



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**CHEMISTRY**

**0620/13**

Paper 1 Multiple Choice

**May/June 2011**

**45 Minutes**

Additional Materials:      Multiple Choice Answer Sheet  
   Soft clean eraser  
   Soft pencil (type B or HB is recommended)



**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

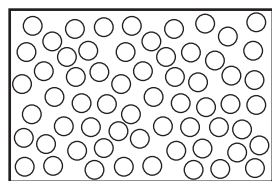
A copy of the Periodic Table is printed on page 16.

You may use a calculator.

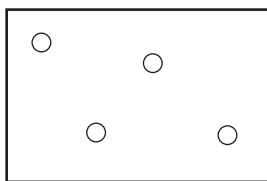
This document consists of **16** printed pages.



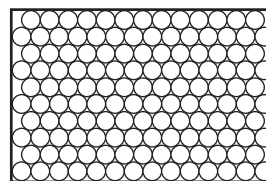
- 1 The diagrams show the arrangement of particles in three different physical states of substance X.



state 1



state 2

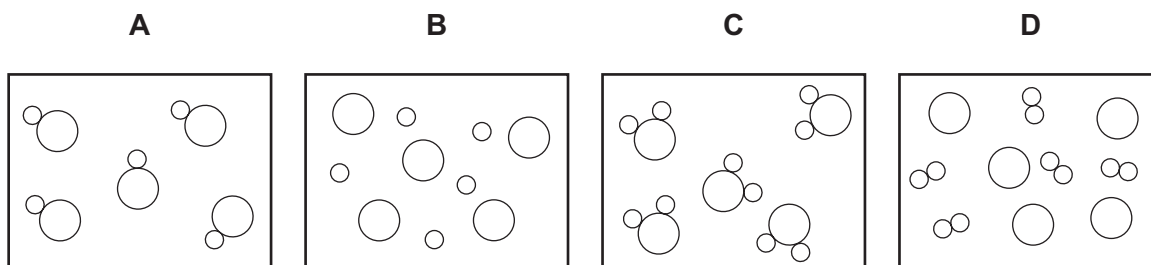


state 3

Which statement about the physical states of substance X is correct?

- A** Particles in state 1 vibrate about fixed positions.  
**B** State 1 changes to state 2 by diffusion.  
**C** State 2 changes directly to state 3 by condensation.  
**D** The substance in stage 3 has a fixed volume.
- 2 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram represents hydrogen chloride gas?



- 3 The diagram shows part of the Periodic Table.

|          |          |  |  |  |  |  |  |  |  |  |  |          |  |          |  |  |  |
|----------|----------|--|--|--|--|--|--|--|--|--|--|----------|--|----------|--|--|--|
|          |          |  |  |  |  |  |  |  |  |  |  |          |  |          |  |  |  |
| <b>A</b> |          |  |  |  |  |  |  |  |  |  |  |          |  |          |  |  |  |
|          | <b>C</b> |  |  |  |  |  |  |  |  |  |  | <b>B</b> |  | <b>D</b> |  |  |  |
|          |          |  |  |  |  |  |  |  |  |  |  |          |  |          |  |  |  |
|          |          |  |  |  |  |  |  |  |  |  |  |          |  |          |  |  |  |

Which element is correctly matched with its electronic structure?

|          | electronic structure |
|----------|----------------------|
| <b>A</b> | 2,8,1                |
| <b>B</b> | 2,4                  |
| <b>C</b> | 2,8,2                |
| <b>D</b> | 2,8                  |

- 4 An aqueous solution is coloured.

Which method of separation would show that the solution contains ions of different colours?

- A chromatography
- B crystallisation
- C distillation
- D filtration

- 5 The table gives the solubility of four substances in ethanol and in water.

A mixture containing all four substances is added to ethanol, stirred and filtered.

The solid residue is added to water, stirred and filtered.

The filtrate is evaporated to dryness, leaving a white solid.

Which is the white solid?

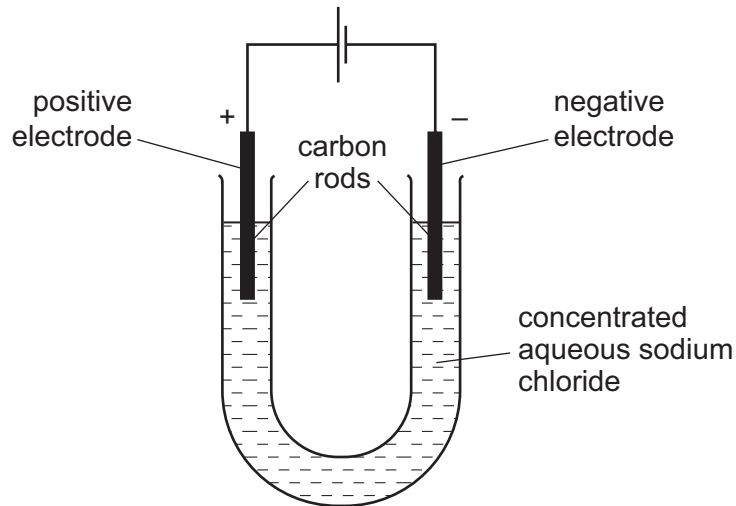
|          | solubility in |           |
|----------|---------------|-----------|
|          | ethanol       | water     |
| <b>A</b> | insoluble     | insoluble |
| <b>B</b> | insoluble     | soluble   |
| <b>C</b> | soluble       | insoluble |
| <b>D</b> | soluble       | soluble   |

- 6 Which two elements react together to form an ionic compound?

| element | electronic structure |
|---------|----------------------|
| W       | 2,4                  |
| X       | 2,8                  |
| Y       | 2,8,1                |
| Z       | 2,8,7                |

- A** W and X      **B** X and Y      **C** Y and Z      **D** Z and W

- 7 Electricity is passed through concentrated aqueous sodium chloride, as shown.



What is the test for the gas formed at the positive electrode?

- A** bleaches damp litmus paper  
**B** 'pops' with a lighted splint  
**C** relights a glowing splint  
**D** turns damp red litmus paper blue
- 8 Electricity from a power station passes through overhead cables to a substation and then to a school where it is used to electrolyse concentrated hydrochloric acid using inert electrodes.

Which substances are used for the overhead cables and for the electrodes?

|          | overhead cables | electrodes |
|----------|-----------------|------------|
| <b>A</b> | aluminium       | copper     |
| <b>B</b> | aluminium       | platinum   |
| <b>C</b> | copper          | platinum   |
| <b>D</b> | platinum        | aluminium  |

- 9 The nucleon number and proton number of the lithium atom are shown by the symbol  ${}^7_3\text{Li}$ .

What is the correct symbol for the lithium ion in lithium chloride?

- A**  ${}^6_2\text{Li}^-$       **B**  ${}^6_3\text{Li}^+$       **C**  ${}^7_3\text{Li}^+$       **D**  ${}^7_3\text{Li}^-$

10 Three processes are listed.

burning methane in air

radioactive decay of  $^{235}\text{U}$

reacting hydrogen with oxygen.

Which statements about these processes are correct?

- 1 Hydrogen and methane are being used as fuels.
- 2 All the processes involve oxidation.
- 3 All the processes are used to produce energy.

**A** 1 and 2 only    **B** 1 and 3 only    **C** 2 and 3 only    **D** 1, 2 and 3

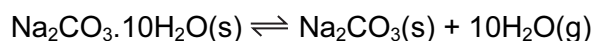
11 Which statement about the electrolysis of molten lead(II) bromide is correct?

- A** A colourless gas is seen at the cathode.
- B** A grey metal is seen at the anode.
- C** A red/brown gas is seen at the anode.
- D** A red/brown metal is seen at the cathode.

12 What is the relative molecular mass ( $M_r$ ) of  $\text{HNO}_3$ ?

**A** 5                      **B** 31                      **C** 32                      **D** 63

13 The equation for the effect of heat on hydrated sodium carbonate is as shown.



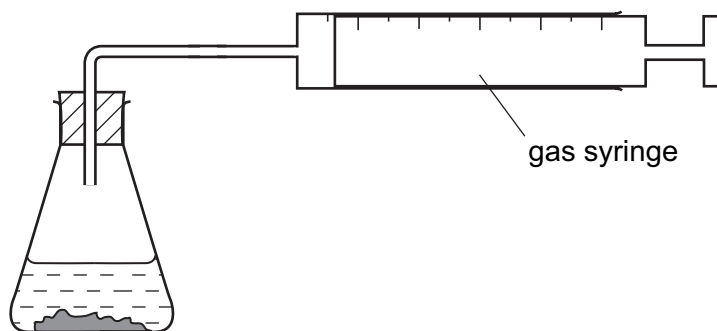
Statements made by four students about the reaction are given.

- P** Anhydrous sodium carbonate is formed.
- Q** Steam is formed.
- R** There is a colour change from blue to white.
- S** The reaction is reversible.

Which students' statements are correct?

- A** P, Q and R only
- B** P, Q and S only
- C** Q, R and S only
- D** P, Q, R and S

14 The apparatus shown can be used to measure the rate of some chemical reactions.



For which two reactions would the apparatus be suitable?

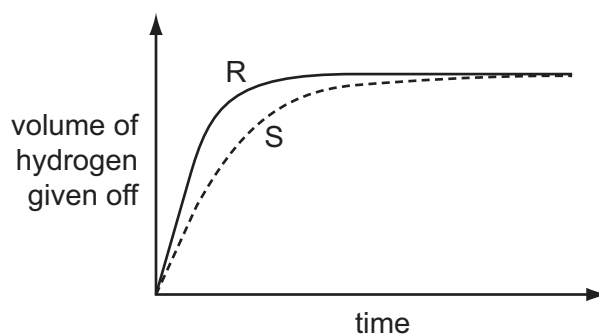
- reaction 1       $\text{AgNO}_3(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{HNO}_3(\text{aq})$   
 reaction 2       $2\text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$   
 reaction 3       $\text{MgO}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
 reaction 4       $\text{ZnCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

- A** 1 and 2      **B** 1 and 3      **C** 2 and 4      **D** 3 and 4

15 A student investigates the rate of reaction between magnesium and excess sulfuric acid.

The volume of hydrogen given off in the reaction is measured over time.

The graph shows the results of two experiments, R and S.



Which change in conditions would cause the difference between R and S?

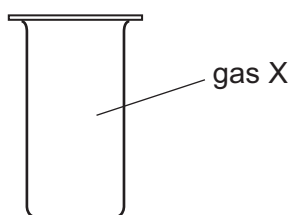
- A** A catalyst is added in S.  
**B** The acid is more concentrated in R than in S.  
**C** The magnesium is less finely powdered in R than in S.  
**D** The temperature in R is lower than in S.

16 Butane, ethanol and hydrogen are fuels.

Which substances produce **both** carbon dioxide and water when used as a fuel?

|          | butane | ethanol | hydrogen |
|----------|--------|---------|----------|
| <b>A</b> | ✓      | ✓       | ✓        |
| <b>B</b> | ✓      | ✓       | x        |
| <b>C</b> | ✓      | x       | ✓        |
| <b>D</b> | x      | ✓       | x        |

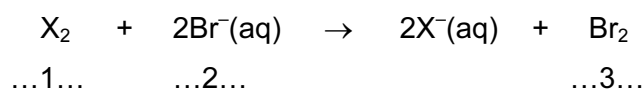
17 X is a monatomic gas.



Which statement about X is correct?

- A** X burns in air.
- B** X is coloured.
- C** X is unreactive.
- D** X will displace iodine from potassium iodide.

18 The equation shows the reaction between a halogen and aqueous bromide ions.



Which words correctly complete gaps 1, 2 and 3?

|          | 1        | 2          | 3          |
|----------|----------|------------|------------|
| <b>A</b> | chlorine | brown      | colourless |
| <b>B</b> | chlorine | colourless | brown      |
| <b>C</b> | iodine   | brown      | colourless |
| <b>D</b> | iodine   | colourless | brown      |

19 Carbon dioxide is an acidic oxide that reacts with aqueous calcium hydroxide.

Which type of reaction takes place?

- A decomposition
- B fermentation
- C neutralisation
- D oxidation

20 A solution contains barium ions and silver ions.

What could the anion be?

- A chloride only
- B nitrate only
- C sulfate only
- D chloride or nitrate or sulfate

21 A mixture containing two anions was tested and the results are shown below.

| test   | result  |
|--|---|
| dilute nitric acid added                                     | effervescence of a gas which turned limewater milky |
| dilute nitric acid added, followed by aqueous silver nitrate | yellow precipitate formed                           |

Which anions were present?

- A carbonate and chloride
  - B carbonate and iodide
  - C sulfate and chloride
  - D sulfate and iodide
- 22 Which is **not** a typical property of an acid?
- A They react with alkalis producing water.
  - B They react with all metals producing hydrogen.
  - C They react with carbonates producing carbon dioxide.
  - D They turn litmus paper red.



23 The diagram shows a section of the Periodic Table.

|  |   |    |     |    |   |    |     |   |
|--|---|----|-----|----|---|----|-----|---|
|  | I | II | III | IV | V | VI | VII | 0 |
|  | V |    |     | W  |   |    | X   |   |
|  |   | Y  |     |    |   | Z  |     |   |

Which elements will conduct electricity at room temperature?

- A** V, W and X    **B** V, Y and W    **C** W, X and Z    **D** Y and Z

24 Water from a reservoir flows to the water works where purification processes 1 takes place followed by process 2.

What are purification processes 1 and 2?

|          | purification process 1  | purification process 2  |
|----------|-------------------------|-------------------------|
| <b>A</b> | chlorination            | filtration              |
| <b>B</b> | filtration              | chlorination            |
| <b>C</b> | fractional distillation | filtration              |
| <b>D</b> | filtration              | fractional distillation |

25 The properties of a metal are important in deciding its use.

Which row lists a property that is **not** correct for the use given?

|          | use of the metal             | metal property needed |
|----------|------------------------------|-----------------------|
| <b>A</b> | aluminium in aircraft wings  | low density           |
| <b>B</b> | aluminium in food containers | resists corrosion     |
| <b>C</b> | mild steel in car bodies     | high density          |
| <b>D</b> | stainless steel in cutlery   | does not rust         |

26 Brass is an alloy of copper and zinc.

Which statement is correct?

- A Brass can be represented by a chemical formula.
- B Brass is formed by a chemical reaction between copper and zinc.
- C The alloy will dissolve completely in dilute hydrochloric acid.
- D The zinc in the alloy will dissolve in dilute hydrochloric acid.

27 Which statement is correct for the element of proton number 19?

- A It is a gas that dissolves in water.
- B It is a hard metal that is not very reactive with water.
- C It is a non-metal that burns quickly in air.
- D It is a soft metal that is highly reactive with water.

28 Which row describes the conditions used to make steel from the iron produced by a blast furnace?

|          | calcium oxide<br>(lime) | oxygen | heat |
|----------|-------------------------|--------|------|
| <b>A</b> | ✓                       | ✓      | ✓    |
| <b>B</b> | ✓                       | ✓      | x    |
| <b>C</b> | x                       | ✓      | ✓    |
| <b>D</b> | x                       | ✓      | x    |

- 29 The table shows the results of adding three metals, P, Q and R, to dilute hydrochloric acid and to water.

| metal | dilute hydrochloric acid | water             |
|-------|--------------------------|-------------------|
| P     | hydrogen produced        | hydrogen produced |
| Q     | no reaction              | no reaction       |
| R     | hydrogen produced        | no reaction       |

What is the order of reactivity of the metals?

|          | most reactive | → | least reactive |
|----------|---------------|---|----------------|
| <b>A</b> | P             |   | Q              |
| <b>B</b> | P             |   | R              |
| <b>C</b> | R             |   | P              |
| <b>D</b> | R             |   | Q              |

- 30 Which substance is a metal?

|          | electrical conductivity (solid) | electrical conductivity (molten) |
|----------|---------------------------------|----------------------------------|
| <b>A</b> | high                            | high                             |
| <b>B</b> | high                            | low                              |
| <b>C</b> | low                             | high                             |
| <b>D</b> | low                             | low                              |

- 31 Greenhouse gases may contribute to climate change.

Two of these gases are emitted into the atmosphere as a result of processes within animals.

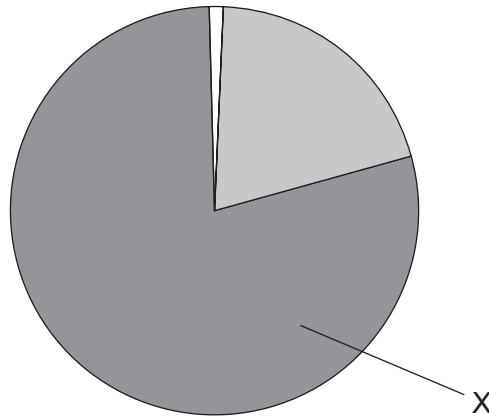
Gas .....1..... is produced by process .....3..... .

Gas .....2..... is produced by process .....4..... .

Which words correctly complete gaps 1, 2, 3 and 4?

|          | 1               | 2                             | 3           | 4           |
|----------|-----------------|-------------------------------|-------------|-------------|
| <b>A</b> | CO              | C <sub>2</sub> H <sub>6</sub> | digestion   | respiration |
| <b>B</b> | CO              | C <sub>2</sub> H <sub>6</sub> | respiration | digestion   |
| <b>C</b> | CO <sub>2</sub> | CH <sub>4</sub>               | digestion   | respiration |
| <b>D</b> | CO <sub>2</sub> | CH <sub>4</sub>               | respiration | digestion   |

32 The diagram shows the composition by volume of air.



What is X?

- A argon
- B carbon dioxide
- C nitrogen
- D oxygen

33 The table gives the composition of the atmosphere of four newly discovered planets.

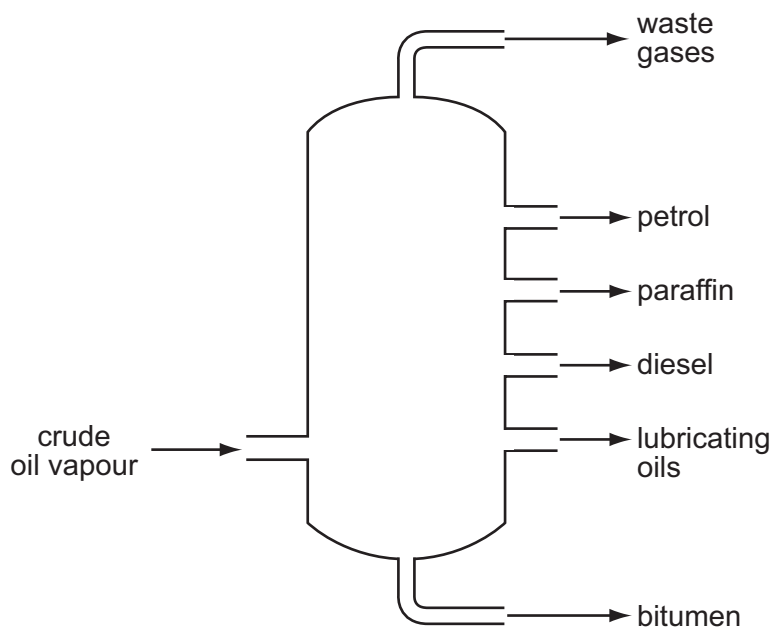
| planet | composition of atmosphere         |
|--------|-----------------------------------|
| W      | argon, carbon dioxide and oxygen  |
| X      | argon, nitrogen and oxygen        |
| Y      | argon, carbon dioxide and methane |
| Z      | methane, nitrogen and oxygen      |

On which planets is the greenhouse effect likely to occur?

- A W only
- B W, X and Z
- C W and Y only
- D W, Y and Z

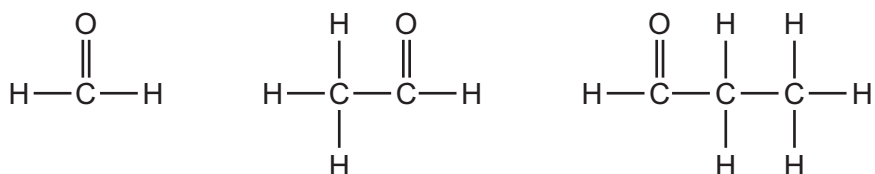
- 34 Which two substances, when reacted together, would form a salt that contains two of the essential elements provided by fertilisers?
- A potassium hydroxide and nitric acid
  - B potassium hydroxide and sulfuric acid
  - C sodium hydroxide and nitric acid
  - D sodium hydroxide and sulfuric acid
- 35 Statement 1: Alloying iron with other materials to form stainless steel prevents iron from rusting by excluding oxygen.
- Statement 2: Painting, oiling and electroplating are all methods of preventing iron from rusting.
- Which is correct?
- A Both statements are correct and statement 2 explains statement 1.
  - B Both statements are correct but statement 2 does not explain statement 1.
  - C Statement 1 is correct but statement 2 is incorrect.
  - D Statement 2 is correct but statement 1 is incorrect.
- 36 What is the main constituent of natural gas?
- A carbon dioxide
  - B ethane
  - C hydrogen
  - D methane
- 37 What is **not** essential for the formation of ethanol by fermentation?
- A light
  - B sugar
  - C yeast
  - D water

38 Which industrial process is shown in the diagram?



- A cracking
- B fermentation
- C fractional distillation
- D polymerisation

39 The diagram shows the structures of three compounds.



Why do these three compounds belong to the same homologous series?

- A They all contain carbon, hydrogen and oxygen.
- B They all contain the same functional group.
- C They are all carbon based molecules.
- D They are all flammable liquids.

40 Compounds containing five carbon atoms in a molecule may have names beginning with 'pent...'.  
What is the name of the compound shown?



key

○ = carbon

● = oxygen

● = hydrogen

- A pentane
- B pentanoic acid
- C pentanol
- D pentene

**DATA SHEET**  
**The Periodic Table of the Elements**

|                                   |  | Group                               |                                     |                                    |                                      |                                      |                                      |                                    |  |                                     |                                       |                                       |                                  |
|-----------------------------------|--|-------------------------------------|-------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|--|-------------------------------------|---------------------------------------|---------------------------------------|----------------------------------|
|                                   |  | I                                   | II                                  | III                                | IV                                   | V                                    | VI                                   | VII                                | VIII                                   | IX                                  | X                                     | 0                                     |                                  |
|                                   |  | 1<br><b>H</b><br>Hydrogen<br>1      |                                     |                                    |                                      |                                      |                                      |                                    |  |                                     |                                       |                                       | 4<br><b>He</b><br>Helium<br>2    |
| 7<br><b>Li</b><br>Lithium<br>3    | 9<br><b>Be</b><br>Beryllium<br>4       |                                     |                                     |                                    |                                      |                                      |                                      |                                    |  |                                     |                                       | 19<br><b>F</b><br>Fluorine<br>9       | 20<br><b>Ne</b><br>Neon<br>10    |
| 23<br><b>Na</b><br>Sodium<br>11   | 24<br><b>Mg</b><br>Magnesium<br>12     | 27<br><b>Al</b><br>Aluminium<br>13  | 28<br><b>Si</b><br>Silicon<br>14    | 31<br><b>P</b><br>Phosphorus<br>15 | 32<br><b>S</b><br>Sulfur<br>16       | 35.5<br><b>Cl</b><br>Chlorine<br>17  | 36<br><b>Ar</b><br>Argon<br>18       |                                    |  |                                     |                                       |                                       | 40<br><b>Ar</b><br>Argon<br>18   |
| 39<br><b>K</b><br>Potassium<br>19 | 40<br><b>Ca</b><br>Calcium<br>20       | 70<br><b>Ga</b><br>Gallium<br>31    | 73<br><b>Ge</b><br>Germanium<br>32  | 75<br><b>As</b><br>Arsenic<br>33   | 76<br><b>Se</b><br>Selenium<br>34    | 79<br><b>Br</b><br>Bromine<br>35     | 80<br><b>Kr</b><br>Krypton<br>36     |                                    |  |                                     |                                       |                                       | 84<br><b>Kr</b><br>Krypton<br>36 |
| 85<br><b>Rb</b><br>Rubidium<br>37 | 88<br><b>Sr</b><br>Strontium<br>38     | 101<br><b>Ru</b><br>Ruthenium<br>44 | 106<br><b>Pd</b><br>Palladium<br>46 | 108<br><b>Ag</b><br>Silver<br>47   | 112<br><b>Cd</b><br>Cadmium<br>48    | 115<br><b>In</b><br>Indium<br>49     | 119<br><b>Sn</b><br>Tin<br>50        | 122<br><b>Sb</b><br>Antimony<br>51 | 127<br><b>I</b><br>Iodine<br>53        | 128<br><b>Te</b><br>Tellurium<br>52 | 131<br><b>Xe</b><br>Xenon<br>54       | 131<br><b>Xe</b><br>Xenon<br>54       |                                  |
| 133<br><b>Cs</b><br>Caesium<br>55 | 137<br><b>Ba</b><br>Barium<br>56       | 186<br><b>Os</b><br>Osmium<br>76    | 190<br><b>Ir</b><br>Iridium<br>77   | 195<br><b>Pt</b><br>Platinum<br>78 | 197<br><b>Au</b><br>Gold<br>79       | 201<br><b>Hg</b><br>Mercury<br>80    | 204<br><b>Tl</b><br>Thallium<br>81   | 207<br><b>Pb</b><br>Lead<br>82     | 209<br><b>Bi</b><br>Bismuth<br>83      | 210<br><b>Po</b><br>Polonium<br>84  | 210<br><b>Rn</b><br>Radon<br>86       | 210<br><b>Rn</b><br>Radon<br>86       |                                  |
| 226<br><b>Ra</b><br>Radium<br>88  | 227<br><b>Ac</b><br>Actinium<br>89     |                                     |                                     |                                    |                                      |                                      |                                      |                                    |  |                                     |                                       | 227<br><b>Ac</b><br>Actinium<br>89    |                                  |
| *58-71 Lanthanoid series          |  |                                     |                                     |                                    |                                      |                                      |                                      |                                    |  |                                     |                                       |                                       |                                  |
| †90-103 Actinoid series           |  |                                     |                                     |                                    |                                      |                                      |                                      |                                    |  |                                     |                                       |                                       |                                  |
| 140<br><b>Ce</b><br>Cerium<br>58  | 141<br><b>Pr</b><br>Praseodymium<br>59 | 144<br><b>Nd</b><br>Neodymium<br>60 | 150<br><b>Sm</b><br>Samarium<br>62  | 152<br><b>Eu</b><br>Europium<br>63 | 157<br><b>Gd</b><br>Gadolinium<br>64 | 162<br><b>Dy</b><br>Dysprosium<br>66 | 165<br><b>Ho</b><br>Holmium<br>67    | 167<br><b>Er</b><br>Erbium<br>68   | 169<br><b>Tm</b><br>Thulium<br>69      | 173<br><b>Yb</b><br>Ytterbium<br>70 | 175<br><b>Lu</b><br>Lutetium<br>71    | 175<br><b>Lu</b><br>Lutetium<br>71    |                                  |
| 232<br><b>Th</b><br>Thorium<br>90 | 238<br><b>U</b><br>Uranium<br>92       | 238<br><b>U</b><br>Uranium<br>92    | 94<br><b>Pu</b><br>Plutonium<br>94  | 95<br><b>Am</b><br>Americium<br>95 | 96<br><b>Cm</b><br>Curium<br>96      | 98<br><b>Cf</b><br>Californium<br>98 | 99<br><b>Es</b><br>Einsteinium<br>99 | 100<br><b>Fm</b><br>Fermium<br>100 | 101<br><b>Md</b><br>Mendelevium<br>101 | 102<br><b>No</b><br>Nobelium<br>102 | 103<br><b>Lr</b><br>Lawrencium<br>103 | 103<br><b>Lr</b><br>Lawrencium<br>103 |                                  |

Key

|   |          |                          |
|---|----------|--------------------------|
| a | <b>X</b> | = relative atomic mass   |
| b | <b>X</b> | = atomic symbol          |
|   | <b>X</b> | = proton (atomic) number |

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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