| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE

4462/01

S15-4462-01

## SCIENCE A/CHEMISTRY

# CHEMISTRY 1
## FOUNDATION TIER

P.M. FRIDAY, 12 June 2015

1 hour

| For Examiner's use only | | |
|---|---|---|
| **Question** | **Maximum Mark** | **Mark Awarded** |
| **1.** | **5** | |
| **2.** | **6** | |
| **3.** | **7** | |
| **4.** | **6** | |
| **5.** | **4** | |
| **6.** | **8** | |
| **7.** | **7** | |
| **8.** | **7** | |
| **9.** | **4** | |
| **10.** | **6** | |
| **Total** | **60** | |

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### ADDITIONAL MATERIALS

In addition to this paper you will need a calculator and a ruler.

### INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

### INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **10**.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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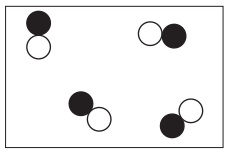
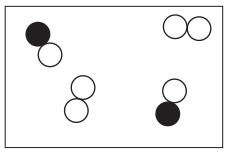
*Answer* **all** *questions.*

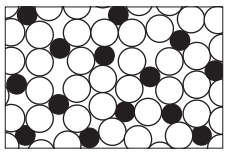
**1.** *(a)* The following five diagrams show the arrangement of atoms in different substances.



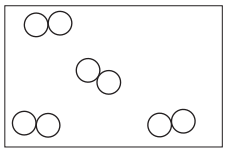
**A**



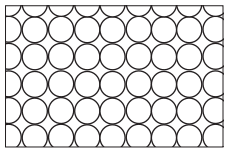
**B**



**C**



**D**



**E**

Give the **letter** of the diagram that best represents [3]

a compound, .....

a gaseous element, .....

an alloy. .....

*(b)* Choose the answers to this question from the following symbols and formulae.

| | | | |
|---|---|---|---|
| **Cu** | **Fe** | **$H_2$** | |
| **$Mg^{2+}$** | **Ne** | **$NH_3$** | **$O^{2-}$** |

Give the symbol or formula for [2]

a compound, .....

a metal ion. .....

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**2.** *(a)* The formula for calcium chloride is $CaCl_2$.

Give the **names** of the two elements present in this compound. [1]

..... and .....

*(b)* Name a **metal** which is in the same period of the Periodic Table as argon. [1]

.....

*(c)* (i) A formula for nitrogen oxide is $N_2O$.

A molecule of nitrogen oxide can be drawn as follows.

Give the **name** of the element which is represented by  . [1]

.....

(ii) Draw your own key to represent hydrogen and carbon atoms. Use your key to draw a molecule of methane, $CH_4$. [2]

Key

| | |
|---|---|
| hydrogen | |
| carbon | |

*Methane*

*(d)* Fizzy drinks such as lemonade contain carbonic acid. Each molecule of carbonic acid contains two atoms of hydrogen, one atom of carbon and three atoms of oxygen. [1]

Give the formula for carbonic acid. .....

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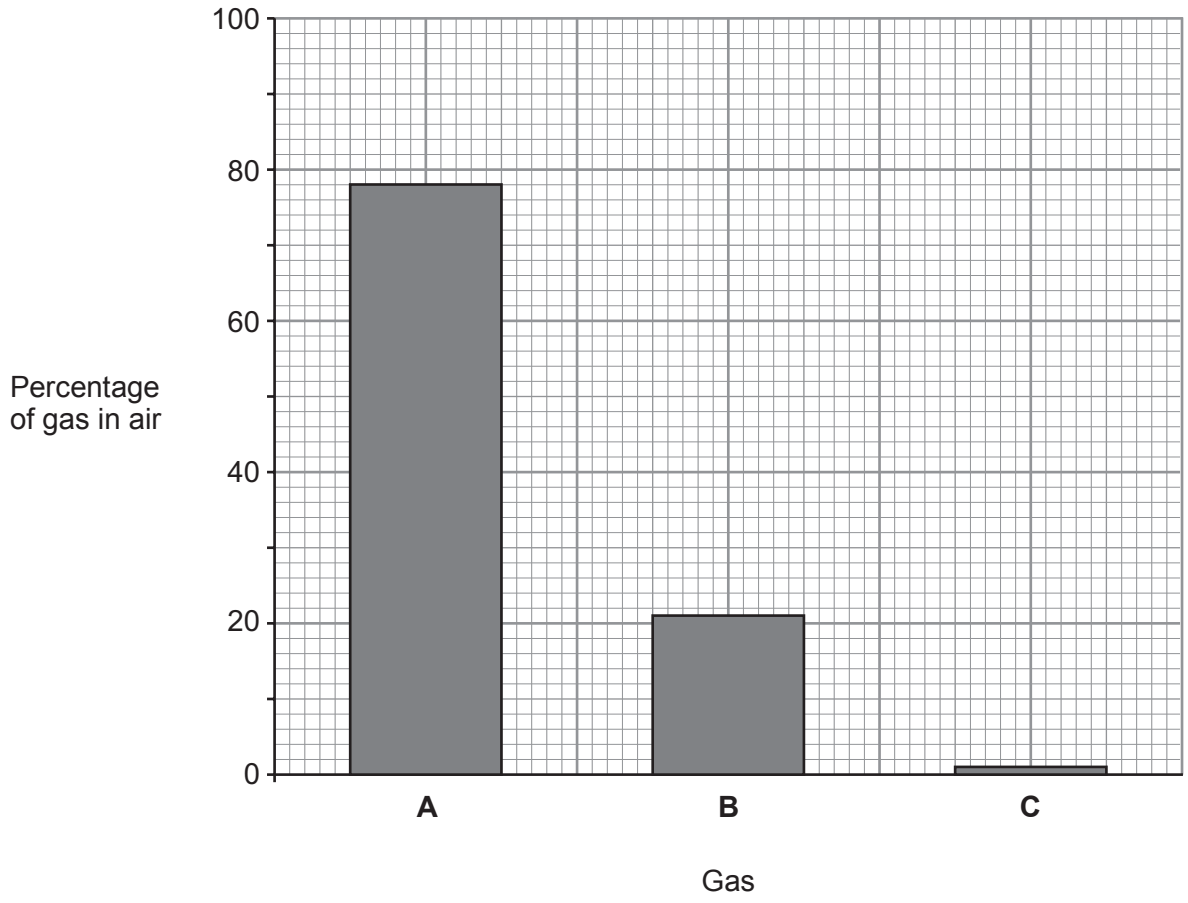
**3.** *(a)* The bar chart below shows the percentage of the three main gases in air.




Choose from the box below the names of gases **A**, **B** and **C**. [3]

| | | |
|---|---|---|
| **argon** | **chlorine** | **hydrogen** |
| **methane** | **nitrogen** | **oxygen** |

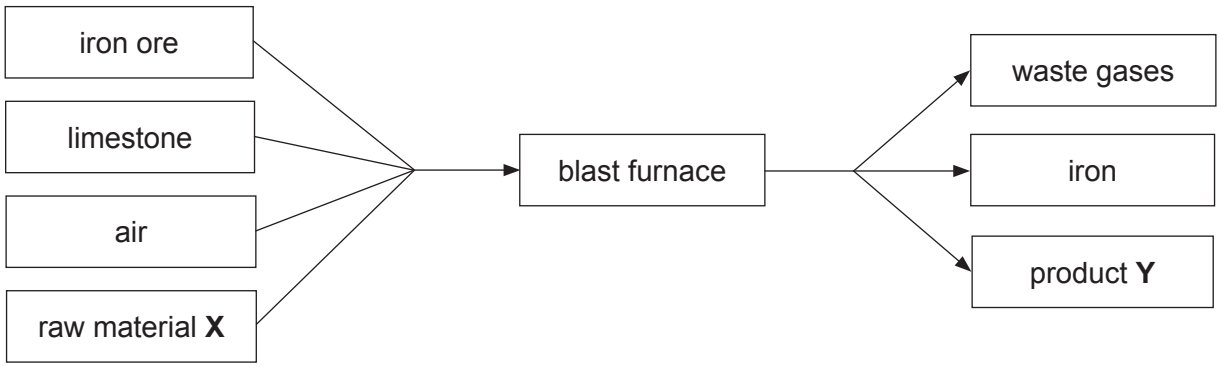
**A** .....

**B** .....

**C** .....

Examiner only

*(b)* Air is one of the raw materials used in the extraction of iron from iron ore in the blast furnace. The following flow diagram summarises the process.




(i) Give the names of [2]

raw material **X**, .....

product **Y**. .....

(ii) Name the gas present in the air which is used up during combustion inside the blast furnace. [1]

.....

(iii) Balance the following symbol equation which represents a reaction that takes place in the blast furnace. [1]

$$Fe_2O_3 + 3CO \longrightarrow \square\ Fe + \square\ CO_2$$

7

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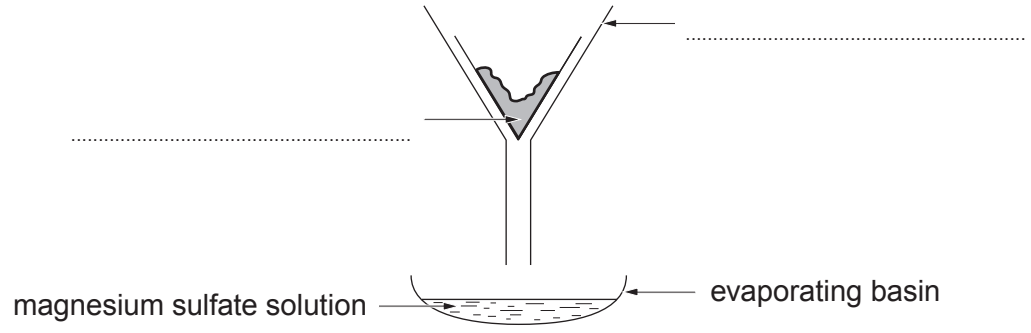
**4.** Magnesium sulfate can be made by adding **excess** magnesium oxide to sulfuric acid. Magnesium oxide is insoluble in water.

*(a)* State why **excess** magnesium oxide is added. [1]

.....

.....

*(b)* The following apparatus could be used to remove the excess magnesium oxide from the solution. Complete the labelling of the diagram. [2]




*(c)* State how you can obtain crystals from the solution. [1]

.....

.....

*(d)* Complete the **word** equation for the reaction. [1]

magnesium oxide + sulfuric acid ⟶ ..... + .....

*(e)* If the reaction was carried out with hydrochloric acid, instead of sulfuric acid, magnesium chloride would be formed.

Write the chemical formula for magnesium chloride. [1]

.....

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Examiner only

**5.** A new plastic called 'NPFC' has been developed.

'NPFC' has the following properties.

- easy to colour with dyes
- poor conductor of heat
- easy to cut with a knife
- starts to soften at 50 °C
- biodegradable

A food company investigated the use of this plastic to make containers for take away fish and chips.

*(a)* State the property which makes 'NPFC' a good material for a **disposable** container and give a reason for your answer. [2]

.....

.....

.....

*(b)* Using the properties given, explain why the food company decided **not** to use 'NPFC' to make fish and chip containers. [2]

.....

.....

.....

4

Examiner only

**6.** *(a)* Grapes contain tartaric acid.
Place a tick (✓) in the box with the expected value for the pH of tartaric acid and explain your choice. [3]

| pH value | |
|---|---|
| 1 | ☐ |
| 5 | ☐ |
| 7 | ☐ |
| 9 | ☐ |
| 13 | ☐ |

*Explanation* .....

.....

Examiner only

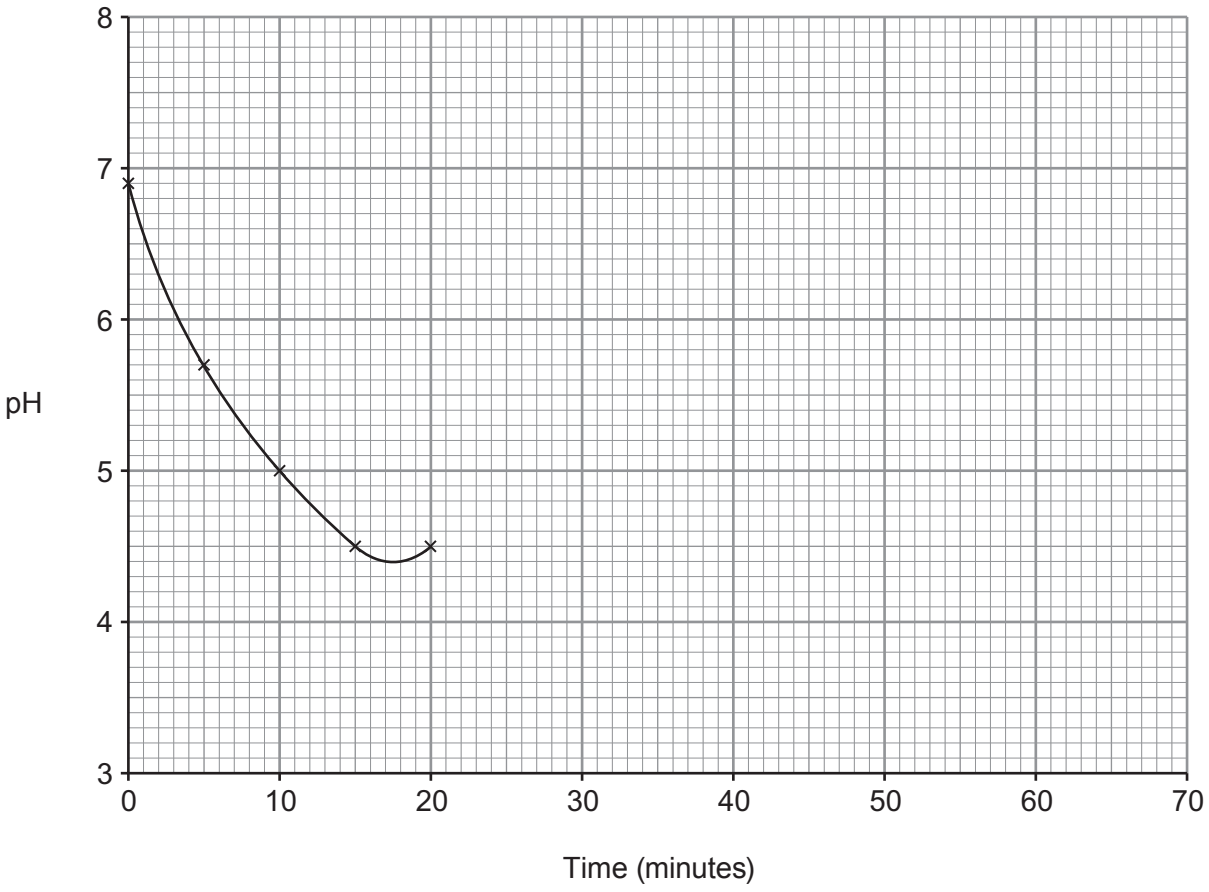
*(b)* Tim was asked to carry out an experiment to investigate the effect of food on the pH of saliva.

At the start of the experiment the pH of saliva in Tim's mouth was 6.9. He ate an apple and the pH of his saliva was measured every 5 minutes for 45 minutes.

The results of the experiment are shown in the table below.

| Time (minutes) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|
| pH | 6.9 | 5.7 | 5.0 | 4.5 | 4.5 | 5.0 | 5.7 | 6.1 | 6.4 | 6.6 |

(i) Five points have already been plotted. Complete the graph. [3]




(ii) Use the graph to give the minimum pH value obtained during the experiment. [1]

.....

(iii) Use the graph to predict when the pH of Tim's saliva will return to its original value. [1]

..... minutes

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**7.** The following table contains some information about five elements, **A**, **B**, **C**, **D** and **E**.

| Element | Melting point (°C) | Boiling point (°C) | Electrical conductivity |
|---|---|---|---|
| **A** | 113 | 445 | poor |
| **B** | −39 | 357 | good |
| **C** | 3550 | 4828 | poor |
| **D** | −101 | −35 | poor |
| **E** | 1540 | 2750 | good |

*(a)* Give the **letter** of the element, **A-E**, that is a liquid at 20 °C. Explain your choice. [3]

.....

.....

.....

*(b)* State which element could be iron and explain your choice. [3]

.....

.....

.....

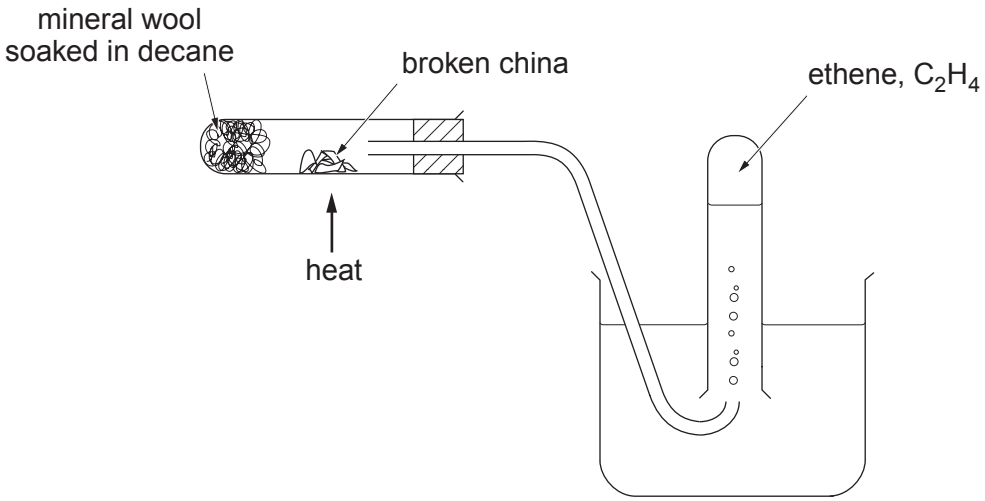
*(c)* State **one** property of iron that is not mentioned in the table. [1]

.....

7

Examiner only

**8.** *(a)* The following diagram shows an experiment that could be carried out in the laboratory to obtain ethene from decane, $C_{10}H_{22}$.




(i) Complete the following **symbol** equation for the reaction taking place. [1]

$$C_{10}H_{22} \longrightarrow \text{.....} + C_2H_4$$

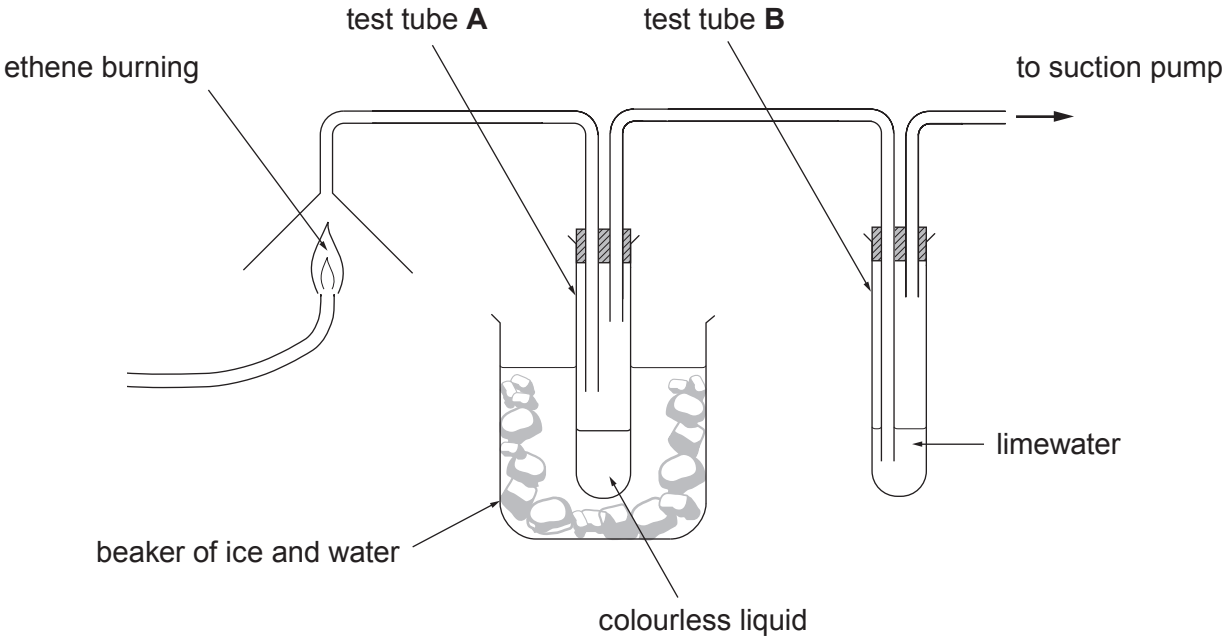
(ii) Name the process which has taken place. [1]

.....

Examiner only

*(b)* Ethene is a hydrocarbon.

The following diagram shows apparatus that can be used to investigate the products formed when ethene is burned.




(i) State what you would expect to happen to the limewater in test tube **B** and give the reason for your answer. [1]

.....

.....

(ii) The experiment was repeated with hydrogen being burned instead of ethene.

I. State what would be seen in test tube **A**. Give a reason for your answer. [2]

.....

.....

II. State and explain what would be seen in test tube **B**. [2]

.....

.....

7

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**9.** The table below gives information about the concentration of ions in drinking water from four different locations.

| Location | Concentration of ions (mol / $m^3$ of water) | | | | | |
|---|---|---|---|---|---|---|
| | $Na^+$ | $NH_4^+$ | $Mg^{2+}$ | $F^-$ | $SO_4^{2-}$ | $NO_3^-$ |
| **A** | 3.4 | 2.1 | 2.0 | 2.1 | 2.5 | 2.3 |
| **B** | 0.2 | 0.6 | 2.7 | 4.4 | 0.0 | 0.1 |
| **C** | 0.0 | 0.3 | 0.4 | 0.4 | 0.2 | 0.0 |
| **D** | 0.1 | 0.4 | 0.0 | 0.0 | 0.4 | 0.2 |

*(a)* (i) Sodium sulfate can be formed from the ions found in water at location **A**. [1]

Write the formula of sodium sulfate. .....

(ii) Suggest the names of **two** compounds that could be formed from the ions present in the water at location **C**. [1]

*Compound 1* .....

*Compound 2* .....

*(b)* State the location where you would expect to find the least amount of tooth decay. Give a reason for your choice. [2]

.....

.....

.....

4

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**10.** Fossil fuels such as coal release sulfur dioxide into the atmosphere when burned. This causes acid rain. Describe how acid rain is formed and its effects on the environment. [6 QWC]

.....

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**END OF PAPER**

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## FORMULAE FOR SOME COMMON IONS

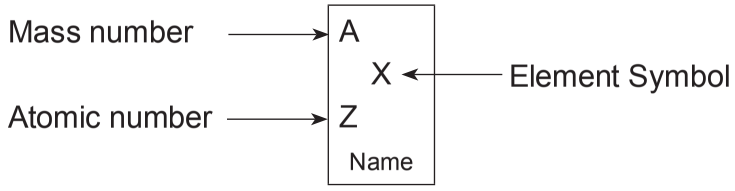
| POSITIVE IONS | | NEGATIVE IONS | |
|---|---|---|---|
| **Name** | **Formula** | **Name** | **Formula** |
| Aluminium | $Al^{3+}$ | Bromide | $Br^{-}$ |
| Ammonium | $NH_4^{+}$ | Carbonate | $CO_3^{2-}$ |
| Barium | $Ba^{2+}$ | Chloride | $Cl^{-}$ |
| Calcium | $Ca^{2+}$ | Fluoride | $F^{-}$ |
| Copper(II) | $Cu^{2+}$ | Hydroxide | $OH^{-}$ |
| Hydrogen | $H^{+}$ | Iodide | $I^{-}$ |
| Iron(II) | $Fe^{2+}$ | Nitrate | $NO_3^{-}$ |
| Iron(III) | $Fe^{3+}$ | Oxide | $O^{2-}$ |
| Lithium | $Li^{+}$ | Sulfate | $SO_4^{2-}$ |
| Magnesium | $Mg^{2+}$ | | |
| Nickel | $Ni^{2+}$ | | |
| Potassium | $K^{+}$ | | |
| Silver | $Ag^{+}$ | | |
| Sodium | $Na^{+}$ | | |
| Zinc | $Zn^{2+}$ | | |

# PERIODIC TABLE OF ELEMENTS

20

| 1 | 2 | Group | | | | | | | | | | 3 | 4 | 5 | 6 | 7 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | $^{1}_{1}$H Hydrogen | | | | | | | | $^{4}_{2}$He Helium |
| $^{7}_{3}$Li Lithium | $^{9}_{4}$Be Beryllium | | | | | | | | | | | $^{11}_{5}$B Boron | $^{12}_{6}$C Carbon | $^{14}_{7}$N Nitrogen | $^{16}_{8}$O Oxygen | $^{19}_{9}$F Fluorine | $^{20}_{10}$Ne Neon |
| $^{23}_{11}$Na Sodium | $^{24}_{12}$Mg Magnesium | | | | | | | | | | | $^{27}_{13}$Al Aluminium | $^{28}_{14}$Si Silicon | $^{31}_{15}$P Phosphorus | $^{32}_{16}$S Sulfur | $^{35}_{17}$Cl Chlorine | $^{40}_{18}$Ar Argon |
| $^{39}_{19}$K Potassium | $^{40}_{20}$Ca Calcium | $^{45}_{21}$Sc Scandium | $^{48}_{22}$Ti Titanium | $^{51}_{23}$V Vanadium | $^{52}_{24}$Cr Chromium | $^{55}_{25}$Mn Manganese | $^{56}_{26}$Fe Iron | $^{59}_{27}$Co Cobalt | $^{59}_{28}$Ni Nickel | $^{64}_{29}$Cu Copper | $^{65}_{30}$Zn Zinc | $^{70}_{31}$Ga Gallium | $^{73}_{32}$Ge Germanium | $^{75}_{33}$As Arsenic | $^{79}_{34}$Se Selenium | $^{80}_{35}$Br Bromine | $^{84}_{36}$Kr Krypton |
| $^{86}_{37}$Rb Rubidium | $^{88}_{38}$Sr Strontium | $^{89}_{39}$Y Yttrium | $^{91}_{40}$Zr Zirconium | $^{93}_{41}$Nb Niobium | $^{96}_{42}$Mo Molybdenum | $^{99}_{43}$Tc Technetium | $^{101}_{44}$Ru Ruthenium | $^{103}_{45}$Rh Rhodium | $^{106}_{46}$Pd Palladium | $^{108}_{47}$Ag Silver | $^{112}_{48}$Cd Cadmium | $^{115}_{49}$In Indium | $^{119}_{50}$Sn Tin | $^{122}_{51}$Sb Antimony | $^{128}_{52}$Te Tellurium | $^{127}_{53}$I Iodine | $^{131}_{54}$Xe Xenon |
| $^{133}_{55}$Cs Caesium | $^{137}_{56}$Ba Barium | $^{139}_{57}$La Lanthanum | $^{179}_{72}$Hf Hafnium | $^{181}_{73}$Ta Tantalum | $^{184}_{74}$W Tungsten | $^{186}_{75}$Re Rhenium | $^{190}_{76}$Os Osmium | $^{192}_{77}$Ir Iridium | $^{195}_{78}$Pt Platinum | $^{197}_{79}$Au Gold | $^{201}_{80}$Hg Mercury | $^{204}_{81}$Tl Thallium | $^{207}_{82}$Pb Lead | $^{209}_{83}$Bi Bismuth | $^{210}_{84}$Po Polonium | $^{210}_{85}$At Astatine | $^{222}_{86}$Rn Radon |
| $^{223}_{87}$Fr Francium | $^{226}_{88}$Ra Radium | $^{227}_{89}$Ac Actinium | | | | | | | | | | | | | | | |

Key:



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