



# education

Department of  
Education  
FREE STATE PROVINCE

GRADE 10  
PROVINCIAL FORMAL ASSESSMENT TASK

SEPTEMBER 2016

PHYSICAL SCIENCES  
CONTROL TEST  
(PHYSICS AND CHEMISTRY)

TIME: 2 HOURS

MARKS: 100

**This paper consists of 8 pages and 2 information sheets.**

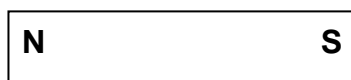
**INSTRUCTIONS AND INFORMATION**

1. Write your name and grade on the ANSWER BOOK.
2. This question paper consists of seven (7) questions. Answer ALL the questions.
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. Write neatly and legibly.
7. Show ALL formulae and substitutions in ALL calculations.
8. You may use a non-programmable calculator.
9. You may use appropriate mathematical instruments.
10. Round off your FINAL numerical answers to a minimum of TWO decimal places.
11. YOU ARE ADVISED TO USE THE ATTACHED DATA SHEETS.
12. Give brief motivations, discussions, et cetera where required.

**QUESTION 1**

Four options are given 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 your ANSWER BOOK.

- 1.1 Consider the magnet below:



If it is cut into two pieces, which ONE of the options below is correct?

A 

N
---

S
---

B 

N	N
---	---

S	S
---	---

C 

N	S
---	---

N	S
---	---

D The magnet will lose its polarity.

(2)

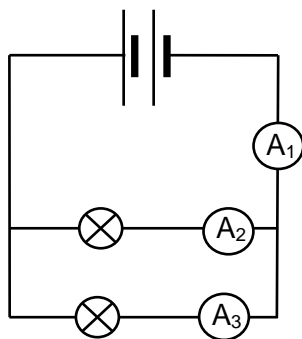
1.2 Amy rubs a glass rod with a silk cloth. The glass rod ...

- A gains electrons and becomes positively charged.
- B gains protons and becomes positively charged.
- C loses electrons and become positively charged.
- D loses protons and becomes positively charged. (2)

1.3 Resistors connected in series are called ... dividers.

- A current
- B charge
- C time
- D potential difference (2)

1.4 Consider the circuit diagram below. The light bulbs are NOT necessarily identical.



The reading on  $A_2$  will be equal to ...

- A the reading on  $A_1$ .
- B half the reading on  $A_1$ .
- C the reading on  $A_3$  minus the reading on  $A_1$ .
- D the reading on  $A_1$  minus the reading on  $A_3$ . (2)

1.5 A reaction in which a hydrogen ion ( $H^+$ ) is transferred from one of the reactants to another is known as a/an ...

- A gas forming reaction.
- B acid-base reaction.
- C precipitation reaction.
- D decomposition reaction. (2)

1.6 Avogadro's number represents the number of atoms in ...

- A 12 g of C-12.
- B 320 g of sulphur.
- C 32 g of oxygen.
- D 12,7 g of iodine. (2)

1.7 2 moles of hydrogen gas at STP occupy a volume of ...

- A 11,2 dm<sup>3</sup>.
- B 44,8 dm<sup>3</sup>.
- C 2 dm<sup>3</sup>.
- D 22,4 dm<sup>3</sup>. (2)

1.8 A compound consists of X<sup>2+</sup> and Y<sup>3-</sup> ions.

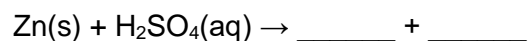
A possible formula for the compound could be:

- A 3X2Y
- B X<sub>2</sub>Y<sub>3</sub>
- C X<sub>3</sub>Y<sub>2</sub>
- D (XY)<sub>6</sub> (2)

1.9 An aqueous mixture in a test tube contains Ag<sup>+</sup>(aq), K<sup>+</sup>(aq) and Pb<sup>2+</sup>(aq). How many different SOLIDS will form when NaCl(aq) is added to this mixture?

- A 0
- B 1
- C 2
- D 3 (2)

1.10 Consider the following incomplete equation for a chemical reaction:



Which ONE of the following correctly completes the above equation?

- A ZnS + H<sub>2</sub>O
  - B ZnSO<sub>4</sub> + H<sub>2</sub>
  - C ZnSO<sub>4</sub> + H<sub>2</sub>O
  - D ZnO + H<sub>2</sub>S (2)
- [20]**

**QUESTION 2 (Start on a new page.)**

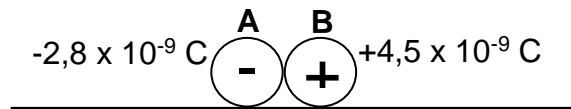
- 2.1 What is meant by the term *magnetic field*? (2)
- 2.2 Write down the NAME or SYMBOL of two ferromagnetic materials. (2)
- 2.3 Two bar magnets are placed close to one another as shown in the diagram below.



- 2.3.1 Draw the magnetic field pattern BETWEEN the two magnets. (3)
- 2.3.2 The magnets are now moved further apart. How will this change influence the magnetic field pattern in QUESTION 2.3.1 (1)
- [8]**

**QUESTION 3 (Start on a new page.)**

Two identical metal spheres, **A** and **B**, on an insulated surface carry charges of  $-2,8 \times 10^{-9} \text{ C}$  and  $+4,5 \times 10^{-9} \text{ C}$  respectively. The spheres are brought in contact with each other.

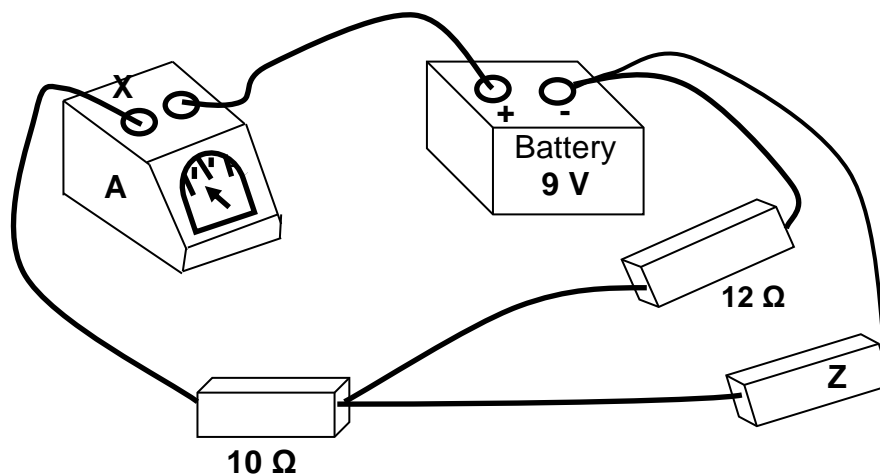


It is observed that the spheres move apart after contact.

- 3.1 Explain the above observation. (2)
- 3.2 Calculate the NEW charge on each sphere after they moved apart. (2)
- 3.3 Calculate the change in charge on sphere **B**. (3)
- [7]**

**QUESTION 4 (Start on a new page.)**

The sketch below shows an electric circuit with various components. The emf of the battery is 9 V and the instrument labelled **A** registers a reading of 1,5 A. The value of the resistance of resistor **Z** is unknown.



4.1 Draw the above circuit using CORRECT symbols. (5)

4.2 Define the term *electric current*. (2)

4.3 Identify the polarity indicated as **X** for instrument **A**. Choose from POSITIVE, NEGATIVE or NEUTRAL. (1)

4.4 Explain your choice in QUESTION 4.3. (2)

The TOTAL (effective) resistance of **Z** and the 12 Ω resistor is 8 Ω.

4.5 Calculate the:

4.5.1 Resistance of **Z** (4)

4.5.2 Amount of charge transferred between the terminals of the battery in 1 minute (4)

4.5.2 Amount of work done to transfer the charge referred to in QUESTION 4.5.2 (3)

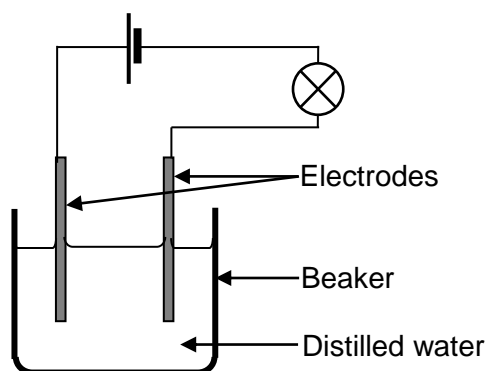
4.6 Explain by referring to the energy conversion why the battery goes flat after a while. (1)

**[22]**

The issue is about the MEANING of the negative (black terminal) and positive (red connection) signs on the terminals of an ammeter. Do they indicate polarity of the ammeter as such, or do they merely show which one must be connected to the positive terminal of the cell and which one to the negative terminal of the cell. We know for sure that an ammeter must be connected in series, but the signs on the ammeter contacts seem to be a problem at this stage.

**QUESTION 5 (Start on a new page.)**

The setup below is used in a class to investigate the conductivity of a solution. The beaker is initially filled with 250 cm<sup>3</sup> distilled water.



It is observed that the bulb does not glow.

5.1 Give a reason why the bulb does not glow. (1)

5.2 A 15 g sample of ammonium nitrate is now dissolved in distilled water. It is observed that the bulb glows brightly.

5.2.1 Define the term *electrolyte*. (2)

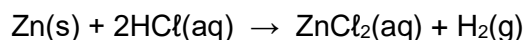
5.2.2 Write down the FORMULAE of the ions present in this solution. (2)

5.2.3 Calculate the concentration of the ammonium nitrate solution. (4)

**[9]**

**QUESTION 6 (Start on a new page.)**

6.1 The reaction between zinc and dilute hydrochloric acid is represented by the balanced equation below.



During an experiment, 1,5 g of zinc reacts with excess dilute hydrochloric acid to produce hydrogen gas at STP.

6.1.1 What is represented by the acronym *STP*. (1)

Calculate the:

6.1.2 Number of moles of zinc used (3)

6.1.3 Volume (in dm<sup>3</sup>) of hydrogen gas produced at STP (3)

6.1.4 Number of chlorine atoms present in the ZnCl<sub>2</sub> produced (4)

- 6.2 The molar mass of hydrated sodium carbonate, with formula  $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ , is  $268 \text{ g} \cdot \text{mol}^{-1}$ .

Calculate the number of moles water of crystallisation (x) in the compound. (4)

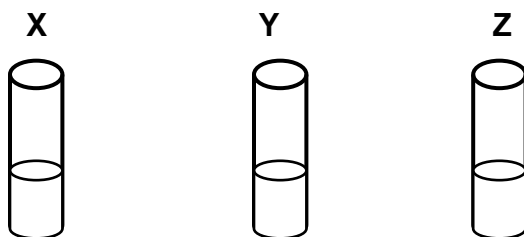
- 6.3 The empirical formula of a certain compound is to be determined. On analysis of a sample of the compound it was found to have the following composition:  
71,66% Cl; 24,27% C; 4,07% H

6.3.1 Define the term *empirical formula*. (2)

6.3.2 Determine the empirical formula of the compound. Show ALL calculations. (6)  
**[23]**

### QUESTION 7 (Start on a new page.)

The test tubes marked **X**, **Y** and **Z** each contain a solution of unknown POTASSIUM SALT.



The following observations were made during a practical investigation to identify the solutions in each of the test tubes.

	Observations
<b>A</b>	A white precipitate is formed when $\text{AgNO}_3$ is added to test tube <b>X</b> .
<b>B</b>	A yellow precipitate is formed when $\text{AgNO}_3$ is added to test tube <b>Y</b> .
<b>C</b>	A cream precipitate is formed when $\text{AgNO}_3$ is added to test tube <b>Z</b> .

- 7.1 Write down the NAME of the solution used in the test for halides. (1)
- 7.2 Use the above information to identify the solutions in each of the test tubes **X**, **Y** and **Z**. First write down the LETTER that represents the test tube and next to it the NAME of the solution. (6)
- 7.3 Write down the FORMULA of the ANION present in the yellow precipitate. (1)
- 7.4 Write down a balanced chemical equation for the reaction taking place in test tube **X**. (3)  
**[11]**

**GRAND TOTAL: 100**



**DATA FOR PHYSICAL SCIENCES GRADE 10****GEGEWENS VIR FISIESTE WETENSKAPPE GRAAD 10****TABLE 1: PHYSICAL CONSTANTS / TABEL 1: FISIESTE KONSTANTES**

NAME / NAAM	SYMBOL / SIMBOOL	VALUE / WAARDE
Speed of light in a vacuum <i>Spoed van lig in 'n vacuum</i>	c	$3,0 \times 10^8 \text{ m}\cdot\text{s}^{-1}$
Plank's constant <i>Plank se konstante</i>	h	$6,63 \times 10^{-34} \text{ J}\cdot\text{s}$
Charge on electron <i>Lading op electron</i>	e	$-1,6 \times 10^{-19} \text{ C}$
Electron mass <i>Elektronmassa</i>	$m_e$	$9,11 \times 10^{-31} \text{ kg}$
Avogadro's constant <i>Avogadro-konstante</i>	$N_A$	$6,02 \times 10^{23} \text{ mol}^{-1}$
Molar gas volume at STP <i>Molêre gasvolume by STD</i>	$V_m$	$22,4 \text{ dm}^3\cdot\text{mol}^{-1}$

**TABLE 2: PHYSICS FORMULAE / TABEL 2: FISIKA FORMULES****ELECTRIC CIRCUITS / ELEKTRIESE STROOMBANE**

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

**TABLE 3: CHEMISTRY FORMULAE/TABEL 3: CHEMIE FORMULES**

$n = \frac{m}{M}$	$c = \frac{n}{V}$		
	or/of		
	$c = \frac{m}{MV}$	$n = \frac{V}{V_m}$	$n = \frac{N}{N_A}$

# THE PERIODIC TABLE OF ELEMENTS/ PERIODIEKE TABEL VAN ELEMENTE

1 (I)	2 (II)	3	4	5 KEY/SLEUTEL	6	7	8 Atomic number Atoomgetal	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
2,1 1 H 1							29 Cu 63,5										2 He 4
1,0 3 Li 7	1,5 4 Be 9						Electronegativity Elektronegatiwiteit	Symbol Simbool				5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20
0,9 11 Na 23	1,2 12 Mg 24						Approximate relative atomic mass Benaderde relatiewe atoommassa					13 Al 27	14 Si 28	15 P 31	16 S 32	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	3,6 36 Kr 84
0,8 37 Rb 86	1,0 38 Sr 88	1,2 39 Y 89	1,4 40 Zr 91	1,6 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	1,6 57 La 139	1,6 72 Hf 179	1,6 73 Ta 181	1,6 74 W 184	1,6 75 Re 186	1,6 76 Os 190	1,6 77 Ir 192	1,6 78 Pt 195	1,6 79 Au 197	1,6 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	