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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION
VHEMBE EAST DISTRICT

VHEMBE EAST DISTRICT

NATIONAL
SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES
TERM 1 CONTROLLED TEST
07 MARCH 2022

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MARKS: 100

TIME: 2 hours

This Question paper consists of 13 pages including the cover page and DATA SHEETS

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INSTRUCTIONS AND INFORMATION

1. Write your name on the ANSWER SCRIPT.
2. This question paper consists of 6 questions. Answer ALL the questions in the ANSWER SCRIPT.
3. Number the answers correctly according to the numbering system used in this question paper
4. Leave ONE line between two sub questions, for example between QUESTION 2.1 QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEET ANSWER SCRIPT..
8. Show ALL formulae and substitutions in ALL calculations.
9. Round off your final numerical answers to a minimum of TWO decimal places.
10. Give brief motivations, discussions etc where required.

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QUESTION 1: MULTIPLE – CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER SCRIPT , for example 1.11 E.

1.1 Which ONE of the following groups of elements are classified as halogens?

A. Li, Na, K
B. Ne, Ar, Kr
C. F, Cℓ, Br
D. Si, Ge, As (2)

1.2 According to the kinetic molecular theory the particles of a solid ……

A. vibrate in their fixed positions and have a fixed shape
B. are free to move and are compressible
C. are free to move and have a fixed shape.
D. vibrate in their fixed positions and are compressible. (2)

1.3 Which ONE of the following substances undergoes the process of sublimation?

A. Water
B. Wood
C. Solid carbon dioxide
D. Sodium chloride (2)

1.4 Which ONE of the molecules below contains the greatest number of atoms?

A. N_2
B. H_2O
C. CH_4
D. H_2SO_4 (2)

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1.5 The chemical formula for sodium sulphate is ……..

A. $NaSO_4$

B. $Na_2(SO_4)_2$

C. Na_2SO_4

D. $Na(SO_4)_2$ (2)

1.6 An object which is charged positively has

A. Gained electrons

B. Lost electrons

C. Gained protons

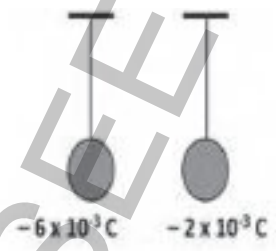
D. Lost protons (2)

1.7 Which of the following is true for metals?

	Thermal conductivity	electrical conductivity
A.	Good	Good
B.	Good	Poor
C.	Poor	Good
D.	Poor	Poor

(2)

1.8 Two insulated, graphite-coated polystyrene spheres are suspended from threads. The spheres are held a small distance apart. The charges on the spheres are -6×10^{-3} C and -2×10^{-3} C.



Which of the following is likely to happen?

A. The spheres move towards each other and cling to one another.

B. The spheres will repel each other.

C. The spheres will swing towards each other, touch each other and move apart again.

D. The spheres will move towards each other, touch each other and become neutral. (2)

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1.9 An object is positively charged if it has more …….

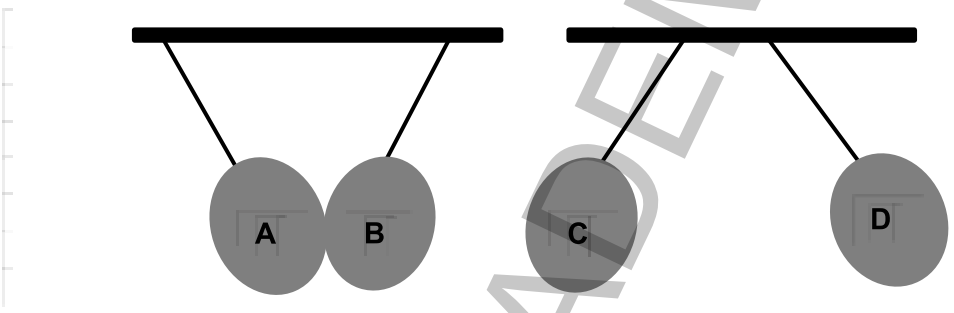
A. electrons than protons.

B. electrons than neutrons.

C. protons than electrons.

D. protons than neutrons. (2)

1.10 Four identical balloons, each carrying a charge, are suspended from a ceiling, as shown in the diagram below.



Ballon B is negatively charged

Which combination is CORRECT regarding the charges on the balloons?

	SIGN OF CHARGE ON A	SIGN OF CHARGE ON C	SIGN OF CHARGE ON D	
A.	–	+	–	
B.	+	+	+	
C.	+	–	–	
D.	+	+	–	(2)

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QUESTION 2

2.1 Define the term *pure substance*. (2)

2.2 Complete the table below. Write down only the answer next to the question number (2.2.1–2.2.4) in your ANSWER SCRIPT.

SUBSTANCE	ELEMENT/ COMPOUND	REASON
Magnesium	2.21	2.2.2
Water	2.2.3	2.2.4

(4)

2.3 Explain why pots and pans are made of metal but the handles are made of plastic or wood. (2)

2.4 Write down the chemical formulae of the following compounds:

2.4.1 Table salt (2)

2.4.2 Calcium hydroxide (2)

2.4.3 Ammonium Phosphate (2)

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QUESTION 3

3.1 The table below shows the boiling and melting points of substances **A** to **D**.

SUBSTANCE	BOILING POINT ^{0}C	MELTING POINT ^{0}C
A	78	177
B	444	133
C	-188	- 220
D	184	90

3.1.1 Define the term *boiling point*. (2)

3.1.2 From the above table, write down the LETTER (A–D) that represents the substance which is a:

(a) liquid at 100 °C (1)

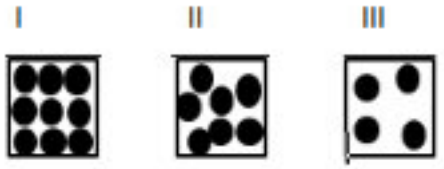
(b) Solid at 100 °C (1)

(c) Gas at 25°C (1)

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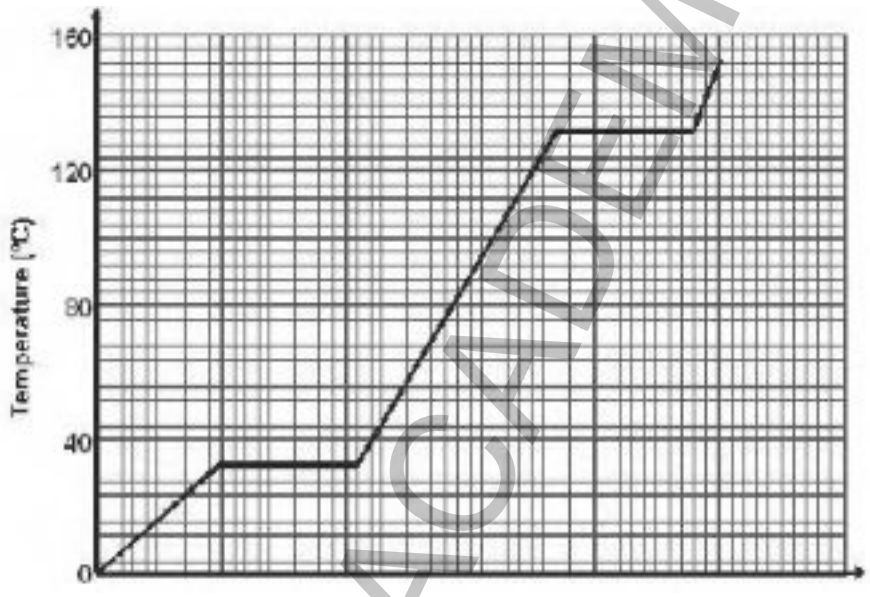
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3.1.3 Which ONE of the following diagrams represents the PARTICLE ARRANGEMENT of substance **A** at –120 °C? Write down only I, II or III.



(2)

3.2 The heating curve of a substance is shown below.



3.2.1 Write down the physical state of the substance at t = 15 minutes (1)

3.2.2 What is the boiling point of the substance? (1)

3.2.3 How will the average kinetic energy of the particles of the substance be affected between:
(Write down only INCREASES, DECREASES or REMAINS THE SAME.)

(a) t = 0 minutes and t = 5 minutes. (1)

(b) t = 5 minutes and t = 10 minutes. (1)

3.2.4 Refer to the kinetic molecular theory to fully explain the answer to QUESTION 3.2.3(b). (3)

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QUESTION 4

Study the table below and answer the questions that follow.

ELEMENT / ION	NUMBER OF PROTONS	NUMBER OF NEUTRONS	NUMBER OF ELECTRONS
P	11	12	11
Q	14	16	14
R	16	16	16

4.1 Define the term *atomic number.* (2)

4.2 Write down the:

4.2.1 Chemical symbol of element **Q** using the notation $^{A}_{Z}X$ (2)

4.2.2 Element (**P**, **Q** or **R**) that is an alkali metal (1)

4.2.3 Chemical symbol of **R** (2)

4.3 Element **P** reacts with oxygen to form the compound with the chemical formula P_2O.

4.3.1 Predict the chemical formula that element *Li* in the periodic table will form when it reacts with oxygen. (2)

4.3.2 Explain the answer to QUESTION 4.3.1. (2)

4.4 What is the trend in ionization energy as you move from element **P** to element **R**? Write down only INCREASES, DECREASES or REMAINS THE SAME. Explain the answer. (4)

4.5 How many electrons does an ION of element **P** have? Draw the Aufbau diagram of this ion. (3)

4.6 When orbitals of identical energy are available, electrons are placed in individual orbitals before they are paired. Give the name of this rule. (1)

4.7 Element **Y** occurs as these isotopes in the following proportions:
Y – 28(92, 23%); **Y** – 29 (4, 68%); **Y** – 30(3, 09%)
Calculate the relative atomic mass of element **Y**. (3)

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QUESTION 5

5.1 Define the term *covalent bond.* (2)

5.2 Draw Lewis diagrams for the following molecules:

5.2.1 N_2 (2)

5.2.2 NH_3 (2)

5.3 Potassium burns in chlorine gas to form potassium chloride.

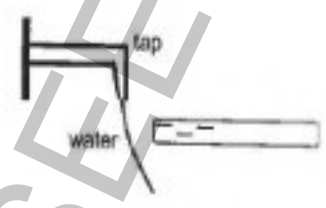
5.3.1 Name the type of bonding that occurs in potassium chloride. (1)

5.3.2 By means of Lewis diagrams, show the formation of potassium chloride. (5)

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QUESTION 6

A Learner in Physical Sciences class rubs his hair with a plastic rod. The rod becomes negatively charged. The learner now opens a tap so that thin stream water runs from it. When the rod is brought close to the water without touching it, it is observed that the water bends towards the rod as shown in the diagram below.



6.1 Give a reason why the steam of water bends towards the rod. (3)

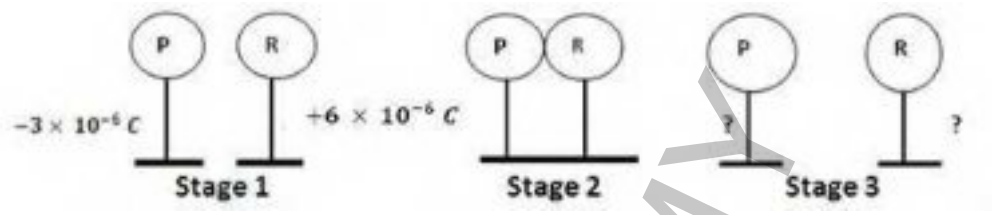
During rubbing process 10^{14} electrons are transferred to the rod.

6.2 Calculate the net charge carried by the rod after rubbing. (3)

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6.3 Two small metal spheres, on insulated stands, carry charges of $-3 \times 10^{-6}\ C$ and $+6 \times 10^{-6}\ C$ respectively. The spheres were moved to touch one another, got separated and then returned to their original positions



6.3.1 Which ONE of the two spheres, **P** or **R**, at Stage 1, has electron deficiency? (1)

6.3.2 Will the spheres at Stage 3 **Attract** or **Repel**? (1)

6.3.3 Write down the reason for your answer in 6.3.2 above. (2)

6.3.4 State the *principle of Conservation of Charge.* (2)

6.3.5 Calculate the charge on **Sphere P** at **Stage 3** (3)

6.3.6 Comparing stage 1 and stage 3, determine the number of electrons transferred. (3)

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TOTAL: 100

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4.2 Information sheets – Paper 1 (Physics)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	$9,8\ m{\cdot}s^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	$3,0 \times 10^{8}\ m{\cdot}s^{-1}$
Planck's constant *Planck se konstante*	h	$6,63 \times 10^{-34}\ J{\cdot}s$
Charge on electron *Lading op elektron*	e	$-1,6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9,11 \times 10^{-31}\ kg$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t$

WORK, ENERGY AND POWER/*ARBEID, ENERGIE EN DRYWING*

$U = mgh$ or/*of* $E_p = mgh$	$K = \frac{1}{2}mv^2$ or/*of* $E_k = \frac{1}{2}mv^2$

WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*

$v = f\lambda$	$T = \frac{1}{f}$
$E = hf$ or/*of* $E = h\frac{c}{\lambda}$	

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

$Q = I\Delta t$	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$
$R_s = R_1 + R_2 + \ldots$	$V = \frac{W}{Q}$

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4.3 Information sheets – Paper 2 (Chemistry)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^θ	$1{,}013 \times 10^5$ Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	$22{,}4\ dm^3 \cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^θ	273 K
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}$ C
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ OR $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$

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

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce 140	Pr 141	Nd 144	Pm	Sm 150	Eu 152	Gd 157	Tb 159	Dy 163	Ho 165	Er 167	Tm 169	Yb 173	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

Electronegativity
Elektronegatiwiteit

29 Cu 1,9 63,5

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa

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