education

Department of Education
FREE STATE PROVINCE

See corrections/notes in paper.

GRADE 11
PROVINCIAL FORMAL ASSESSMENT TASK

TERM 3 - 2016

PHYSICAL SCIENCES
CONTROL TEST 2

TIME: 2 HOURS

MARKS: 100

This paper consists of 8 pages and 3 information sheets.

INSTRUCTIONS AND INFORMATION

1. Write your name and other applicable information in the appropriate spaces on the ANSWER BOOK.
2. The question paper consists of EIGHT (8) questions. Answer ALL 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 sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable pocket 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 where applicable.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

QUESTION 1

Four options are given as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and only write down the letter A, B, C or D next to the question number (2.1 – 2.10) in your ANSWER BOOK.

1.1 The magnitude of the electric field on a distance *r* from a point charge is **E**.

The magnitude of the electric field on a distance *2r* from the same point charge will be ….

A ¼**E**.

B ½**E**.

C 2**E**.

D 4**E**. (2)

1.2 One volt is:

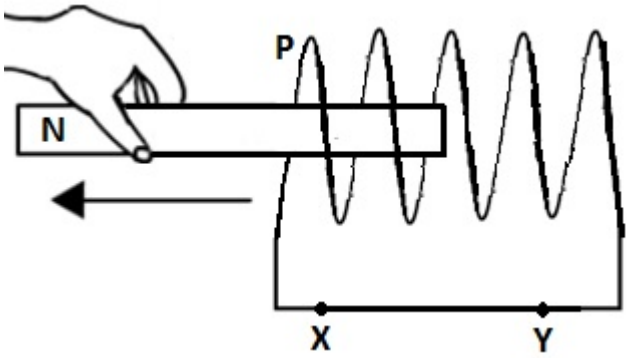
A One coulomb of charge per joule

B One joule per coulomb of charge

C One joule coulomb of charge

D One joule per second (2)

1.3 A bar magnet is moved out of a coil as shown in the diagram below. **X** and **Y** are two points on the conductor.



Which ONE of the following CORRECTLY describes the direction of the current and the polarity of end **P** of the coil?

	DIRECTION OF CURRENT	**POLARITY OF END P OF THE COIL**
A	X to Y	North
B	X to Y	South
C	Y to X	North
D	Y to X	South

(2)

1.4 The minimum resistance that can be obtained by connecting two 4 Ω resistors is …

A 0,5 Ω

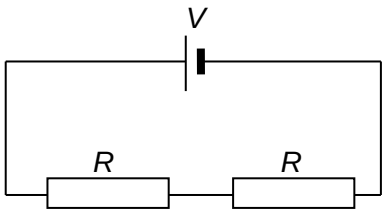
B 2 Ω

C 3 Ω

D 8 Ω (2)

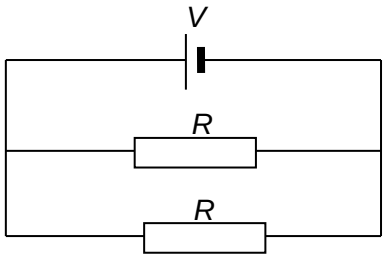
1.5 The two resistors in **circuit 1** below are identical. They are connected in series to a cell of emf **V** and negligible internal resistance. The power dissipated by each resistor is **P**.

Circuit 1



The two resistors are now connected in parallel, as shown in **circuit 2** below.

Circuit 2



The power dissipated by each resistor in the **circuit 2** is …

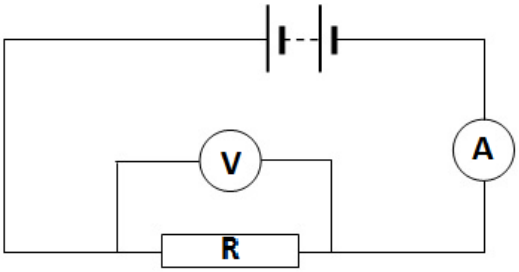
A 2P.

B 4P.

C 8P.

D 16P. (2)

1.6 A battery with a potential difference *V* is connected to resistor **R** as shown in the circuit diagram below.



A second resistor of the SAME RESISTANCE is now connected in parallel with resistor ***R***.

How will the voltmeter and ammeter readings change when the second resistor is connected in the circuit?

	Voltmeter reading	**Ammeter reading**
A	Decreases	Increases
B	Increases	Decreases
C	Stays the same	Increases
D	Increases	Increases

(2)

1.7 10 moles of hydrogen gas (H_2) and 2,5 moles of nitrogen gas (N_2) are mixed and allowed to react to form ammonia (NH_3) according to the following balanced equation:

$$3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$$

If 4 moles of $NH_3(g)$ is formed during the reaction, the number of moles of $H_2(g)$ and $N_2(g)$ that remain in the container are respectively:

	Moles of $H_2(g)$	**Moles of $N_2(g)$**
A	0	0
B	7	1,5
C	4	0,5
D	4	2

(2)

1.8 Which ONE of the following statements about a chemical reaction is CORRECT? The actual yield of a chemical reaction is usually...

A equal to the percentage yield.

B. greater than the percentage yield.

C. less than the theoretical yield.

D. greater than the theoretical yield. (2)

1.9 A certain amount of NaCℓ is dissolved in 100cm^3 of water. The concentration is calculated as *C*. What will the concentration in terms of C be, if four (4) times the amount of NaCℓ is dissolved in 1 200 dm^3 of water?

A ⅓*C*.

B. *C*.

C. 9*C*.

D. 27*C*. (2)

1.10 A certain oxide is formed when 0,5 mole of element x combines with 0,25 mole of oxygen gas. Which ONE of the following is the correct empirical formula of this oxide?

A XO.

B X_2O.

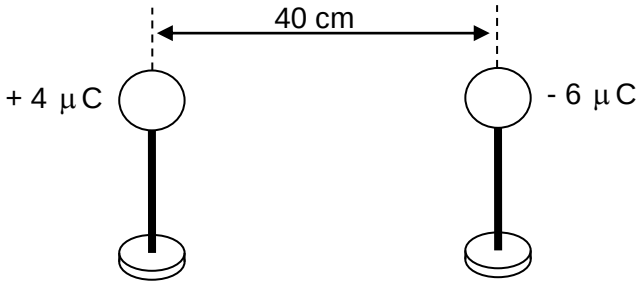
C X_4O.

D X_8O. (2)

[20]

QUESTION 2

Two identical metal spheres on insulated stands carry charges of +4 µC and -6 µC respectively. The spheres are arranged with their centres 40 cm apart, as shown below.



2.1 State *Coulomb's law* in words. (3)

2.2 Calculate the magnitude of the force exerted by each sphere on the other. (4)

2.3 By what factor will the magnitude of the force in QUESTION 2.2 change if the distance between the spheres is halved? (Do not calculate the new value of the force.) (1)
~~**[8]**~~

Paper does not count 100; suggestion was to make this two marks as a unit.

(2)
[9]

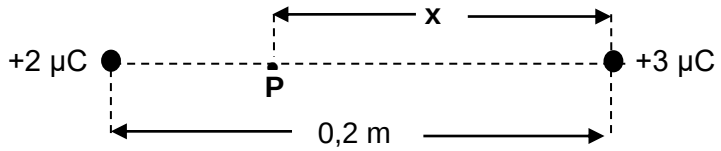
QUESTION 3

A point charge has a charge of +2 µC.

3.1 Define the term *electric field at a point* in words. (2)

3.2 Draw the electric field pattern around the above point charge. (3)

A second point charges of + 3 µC is now placed a distance of 0,2 m from the above point charge as shown below. **P** is a point on the line joining the two charges, a distance of *x* m from the 3 µC charge, such that the NET ELECTRIC FIELD AT POINT **P** is zero.



3.3 Calculate the distance **x**. (7)
[12]

QUESTION 4

A 200-turn circular coil is placed in a magnetic field such that the field is perpendicular to the surface of each loop of the coil at all times. As the coil rotates, the magnetic field changes at a constant rate from 0,22 T to 0,42 T in 3,2 x 10^{-2} s. The emf induced in the coil during this time is -15,2 V.

4.1 State *Faraday's law of electromagnetic induction* in words. (2)

4.2 Calculate the:

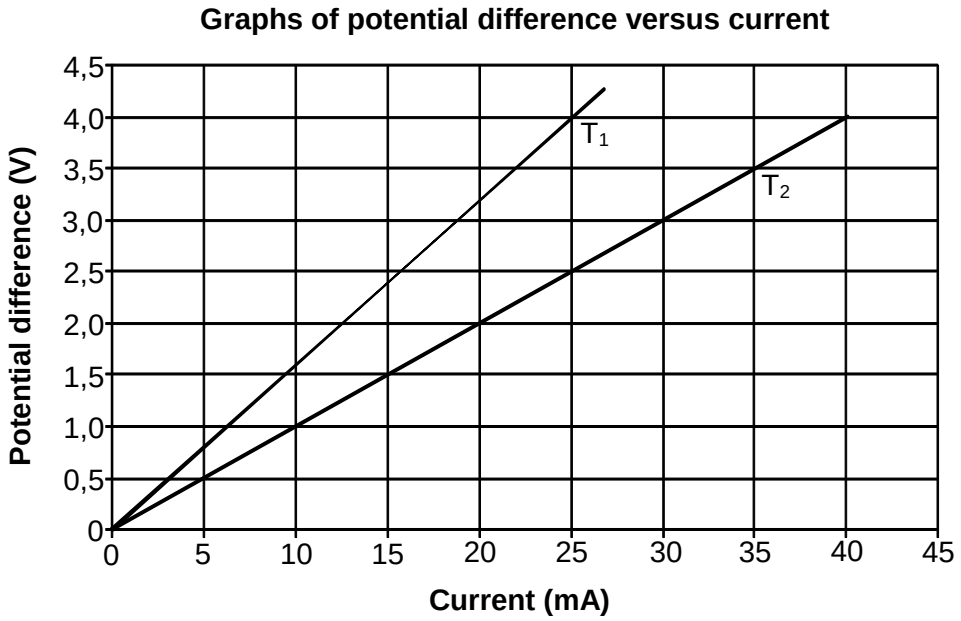
4.2.1 Change in magnetic flux through the circular coil (4)

4.3.2 Radius of the circular coil (4)

4.4 The coil now rotates in the opposite direction and the magnetic field changes from 0,42 T to 0,22 T in the same time interval. Write down the induced emf. (1)
[11]

QUESTION 5

The two graphs below represent the relationship between potential difference and current in a metal wire at two different constant temperatures, T_1 and T_2.



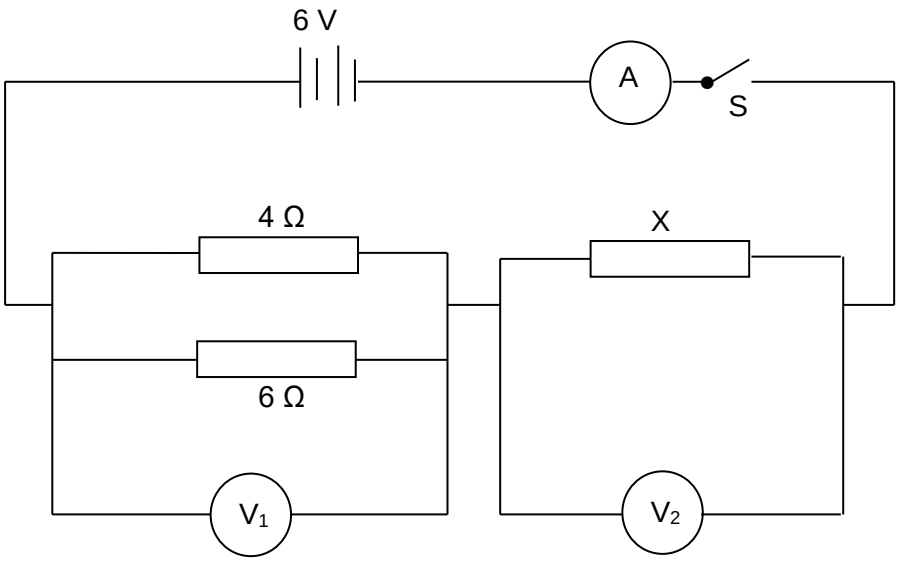
5.1. Calculate the resistance of the metal wire at temperature T_1. (3)

5.2 The metal wire is an ohmic conductor. Justify this statement by referring to the graphs. (1)

5.3 Calculate the power dissipated in the metal wire when the current in it is 25 mA at temperature T_2. (4)
[8]

QUESTION 6

In the circuit below the internal resistance of the 6 V battery is negligible. The resistance of the connecting wires is negligible. When switch **S** is closed, the current in the 6 Ω resistor is 0,6 A.



6.1 State *Ohm's law* in words. (2)

6.2 Calculate the:

6.2.1 Current passing through the 4 Ω resistor (4)

6.2.2 Total current in the circuit (2)

6.2.3 Resistance **X** (3)

The 4 Ω resistor gets hotter than the 6 Ω resistor after a while.

6.5 Explain this observation. (3)
[14]

QUESTION 7

Sodium sulphite is a soluble salt used as a preservative for dried fruit and meat.

It is found that a 5,235 g sample of sodium sulphite contains 1,911 g of sodium, 1,329 g of sulphur and 1,995 g of oxygen.

7.1 Determine the empirical formula of sodium sulphite. (9)

7.2 If the molar mass of sodium sulphite is 126 $g \cdot mol^{-1}$, what is its molecular formula? (2)
[11]

QUESTION 8

8.1 Define *one mole* of a substance. (2)

8.2 Iron (Fe) reacts with sulphur (S) to form iron sulphide (FeS) according to the following balanced equation:

$$Fe(s) + S(s) \rightarrow FeS(s)$$

8.2.1 Use a calculation to show which of the two substances will be completely used up if 20 g of Fe and 10 g of S are mixed and heated. (5)

8.2.2 How many grams of the other substance will remain unused? (2)

8.3 Magnesium burns in air to form magnesium oxide according to the following balanced equation:

$$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$$

If the percentage yield of this reaction is 80%, calculate the mass of magnesium that needs to be burned to produce 30 g of magnesium oxide. (6)
[15]

GRAND TOTAL: 100

DATA FOR PHYSICAL SCIENCES GRADE 11 (PHYSICS)
CONTROL TEST - TERM 3

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11 (FISIKA)
KONTROLETOETS - KWARTAAL 3

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

NAME / *NAAM*	SYMBOL / *SIMBOOL*	VALUE / *WAARDE*
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	$-1,6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9,11 \times 10^{-31}\ kg$

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

ELECTROSTATICS/*ELEKTROSTATIKA*

$F=\frac{kQ_1Q_2}{r^2}$ $(k = 9,0 \times 10^{9}\ N{\cdot}m^2{\cdot}C^{-2})$	$E=\frac{F}{q}$
$E=\frac{kQ}{r^2}$ $(k = 9,0 \times 10^{9}\ N{\cdot}m^2{\cdot}C^{-2})$	$V=\frac{W}{Q}$

ELECTROMAGNETISM/*ELEKTROMAGNETISME*

$\varepsilon=-N\frac{\Delta\Phi}{\Delta t}$	$\Phi=BA\cos\theta$

CURRENT ELECTRICITY/*STROOMELEKTRISITEIT*

$I=\frac{Q}{\Delta t}$	$R=\frac{V}{I}$
$\frac{1}{R}=\frac{1}{r_1}+\frac{1}{r_2}+\frac{1}{r_3}+...$	$R=r_1+r_2+r_3+...$
$W = Vq$ $W = VI\Delta t$ $W = I^2R\Delta t$ $W = \frac{V^2\Delta t}{R}$	$P=\frac{W}{\Delta t}$ $P = VI$ $P = I^2R$ $P=\frac{V^2}{R}$

DATA FOR PHYSICAL SCIENCES GRADE 11 (CHEMISTRY)
CONTROL TEST - TERM 3

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11 (CHEMISTRY)
KONTROLETOETS - KWARTAAL 3

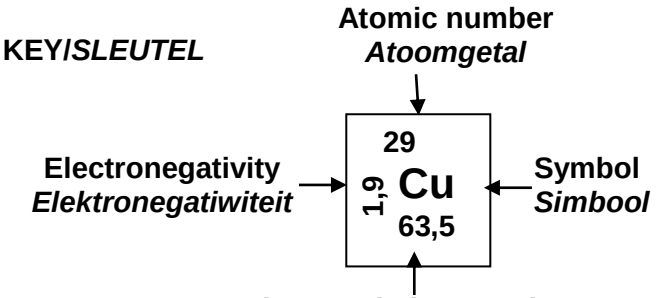
TABLE 1: PHYSICAL CONSTANTS / *TABEL 1: FISIESE KONSTANTES*

NAME / *NAAM*	SYMBOL / *SIMBOOL*	VALUE / *WAARDE*
Avogadro's constant *Avogadrokonstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	$22{,}4\ dm^3 \cdot mol^{-1}$
Standard pressure *Standaarddruk*	p^θ	$1{,}013 \times 10^5\ Pa$
Standard temperature *Standaardtemperatuur*	T^θ	273 K
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}\ C$
Molar gas constant *Molêre gaskonstante*	R	$8{,}31\ J \cdot K^{-1} \cdot mol^{-1}$

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$	$pV = nRT$
$n = \frac{m}{M}$	$c = \frac{n}{V}$
$c = \frac{m}{MV}$	$\frac{n_a}{n_b} = \frac{c_aV_a}{c_bV_b}$ / $\frac{n_s}{n_b} = \frac{c_sV_s}{c_bV_b}$

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