

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

**NAMIBIA SENIOR SECONDARY CERTIFICATE**

**PHYSICAL SCIENCE HIGHER LEVEL**

**8322/1**

PAPER 1

1 hour 30 minutes

Marks 70

**2020**

Additional materials: Ruler  
Non-programmable calculator

**INSTRUCTIONS AND INFORMATION TO CANDIDATES**

- Candidates answer on the Question Paper in 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 diagrams, graphs or rough working.
- 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.
- The Periodic Table is printed on page 10.

| For Examiner's Use |  |
|--------------------|--|
| 1                  |  |
| 2                  |  |
| 3                  |  |
| 4                  |  |
| 5                  |  |
| 6                  |  |
| 7                  |  |
| <b>Total</b>       |  |

|         |  |
|---------|--|
| Marker  |  |
| Checker |  |

This document consists of **10** printed pages and **2** blank pages.



Republic of Namibia  
**MINISTRY OF EDUCATION**

**1** Caesium iodide is a crystalline solid used in medicine as the scintillating material in x-ray detectors.

**(a)** Write down the formula of caesium iodide.

..... [1]

**(b)** In terms of the difference in electronegativity, explain the type of bonding in caesium iodide.

.....  
 .....  
 .....  
 ..... [3]

**(c)** Iodine has a higher melting point than caesium.

**(i)** State the strongest type of intermolecular forces present in each of the two solids.

iodine.....  
 caesium..... [2]

**(ii)** Explain why Iodine, a non-metal, has such a high melting point.

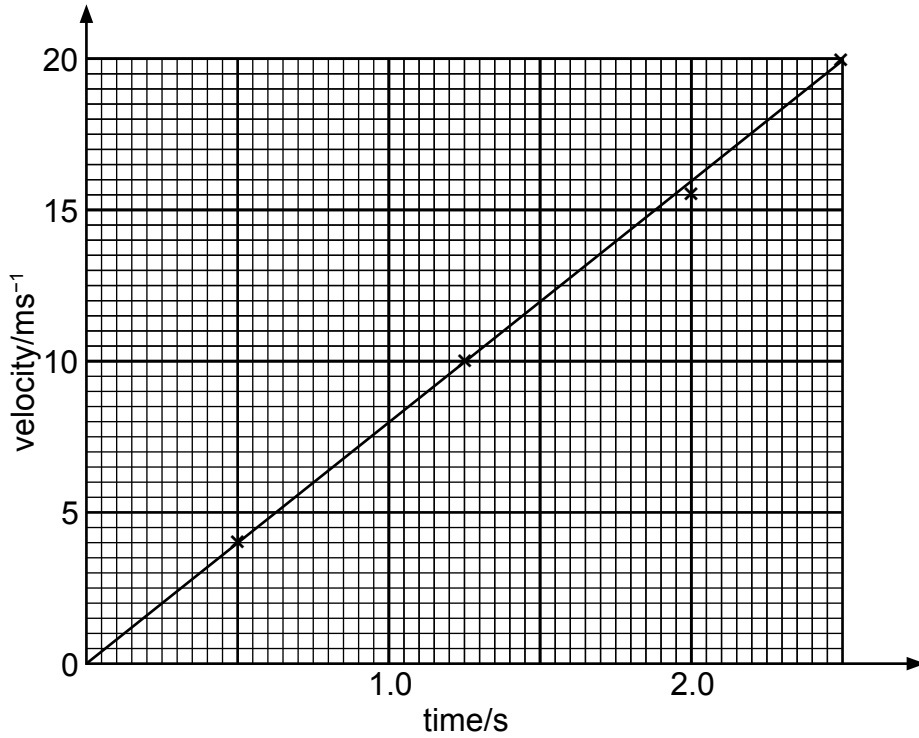
..... [1]

**(d)** Explain why caesium can conduct electricity when solid, but caesium iodide conducts electricity only when molten or dissolved in water.

.....  
 .....  
 .....  
 .....  
 .....  
 ..... [3]

**[10]**

2 Fig. 2.1 shows the velocity/time graph of an object falling towards Earth until it reaches terminal velocity.



**Fig. 2.1**

(a) (i) State a conclusion that can be made about the acceleration due to gravity from the shape of the graph.

..... [1]

(ii) State the meaning of the phrase *terminal velocity*.

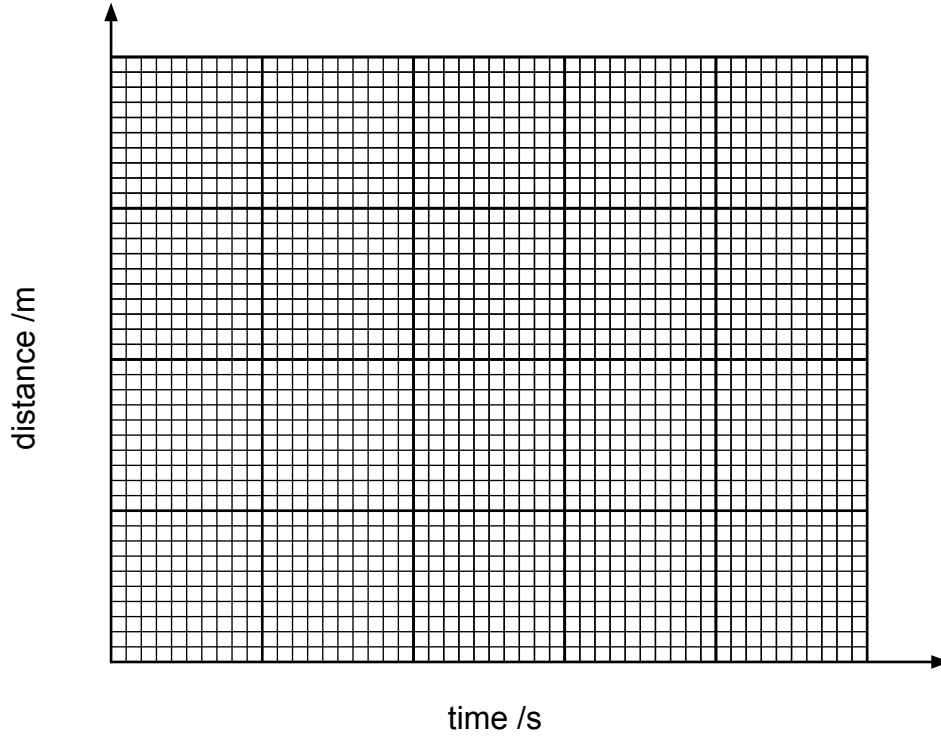
.....  
..... [2]

(b) (i) Calculate the distance fallen by the object in the first 1.5 s of its fall. Show all your working.

Distance = ..... m [2]

- (ii) On Fig. 2.2 mark the suitable values on the axes and draw a graph to show how the distance fallen changes with time.

[3]

**Fig. 2.2**

[8]

3 Hydrogen fuel cell technologies has been used to power commercial vehicles in an effort to reduce global warming.

(a) State what it is meant by the term *fuel*.

.....  
.....

[1]

(b) Hydrogen burns in air with a pale blue flame.

(i) Write down a balanced equation for the combustion of hydrogen. Include state symbols.

.....

[3]

(ii) Explain why hydrogen is considered a clean fuel.

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

[2]

(c) The combustion of hydrogen is exothermic. Explain why.

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

[3]

(d) Energy from the sun is produced by nuclear fusion of hydrogen isotopes. This releases large amounts of energy according to the equation  $E = mc^2$ .

Calculate the energy released when the mass difference between reactants and products is  $2.0 \times 10^{-20}$  kg. [ $c = 3.0 \times 10^8$  m/s].

Energy = .....J [2]

[11]

- 4** The solubility of sulfates of group 2 metals in water decreases down the group. Magnesium sulfate is soluble in water but calcium sulfate is only sparingly soluble in water.

**(a)** Predict the solubility of barium sulfate in water.

..... [1]

**(b)** Magnesium sulfate and barium sulfate can be prepared from dilute sulfuric acid.

Identify the other substance required to prepare each salt.

Magnesium sulfate.....

Barium sulfate ..... [2]

**(c)** Describe, how dry solid barium sulfate can be prepared.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 ..... [3]

**(d)** Calculate the maximum mass of barium sulfate that can be prepared from 75 cm<sup>3</sup> of 0.5 mol/dm<sup>-3</sup> sulfuric acid.

Maximum mass..... g [3]

[9]

5 Camping gas canisters contain butane gas.

(a) Real gases approach ideal gas behaviour under certain conditions.

(i) State **two** conditions required for real gases to behave like ideal gases.

1 .....

2 ..... [2]

(ii) The butane in a full gas canister does not behave as an ideal gas. Explain why.

.....

.....

.....

..... [2]

(b) A camper needs to boil  $650 \text{ cm}^3$  of water to make coffee. The water boils at  $100^\circ\text{C}$  and the ambient temperature is  $25^\circ\text{C}$ .

(i) Determine the temperature change, in Kelvin, when the water is boiled.

Temperature change = ..... K [1]

(ii) Calculate the minimum heat required to boil the water. [ $c = 4.2 \text{ J g}^{-1}\text{K}^{-1}$ ].

Minimum heat = ..... [3]

(iii) State **one** assumption which can be made in order to calculate the heat in **b(ii)**.

..... [1]

(iv) Calculate the minimum mass of butane required to boil the water given that one mole of butane releases  $2877.5 \text{ kJ}$  on complete combustion.

Minimum mass..... g [3]

[12]

6 Crude oil is a mixture of saturated hydrocarbons.

(a) State what is meant by the term *mixture*.

.....  
 ..... [1]

(b) Crude oil is separated into fractions by fractional distillation.  
 Explain why fractional distillation can be used to separate the hydrocarbons.

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

(c) State **one** use of the bitumen fraction.

.....  
 ..... [1]

(d) Crude oil does not contain sufficient quantities of petrol.  
 Large hydrocarbon molecules are converted into smaller molecules found in petrol.

(i) State the name of the process used to convert large hydrocarbon molecules into simpler molecules.

..... [1]

(ii) Suggest the formula of **one** alkane and **one** alkene formed from  $C_8H_{18}$ .

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

(iii) Describe a chemical test that can be used to distinguish between an alkane and an alkene.

Test.....

Result with alkane .....

.....

Result with alkene .....

..... [3]

[10]



- 7 Selma is given a radioactive isotope of uranium. She is told that it emits  $\alpha$ -particles and  $\gamma$ -rays.

(a) Define the term *radioactive decay*.

.....

.....

.....

.....

[2]

(b) She conducted the experiment and Table 7.1 shows her results.

**Table 7.1**

| count with | count with  | count with     | count with  | count with  |
|------------|-------------|----------------|-------------|-------------|
| no source  | no absorber | paper absorber | Al absorber | Pb absorber |
| 20         | 450         | 222            | 218         | 23          |

(i) State why there is a count when there is no source present.

.....

.....

[1]

(ii) Explain whether the information that Selma received is accurate.

.....

.....

.....

.....

.....

[4]

(c) (i) Define an *alpha particle*.

.....

.....

[1]

(ii) Describe the changes that occur in the nucleus of an atom when it emits an alpha particle

.....

.....

.....

.....

[2]

[10]



**BLANK PAGE**

**BLANK PAGE**