

|       |                 |      |
|-------|-----------------|------|
| Class | Register Number | Name |
|-------|-----------------|------|



南洋女子中学校  
**NANYANG GIRLS' HIGH SCHOOL**  
**End-of-Year Examination 2015**  
**Secondary Three**

**Chemistry**

**Paper 1**

Multiple Choice

**Wednesday**

**7 October 2015**

**45 minutes**

**0800-0845**

Additional materials: Multiple Choice Answer Sheet

**READ THESE INSTRUCTIONS FIRST**

**Do not open this booklet until you are told to do so.**

Write in soft pencil.

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

Write your name, class and register number on the Multiple Choice Answer Sheet provided.

There are **thirty** questions in 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 Multiple Choice Answer Sheet.

**INFORMATION FOR CANDIDATES**

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.

The use of approved scientific calculators is allowed.

A copy of the periodic table is found on page 9.

This document consists of 9 printed pages.

**Setters: LSC**

**NANYANG GIRLS' HIGH SCHOOL**

**[Turn over]**

- 1 The atmosphere of Venus contains mainly oxygen, argon and nitrogen. The melting and boiling points of these gases are shown in the table below.

| gas      | melting point/ $^{\circ}\text{C}$ | boiling point/ $^{\circ}\text{C}$ |
|----------|-----------------------------------|-----------------------------------|
| oxygen   | -219                              | -183                              |
| argon    | -189                              | -186                              |
| nitrogen | -210                              | -196                              |

If only liquid oxygen is to be obtained, while the other gases may remain in the solid or gaseous states, what temperature should the sample of air be decreased to?

- A -180 $^{\circ}\text{C}$   
 B -185 $^{\circ}\text{C}$   
 C -187 $^{\circ}\text{C}$   
 D -198 $^{\circ}\text{C}$
- 2 Which statements are correct about a gas?
- I Its particles move at a low speed.  
 II It is easily compressed.  
 III It has a higher rate of diffusion compared to a liquid.  
 IV Its particles spread throughout the container.
- A I and II only  
 B II, III and IV only  
 C II and IV only  
 D I, II, III and IV
- 3 When a sample of impure naphthalene was heated, the sample was found to melt over a temperature range of 69 $^{\circ}\text{C}$  to 76 $^{\circ}\text{C}$ . What could be the melting point of naphthalene?
- A 69 $^{\circ}\text{C}$   
 B 72 $^{\circ}\text{C}$   
 C 76 $^{\circ}\text{C}$   
 D 80 $^{\circ}\text{C}$
- 4 Which of the following shows the correct order of processes that should be carried out to obtain solid iodine, sand and sodium chloride from a mixture of these three solids?
- A evaporation, sublimation, dissolving, filtration  
 B sublimation, dissolving, filtration, evaporation  
 C dissolving, filtration, sublimation, evaporation  
 D sublimation, filtration, dissolving, evaporation
- 5 Which of the following statements about a strong acid and a weak acid is true?
- A Blue litmus paper turns red in the presence of a strong acid while it remains blue in a weak acid.  
 B A strong acid has a higher concentration of hydrogen ions as compared to a weak acid when both acids are of the same concentration and basicity.  
 C A larger volume of hydrogen gas is given out when a strong acid of the same concentration as the weak acid, reacts with a reactive metal.  
 D Phosphoric acid is a strong acid because it is a tribasic acid while hydrochloric acid is a weak acid since it is monobasic.

- 6 Which of the following chemicals can be added to dilute hydrochloric acid to prepare copper(II) chloride?
- A copper metal  
B copper(II) nitrate  
C copper(II) sulfate  
D copper(II) carbonate
- 7 Which of the following best describes acidic oxides and amphoteric oxides?
- A Acidic oxides are all gases but amphoteric oxides are all solids.  
B Acidic oxides react with bases but amphoteric oxides react with both acids and bases.  
C Acidic oxides are covalent compounds while amphoteric oxides are either covalent or ionic compounds.  
D Acidic oxides are soluble in water while amphoteric oxides are insoluble in water but soluble in organic solvents.
- 8 Which of the following pairs of substances cannot react with each other?
- A aqueous sodium hydroxide and zinc oxide  
B limewater with aqueous ammonium sulfate  
C dilute nitric acid with calcium hydrogencarbonate  
D aqueous potassium chloride with magnesium oxide
- 9 Which of the following is/are correct about an aqueous solution of sodium hydroxide?
- I it produces ammonia when heated with aluminium  
II a colourless solution is formed when it is added in excess to lead(II) oxide  
III it forms a brown precipitate with aqueous iron(III) chloride
- A I and II only  
B II and III only  
C III only  
D I, II, and III
- 10 Substance **X** is a solid at room temperature. When calcium carbonate is added to an aqueous solution of **X**, a gas that forms a white precipitate with limewater is formed. What is the identity of substance **X**?
- A citric acid  
B hydrogen chloride  
C aluminium oxide  
D sodium hydroxide
- 11 Which of the following is the best conductor of electricity if an equal number of moles of each substance is dissolved in the stated volume of water?
- A ammonia in 500 cm<sup>3</sup> of water  
B ethanoic acid in 1 dm<sup>3</sup> of water  
C hydrogen chloride in 500 cm<sup>3</sup> of water  
D potassium hydroxide in 1 dm<sup>3</sup> of water

- 12** Which of the following methods listed below cannot be effectively used to prepare the respective gases?

|          | method                                      | gas evolved |
|----------|---------------------------------------------|-------------|
| <b>A</b> | add hydrochloric acid to lead               | hydrogen    |
| <b>B</b> | add sulfuric acid to magnesium              | hydrogen    |
| <b>C</b> | warm limewater with ammonium sulfate        | ammonia     |
| <b>D</b> | warm alkaline sodium nitrate with aluminium | ammonia     |

- 13** When aqueous ammonia was added in excess to an aqueous solution of salt **Z**, a green precipitate which turned brown on exposure to air was formed.

Which one of the following could be **Z**?

- A**    FeCO<sub>3</sub>
- B**    Fe<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub>
- C**    FeSO<sub>4</sub>
- D**    Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>

- 14** Solution **S** reacts with aqueous lead(II) nitrate to form a white precipitate that is insoluble in dilute nitric acid. Which anions are likely to be in solution **S**?

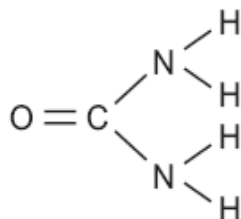
- |     |               |
|-----|---------------|
| I   | carbonate ion |
| II  | chloride ion  |
| III | iodide ion    |
| IV  | sulfate ion   |

- A** I and II only  
**B** I, II and IV only  
**C** II and IV only  
**D** I, II, III and IV

- 15** Which of the following would be observed when an aqueous solution containing aluminium, copper(II), and zinc ions was treated with an excess of aqueous ammonia?

- A** white precipitate in blue solution  
**B** blue precipitate in colourless solution  
**C** white precipitate in colourless solution  
**D** blue precipitate in blue solution

- 16** Urea,  $\text{CO}(\text{NH}_2)_2$ , is one of the fertilisers manufactured from ammonia. How many pairs of electrons are shared in a molecule of urea?



- |          |   |          |   |
|----------|---|----------|---|
| <b>A</b> | 3 | <b>C</b> | 7 |
| <b>B</b> | 4 | <b>D</b> | 8 |

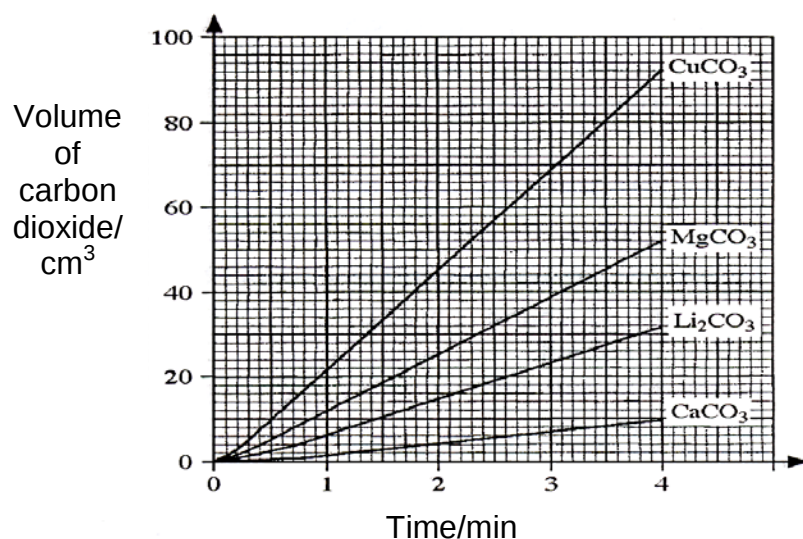
- 17 Silicon carbide and diamond are both macromolecules having similar structures. Which of the following is an INCORRECT description of the two substances?
- A both substances are hard  
B both substances are compounds  
C both substances have high melting points  
D both substances are non-conductors of electricity
- 18  $100\text{ cm}^3$  of gaseous ammonia contains  $n$  molecules. How many atoms are there in  $100\text{ cm}^3$  of gaseous hydrogen under the same temperature and pressure?
- A  $n$   
B  $2n$   
C  $1.5n$   
D  $2.5n$
- 19 Two moles of ethanol,  $\text{C}_2\text{H}_5\text{OH}$ , have the same mass as one mole of an oxide of nitrogen,  $\text{N}_2\text{O}_x$ . What is the value of  $x$ ?
- A 1  
B 2  
C 3  
D 4
- 20 Which of the following statements regarding helium and hydrogen are correct?
- I 4 atoms of hydrogen have the same mass as 1 atom of helium.  
II 4 g of helium gas has the same number of atoms as 2 g of hydrogen gas.  
III 2 moles of helium gas have the same mass as 4 moles of hydrogen gas.
- A I and II only  
B II and III only  
C I and III only  
D I, II and III
- 21 If 4 g of hydrogen and 4 g of oxygen are exploded, what is the mass of water formed at room temperature and pressure?
- A 2.25 g  
B 4.50 g  
C 18.0 g  
D 36.0 g
- 22 2.75 g of metal **M** combines with 1.6 g of oxygen to form an oxide with an empirical formula of  $\text{MO}_2$ . What is the relative atomic mass of metal **M**?
- A 13  
B 27  
C 55  
D 110
- 23 When excess aqueous sodium hydroxide is added gradually to an aqueous solution **X**, a blue precipitate, which is insoluble in excess aqueous sodium hydroxide, is formed. An aqueous chloride **Y**, is also produced.
- If 11.7g of **Y** is produced, what is the mass of **X** that reacted?
- A 13.5 g  
B 27.0 g  
C 12.7 g  
D 25.4 g

- 24** **P** is a solution containing  $3.80 \text{ g dm}^{-3}$  hydrochloric acid,  $\text{HCl}$ .  
**Q** is a solution containing  $4.24 \text{ g dm}^{-3}$  of an alkali,  $\text{ROH}$ .  
 $20.35 \text{ cm}^3$  of solution **P** neutralises  $20.0 \text{ cm}^3$  of solution **Q**.

What is the possible identity of **R**?

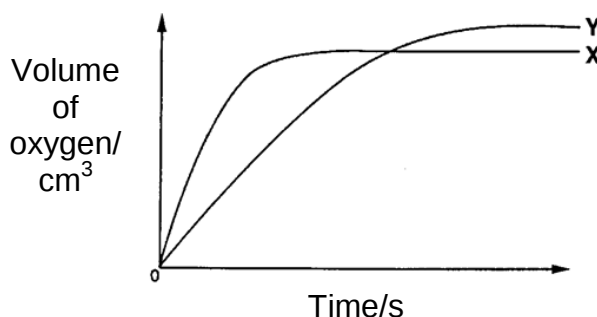
- |          |         |          |           |
|----------|---------|----------|-----------|
| <b>A</b> | lithium | <b>C</b> | silver    |
| <b>B</b> | sodium  | <b>D</b> | potassium |

- 25** The graph below shows the rate of decomposition of the same number of moles of four carbonates heated to the same temperature. The volume of carbon dioxide produced was recorded every minute.



Which carbonate decomposed at the fastest rate?

- |          |                 |          |                          |
|----------|-----------------|----------|--------------------------|
| <b>A</b> | $\text{CuCO}_3$ | <b>C</b> | $\text{Li}_2\text{CO}_3$ |
| <b>B</b> | $\text{MgCO}_3$ | <b>D</b> | $\text{CaCO}_3$          |
- 26** Curve **X** in the graph below was obtained by observing the decomposition of  $100 \text{ cm}^3$  of  $1.00 \text{ mol dm}^{-3}$  hydrogen peroxide, catalysed by manganese(IV) oxide.



Which of the following alterations to the conditions would produce curve **Y**?

- |          |                                                                         |
|----------|-------------------------------------------------------------------------|
| <b>A</b> | adding water                                                            |
| <b>B</b> | increasing the temperature                                              |
| <b>C</b> | using more manganese(IV) oxide                                          |
| <b>D</b> | adding $10 \text{ cm}^3$ of $0.1 \text{ mol dm}^{-3}$ hydrogen peroxide |

- 27** Two experiments were carried out to compare the speed of precipitation and the amount of silver chloride formed when aqueous sodium chloride was added to aqueous silver nitrate.

| experiment | aqueous sodium chloride |                                        | aqueous silver nitrate |                                        |
|------------|-------------------------|----------------------------------------|------------------------|----------------------------------------|
|            | volume                  | concentration/<br>$\text{mol dm}^{-3}$ | volume                 | concentration/<br>$\text{mol dm}^{-3}$ |
| <b>I</b>   | $10 \text{ cm}^3$       | 1.00                                   | $10 \text{ cm}^3$      | 1.00                                   |
| <b>II</b>  | $1 \text{ dm}^3$        | 0.01                                   | $1 \text{ dm}^3$       | 0.01                                   |

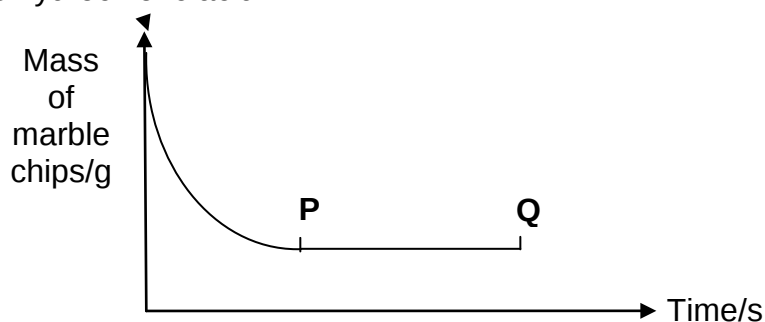
Which of the following shows the correct description of the two experiments?

|          | speed of precipitation                                 | amount of silver chloride formed                         |
|----------|--------------------------------------------------------|----------------------------------------------------------|
| <b>A</b> | same speed for both experiments <b>I</b> and <b>II</b> | same number of moles                                     |
| <b>B</b> | experiment <b>II</b> is slower                         | same number of moles                                     |
| <b>C</b> | same speed for both experiments <b>I</b> and <b>II</b> | more silver chloride is produced in experiment <b>II</b> |
| <b>D</b> | experiment <b>II</b> is slower                         | more silver chloride is produced in experiment <b>II</b> |

- 28** In which reaction is pressure **least** likely to affect the rate of reaction?

- A**  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$   
**B**  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$   
**C**  $\text{C}(\text{s}) + \text{CO}_2(\text{g}) \rightarrow 2\text{CO}(\text{g})$   
**D**  $\text{C}(\text{s}) + 2\text{S}(\text{s}) \rightarrow \text{CS}_2(\text{l})$

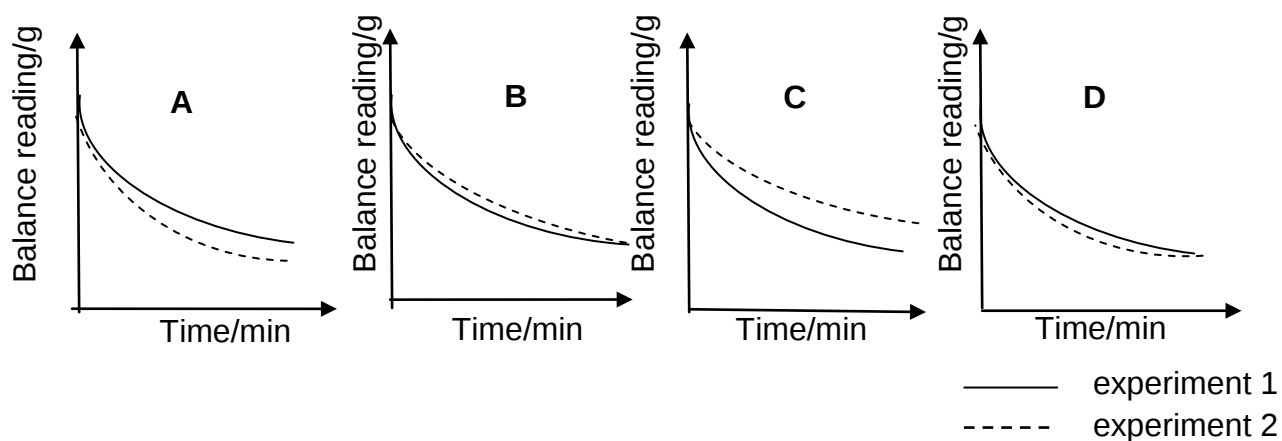
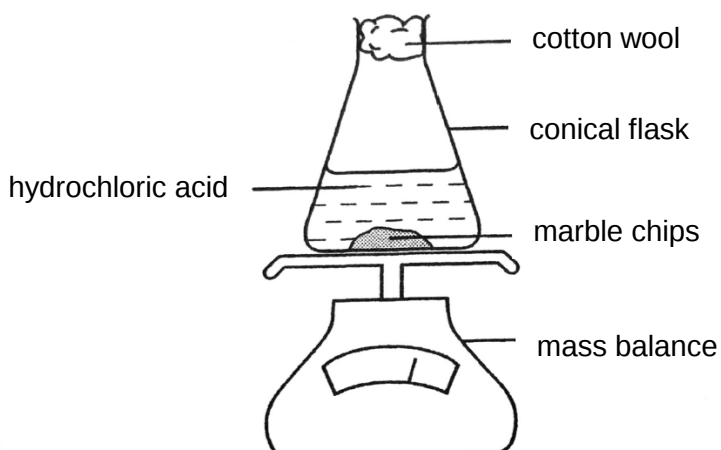
- 29** The graph below shows how the mass of marble chips varies with time as it reacts with excess hydrochloric acid.



Which of the following statements about section **PQ** of the curve is correct?

- A** Hydrochloric acid has fully reacted.  
**B** Marble chips are used up.  
**C** The reaction continues at a constant speed.  
**D** The speed of reaction is decreasing at a constant rate.

- 30** Two experiments were carried out. Dilute hydrochloric acid was used in experiment 1 while a more concentrated solution of hydrochloric acid was used in experiment 2. All other conditions were the same and in both experiments all the marble chips had completely reacted. Which diagram shows the results obtained?



**End of paper**

| Group                      |                             |                                       |                             |                             |                              |                             |                              |                            |                              |                           |                            |                             |                             |                             |                              |                              |                           |
|----------------------------|-----------------------------|---------------------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|----------------------------|------------------------------|---------------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|------------------------------|---------------------------|
| I                          | II                          |                                       |                             |                             |                              |                             | III                          | IV                         | V                            | VI                        | VII                        | 0                           |                             |                             |                              |                              |                           |
|                            |                             | <div>1<br/>H<br/>hydrogen<br/>1</div> |                             |                             |                              |                             |                              |                            |                              |                           |                            |                             |                             |                             |                              |                              |                           |
| 7<br>Li<br>lithium<br>3    | 9<br>Be<br>beryllium<br>4   |                                       |                             |                             |                              |                             |                              |                            |                              |                           |                            | 11<br>B<br>boron<br>5       | 12<br>C<br>carbon<br>6      | 14<br>N<br>nitrogen<br>7    | 16<br>O<br>oxygen<br>8       | 19<br>F<br>fluorine<br>9     | 20<br>Ne<br>neon<br>10    |
| 23<br>Na<br>sodium<br>11   | 24<br>Mg<br>magnesium<br>12 |                                       |                             |                             |                              |                             |                              |                            |                              |                           |                            | 27<br>Al<br>aluminium<br>13 | 28<br>Si<br>silicon<br>14   | 31<br>P<br>phosphorus<br>15 | 32<br>S<br>sulfur<br>16      | 35.5<br>Cl<br>chlorine<br>17 | 40<br>Ar<br>argon<br>18   |
| 39<br>K<br>potassium<br>19 | 40<br>Ca<br>calcium<br>20   | 45<br>Sc<br>scandium<br>21            | 48<br>Ti<br>titanium<br>22  | 51<br>V<br>vanadium<br>23   | 52<br>Cr<br>chromium<br>24   | 55<br>Mn<br>manganese<br>25 | 56<br>Fe<br>iron<br>26       | 59<br>Co<br>cobalt<br>27   | 59<br>Ni<br>nickel<br>28     | 64<br>Cu<br>copper<br>29  | 65<br>Zn<br>zinc<br>30     | 70<br>Ga<br>gallium<br>31   | 73<br>Ge<br>germanium<br>32 | 75<br>As<br>arsenic<br>33   | 79<br>Se<br>selenium<br>34   | 80<br>Br<br>bromine<br>35    | 84<br>Kr<br>krypton<br>36 |
| 85<br>Rb<br>rubidium<br>37 | 88<br>Sr<br>strontium<br>38 | 89<br>Y<br>yttrium<br>39              | 91<br>Zr<br>zirconium<br>40 | 93<br>Nb<br>niobium<br>41   | 96<br>Mo<br>molybdenum<br>42 | -<br>Tc<br>technetium<br>43 | 101<br>Ru<br>ruthenium<br>44 | 103<br>Rh<br>rhodium<br>45 | 106<br>Pd<br>palladium<br>46 | 108<br>Ag<br>silver<br>47 | 112<br>Cd<br>cadmium<br>48 | 115<br>In<br>indium<br>49   | 119<br>Sn<br>tin<br>50      | 122<br>Sb<br>antimony<br>51 | 128<br>Te<br>tellurium<br>52 | 127<br>I<br>iodine<br>53     | 131<br>Xe<br>xenon<br>54  |
| 133<br>Cs<br>caesium<br>55 | 137<br>Ba<br>barium<br>56   | 139<br>La<br>lanthanum<br>57          | 178<br>Hf<br>hafnium<br>72  | 181<br>Ta<br>tantalum<br>73 | 184<br>W<br>tungsten<br>74   | 186<br>Re<br>rhenium<br>75  | 190<br>Os<br>osmium<br>76    | 192<br>Ir<br>iridium<br>77 | 195<br>Pt<br>platinum<br>78  | 197<br>Au<br>gold<br>79   | 201<br>Hg<br>mercury<br>80 | 204<br>Tl<br>thallium<br>81 | 207<br>Pb<br>lead<br>82     | 209<br>Bi<br>bismuth<br>83  | -<br>Po<br>polonium<br>84    | -<br>At<br>astatine<br>85    | -<br>Rn<br>radon<br>86    |
| -<br>Fr<br>francium<br>87  | -<br>Ra<br>radium<br>88     | -<br>Ac<br>actinium<br>89             |                             |                             |                              |                             |                              |                            |                              |                           |                            |                             |                             |                             |                              |                              |                           |

**Key**

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

The volume of one mole of any gas is  $24 \text{ dm}^3$  at room temperature and

|     |    |         |    |     |    |              |    |     |    |           |    |   |    |            |    |     |    |           |    |     |    |           |    |     |    |            |    |     |    |           |    |     |    |             |    |     |    |             |    |     |    |         |     |     |    |             |     |     |    |           |     |     |    |            |     |
|-----|----|---------|----|-----|----|--------------|----|-----|----|-----------|----|---|----|------------|----|-----|----|-----------|----|-----|----|-----------|----|-----|----|------------|----|-----|----|-----------|----|-----|----|-------------|----|-----|----|-------------|----|-----|----|---------|-----|-----|----|-------------|-----|-----|----|-----------|-----|-----|----|------------|-----|
| 140 | Ce | cerium  | 58 | 141 | Pr | praseodymium | 59 | 144 | Nd | neodymium | 60 | - | Pm | promethium | 61 | 150 | Sm | samarium  | 62 | 152 | Eu | euporium  | 63 | 157 | Gd | gadolinium | 64 | 159 | Tb | terbium   | 65 | 162 | Dy | dysprosium  | 66 | 165 | Ho | holmium     | 67 | 167 | Er | erbium  | 68  | 169 | Tm | thulium     | 69  | 173 | Yb | ytterbium | 70  | 175 | Lu | lutetium   | 71  |
| 232 | Th | thorium | 90 | -   | Pa | protactinium | 91 | 238 | U  | uranium   | 92 | - | Np | neptunium  | 93 | -   | Pu | plutonium | 94 | -   | Am | americium | 95 | -   | Cm | curium     | 96 | -   | Bk | berkelium | 97 | -   | Cf | californium | 98 | -   | Es | einsteinium | 99 | -   | Fm | fermium | 100 | -   | Md | mendelevium | 101 | -   | No | nobelium  | 102 | -   | Lr | lawrencium | 103 |