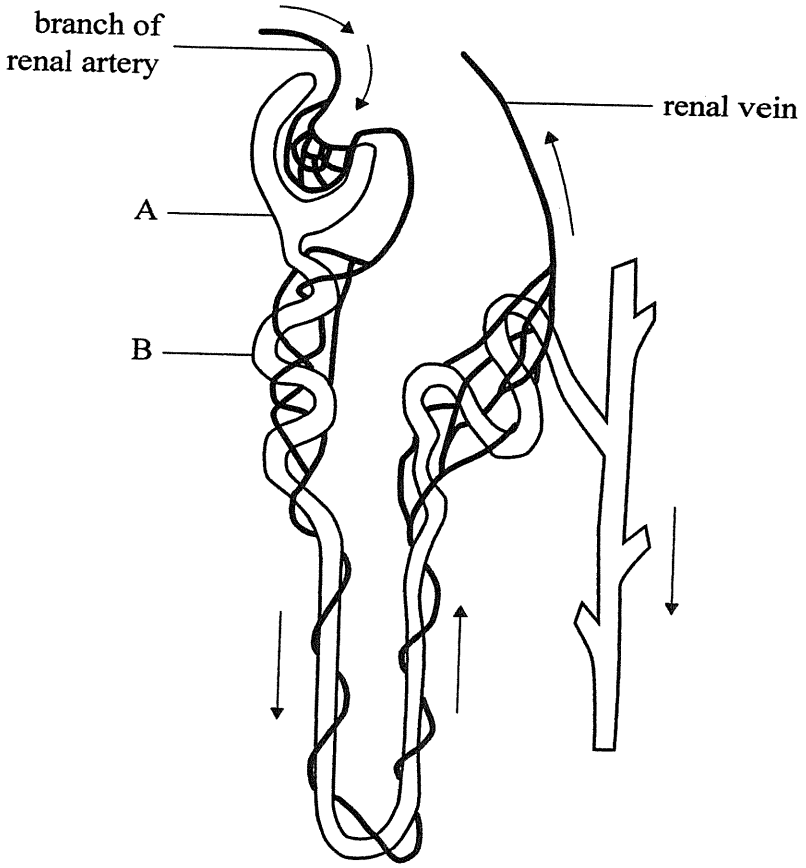
_____ [2]

4 _____

_____ [2]

TOTAL MARKS [10]

2. The diagram shows a section through a nephron.



(a) (i) Name the process occurring at structure **A**.

_____ [1]

(ii) State **TWO** differences in the content of the blood entering and leaving the kidneys.

1. _____

_____

2. _____

_____ [2]

(iii) Name **ONE** substance which is reabsorbed in **B** and state its use in the body.

substance _____

use _____

_____ [2]

(b) The table shows the comparison between the daily intake and output of water in an adult.

daily intake/cm^3		**daily output/cm^3**	
drinks	1 500	urine	1 400
food	700	faeces	150
respiration	200	sweat	200
		exhaled air	400

Use the data in the table to calculate

(i) the average daily intake of water. Show your working;

[2]

(ii) the difference in the **TOTAL** intake and output of water.

[1]

(iii) Name the hormone which regulates the amount of water in the body.

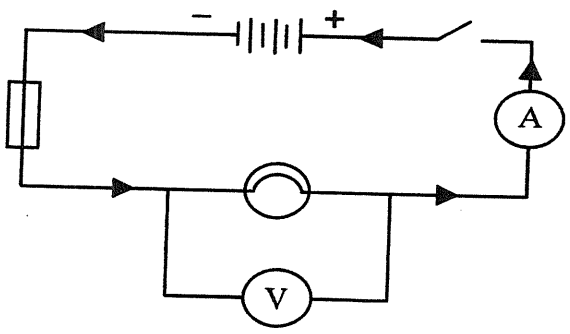
_____ [1]

(c) Name the excretory product found in human faeces.

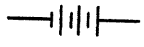
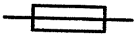
_____ [1]

TOTAL MARKS [10]

3. The diagram shows an electrical circuit.



(a) (i) Name and give the function of each electrical symbol shown.

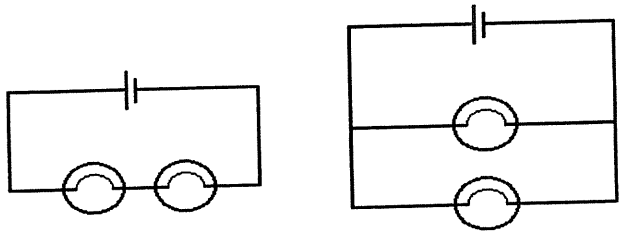
component	name	function
		
		
		
		
		
		

[6]

(ii) State what the arrows in the circuit indicate.

_____ [1]

(b) The diagrams show two different electrical circuits.



X Y

Name the types of electrical circuit shown by diagrams **X** and **Y**.

X _____

Y _____ [1]

(c) Name the type of electrical circuit used in household wiring and give a reason for your choice.

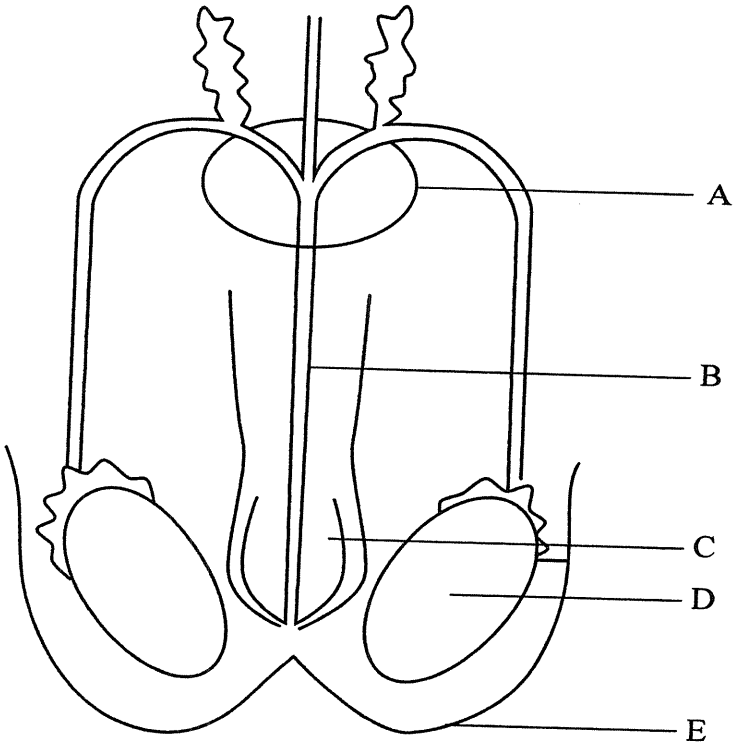
name _____ [1]

reason _____

_____ [1]

TOTAL MARKS [10]

4. The diagram shows the male reproductive system.



(a) Use the letters from the diagram to match each function with its structure.

function		**letter**
(i)	allows both urine and sperm to exit the body	_____
(ii)	manufactures sperm cells	_____
(iii)	produces testosterone	_____
(iv)	produces seminal fluid which contains sperm	_____
(v)	organ enlarges when filled with blood	_____ [5]

(b) Give the letter of the structure which contains the testes.

_____ [1]

(c) Briefly explain why the testes are located outside the body.

_____

_____ [2]

(d) (i) On the diagram, place an **X** on the structure where a surgeon would cut when performing a vasectomy. [1]

(ii) State the effect of cutting this structure.

_____

_____ [1]

TOTAL MARKS [10]

5. Water is an important resource and is filtered and treated with chlorine so that it is safe to use.

(a) Explain why water is

(i) filtered; _____

_____ [1]

(ii) treated with chlorine. _____

_____ [1]

(b) The quality of drinking water can vary. The table gives information on the percentage of ions found in drinking water from four locations.

location	percentage of ions present				pH
	Ca^{2+}	Na^{+}	SO_4^{2-}	NO_3^{-}	
A	5.1	3.4	3.5	3.0	7.1
B	3.5	0.6	0	0.1	7.6
C	0.4	0.3	0.2	0	8.2
D	0.3	0.4	0.4	0.2	6.7

(i) Give the letter of the location where the water is acidic.

_____ [1]

(ii) Drops of Universal Indicator are added to water from location C.

Suggest the likely colour change.

_____ [1]

(iii) Write the names of **TWO** compounds which produce the ions present in the water at location B.

1. _____

2. _____ [2]

(iv) Give the location where the water is most likely to be polluted by fertiliser. Give a reason for your choice.

location _____ [1]

reason _____

_____ [1]

(c) Describe the test and its positive results which shows that a sample of water is pure.

test _____

_____

_____

positive result _____ [2]

TOTAL MARKS [10]

6. This question is about bonding.

(a) Element **X** is found in group IV and is a solid at room temperature Element **Y** is found in group I and is a gas at room temperature.

(i) Draw a dot and cross diagram using only the outer electrons to show the bonding formed between **X** and **Y**.

[2]

(ii) Name the type of bond formed between **X** and **Y**.

_____ [1]

(iii) Write a possible formula for the compound formed between **X** and **Y**.

_____ [1]

(b) The table gives information about **FOUR** elements **P**, **Q**, **R** and **S**.

These letters are not the symbols of the elements.

element	**P**	**Q**	**R**	**S**
atomic number	7	8	10	11

(i) Identify the element which is the **least** chemically reactive.

_____ [1]

(ii) Draw a dot and cross diagram using only the outer electrons to show the bonding between element **S** and chlorine.

[2]

(iii) Name the type of bond formed between **S** and chlorine.

_____ [1]

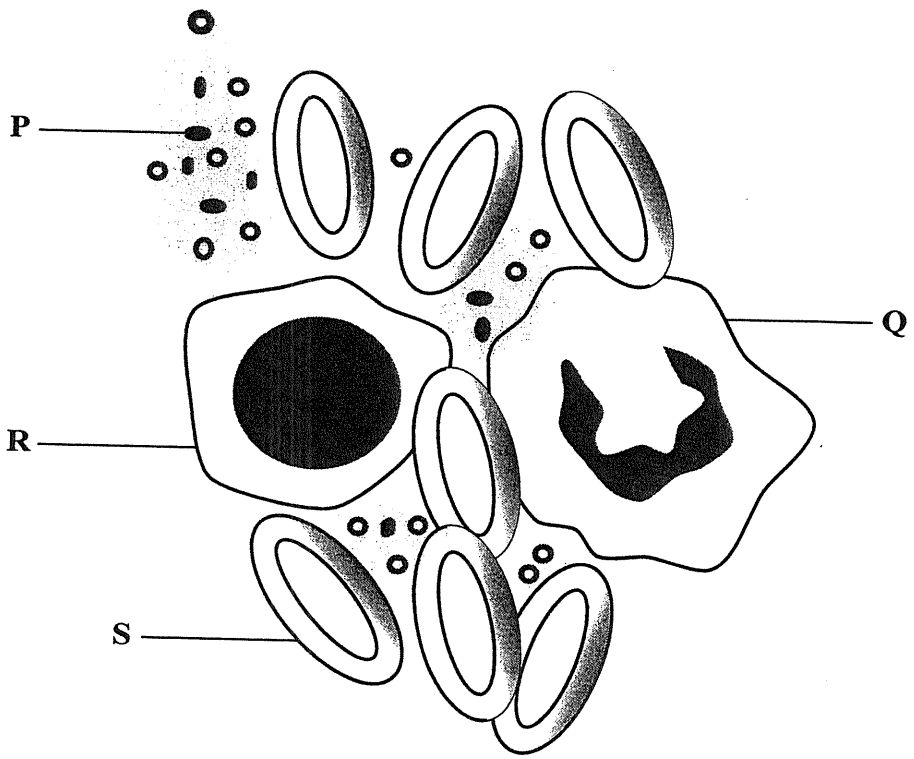
(iv) In terms of electron transfer explain what happens when **S** bonds with chlorine.

_____

_____ [2]

TOTAL MARKS [10]

7. The diagram shows cells in a sample of human blood.



(a) (i) State the name of the fluid part of blood.

_____ [1]

(ii) State the function of cell **S**.

_____ [1]

(iii) Describe **ONE** way in which cell **S** is adapted for its function.

_____

_____ [1]

(iv) Explain how structures **P**, **Q**, and **R** protect the human body against microorganisms.

P _____

_____ [1]

Q _____

_____ [1]

R _____

_____ [1]

(b) A student performs a series of exercises to determine his fitness. The results are recorded in the table.

activities	**heartbeat (per minute)**
jogging	77
walking	55
running	90

(i) Calculate the average heartbeat for the **THREE** exercises.

[1]

(ii) Explain and give a reason for the effect of exercise on heartbeat.

_____

_____ [1]

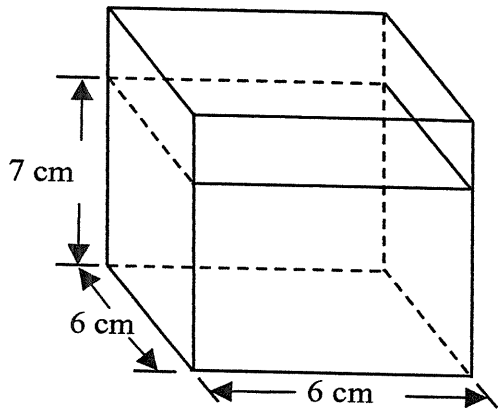
(c) Apart from exercise, give **TWO** other factors which may decrease a person's risk of coronary heart disease.

1. _____

2. _____ [2]

TOTAL MARKS [10]

8. The diagram shows the dimensions of a glass tank with water.



(a) (i) Calculate the volume of water in the tank. Show all working.

[2]

(ii) A stone on a piece of string is lowered into the water in the tank until it is completely covered. The water rises to 8 cm. Calculate the volume of water and the stone together.

[1]

(iii) Find the volume of the stone.

[1]

(b) The stone has a mass of 64 g, what is its density in kg?

[2]

(c) The density of water is 1.0 g/cm^3. State what happens to the stone if the string is let go. Give a reason for your answer.

_____

_____ [2]

(d) Why does ice float?

_____ [2]

TOTAL MARKS [10]

End]

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