Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9-1)

Centre Number | | | | | |

Candidate Number | | | | |

Chemistry

Paper 1

Foundation Tier

Additional Sample Assessment Material for first teaching September 2016

Time: 1 hour 45 minutes

Paper Reference
1CH0/1F

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- There is a periodic table on the back cover of the paper.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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S 5 6 6 7 9 A 0 1 2 8

Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 A student is investigating the maximum mass of sodium chloride that can be dissolved in 100 cm^3 water at room temperature.

The student has been given 1.0 g samples of solid sodium chloride to dissolve in the water.

(a) Draw **one** straight line from each substance to its state symbol.

(2)

substance	state symbol
solid sodium chloride	aq
sodium chloride solution	g
water	l
	s

(b) Which row of the table shows the correct formula of sodium chloride and of water?

		sodium chloride	water
☒	**A**	$NaCl_2$	H_2O
☒	**B**	$NaCl_2$	HO_2
☒	**C**	NaCl	H^2O
☒	**D**	NaCl	H_2O

(1)

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(c) The method the student uses is

step **1** fill a 100 cm^3 beaker with tap water

step **2** add 1.0 g sodium chloride and see if it dissolves

step **3** keep adding 1.0 g portions of sodium chloride until a portion of solid does not dissolve completely

Explain **two** improvements that could be made, one to step **1** and one to step **2**, to obtain a more accurate result.

(4)

step **1** improvement .....

explanation .....

.....

step **2** improvement .....

explanation .....

.....

(d) In step **3**, some sodium chloride remains undissolved.

(i) State what would you **see** in the beaker when this step is complete.

(1)

.....

.....

.....

(ii) State the name of the method that could be used to separate the undissolved sodium chloride from the mixture.

(1)

.....

(Total for Question 1 = 9 marks)

2 Many elements are useful in everyday life.

(a) Draw **one** straight line from each substance and its use to the property that makes it suitable for the use given.

(3)

substance and use	property
aluminium in aeroplane parts	kills pests on plants
copper in household wiring	low density
phosphorus compounds in fertilisers	helps plants to grow
	good conductor of heat
	good conductor of electricity

(b) Some metallic elements are used in everyday life as alloys rather than as pure metals.

Use words from each of the boxes to complete the sentences in parts (i) and (ii).

(i)

compounds	elements	denser	shinier	mixtures

Alloys made from two metals are ..... .

(1)

(ii)

brass	copper	magnalium	nitrogen	sulfur

Examples of alloys include ..... and ..... .

(1)

(c) The mass of a sample of pure gold is compared to the mass of a sample of an alloy of gold.
The two samples have the **same total number of atoms** but the alloy of gold contains both gold atoms and silver atoms.

What is the description and explanation for the mass of the alloy compared to the mass of pure gold?

Use the periodic table to help you.

(1)

The sample of the alloy is

☒ **A** heavier because silver atoms are heavier than gold atoms

☒ **B** lighter because silver atoms are lighter than gold atoms

☒ **C** unchanged because the number of atoms is the same

☒ **D** unchanged because atoms have a negligible mass

(Total for Question 2 = 6 marks)

3 Hydrogen reacts with chlorine to form hydrogen chloride.

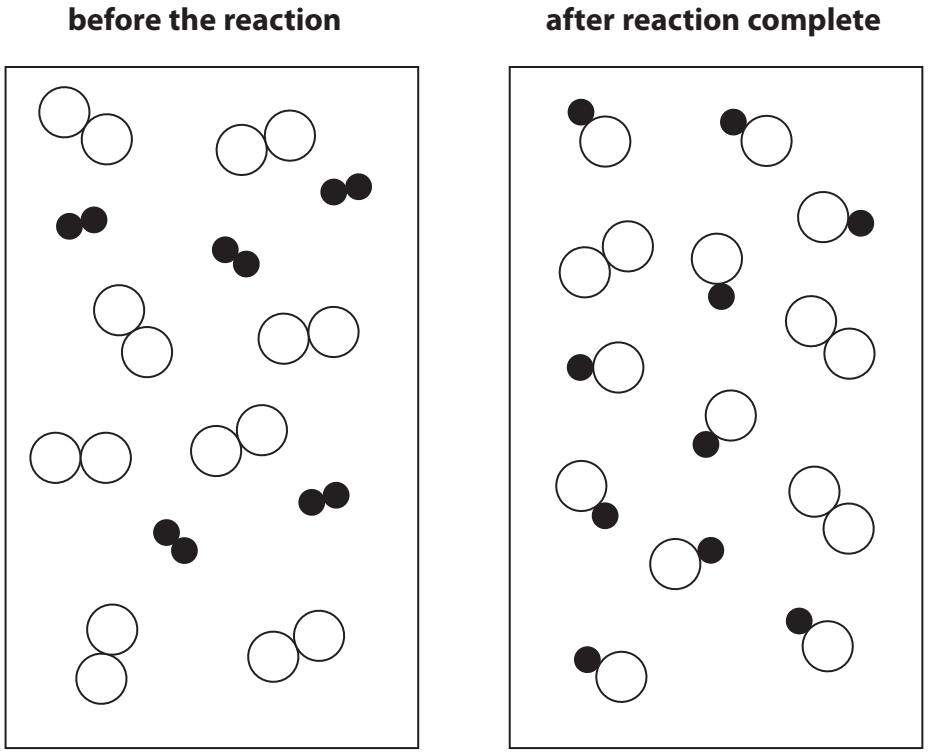
(a) Write the word equation for this reaction.

(1)

.....

(b) In an experiment some hydrogen molecules, H_2, are mixed with chlorine molecules, Cl_2, and reacted to form hydrogen chloride molecules, HCl.

Figure 1 shows the mixture of gases before they have reacted and then after the reaction is complete.



key:

hydrogen molecule, H_2

chlorine molecule, Cl_2

hydrogen chloride molecule, HCl

Figure 1

(i) For this sample, calculate the simplest ratio of hydrogen molecules that have reacted to chlorine molecules that have **reacted**.

You must show your working.

(2)

ratio of hydrogen molecules reacted : chlorine molecules reacted = ...

(ii) Which is the balanced equation for the reaction of hydrogen with chlorine to form hydrogen chloride?

(1)

☒ **A** $H + Cl \rightarrow HCl$

☒ **B** $H_2 + 2Cl \rightarrow H2Cl$

☒ **C** $H_2 + Cl_2 \rightarrow 2HCl$

☒ **D** $5H_2 + 8Cl_2 \rightarrow 10HCl$

(c) When hydrogen chloride gas, HCl, is dissolved in water an acidic solution is formed.

(i) Give the name of the acid.

(1)

.....

(ii) What colour is seen when methyl orange is added to this acidic solution?

(1)

☒ **A** blue

☒ **B** green

☒ **C** pink-red

☒ **D** orange

(Total for Question 3 = 6 marks)

4 (a) (i) Which type of water is potable water?

(1)

- ☒ **A** tap water
- ☒ **B** sea water
- ☒ **C** waste water
- ☒ **D** ground water

(ii) When sea water is distilled a white solid and a colourless liquid are obtained.

Give the name of the main substance present in

(2)

the white solid .....

the colourless liquid .....

(b) Four equally sized pieces of pure metals, **A**, **B**, **C** and **D**, are dropped into water.

Figure 2 shows what was observed.

metal	colour of metal	observation in water
A	silver coloured	fizzing
B	silver coloured	a small number of bubbles form
C	silver coloured	no fizzing
D	red-brown coloured	no fizzing

Figure 2

The four metals are known to be calcium, copper, magnesium and silver.

Use the data to give the names of the metals **A**, **B**, **C** and **D**.

(3)

A .....

B .....

C .....

D .....

(c) Water is a simple molecular, covalent substance.

Explain, in terms of forces between the molecules, why water at room temperature is a liquid and not a solid.

(3)

(Total for Question 4 = 9 marks)

5 Some elements in the periodic table are called transition metals.

(a) Which of these elements is a transition metal?

(1)

☒ **A** calcium

☒ **B** carbon

☒ **C** chlorine

☒ **D** copper

(b) Iron is a transition metal.

Give **three** properties of iron that are typical of all transition metals.

(3)

property 1 .....

property 2 .....

property 3 .....

(c) The density of an object is given by the formula

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Figure 3 gives the density of iron and of water.

substance	density in g cm^{-3}
iron	7.87
water	1.00

Figure 3

(i) Calculate the mass of a cube of iron with the dimensions 10.0 cm × 10.0 cm × 10.0 cm.

(3)

mass = ... g

(ii) An iron cube is electroplated with nickel.
The cube is placed in water.

Suggest what you would **see** if this cube is left in the water for one week.

(1)

(iii) A piece of impure zinc contains 1.20 kg of zinc and 50 g of impurity.

Calculate the percentage by mass of pure zinc in this sample.

(3)

.....

.....

.....

.....

.....

.....

percentage by mass of pure zinc = ...

(Total for Question 5 = 11 marks)

6 (a) Figure 4 shows information about the charges and relative masses of the three subatomic particles.

	particle **A**	particle **B**	particle **C**
charge	positive	neutral	negative
relative mass	1	1	$\frac{1}{1840}$

Figure 4

Use the information to give the names of particles **A**, **B** and **C**.

(2)

particle **A** .....

particle **B** .....

particle **C** .....

(b) Figure 5 shows a diagram of an atom of sulfur.

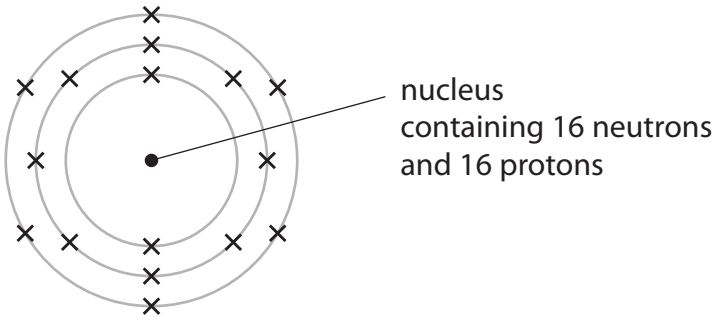


Figure 5

(i) State why this atom of sulfur has an atomic number of 16 and a mass number of 32.

(2)

.....

.....

.....

.....

(ii) Give the electronic configuration of an atom of sulfur.

(1)

.....

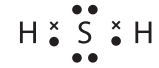
(c) Hydrogen sulphide, H_2S, is a simple molecular, covalent compound.

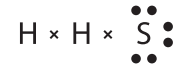
(i) A hydrogen atom has one electron in its outer shell.
A sulfur atom has six electrons in its outer shell.

Which of the following is the dot and cross diagram of a molecule of hydrogen sulfide?

(1)

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

(ii) Which row in Figure 6 shows the properties of a simple molecular, covalent compound such as hydrogen sulfide?

(1)

	melting point	boiling point	conduction of electricity
☒ **A**	high	high	poor conductor
☒ **B**	high	high	good conductor only when liquid
☒ **C**	low	low	poor conductor
☒ **D**	high	high	good conductor

Figure 6

(d) A compound of sulfur was analysed to determine its empirical formula.

(i) State the meaning of the term **empirical formula**.

(1)

.....

.....

(ii) A compound of sulfur and fluorine contains 4.8 g of sulfur and 17.1 g of fluorine.

Calculate the empirical formula of this compound.

You must show your working.
(Relative atomic masses: F = 19, S = 32)

(3)

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.....

empirical formula = ...

(Total for Question 6 = 11 marks)

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7 (a) A Bunsen burner has a base and a chimney as shown in Figure 7.

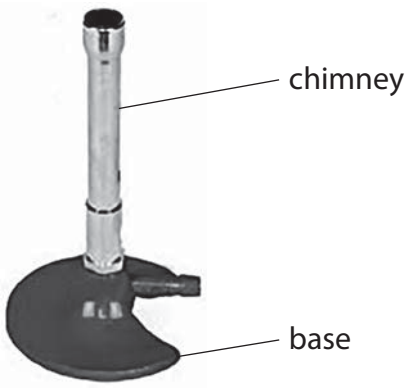

Figure 7

The base can be made of steel.

Explain why steel is a suitable material for the base.
Do not consider cost.

(2)

.....

.....

.....

*(b) An experiment is carried out to find what is required to cause an iron nail to rust.

One iron nail is left in each of three test tubes, A, B and C, as shown in Figure 8.

Tube A contains tap water, tube B contains a drying agent, tube C contains water which has been boiled to remove air and then covered by a layer of oil.

The test tubes are left for one week.

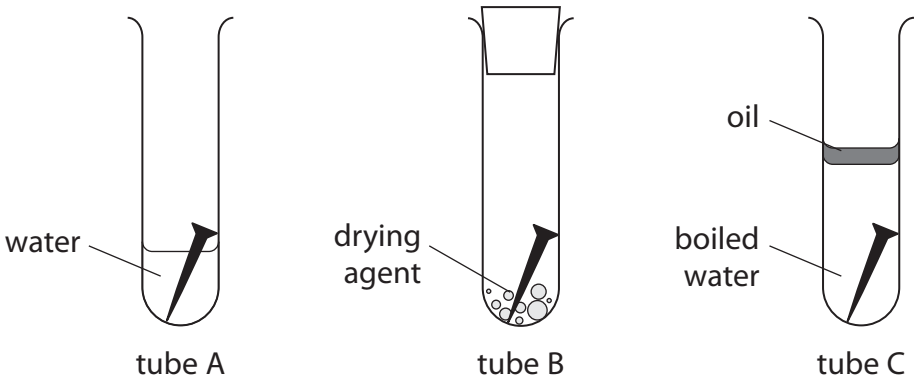

Figure 8

The results are shown in Figure 9.

tube A	tube B	tube C
a red-brown deposit is seen on the nail and at the bottom of the tube	no change	no change

Figure 9

Analyse the results shown in Figure 9 to explain what is required for iron to rust.

(6)

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(c) An alloy of aluminium contains aluminium and copper.
This alloy is stronger than pure aluminium.

Figure 10 shows the structures of pure aluminium and this alloy.

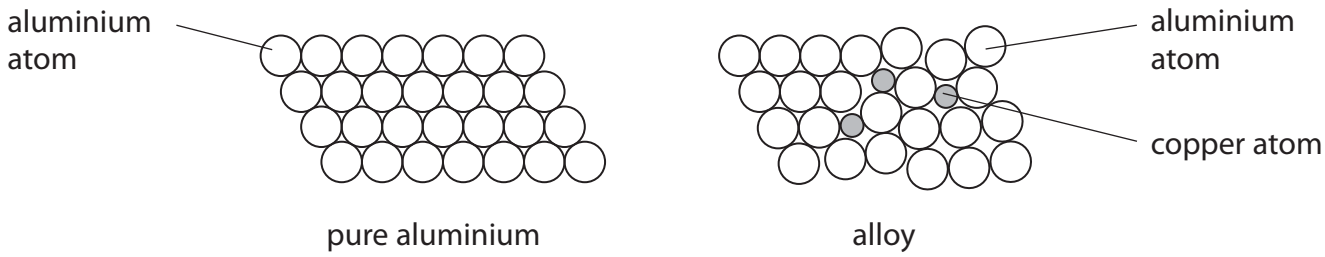

Figure 10

Explain, in terms of these structures, how the presence of copper atoms in the alloy results in the alloy being stronger than pure aluminium.

(3)

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(Total for Question 7 = 11 marks)

8 (a) The equation for the reaction that occurs in the Haber process is

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

(i) Use the periodic table to give the number of the group and of the period of nitrogen.

(2)

group .....

period .....

(ii) State what is meant by the symbol $\rightleftharpoons$ in the equation.

(1)

.....

.....

(b) The compound ammonium chloride is used as a fertiliser.

Starting with a dilute solution of ammonia, describe how you could prepare a pure solution of ammonium chloride in the laboratory.

(3)

.....

.....

.....

.....

.....

.....

(c) A student plans to heat the pure solution of ammonium chloride to dryness to obtain a sample of pure, dry ammonium chloride.

A teacher explains that if dry ammonium chloride is heated, the following reaction can occur.

$$NH_4Cl \rightarrow NH_3 + HCl$$

(i) Which statement describes this reaction of ammonium chloride to form ammonia and hydrogen chloride?

(1)

☒ **A** a crystallisation reaction

☒ **B** a decomposition reaction

☒ **C** a neutralisation reaction

☒ **D** a reaction at equilibrium

(ii) Describe how you could alter the method of obtaining the pure, dry ammonium chloride to avoid losing product by heating the sample too strongly.

(2)

.....

.....

.....

.....

(d) In an experiment to prepare some ammonium chloride crystals, it is calculated that the maximum mass of ammonium chloride produced from the mass of ammonia used should be 24.60 g.

In the experiment, the actual yield was 17.73 g.

Calculate the percentage yield, giving your answer to **three** significant figures.

(3)

.....

.....

.....

.....

.....

.....

percentage yield = ...

(Total for Question 8 = 12 marks)

9 (a) Calcium nitrate solution can be made by adding solid calcium carbonate to dilute nitric acid in a beaker.
The solid calcium carbonate is added until some remains at the bottom of the beaker.

(i) The mixture in the beaker is filtered to remove the excess solid calcium carbonate.

Draw a diagram to show the apparatus used to filter the mixture and to collect the filtrate.

(2)

(ii) Explain why the calcium carbonate is added until some solid remains at the bottom of the beaker.

(2)

.....

.....

.....

(iii) Write the balanced equation for the reaction between calcium carbonate and nitric acid to form calcium nitrate, $Ca(NO_3)_2$.

(3)

.....

(b) Calculate the relative formula mass of strontium nitrate, $Sr(NO_3)_2$.

(relative atomic masses: N = 14, O = 16, Sr = 88)

(2)

relative formula mass = ...

(c) 100 g of strontium nitrate is dissolved in water to make 400 cm^3 of solution.

Calculate the concentration of this solution in g dm^{-3}.

(3)

concentration = ... g dm^{-3}

(Total for Question 9 = 12 marks)

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10 Figure 11 shows the apparatus that can be used to electrolyse sodium chloride solution in the laboratory.

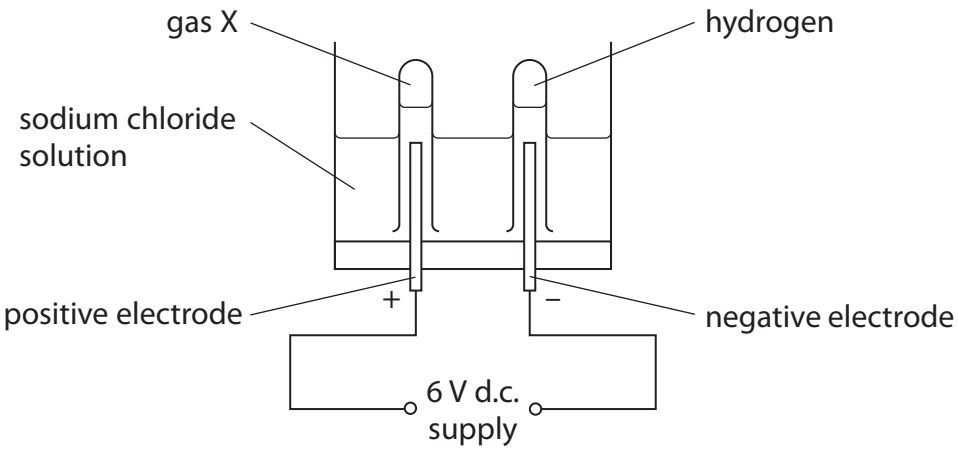

Figure 11

(a) State what could be added to the circuit to show that an electric current is flowing.

(1)

.....

(b) What is the name of the electrode where hydrogen is formed?

(1)

☒ **A** anion

☒ **B** anode

☒ **C** cation

☒ **D** cathode

(c) Gases are produced at both electrodes.

(i) State the name of the yellow-green gas X formed at the positive electrode.

(1)

.....

(ii) Describe the test to show that the gas formed at the negative electrode is hydrogen.

(2)

.....

.....

.....

(d) Explain why sodium chloride solution can conduct electricity.

(2)

.....

.....

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*(e) Molten zinc chloride can be electrolysed.

Describe how this experiment can be carried out in a laboratory, explaining how the products of this electrolysis are formed.

(6)

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(Total for Question 10 = 13 marks)

TOTAL FOR PAPER = 100 MARKS

The periodic table of the elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
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** sulfur 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	63.5 **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	[98] **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	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The elements with atomic numbers from 58 to 71 are omitted from this part of the periodic table.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.