Hillcrest High School

NATURAL SCIENCE

JUNE 2024

Grade 9

MARKS: 120 **EXAMINERS:** Mrs Smith & Mrs Knox-Whitehead

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

Instructions:

1. Answer ALL the questions.
2. This question paper consists of TWO sections:

   LIFE SCIENCE – 60 marks
   PHYSICAL SCIENCE – 60 marks
3. Answer all questions 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 [15]

QUESTION 1: MULTIPLE CHOICE QUESTIONS (5)

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 – 1.5) in the answer book.

1.1 The part of the cell where most of the DNA is stored is the

A cell wall
B cytoplasm
C cell membrane
D nucleus

1.2 The component of blood that produces antibodies that fight infection

A red blood cells
B platelets
C white blood cells
D plasma

1.3 Choose the correct order of events in order for pregnancy to occur:

A menstruation → ovulation → copulation → fertilisation
B ejaculation → menstruation → gestation → fertilisation
C menstruation → fertilisation → ovulation → implantation
D ejaculation → implantation → ovulation → gestation

1.4 The teenage girl who stops eating for fear of putting on weight is suffering from

A marasmus
B anorexia
C kwashiorkor
D rickets

1.5 Connects the alveolus to the bronchus in the lungs

A oesophagus
B trachea
C bronchiole
D epiglottis

QUESTION 2 :

2.1 TERMINOLOGY (5)

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

2.1.1 The lens of a microscope, connected to the rotating nose piece.

2.1.2 Condition a baby may be born with if the mother consumes alcohol during pregnancy.

2.1.3 Finger-like folds in the small intestines to increase the surface area for absorption.

2.1.4 The largest chambers of the heart that pump blood away from the heart.

2.1.5 The only contraceptive that protects against both pregnancy and STD's.

2.2 MATCHING COLUMNS (5)

For each of the following questions, write only the number of the question and the answer from the following list. Choose from **A, B, Both, None**.

2.2.1	The outer layer of a plant cell	A. cytoplasm B. cell membrane
2.2.2	Where C-shaped cartilage rings are found.	A. oesophagus B. trachea
2.2.3	Pregnancy begins at	A. implantation B. conception
2.2.4	Connects the foetus to the placenta	A. umbilical cord B. uterus
2.2.5	Produced by the ovaries	A. oestrogen B. egg cells

TOTAL SECTION A : [15]

SECTION B : LIFE AND LIVING [45]

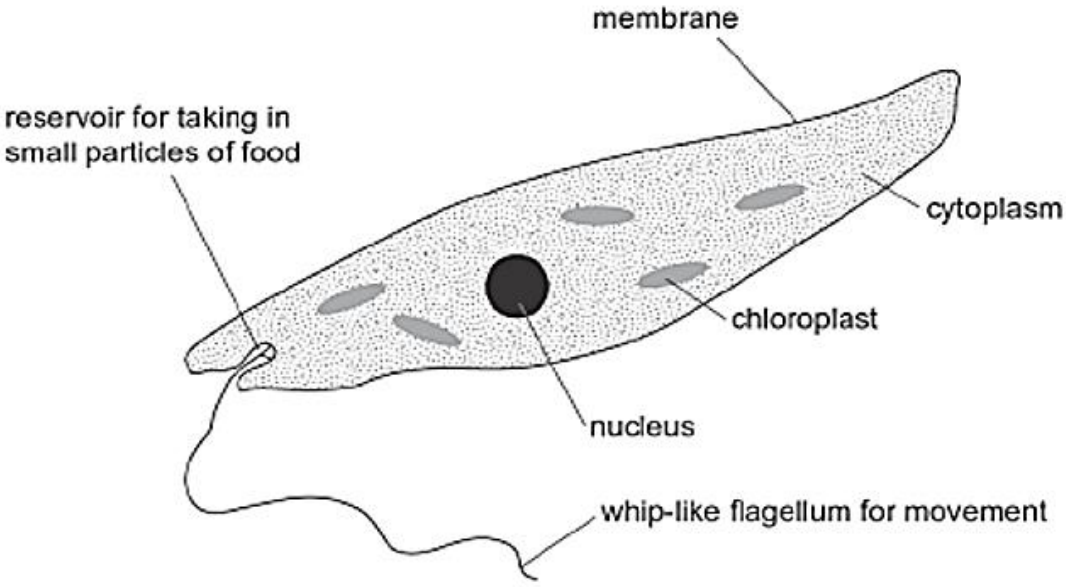
INSTRUCTIONS

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 **(5)**

The diagram below shows an organism called Euglena. It lives in ponds and streams and is unicellular. Euglena have features of both plants and animals.

Look carefully at the diagram of Euglena below and answer the questions that follow.



3.1 Give TWO pieces of evidence to suggest Euglena is an animal cell and not a plant cell. (2)

3.2 Plants can carry out photosynthesis. How can you tell from the diagram that Euglena is able to photosynthesize? (1)

3.3 Mention ONE feature that is present in all plant cells that is absent in Euglena. (1)

3.4 State the function of the cytoplasm in this cell. (1)

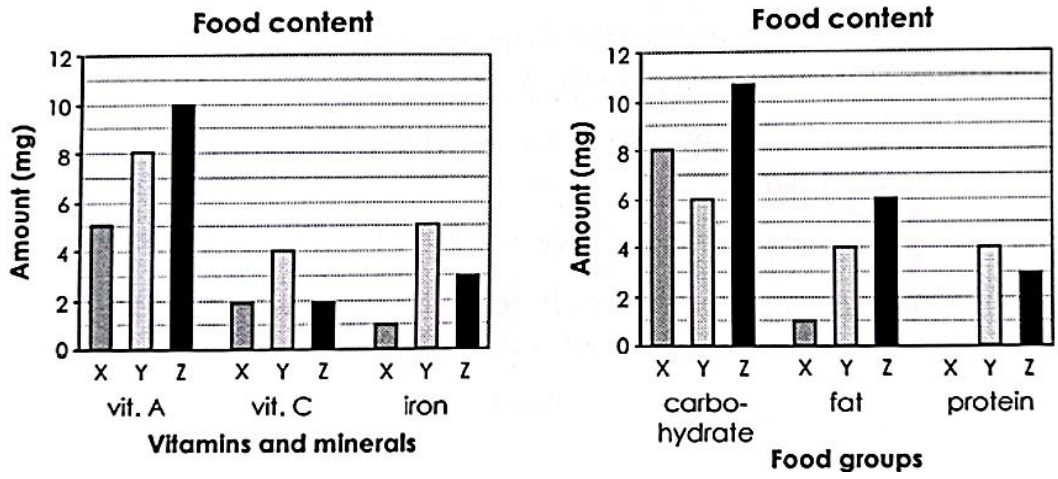
QUESTION 4 **(7)**

Read the following paragraph on the human respiratory system. Choose the correct answer from the choice in the brackets. Write down only the question numbers (**4.1 – 4.7) followed by** the answer. **Do <u>NOT</u> re-write the paragraph.**

During inhalation the muscles of the diaphragm ***(4.1 relax / contract)*** *which causes the diaphragm to move* ***(4.2 downwards / upwards)****.*
The intercostal muscles ***(4.3 relax / contract)*** *which causes the rib cage to* ***(4.4 drop downwards / lift upwards)****.*
The volume of the chest cavity ***(4.5 increases / decreases)*** *while the air pressure in the chest cavity becomes* ***(4.6 higher / lower)*** *than the atmospheric air pressure. This causes air to* ***(4.7 rush into / escape from)*** *the lungs.*

QUESTION 5 **(11)**

Many children in South Africa do not eat breakfast which negatively affects their academic performance. The Department of Health provides cereal to some primary learners in impoverished areas of the country. The contents of **one** serving in three different cereals **X**, **Y** and **Z** are shown in the bar graphs below. Study the graphs and answer the questions that follow.



5.1 Children at one particular school are suffering from Kwashiorkor.

5.1.1 Which cereal (**X**, **Y** or **Z**) would you **not** recommend and why? (3)

5.1.2 Other than this cereal, name any food that you would recommend be included in their daily diet. (1)

5.2 The recommended daily allowance (RDA) of iron is 15 mg.

5.2.1 How many mg of iron is provided by cereal **Y**? (1)

5.2.2 How many servings of cereal **Z** are needed to obtain the RDA of iron? Show your working. (2)

5.3 Cereals **X**, **Y** and **Z** all contain Vitamin C.

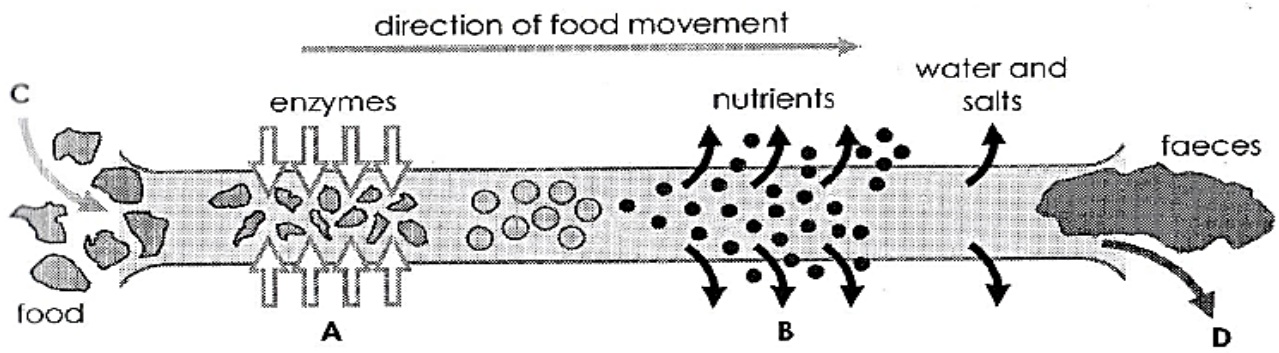
5.3.1 Why is vitamin C so important in the diet? (1)

5.3.2 Name a food source, other than these cereals, that would provide Vitamin C. (1)

5.4 The daily food intake of children should be approximately 15% protein, 30% fat and 55% carbohydrates. Based on this information, which cereal would you recommend for growing children and explain how you arrived at your answer. (2)

QUESTION 6 **(7)**

Examine the diagram of the alimentary canal below and answer the questions that follow.



6.1 What processes are happening at:

6.1.1 **C** (1)

6.1.2 **A** (1)

6.1.3 **B** (1)

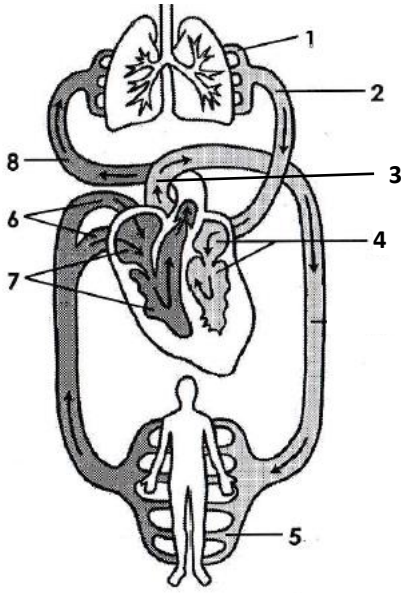
6.1.4 **D** (1)

6.2 Briefly explain the role of enzymes in process **A**. (1)

6.3 Explain the role of the blood system in process **B.** (2)

QUESTION 7 **(8)**

The diagram shows an overview of the circulatory system. Match the labels **1** to **8** with the statements in questions **7.1** to **7.8** below. For each statement, write only the question number (e.g. **7.1**) and the label that it matches (e.g. **1**).



7.1 Aorta

7.2 Blood rich in carbon dioxide is pumped from the heart to the lungs

7.3 Capillaries that join arteries and veins to form networks all over the body

7.4 Capillaries that surround the alveoli and where gaseous exchange takes place

7.5 Pulmonary veins carry deoxygenated blood back to the heart

7.6 Oxygen rich blood is transported from the lungs to the heart

7.7 The heart receives oxygenated blood from the lungs

7.8 The heart receives deoxygenated blood from the upper and lower body

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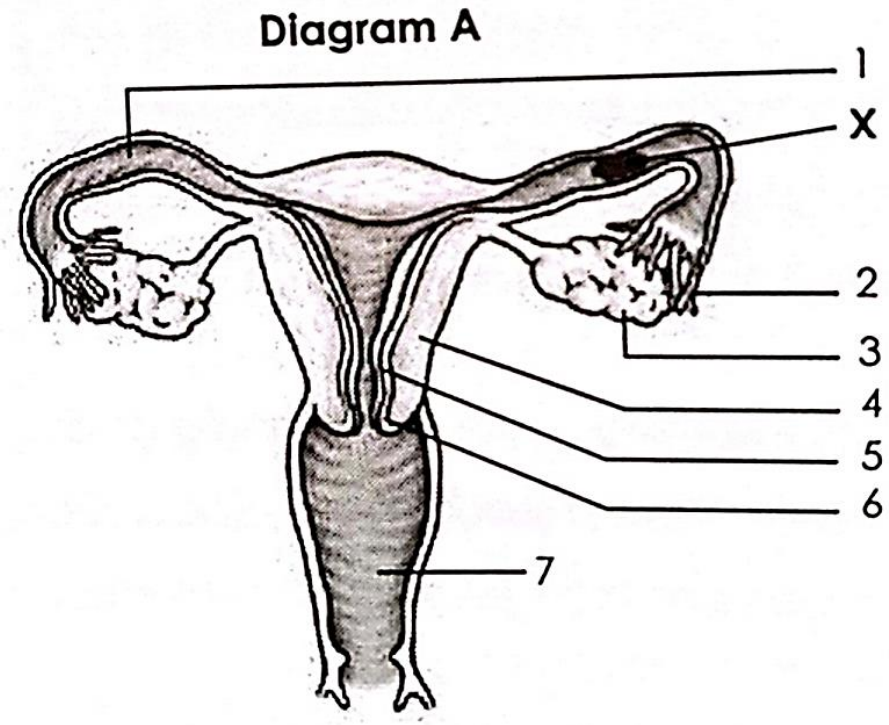
QUESTION 8 **(7)**



8.1 Provide a suitable heading for the diagram above. (1)

8.2 Provide labels for:

8.2.1 3 (1)

8.2.2 6 (1)

8.2.3 7 (1)

8.3 Write down the number of the part which

8.3.1 is shed during menstruation (1)

8.3.2 is made of muscles which contract during child birth (1)

8.4 On which day of the menstrual cycle is ovulation most likely to occur? (1)

SECTION B: [45]
TOTAL SECTION A & B: [60]

SECTION C : PHYSICAL SCIENCE [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.**

FORMULA SHEET

Forces:

$F_{res} = F_1 + F_2 + \ldots$ $W = m \times g$ $g = 9{,}8\ m.s^{-2}$

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 Which of the following ions are included in the formula $Al_2(CO_3)_3$?

A. Al^{2+} and CO_3^{3-}
B. Al^{2-} and CO_3^{3+}
C. Al^{3+} and CO_3^{2-}
D. Al^{3-} and CO_3^{2+}

9.2 The correct name for the compound $Ca_3(PO_4)_2$ is

A. tricalcium diphosphate
B. calcium phosphorate
C. calcium phosphide
D. calcium phosphate

9.3 The number of elements present in NH_4NO_3 is ..

A. 2
B. 3
C. 4
D. 9

9.4 The total number of atoms present in **$Zn(NO_3)_2$** is …

A. 3
B. 7
C. 8
D. 9

9.5 The gravitational force of attraction experienced by an elephant of mass 5 443 kg:

A. 555,4 N
B. 5 443 N
C. 8 708,8 N
D. 53 341,4 N

9.6 The correct symbol for iron on the periodic table:

A. Ag
B. Au
C. Fe
D. I

9.7 A semi-metal:

A. aluminium
B. gallium
C. silicon
D. tin

9.8 A force that always acts in the opposite direction to the motion of an object:

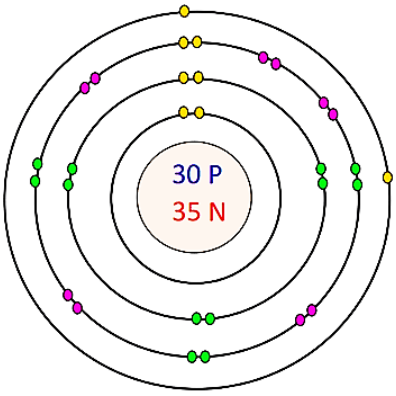
A. Electrostatic force
B. Gravitational force
C. Friction
D. Weight

9.9 An object becomes negatively charged when…

A. it gains electrons
B. it loses electrons
C. it gains protons
D. it loses protons

9.10 The element shown in the diagram is:

A. Br
B. Cl
C. Tb
D. Zn



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 = C)**

COLUMN A		**COLUMN B**
10.1.1	A diatomic gas	A tension
10.1.2	The colour of litmus paper in base	B red C blue
10.1.3	A field force between two charged objects	D electrostatic force
10.1.4	A contact force	E weight F H_2
10.1.5	The force of attraction between the earth and me	G CO_2 H CO

10.2 TERMINOLOGY (5)

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

10.2.1 A force applied to an object that causes it to change shape.

10.2.2 The number that describes how many nucleons are present in an atom.

10.2.3 The name of the unit used for Weight.

10.2.4 The force that is used to tow a car using a rope.

10.2.5 Neutral sub-atomic particles found in an atom.

TOTAL SECTION C : [20]

SECTION D : PHYSICAL SCIENCE [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.

QUESTION 11 (7)

Study the elements below and answer the questions:

11.1 What is the name of the group that these elements belong to? (1)

11.2 Lithium is used to make batteries, Sodium is used in street lights and Potassium is used to make fertilisers and soaps. The number shown for each element in the picture alongside gives a hint as to why these elements behave so differently, even though they are part of the same group on the Periodic Table.

11.2.1 What is the name of the number shown? (1)

11.2.2 What does this number represent about each element? (1)

11.3 Give the NAME of the element to the right of Potassium on the Periodic Table. (1)

11.4 Use your attached Periodic Table to calculate the number of neutrons that Rubidium has. Show your workings. (2)

11.5 Write down the SYMBOL for any other element in the same period as Lithium. (1)

QUESTION 12 (4)

Write ONLY the numbers **12.1 – 12.4** in your answer booklet and fill in the correct answer for each square of the table next to the relevant number. **DO NOT** copy the table into your booklet.

$^{A}_{Z}X$ notation	Name of element	Number of protons	Number of neutrons	Number of electrons
$^{14}_{7}N$	Nitrogen	**12.1**	7	**12.2**
$^{9}_{4}Be$	**12.3**	4	**12.4**	4

QUESTION 13 (7)

13.1 Name the following compounds.

13.1.1 $MgCO_3$ (2)

13.1.2 $CC\ell_4$ (2)

13.2 Write formulae for the following compounds:

13.2.1 aluminium nitrate (1)

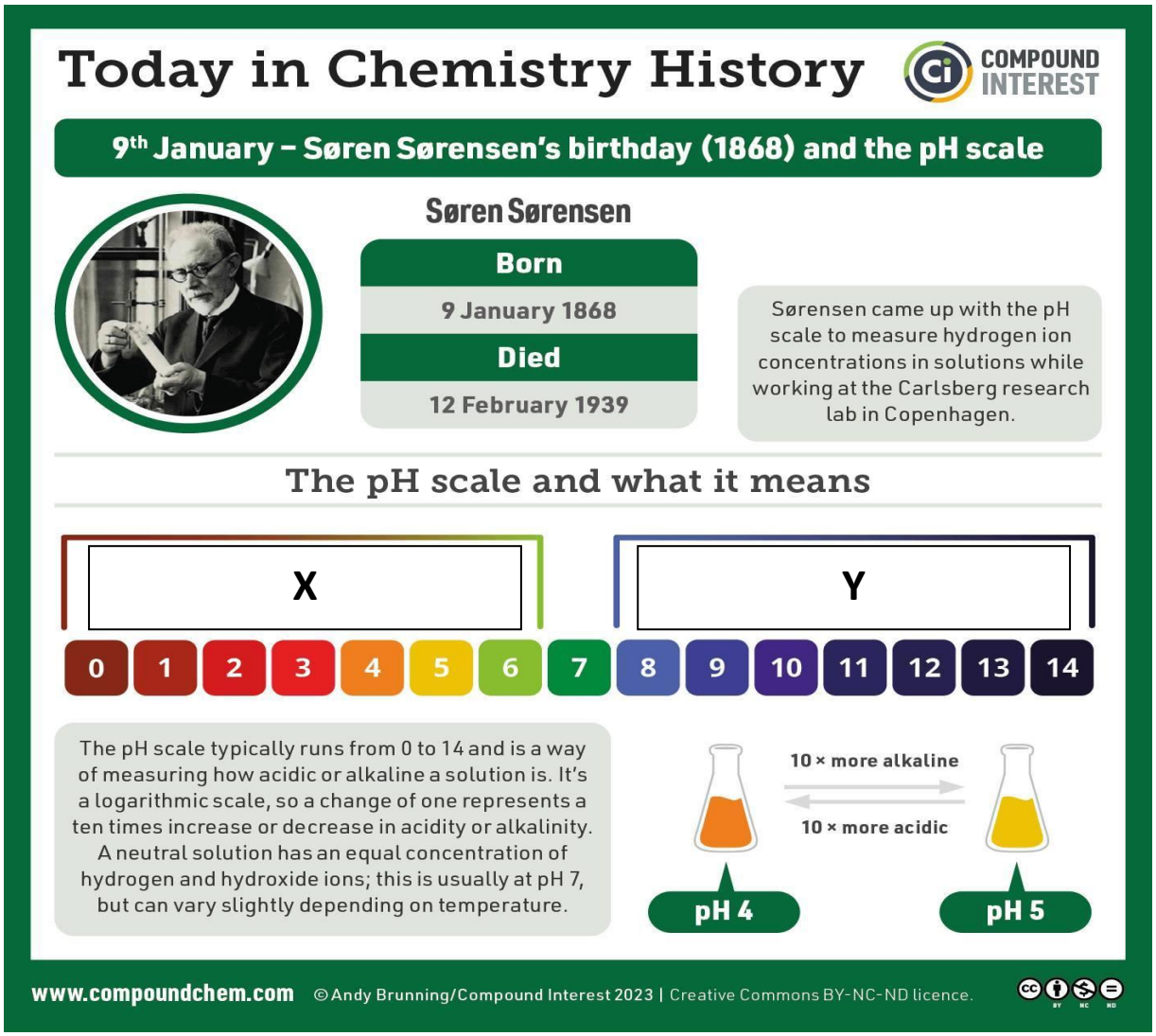
13.2.2 dihydrogen monosulfide (1)

13.3 Re-write and balance the following equation:

$Mg(OH)_2 + HC\ell \rightarrow MgC\ell_2 + H_2O$ (1)

QUESTION 14 (9)

Study the infographic below and answer the questions that follow.



14.1 Examine the pH scale shown in the picture. Write down appropriate labels for:

14.1.1 **X** (1)

14.1.2 **Y** (1)

14.2 Why is the scientist, Soren Sorensen, pictured on this infographic? (1)

14.3 Give another word for "*alkaline*". (1)

14.4 What pH on this scale would be considered neutral? (1)

14.5 If this infographic was printed in colour, what colour do you expect the following blocks would be:

14.5.1 1 (1)

14.5.2 7 (1)

14.5.3 12 (1)

14.6 If Acid **A** has pH 4 and Acid **B** has pH 5 which of the two acids is MORE ACIDIC? Write down only **A** or **B**. (1)

QUESTION 15 (5)

This new "levitating" Chinese train will be the fastest in the world.

Using electro-magnetic force, the maglev train "levitates" above the track with no contact between body and rail.

Taken from FreeThink website, By Reuters Staff | World Economic Forum, April 3, 2022

15.1 Is the force described above a contact or non-contact force? (1)

15.2 Would you describe this force between the train and track as ATTRACTION or REPULSION? (1)

15.3 Copy the 2 bar magnets below and draw an **ATTRACTION** field diagram around them. Make sure to label the <u>poles</u> of the bar magnets to match your field diagram.

(3)

QUESTION 16 (8)

16.1 A car is moving East along a straight road. The car experiences three forces: a forward force of 750 N applied by the engine, a backward force of 200 N due to air resistance, and the car experiences a frictional force of 300 N opposing its motion. Calculate the net / resultant / overall force acting on the car.

(4)

16.2 An astronaut travels to the Moon. (Hint: g = 1,6 m.s^{-2} on the Moon.)

16.2.1 If the astronaut's weight on the moon is 138 N, calculate his mass. (3)

16.2.2 How will the astronaut's mass change when he returns to Earth?

Choose from INCREASE, DECREASE or STAY THE SAME. (1)

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)
1 2,1 **H** 1																	2 **He** 4
3 1,0 **Li** 7	4 1,5 **Be** 9											5 2,0 **B** 11	6 2,5 **C** 12	7 3,0 **N** 14	8 3,5 **O** 16	9 4,0 **F** 19	10 **Ne** 20
11 0,9 **Na** 23	12 1,2 **Mg** 24	21 1,3 **Sc** 45	22 1,5 **Ti** 48	23 1,6 **V** 51	24 1,6 **Cr** 52	25 1,5 **Mn** 55	26 1,8 **Fe** 56	27 1,8 **Co** 59	28 1,8 **Ni** 59	29 1,9 **Cu** 63,5	30 1,6 **Zn** 65	13 1,5 **Aℓ** 27	14 1,8 **Si** 28	15 2,1 **P** 31	16 2,5 **S** 32	17 3,0 **Cℓ** 35,5	18 **Ar** 40
19 0,8 **K** 39	20 1,0 **Ca** 40	21 1,3 **Sc** 45	22 1,5 **Ti** 48	23 1,6 **V** 51	24 1,6 **Cr** 52	25 1,5 **Mn** 55	26 1,8 **Fe** 56	27 1,8 **Co** 59	28 1,8 **Ni** 59	29 1,9 **Cu** 63,5	30 1,6 **Zn** 65	31 1,6 **Ga** 70	32 1,8 **Ge** 73	33 2,0 **As** 75	34 2,4 **Se** 79	35 2,8 **Br** 80	36 **Kr** 84
37 0,8 **Rb** 86	38 1,0 **Sr** 88	39 1,2 **Y** 89	40 1,4 **Zr** 91	41 1,6 **Nb** 92	42 1,8 **Mo** 96	43 1,9 **Tc** –	44 2,2 **Ru** 101	45 2,2 **Rh** 103	46 2,2 **Pd** 106	47 1,9 **Ag** 108	48 1,7 **Cd** 112	49 1,7 **In** 115	50 1,8 **Sn** 119	51 1,9 **Sb** 122	52 2,1 **Te** 128	53 2,5 **I** 127	54 **Xe** 131
55 0,7 **Cs** 133	56 0,9 **Ba** 137	57 1,1 **La** 139	72 1,6 **Hf** 179	73 1,5 **Ta** 181	74 1,7 **W** 184	75 1,9 **Re** 186	76 2,2 **Os** 190	77 2,2 **Ir** 192	78 2,2 **Pt** 195	79 2,4 **Au** 197	80 1,9 **Hg** 201	81 1,8 **Tℓ** 204	82 1,8 **Pb** 207	83 1,9 **Bi** 209	84 2,0 **Po** –	85 2,2 **At** –	86 **Rn** –
87 0,7 **Fr** –	88 0,9 **Ra** 226	89 1,1 **Ac** –															

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
2,9 **Cu** 1,9
63,5

Electronegativity
Elektronegatiwiteit

Approximate relative atomic mass
Benaderde relatiewe atoommassa