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COMBINED SCIENCE

PAPER 3 3102/3

Wednesday **4 JUNE 2025** 9:00 A.M.–10:30 A.M.
(1 hr. 30mins)

Additional materials:
Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION 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 in **Section A** (1 – 4) in the spaces provided.

Answer **ANY** two (2) out of the three [3] questions from **Section B** on the lined pages provided in this booklet.

Candidates are advised to spend no more than 35 minutes on **Section A**.

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	
SECTION A	
1	
2	
3	
4	
SECTION B	
5	
6	
7	
TOTAL	

This question paper consists of 16 printed pages and 4 lined pages.

The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H Hydrogen																	
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	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	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	232 Pa Protactinium 91	238 U Uranium 92	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

Key

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

SECTION A

Answer **ALL** Questions in this Section.

1. Biological washing powders contain enzymes that breakdown food stains.

(a) (i) Describe what is meant by an enzyme.

[2]

(ii) List **two** properties of enzymes.

1

2

[2]

(b) State why biological washing powders should **not** be used in hot water.

[1]

(c) Complete the table by listing the enzyme that breakdowns the nutrient substance in foods.

nutrient	enzyme
starch	
fat	

[2]

- (d) The graph in **Fig. 1.1** shows the activity of enzymes **A** and **B**.

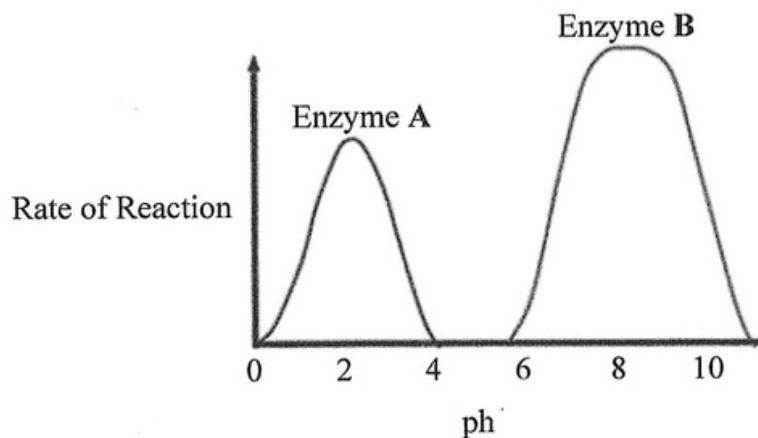


Fig. 1.1

- (i) State the property of enzymes shown in the graph.

_____ [1]

- (ii) Use the graph to identify the condition in which enzymes **A** and **B** work best.

A _____

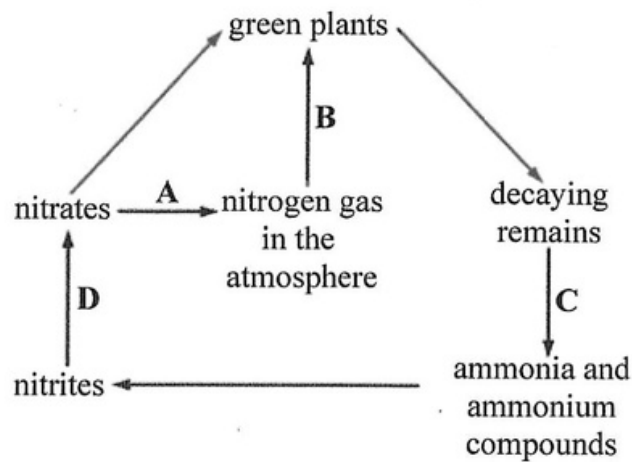
B _____

[2]

TOTAL MARKS [10]



2. The diagram shows a part of the nitrogen cycle.



- (a) The labels A–D represents four key processes that occur in the nitrogen cycle.

Identify the processes labelled A–D.

- A _____
- B _____
- C _____
- D _____

[4]

- (b) (i) Name a natural process that converts nitrogen gas into nitrates.

_____ [1]

- (ii) State the name of the type of plants that contain bacteria in their root nodules.

_____ [1]

- (iii) Explain the advantage of these plants having bacteria in root nodules.

_____ [2]

(c) Plants absorb nitrogen in the form of nitrates from the soil.

(i) Write the symbol for the nitrate ion.

_____ [1]

(ii) State how plants use nitrates from the soil.

_____ [1]

TOTAL MARKS [10]



3. This question is about **speed**, **velocity** and **acceleration**.

(a) Define the terms speed and velocity.

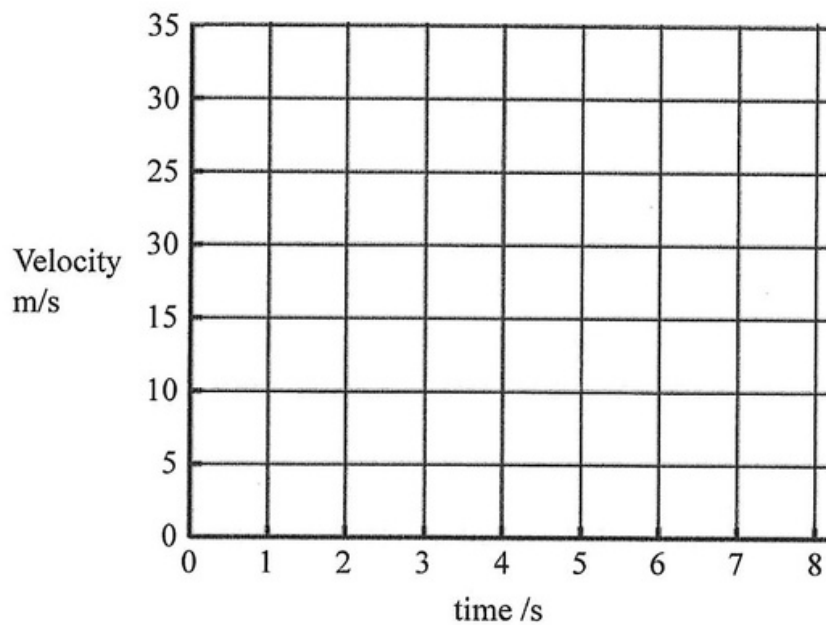
speed: _____

velocity: _____

_____ [2]

(b) Car A begins a journey from rest with a constant acceleration, reaching a velocity of 15 m/s within 3 seconds. It maintains this velocity for 5 seconds.

Sketch a graph of velocity (y-axis) against time (x-axis) for the first 8 seconds of car A's journey.



[2]

(c) Calculate the total distance travelled in (m), by car A for the first 8 seconds of the journey.

Show your working.

[2]

[Turn over]



- (d) Another car, **B** starts its journey from rest and travels with a constant acceleration of 6.5 m/s^2 for 20 seconds. Show all working and state the equation. State the answer with the correct unit.

Show your working.

- (i) Determine the velocity of car **B**.

[2]

- (ii) Determine the distance travelled by car **B** during the 20 seconds.

State the equation, show your working and state the answer with the correct units.

[2]

TOTAL MARKS [10]



4. **Fig. 4.1** shows changes occurring in the uterine lining of a female during a 28-day menstrual cycle.

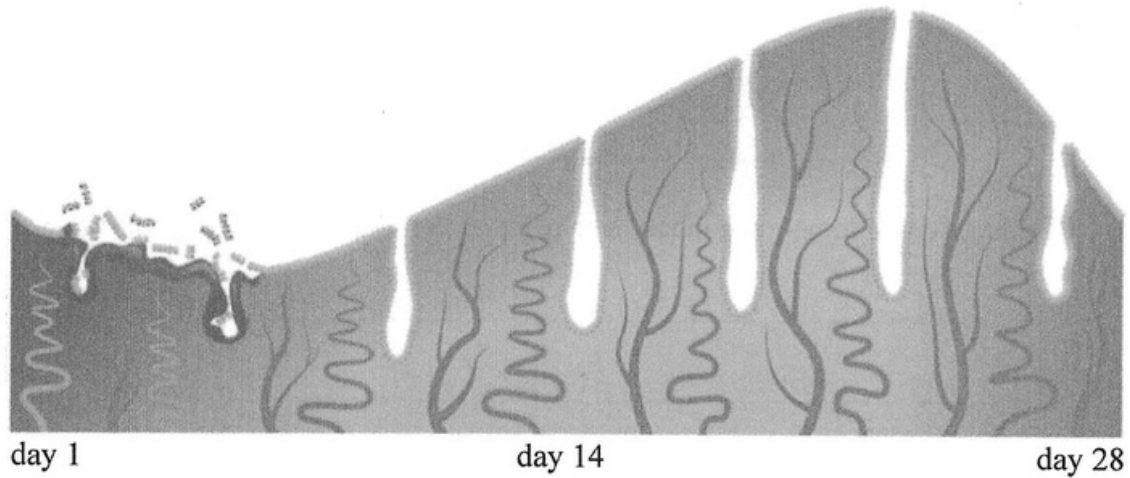


Fig. 4.1

- (a) Define the term menstrual cycle.

[2]

- (b) The menstrual cycle is regulated by hormones.

- (i) Describe the role of **oestrogen** and **progesterone** in the menstrual cycle.

[2]

- (ii) State how these hormones travel from the ovary to the uterus.

[1]

- (c) (i) On the diagram draw a line to show where ovulation takes place. Label it **X**. [1]

- (ii) Describe what happens at ovulation and give the name of the hormone responsible for this process.

_____ [2]

- (d) Identify **two** female secondary sexual characteristics that develops during puberty.

1. _____

2. _____ [2]

TOTAL MARKS [10]



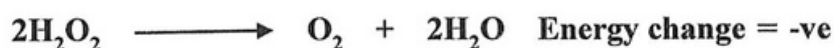
SECTION B

Answer any **two** questions in this section

5. This question is based on energy changes and rate of reaction.

A sample of oxygen can be prepared in the science laboratory using hydrogen peroxide and a **catalyst**, manganese dioxide.

The equation for the reaction is given below:



This reaction is exothermic.

- (a) Describe an exothermic reaction in terms of bond-making and bond-breaking energies. [2]
- (b) Explain in terms of collision theory the effect of lowering the temperature of H_2O_2 on the rate of reaction. [3]
- (c) A student recommends using 1 g of powdered manganese dioxide instead of lumps to prepare the sample of oxygen.
- (i) Explain if the student's recommendation is correct. [1]
- (ii) Explain the purpose of the manganese oxide catalyst in the preparation of hydrogen peroxide. [2]

- (d) In another experiment zinc was reacted with excess dilute hydrochloric acid at room temperature and pressure. In the experiment 0.002 moles of the zinc metal was used to produce the chloride of the metal and hydrogen gas. The volume of hydrogen gas produced was recorded at time intervals as shown in the table below.

Time/minutes	0	1	2	3	4	5	6	7	8
Volume of hydrogen produced/cm ³	0	17	30	41	50	58	65	70	72

- (i) Plot a suitable graph of the volume of hydrogen produced in this experiment. Label your graph **A**. [4]
- (ii) Determine the volume of the gas produced in the first 30 seconds for the zinc experiment using dilute hydrochloric acid. [1]
- (iii) Write a balanced symbol equation for the reaction between zinc and dilute hydrochloric acid. [3]
- (e) The experiment is repeated using a higher concentration of hydrochloric acid. All other conditions remain the same.
- (i) On the graph you have drawn in (d)(i), sketch a graph to show the volume of hydrogen produced using a higher concentration of hydrochloric acid. Label your graph **B**. [1]
- (ii) Describe and explain, in terms of particles and collisions, the effect that increasing the concentration of the hydrochloric acid has on the rate of the reaction. [3]

TOTAL MARKS [20]



6. This question is about electricity.

- (a) Define the term **potential difference** and **electric current**. [2]
- (b) **Fig. 6.1** shows two resistors in parallel.

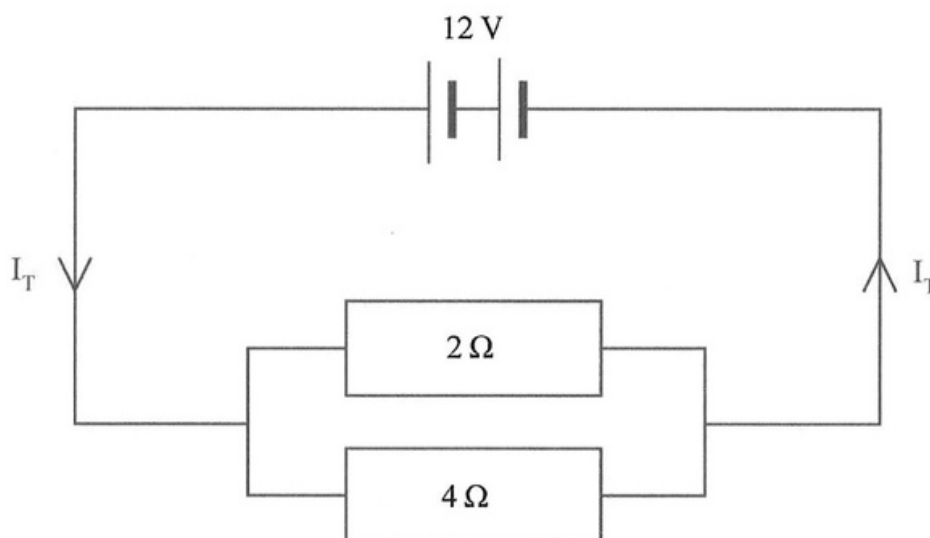


Fig. 6.1

- (i) Calculate the total resistance in the circuit. [2]
- (ii) Calculate the total current, I_T , in the circuit. [2]
- (iii) A technician wants to increase the main current.
- State how this can be accomplished by changing the value of one of the resistors. [1]
- (c) A resistor is a fundamental component in the flow of an electric current in a circuit.
- (i) State **one** other type of resistor in an electric circuit other than the type shown in the diagram. [1]
- (ii) The resistor in **Fig. 6.1** are now connected in series. Calculate the total current. [2]
- (iii) Calculate the voltage drop across the 4Ω resistor. [2]

- (d) Some measurements obtained in the experiment are shown in the chart.

Potential Difference / V	0	2	4	6	8	10	12
Current / A	0	0.6	1	1.3	1.6	1.8	2

- (i) Plot a graph of current (y-axis) against potential difference (x-axis) [5]

From the graph, determine:

- (ii) the value for the current when the potential difference is 5 V. [1]
- (iii) the resistance of the conductor at 5 V. [1]
- (iv) suggest a possible reason why the graph is not a straight line. [1]

TOTAL MARKS [20]



7. The human nervous system is made up of two parts: the central nervous system and the peripheral nervous system.

(a) Differentiate between the two parts of the human nervous system. [2]

(b) Define the term coordination. [2]

(c) Fig. 7.1 shows a reflex arc.

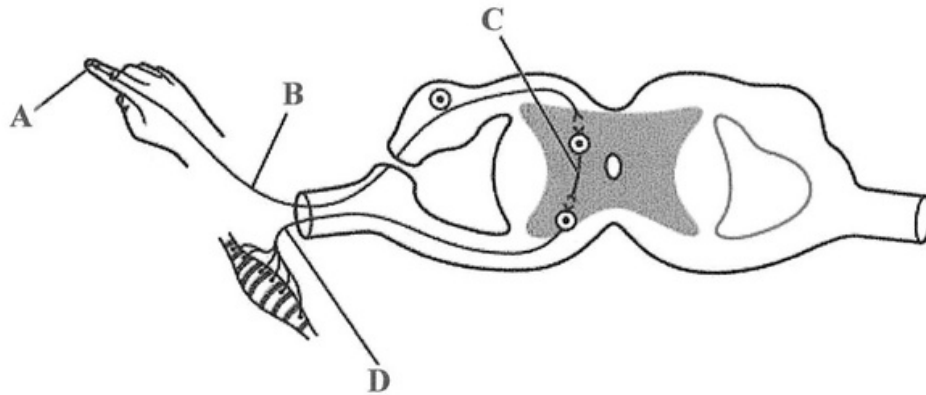


Fig. 7.1

(i) State the name and function of the labelled structures **B** and **D**. [4]

(ii) State the difference between a reflex arc and a reflex action. [2]

(iii) Explain the importance of a reflex action and give one other example. [2]

(iv) The impulse shown takes 0.02 seconds to pass from the finger to the spinal cord, a distance of 1.5 meters. Calculate the speed of the impulse.

Show your working, answer and correct unit. [2]

- (d) **Fig. 7.2** shows a reflex in the iris of a human eye in response to changes in light intensity.

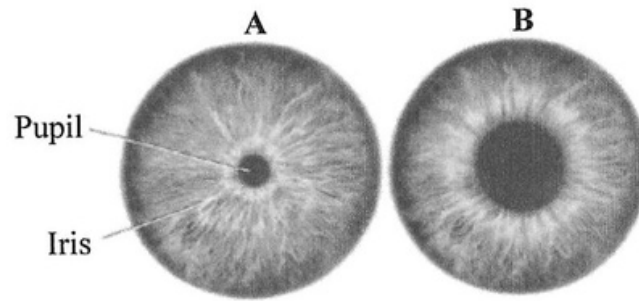


Fig 7.2

- (i) Describe the changes in the pupil and iris in diagrams A to B in **Fig. 7.2**.
Explain how these changes occur. Refer to the changes in light intensity in your answer. [4]
- The response of the skin to cold weather is an involuntary action.
- (ii) Explain how an involuntary action differs from a voluntary action. [1]
- (iii) Give another example of an involuntary action and a voluntary action not mentioned in this question. [1]

TOTAL MARKS [20]



Question

Write on both sides of the paper

Question

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