HILLCREST HIGH SCHOOL

NATURAL SCIENCE

JUNE 2025

Grade 9

MARKS: 120 **EXAMINERS:** Ms Thrash & Mrs Knox-Whitehead

TIME: 2 Hours **MODERATOR:** Mrs Silva

Instructions:

1. Answer ALL the questions.
2. This question paper consists of TWO sections:
3. SECTION A: LIFE SCIENCE (60)
   SECTION B: CHEMISTRY (60)

   Answer SECTIONS A and B in the ANSWER BOOK.
4. Non-programmable calculators may be used.
5. Appropriate mathematical instruments may be used.
6. Number the answers correctly according to the numbering system used in this question paper.
7. A periodic table is attached for your use. You may DETACH it for ease of use.

SECTION A : LIFE AND LIVING [20]

QUESTION 1: MULTIPLE CHOICE QUESTIONS (10)

Four options are provided as possible answers to the following questions. Each question has only one correct answer. Write only the letter (A - D) next to the question number (1.1 – 1.10) in the answer book.

1.1 If the fallopian tubes of a woman are blocked, which process will most likely be prevented?

A Menstruation
B Fertilization
C Ovulation
D Hormone production

1.2 The by-products of cellular respiration are ...

A oxygen, carbon dioxide and energy.
B water and glucose.
C carbon dioxide and oxygen.
D carbon dioxide, water and energy.

1.3 If the left side of the heart fails to function properly, which consequence is most likely?

A Oxygen-rich blood won't reach the lungs
B Carbon dioxide cannot leave the body
C Oxygen-rich blood doesn't reach the body tissues
D Blood clots in the veins

1.4 Look at the table below. Which option best explains the change from running to resting levels?

Activity	Heart Rate (bpm)	Breathing Rate (breaths/min)
Sleeping	55	12
Walking	80	18
Running	130	32
After resting	72	16

A Blood pressure increases dramatically after rest
B Oxygen demand remains high after activity
C Heart and breathing rates gradually return to baseline as demand decreases
D Adrenaline levels increase during recovery

1.5 Why must a specimen on a microscope slide be very thin?

A To keep the microscope clean
B So light can pass through it clearly
C To reduce its size for weighing
D To make it easier to move

1.6 What would likely happen if the large intestine didn't absorb enough water?

A The person would become dehydrated and have diarrhoea
B Nutrients would not be absorbed into the blood
C Food would not reach the stomach
D Digestion would stop

1.7 What is the main function of the nervous system?

A To transport oxygen in the blood
B To control and coordinate body responses
C To break down food for energy
D To remove waste from the body

1.8 Which of the following best explains why ligaments are important in joint movement?

A They cushion bones during movement
B They contract to move bones
C They connect bone to bone
D They attach muscles to bones

1.9 Which waste product is removed by the kidneys and excreted in urine?

A Oxygen
B Urea
C Glucose
D Carbon dioxide

1.10 Which food – nutrient combination shown below is **incorrect**?

A Spinach – iron
B Citrus fruits – vitamin C
C Milk – calcium
D Bread – vitamin D

QUESTION 2 :

2.1 TERMINOLOGY (5)

Give one word / term that best describes the following statements.

2.1.1 The part of the microscope that a person looks through to observe the specimen.

2.1.2 The tough, flexible tissue that covers the ends of bones at joints to reduce friction.

2.1.3 The stage in the human life cycle when sexual organs mature for reproduction.

2.1.4 The breakdown of food by digestive enzymes and hydrochloric acid.

2.1.5 The protective, thin covering of the heart.

2.2 MATCHING COLUMNS (5)

For each of the following questions, write only the number of the question and the LETTER of the answer (for example: 2.2.8 Z)

2.2.1	An eating disorder than can cause a person to become underweight	A. Cytoplasm
2.2.2	A health issue that causes airways to swell, wheezing and a tight chest	B. Liver
2.2.3	organ which produces insulin to break down sugars	C. TB
2.2.4	the jelly like substance where most of the functions of the cell take place	D. Asthma
2.2.5	also known as the voice box	E. Trachea
		F. Anorexia
		G. Kwashiorkor
		H. Pancreas
		I. Nucleus
		J. Larynx

TOTAL SECTION A : [20]

SECTION B : LIFE AND LIVING [40]

INSTRUCTIONS

1. Leave a line between each sub question for example, between **QUESTION 3.1** and **QUESTION 3.2.**
2. Rule off after each QUESTION for example, between **QUESTION 3** and **QUESTION 4.**

QUESTION 3 (4)

3.1 Use the list below to answer the following questions:

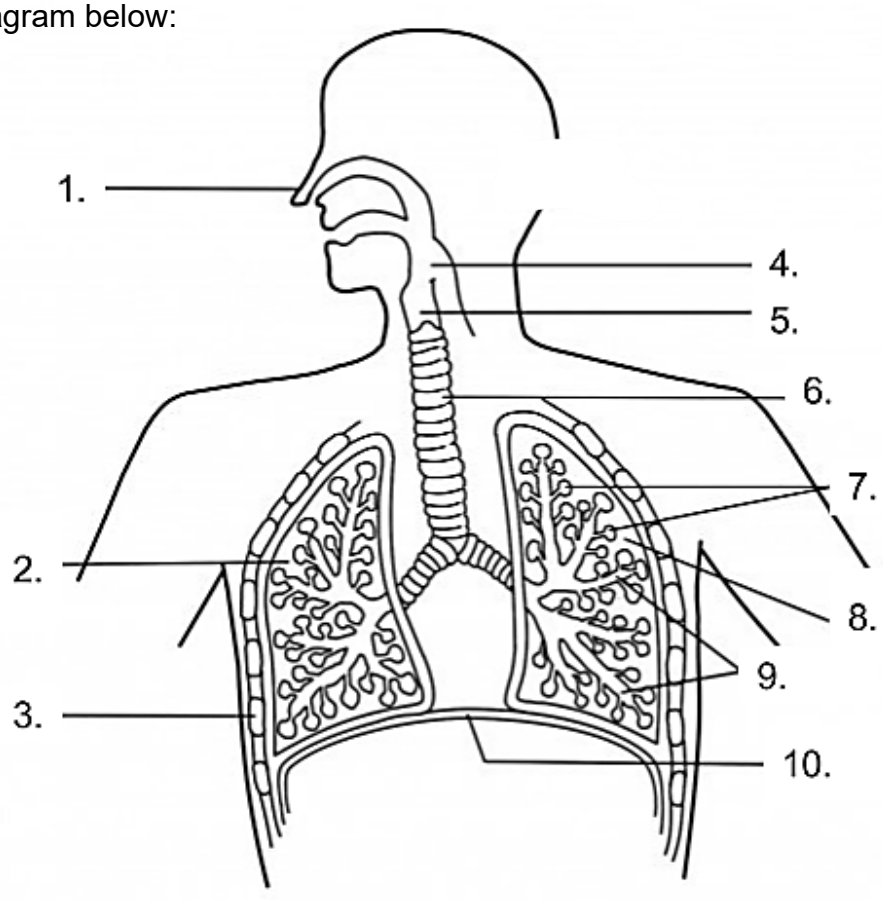
- Nucleus
- Cell wall
- Cell membrane
- Chloroplasts

3.1.1 Give one structure found in both animal and plant cells and its function. (2)

3.1.2 Give one structure found only in plant cells and its function. (2)

QUESTION 4 (8)

Refer to the diagram below:



4.1 Provide a heading for the diagram (1)

4.2 Identify the parts labelled:

4.2.1 **6** (1)

4.2.2 **7** (1)

4.3 Give one adaptation of part **6** which assists with its function (1)

4.4 What are the two main sites of gaseous exchange in the human body? (2)

4.5 For each site named in QUESTION 4.4, state the direction in which oxygen diffuses.
Choose from **INTO BLOOD** or **OUT OF BLOOD.** (2)

QUESTION 5 **(7)**

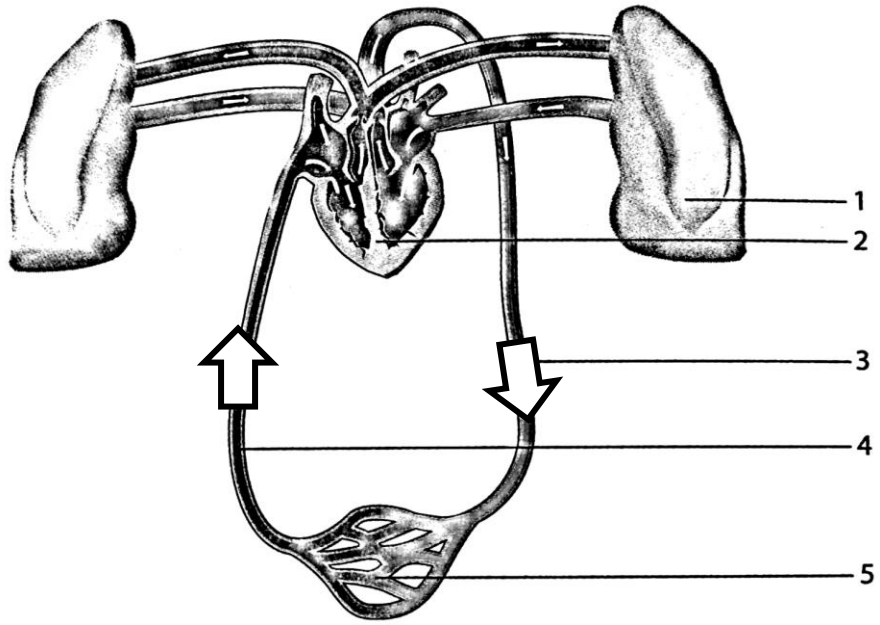
Read the following paragraph on the human digestive system. Select the correct answer from the choice in the brackets. Write down only the question numbers **5.1 – 5.7** and the correct answer next to each number.

Do NOT re-write the paragraph.

*"The digestive system is responsible for breaking down food into smaller molecules that the body can use for energy and growth. Digestion begins in the mouth, where food is first chewed and mixed with saliva. The (**5.1 chyme / bolus)** then passes through the (**5.2 oesophagus / trachea**) to reach the stomach. In the stomach, food is mixed with digestive juices and broken down further before moving to the (**5.3 small intestine / large intestine**). Most nutrients are absorbed in the (**5.4 small intestine / large intestine**), which has many finger-like structures called (**5.5 villi / alveoli**) to increase surface area for absorption. Water is absorbed mainly in the (**5.6 stomach / large intestine**). The undigested waste is finally removed from the body through the (**5.7 anus / urethra**).*

QUESTION 6 **(5)**

The diagram below shows the circulatory system. Study the diagram and answer the questions that follow.



6.1 Which NUMBER represents the

6.1.1 arteries (1)

6.1.2 capillaries (1)

6.2 Why is the wall of the left side of the heart thicker than the wall of the right side? In your explanation mention where the blood goes after it leaves the heart. (3)

QUESTION 7 **(5)**

An investigation was conducted to determine the blood sugar levels of a teenager at different hours of the day. The results are shown in the table below.

Table recording the blood sugar levels of a teenager at different hours of the day

Time of Day (hour)	Blood Sugar Level (mg/dL)
6:00	70
7:00	75
8:00	90
12:00	85
13:00	100
15:00	95
16:00	110
18:00	100
19:00	115
21:00	85

7.1 Give a suitable investigative question for this investigation. (1)

7.2 Name the dependent variable. (1)

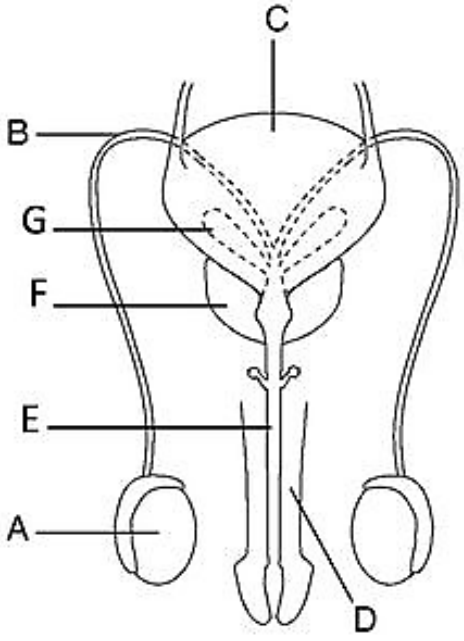
7.3.1 What time of day has the lowest blood sugar reading? (1)

7.3.2 Suggest a reason for the answer in QUESTION 7.3.1 (1)

7.4 Name a disease that is characterised by high blood sugar levels and is caused by taking in too much sugar. (1)

QUESTION 8 **(11)**

8.1 Refer to the diagram of the male reproductive system below



Provide labels for the following organs:

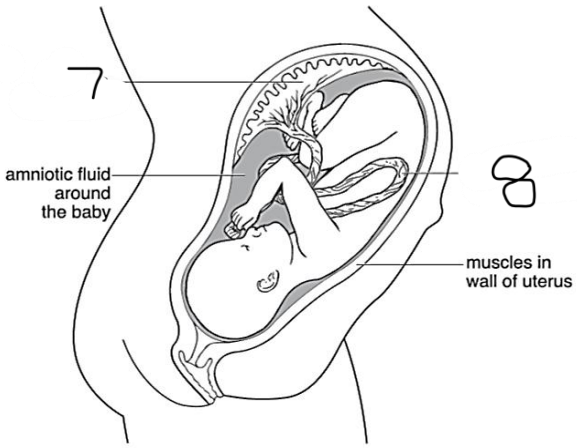
8.1.1 **A** (1)

8.1.2 **B** (1)

8.1.3 **E** (1)

8.2 Give the <u>two</u> functions of part **A.** (2)

8.3 The diagram below shows the female reproductive system during pregnancy.



8.3.1 Provide a label for the part numbered **7.** (1)

8.3.2 Give the <u>functions</u> of the part numbered **8.** (2)

8.4 Place the following words in the correct order for a successful pregnancy. (1)

- Foetus
- Fertilization
- Embryo
- Implantation
- Zygote

8.5 In females, the vagina is referred to as the **copulation canal** as well as the **birth canal**. Briefly explain this statement. (2)

TOTAL SECTION B : [40]
TOTAL SECTION A & B : [60]

SECTION C : MATTER AND MATERIALS [20]

INSTRUCTIONS

1. Start this section at the top of a new page.
2. Leave a line between each sub question for example, between **QUESTION 9.1 and QUESTION 9.2.**
3. Rule off after each question for example between **QUESTION 9 and QUESTION 10.**

QUESTION 9 : MULTIPLE CHOICE QUESTIONS (10)

Four options are provided as possible answers to the following questions. Each question has only one correct answer. Write only the letter (A-D) next to the question number (9.1 – 9.10) in the answer book.

9.1 The particles found in the nucleus that are positively charged:

A. electrons
B. neutrons
C. nucleons
D. protons

9.2 The correct name for the compound $\mathbf{Zn(OH)_2}$ is

A. zinc dihydride
B. zinc hydroxide
C. zinc hydroxate
D. zinc dihydroxide

9.3 The number of elements present in $\mathbf{NH_4NO_3}$ is ..

A. 3
B. 4
C. 8
D. 9

9.4 The total number of atoms present in $\mathbf{(CH_3COO)_2Mg}$ is …

A. 4
B. 6
C. 8
D. 15

9.5 The colour of the flame produced when burning sulfur:

A. blue
B. green
C. orange
D. white

9.6 The correct symbol for silicon on the periodic table:

A. S
B. Sc
C. Si
D. Sn

9.7 A semi-metal:

A. Aℓ
B. As
C. Ga
D. Zn

9.8 The substance with the lowest pH:

A. $CaCO_3$
B. CH_3COOH
C. HCl
D. NaOH

9.9 The name given to group 17 on the Periodic Table:

A. Alkali Metals
B. Transition Elements
C. Halogens
D. Noble Gases

9.10 Name the element in group 16, period 2:

A. sodium
B. oxygen
C. sulfur
D. neon

QUESTION 10 :

10.1 MATCHING COLUMNS **(5)**

Match the statements in column A with the correct words in column B.
Write only the correct letter next to the number in your answer book (e.g. **10.1.1 = A)**

COLUMN A		**COLUMN B**
10.1.1	Reaction of an acid and a base	**A** combustion
10.1.2	A rapid chemical reaction with oxygen that produces heat and light	**B** electroplating **C** corrosion
10.1.3	Reaction of Fe with O_2 in the presence of H_2O	**D** lubricating
10.1.4	Covering iron with a layer of a more reactive metal to protect it.	**E** galvanising **F** neutralisation
10.1.5	An acid or base dissolves or eats away at metals and other strong materials	**G** rusting

10.2 TERMINOLOGY **(5)**

Give one word / term that best describes the following statements:

10.2.1 A base that can dissolve in water.

10.2.2 Particles that surround the nucleus of the atom and are negatively charged.

10.2.3 A dye that has different colours in acid and in base.

10.2.4 Pure substances formed by a chemical reaction between two or more different elements.

10.2.5 A column in the periodic table.

TOTAL SECTION C : [20]

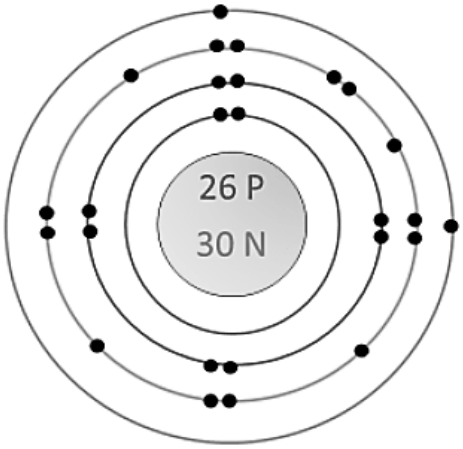
SECTION D : MATTER AND MATERIALS [40]

INSTRUCTIONS

1. Leave a line between each sub question for example between 11.1 and 11.2.
2. Rule off after each question for example between question 11 and question 12.
3. You may DETACH the Periodic Table at the back of the question paper.

QUESTION 11 (4)

Study the Bohr diagram below and answer the questions alongside:



11.1 Give the Mass Number of this element. (1)

11.2 State what the Atomic Number represents. (1)

11.3 Give the SYMBOL of another element in the same Period as this element. (1)

11.5 Give the NAME of this element. (1)

QUESTION 12 (4)

Standard notation for an element is written as shown below:

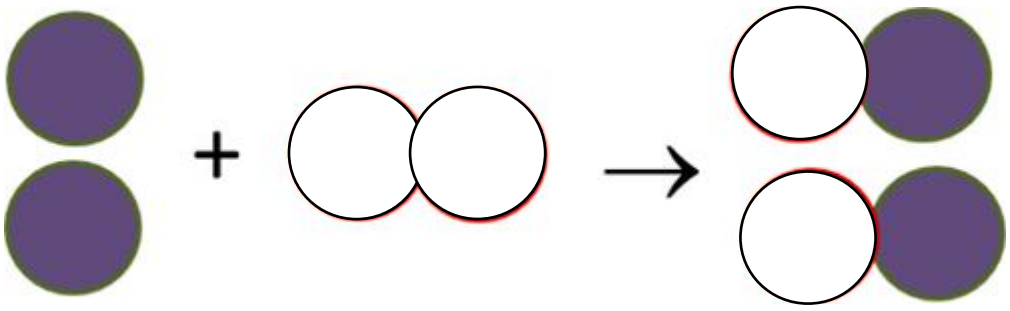
$$\begin{matrix} A \\ Z \end{matrix} X$$

12.1 Using this same type of notation, represent the element PHOSPHORUS. (2)

12.2 Calculate the number of NEUTRONS that phosphorus has, showing all your workings. (2)

QUESTION 13 (6)

In the diagram below the empty circles represent oxygen atoms and the filled circles represent magnesium atoms.



13.1 State the colour of the flame that will be produced when magnesium is burned in oxygen. (1)

13.2 Write a balanced symbol equation to represent this chemical reaction. (4)

13.3 State whether the product formed will be acidic or basic. (1)

QUESTION 14 (12)

14.1 Name the following compounds.

14.1.1 $Cu(NO_3)_2$ (2)

14.1.2 K_3N (2)

14.2 Write chemical formulae for the following compounds:

14.2.1 boron trifluoride (1)

14.2.2 aluminium hydroxide (1)

14.3 Give the COMMON name for NH_3. (1)

14.4 Re-write and balance the following equations:

14.4.1 $HC\ell + Ca(OH)_2 \rightarrow CaC\ell_2 + H_2O$ (1)

14.4.2 $N_2 + H_2 \rightarrow NH_3$ (1)

14.5 Write the following word equation into symbols to represent a balanced chemical equation.

carbon + oxygen gas → carbon dioxide (3)

QUESTION 15 (14)

Read the following extract and answer the questions that follow:

Acid rain is a form of precipitation with a pH measuring below 5.6 on the pH scale, primarily caused by the release of gases such as **SO_2** and nitrogen oxides (**NO_x**) into the atmosphere from the burning of fossil fuels in power plants, vehicles, and industrial facilities. These gases can also be released from natural sources including volcanic eruptions (releasing SO_2) and lightning strikes (producing nitrogen oxides). These gases, originating from both natural and human sources, react with water and other chemicals, forming sulfuric acid and nitric acid which mix with cloud moisture and can be transported long distances by winds before falling as acid rain, snow, sleet, or fog. The resulting acidity can have detrimental effects on ecosystems, human health, and infrastructure.

The effects on human health include respiratory issues like asthma caused by the toxic non-metal oxide gases in the air, as well as corrosion of water pipes by acid rain, potentially leaching heavy metals into drinking water.

15.1 Describe one source of the harmful gases that cause acid rain. (1)

15.2 Give the correct chemical name for the following gases:

15.2.1 SO_2 (1)

15.2.2 NO_x where x = 1 (1)

15.3 Give the correct chemical formulae for the TWO acids mentioned in the text. (2)

15.4 Give one effect on human health resulting from non-metal oxide gases in the atmosphere. (1)

15.5 **Discuss** (name and explain) TWO harmful effects of acid rain on ecosystems and / or infrastructure. (4)

15.6 Explain what the pH scale is and how the scale is interpreted. (4)

TOTAL SECTION D : [40]

TOTAL SECTION C & D : [60]
GRAND TOTAL : [120]

TABLE 3: THE PERIODIC TABLE OF ELEMENTS
TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
2,1 **H** 1																	2 **He** 4
1,0 **Li** 7	1,5 **Be** 9											2,0 **B** 11	2,5 **C** 12	3,0 **N** 14	3,5 **O** 16	4,0 **F** 19	10 **Ne** 20
0,9 **Na** 23	1,2 **Mg** 24											1,5 **Aℓ** 27	1,8 **Si** 28	2,1 **P** 31	2,5 **S** 32	3,0 **Cℓ** 35,5	18 **Ar** 40
0,8 **K** 39	1,0 **Ca** 40	1,3 **Sc** 45	1,5 **Ti** 48	1,6 **V** 51	1,6 **Cr** 52	1,5 **Mn** 55	1,8 **Fe** 56	1,8 **Co** 59	1,8 **Ni** 59	1,9 **Cu** 63,5	1,6 **Zn** 65	1,6 **Ga** 70	1,8 **Ge** 73	2,0 **As** 75	2,4 **Se** 79	2,8 **Br** 80	36 **Kr** 84
0,8 **Rb** 86	1,0 **Sr** 88	1,2 **Y** 89	1,4 **Zr** 91	1,6 **Nb** 92	1,8 **Mo** 96	1,9 **Tc**	2,2 **Ru** 101	2,2 **Rh** 103	2,2 **Pd** 106	1,9 **Ag** 108	1,7 **Cd** 112	1,8 **In** 115	1,8 **Sn** 119	1,9 **Sb** 122	2,1 **Te** 128	2,5 **I** 127	54 **Xe** 131
0,7 **Cs** 133	0,9 **Ba** 137	1,1 **La** 139	1,6 **Hf** 179	1,5 **Ta** 181	1,8 **W** 184	1,9 **Re** 186	2,2 **Os** 190	2,2 **Ir** 192	2,2 **Pt** 195	2,4 **Au** 197	1,9 **Hg** 201	1,8 **Tℓ** 204	1,8 **Pb** 207	1,9 **Bi** 209	2,0 **Po**	2,5 **At**	86 **Rn**
0,7 **Fr** 87	0,9 **Ra** 226	1,1 **Ac** 89															

58 **Ce** 140	59 **Pr** 141	60 **Nd** 144	61 **Pm**	62 **Sm** 150	63 **Eu** 152	64 **Gd** 157	65 **Tb** 159	66 **Dy** 163	67 **Ho** 165	68 **Er** 167	69 **Tm** 169	70 **Yb** 173	71 **Lu** 175
90 **Th** 232	91 **Pa**	92 **U** 238	93 **Np**	94 **Pu**	95 **Am**	96 **Cm**	97 **Bk**	98 **Cf**	99 **Es**	100 **Fm**	101 **Md**	102 **No**	103 **Lr**

KEY/*SLEUTEL*

Atomic number *Atoomgetal*

Symbol *Simbool*

29 **Cu** 63,5

Electronegativity *Elektronegatiwiteit*

Approximate relative atomic mass *Benaderde relatiewe atoommassa*