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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MAFUKUZELA – GANDHI CIRCUIT

INANDA CENTRAL CLUSTER

GRADE 11

PHYSICAL SCIENCES: PHYSICS AND CHEMISTRY

JUNE 2021

CONTROLLED TEST

MARKS: 50

TIME: 1 hour

This question paper consists of 6 pages, 5 data sheets.

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INSTRUCTIONS AND INFORMATION

1. Write your Name, Surname and Class on your answer book

2. This question paper consists of FOUR questions. Answer ALL the questions in the ANSWER BOOK.

3. Start EACH question on a NEW page in the ANSWER BOOK.

4. Number the answers correctly according to the numbering system used in this question paper.

5. Leave ONE line between two subsections, for example between QUESTION 2.1 and QUESTION 2.2.

6. You may use a non-programmable calculator.

7. You may use appropriate mathematical instruments.

8. You are advised to use the attached DATA SHEETS.

9. Show ALL formulae and substitutions in ALL calculations.

10. Round off your final numerical answers to a minimum of TWO decimal places.

11. Give brief motivations, discussions, et cetera where required.

12. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

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 (1.1–1.4) in the ANSWER BOOK, for example 1.11 D.

1.1 The magnitude of the electrostatic force exerted by charge Q_1 on charge Q_2 is ***F***. When the distance between the two charges is doubled, the magnitude of the electrostatic force, in terms of ***F***, will now be …

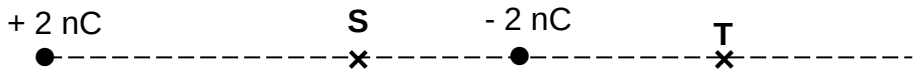
A $\frac{1}{4}F$

B $\frac{1}{2}F$

C $2F$

D $4F$ (2)

1.2 Two charges of + 2 nC and - 2 nC are located on a straight line. **S** and **T** are two points that lie on the same straight line as shown in the diagram below.



Which ONE of the following correctly represents the directions of the RESULTANT electric fields at **S** and at **T**?

	DIRECTION OF THE RESULTANT ELECTRIC FIELD AT POINT S	**DIRECTION OF THE RESULTANT ELECTRIC FIELD AT POINT T**
A	Right	Left
B	Left	Left
C	Right	Right
D	Left	Right

(2)

1.3 The type of intermolecular forces present between HF molecules are…….

A triple bonds.

B dipole-dipole forces.

C hydrogen bonds.

D London forces (2)

1.4 How many cubic decimetres (dm^3) will be occupied by 1, 806 x 10^{24} atoms of Helium gas at STP?

A 22,4 dm^3

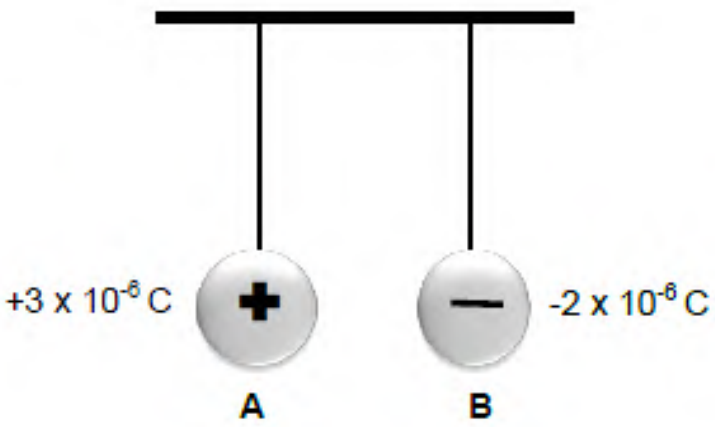
B 48,6 dm^3

C 67,2 dm^3

D 101, 3 dm^3 (2)

QUESTION 2 (Start on a new page.)

Two small identical spheres, **A** and **B**, are suspended on long silk threads, as shown in the sketch below. The spheres carry charges of + 3 x 10^{-6} C and – 2 x 10^{-6} C respectively.





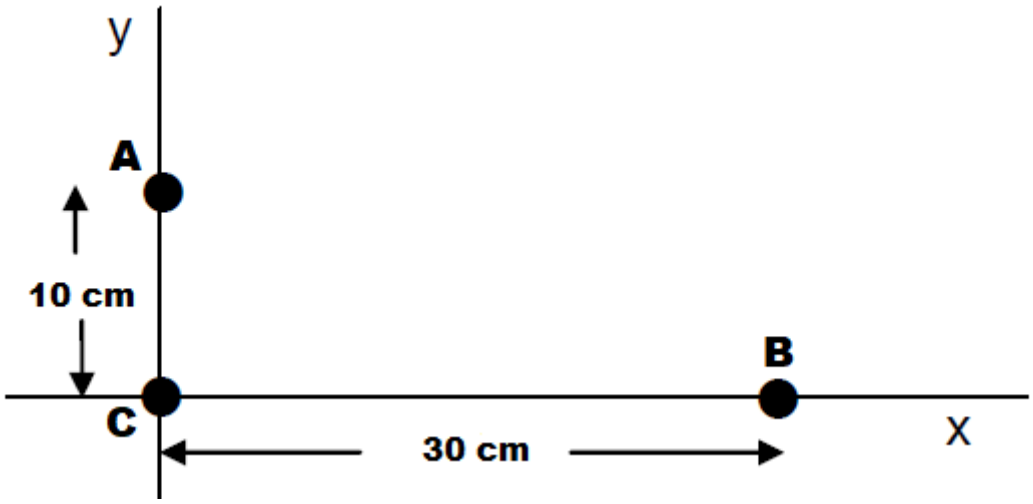
The two sphere are allowed to touch

2.1.1 Will the electrons move from **A to B** or **B to A** (1)

AFTER the spheres are allowed to touch, they are separated and placed back to their original positions

2.1.2 Calculate the new charge on sphere **B** (3)

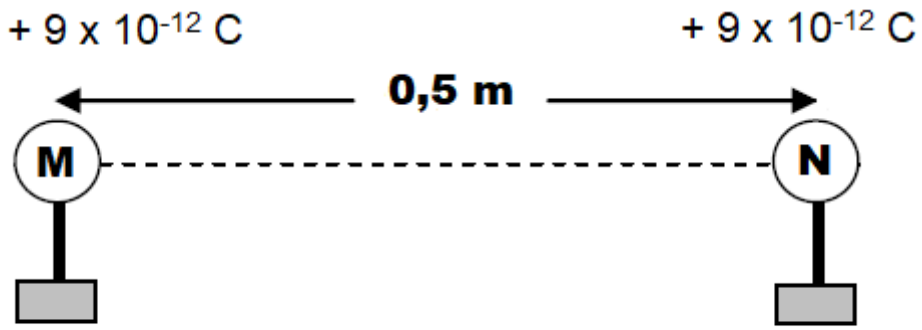
2.2 The spheres, each with the **new charge,** are now placed at points on the *x*-axis and the *y*-axis, as shown in the diagram below, with sphere **C** at the origin. The magnitude of the charge on **sphere C is + 5 µC**



2.2.1 State *Coulomb's law* in words (2)

2.2.2 Calculate the net force experienced by sphere **C** due to sphere **A** and **B** (7)

2.3 Two identical charged spheres **M** and **N,** both carry a charge of + 9 x 10^{-12} C respectively



2.3.1 Define *electric field* at *a point* in words (2)

2.3.2 Draw the net electric field pattern due to charged spheres **M** and **N** (3)
[18]

QUESTION 3 (Start on a new page.)

The boiling points of three substances (**A, B** and **C**) are shown in the table below.

	SUBSTANCES	BOILING POINT (^{0}C)
A	H_2	-252,9
B	N_2	-195,8
C	NH_3	-33,3

3.1 Define the term *intermolecular forces* (2)

3.2 Define the term *boiling point* (2)

3.3 Explain the difference in boiling points between NH_3 and H_2 by referring to the STRENGTH of the intermolecular forces. (3)

3.4 Write down the CHEMICAL FORMULA of the substance in the table that has the highest vapour pressure. Give a reason for your answer by referring to the data on the table. (3)

3.5 Explain why H_2 will evaporate faster than N_2. Refer to the factors that affect evaporation rate. (2)
[12]

QUESTION 4 (Start on a new page.)

2 g of $MgCO_3$ reacts with 25 cm^3 $HC\ell$ of concentration 0,2 $mol \cdot dm^{-3}$ according to the balanced equation.

$$MgCO_{3\,(s)} + 2HC\ell_{\,(aq)} \rightarrow MgC\ell_{2\,(aq)} + H_2O_{\,(\ell)} + CO_{2\,(g)}$$

4.1 Define the term *limiting reagent* (2)

4.2 Determine the limiting reagent in this reaction (5)

Vitamin C, also known as ascorbic acid, is necessary for the growth, development and repair of all body tissues. It is involved in many body functions, including formation of collagen, absorption of iron, the proper functioning of the immune system, wound healing, and the maintenance of cartilage, bones, and teeth.



Vitamin C consists of the elements **carbon, hydrogen and oxygen**. A quantitative analysis of vitamin C revealed that vitamin C had the following percentage composition: **Carbon 40,9% ; Hydrogen 4,6% and Oxygen 54,5%**

4.3 Determine the empirical formula of vitamin C (5)
[12]



DATA FOR PHYSICAL SCIENCES GRADE 11
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11
VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	$9{,}8\ m{\cdot}s^{-2}$
Universal gravitational constant *Universele gravitasiekonstant*	G	$6{,}67 \times 10^{-11}\ N{\cdot}m^2{\cdot}kg^{-2}$
Coulomb's constant *Coulomb se konstante*	k	$9{,}0 \times 10^{9}\ N{\cdot}m^2{\cdot}C^{-2}$
Charge on electron *Lading op elektron*	-e	$-1{,}6 \times 10^{-19}\ C$
Mass of Earth *Massa van Aarde*	M	$5{,}98 \times 10^{24}\ kg$
Radius of Earth *Radius van Aarde*	R_E	$6{,}38 \times 10^{6}\ m$

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INSERT DATA SHEET FOR PHYSICS AND CHEMISTRY

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