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| Centre Number | Candidate Number | Candidate Name |
|---------------|------------------|----------------|

NAMIBIA SENIOR SECONDARY CERTIFICATE

PHYSICAL SCIENCE HIGHER LEVEL

8322/1

PAPER 1

1 hour 30 minutes

Marks 70

2017

Additional materials: Ruler
Non-programmable calculator

INSTRUCTIONS AND INFORMATION TO CANDIDATES

- Candidates answer on the Question Paper on the spaces provided.
- Write your Centre Number, Candidate Number and Name in the spaces at the top of this page.
- Write in dark blue or black pen.
- You may use a soft pencil for any rough work, diagrams or graphs.
- Do not use correction fluid.
- Do not write in the margin *For Examiner's Use*.

- Answer **all** questions.

- The number of marks is given in brackets [] at the end of each question or part question.
- You will lose marks if you do not show your working or if you do not use appropriate units.

- Take the weight of 1 kg to be 10 N (i.e acceleration of free fall $g = 10 \text{ m/s}^2$).
- The Periodic Table is printed on page 11.

| For Examiner's Use | |
|--------------------|--|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| Total | |
| Marker | |
| Checker | |

This document consists of **11** printed pages and **1** blank page.



Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

- 1 The motion of a hot air balloon during the interval **A** to **D** after it began to rise from the ground is shown in Fig. 1.1.

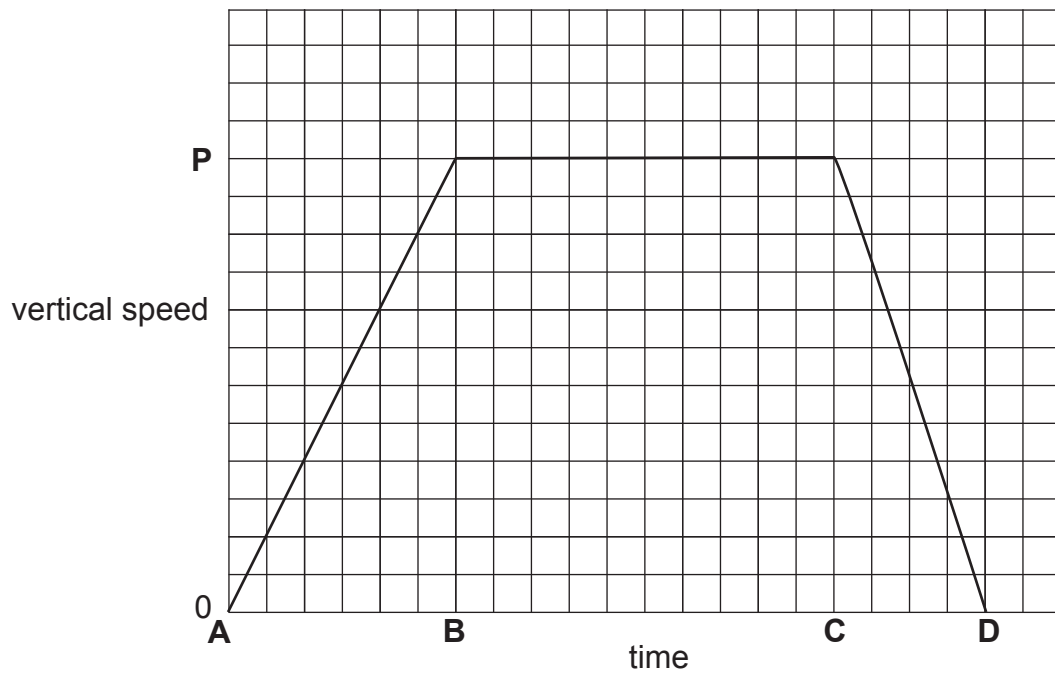


Fig. 1.1

- (a) Describe the motion of the balloon

(i) during the interval **A** to **B**.

..... [1]

(ii) during the interval **B** to **C**.

..... [1]

(iii) at point **D**.

..... [1]

- (b) In terms of **A**, **B**, **C**, **D** and **P**, give the expression of the total distance covered during the time interval **A** to **D**.

Answer

[3]

(c) When the balloon was stationary at a height of 30 m above the ground, a metal ball was dropped. The ball accelerated constantly as it fell to the ground. An observer recorded that it took 3.0s for the ball to reach the ground.

Calculate

(i) the average speed of the ball as it fell.

Average speed.....m/s [2]

(ii) the maximum speed of the ball before it hits the ground.

Maximum speedm/s [3]

(iii) the acceleration of the ball as it fell.

Acceleration m/s² [2]

(iv) Acceleration of free fall is 10 m/s².
Explain why your value in (c) (iii) is different.

.....
.....

[1]

[14]

- 2 (a) (i) Using suitable diagrams showing outer electrons, explain how magnesium oxide is formed from a magnesium atom and an oxygen atom.

.....

[3]

- (ii) State the type of bonds found in magnesium oxide.

.....

[1]

- (iii) Name **two** other compounds with the same bonds as the one mentioned in (a) (ii).

1

2

[2]

- (b) Write an equation, including state symbols, for the reaction between magnesium oxide and hydrochloric acid.

.....

[3]

- (c) Tablets containing magnesium oxide can be used as anti-acids for human stomachs. One anti-acid tablet contains 3g of magnesium oxide.

- (i) Calculate the relative molecular mass (M_r) of magnesium oxide.

M_r

[2]

- (ii) Calculate the number of anti-acid tablets needed to neutralise 100cm^3 of hydrochloric acid of concentration 3mol/dm^3 . Show your working.

Number of tablets [4]

[15]

- 3 (a) State the meaning of *moment of forces about a point* and state how it is calculated.

.....

.....

.....

.....

.....

[2]

- (b) Fig. 3.1 shows a uniform metre ruler, freely pivoted at a point 30cm from end P.

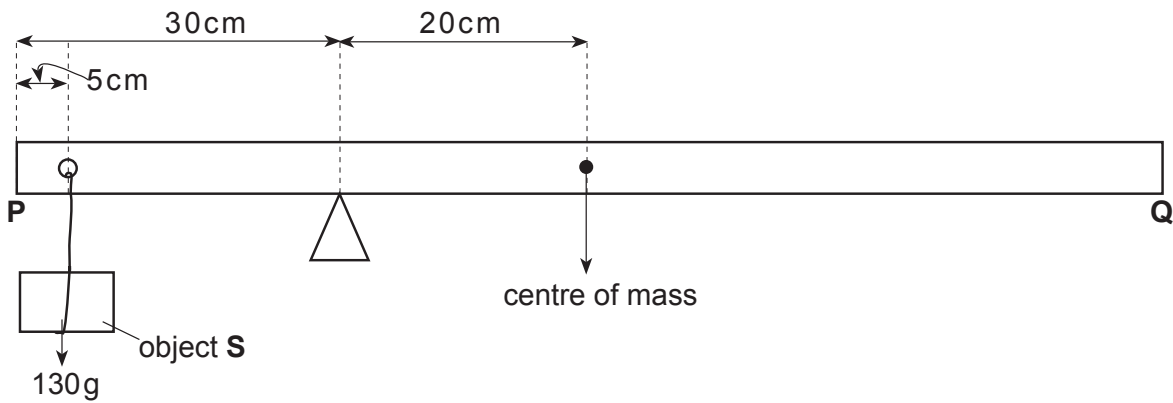


Fig. 3.1

- (i) Calculate the weight of object S.

Weight.....N [2]

- (ii) Use the principle of moments to determine the mass of the metre ruler.

Mass of metre ruler..... g [4]

[8]

4 Sulfuric acid and hydrochloric acid are typical strong acids.

(a) Explain the difference between a strong acid and a weak acid.

.....

[2]

(b) Write the following symbol equation as a **word** equation.



.....

[1]

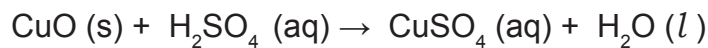
(c) Write the word equation as a **symbol** equation.

sodium oxide + sulfuric acid \rightarrow sodium sulfate + water

.....

[2]

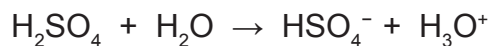
(d) Write the following symbol equation as a **balanced ionic** equation.



.....

[2]

(e) When sulfuric acid dissolves in water, the following reaction occurs.



State and explain which species is acting as a base in this reaction.

Species

Explanation

[2]

[9]

- 5 Fig. 5.1 shows a battery of e.m.f. 6.0V and zero internal resistance connected to a switch and to two resistors in parallel, each of resistance 3.0Ω.

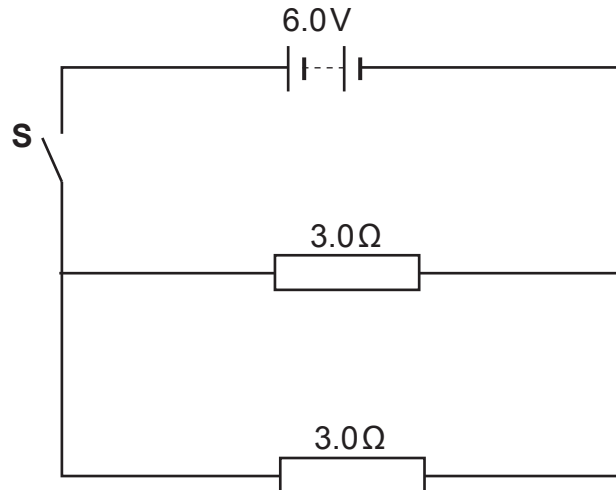


Fig. 5.1

The switch **S** is closed for a period of 5.0 minutes. Calculate

- (a) the current through each resistor.

Current through each resistor..... A [2]

- (b) the current through the battery.

Current through battery A [1]

- (c) the total charge which passes through the battery.

Total charge C [2]

- (d) the energy supplied by the battery.

Energy J [2]

[7]

6 Ethanol can be made from fermentation of glucose, $C_6H_{12}O_6$.

(a) (i) State the substance that is added to glucose in order to make ethanol.

..... [1]

(ii) Explain why air should not be allowed to enter the mixture when ethanol is prepared from this method.

.....
.....
..... [2]

(iii) Write the equation for the preparation of ethanol from glucose by fermentation.

..... [2]

(iv) State the method used to obtain the ethanol formed from the mixture of ethanol and glucose solution.

..... [1]

(b) Give **one** use of ethanol, other than its use in alcoholic drinks.

..... [1]

[7]

7 (a) Determine the number of neutrons contained in one atom of thorium, ${}_{90}^{234}\text{Th}$.

..... [1]

(b) ${}_{90}^{234}\text{Th}$ decays by emitting beta particles to become palladium, Pa.
Write an equation to represent this decay.

..... [2]

(c) A radioactive sample containing 8 600g of thorium is left to decay for 120 days. The half-life of thorium is 24 days.
Calculate the mass of thorium left in the sample after 120 days.

mass of thorium g [2]

(d) Suggest the origin of background radiation.

..... [1]

[6]

8 Diamond and graphite are two forms of the element carbon.

(a) In terms of their structure, explain the difference in hardness of diamond and graphite.

.....
.....
.....
.....
.....
.....

[3]

(b) Give **one** use of diamond.

.....

[1]

[4]

| DATA SHEET | | | | | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|----------------------------------------|-------------------------------------|---|----------|---|
| The Periodic Table of the Elements | | | | | | | | | | | | | |
| Group | | | | | | | | | | | | | |
| I | II | III | IV | V | VI | VII | 0 | | | | | | |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | 1 H Hydrogen 1 | 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 | 13 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulfur 16 | 35.5 C/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 | | | |
| 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 Tc Technetium 43 | 106 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | | | |
| 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 | | | |
| 226 Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 201 Hg Mercury 80 | 204 Bi Bismuth 83 | 209 Po Polonium 84 | 210 At Astatine 85 | 210 Rn Radon 86 | 210 Xe Xenon 54 | | | |
| *58 - 71 Lanthanoid series | | | | | | | | | | | | | |
| †90 - 103 Actinoid series | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>a</td> <td>X</td> <td>b</td> </tr> </table> <p>Key</p> <p>a = relative atomic mass X = atomic symbol b = proton (atomic) number</p> | | | | | | | | | | | a | X | b |
| a | X | b | | | | | | | | | | | |
| 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 | | | |
| 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 Cf Californium 98 | 238 Es Einsteinium 99 | 238 Fm Fermium 100 | 238 Md Mendelevium 101 | 238 No Nobelium 102 | | | |
| The volume of one mole of any gas is 24 dm ³ at room temperature and pressure (r.t.p.). | | | | | | | | | | | | | |

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