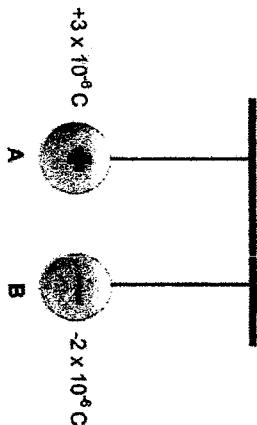


QUESTION 10 (Start on a new page.)

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

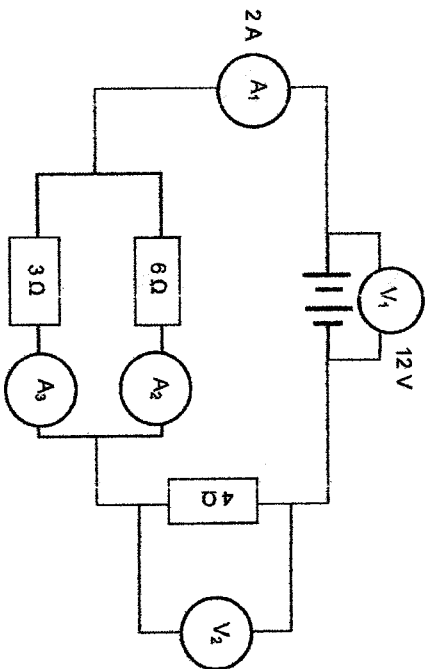


- 10.1 Which sphere has an excess of electrons? (1)
- 10.2 The two spheres are allowed to touch. Will the electrons be transferred from A to B or B to A? (1)
- 10.3 The spheres are now separated. Calculate the new charge on sphere B. (3)
- 10.4 Calculate the number of electrons transferred during contact. (3)



QUESTION 11 (Start on a new page.)

In the circuit diagram below the reading on voltmeter V_1 is 12 V and the reading on ammeter A_1 is 2 A.



- 11.1 Calculate the:
 - 11.1.1 Total resistance of the circuit (4)
 - 11.1.2 Reading on V_2 (3)
 - 11.1.3 Reading on A_2 (3)
 - 11.1.4 Amount of charge that flows through ammeter A_1 in 120 s (3)
 - 11.2 How will the reading on ammeter A_1 be affected if the 6Ω resistor is removed from the circuit? (1)
 - 11.3 Write down only INCREASE, DECREASE or REMAIN THE SAME. Explain the answer to QUESTION 11.2 WITHOUT any calculations. (3)
- TOTAL: 150 [17]**



11.1.3

$R \propto \frac{1}{I}$ or in words: resistance is inversely proportional to current and \therefore ratio of resistors is 6 : 3 ✓ 2 : 1 \therefore ratio of current is 1 : 2 ✓ $A_2 : A_3$ $\therefore I_2 = \frac{2}{3} \times 1$ ✓ $\therefore I_2 = 0,67 \text{ A}$ ✓ $R \propto \frac{1}{I}$ in woorde: weerstand is omgekeer eweredig aan stroom \therefore verhouding van resistors is 6 : 3 ✓ 2 : 1 \therefore verhouding van stroom is 1 : 2 ✓ $A_2 : A_3$ $\therefore I_2 = \frac{2}{3} \times 1$ ✓ $\therefore I_2 = 0,67 \text{ A}$ ✓	ACCEPTAANVAAR: $I = \frac{V}{R}$ ✓ $= \frac{12-6}{6}$ ✓ $= 0,67 \text{ A}$ ✓
---	--

(3)

11.1.4

$A_1 = 2 \text{ A}$
 $\therefore Q = I A t$ ✓
 $= 2 \times 120$ ✓
 $= 240 \text{ C}$ ✓

(3)

11.2

Decrease ✓
Afneem

(1)

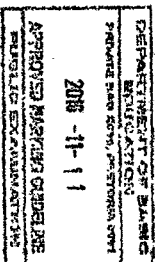
11.3

NEGATIVE MARKING FROM 11.2
NEGATIEWE MERK VANAF 11.2

- If the 6 Ω resistor is removed, the resistance of the whole circuit increases ✓
- Since $R \propto \frac{1}{I}$, if R increases, and V is constant ✓ and I of the circuit decreases
- Indien die 6 Ω-resistor verwyder word, sal die totale weerstand van die stroombaan verhoog.
- $R \propto \frac{1}{I}$ ✓, so indien R verhoog en V konstant, sal die stroom (I) verlaag.

(3)
[17]

TOTAL/TOTAAL: 160



Signature

QUESTION 10/VRAAG 10

10.1

B ✓

(1)

10.2

B to A ✓
B tot A

(1)

10.3

$Q_{\text{removed}} = \frac{Q_1 + Q_2}{2}$
 $= \frac{(+3 \times 10^6 + (-2 \times 10^6))}{2}$ ✓
 $= 5 \times 10^5 \text{ C}$ ✓

(3)

10.4

OPTION 1/OPSIE 1
 $n = \frac{Q}{e}$ ✓
 $= \frac{5 \times 10^7 (-2 \times 10^6)}{1,6 \times 10^{19}}$ ✓
 $= 1,56 \times 10^{13}$ electrons ✓
 elektrone

OPTION 2/OPSIE 2
 $n = \frac{Q}{e}$ ✓
 $= \frac{5 \times 10^7 (-4 \times 10^4)}{1,6 \times 10^{19}}$ ✓
 $= 1,56 \times 10^{13}$ electrons ✓
 elektrone

(3)
[3]

QUESTION 11/VRAAG 11

11.1.1

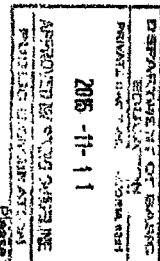
OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓ $\frac{1}{R_T} = \frac{1}{6} + \frac{1}{3}$ ✓ $\therefore R_T = 2 \Omega$	$R_T = \frac{R_1 \times R_2}{R_1 + R_2}$ ✓ $= \frac{6 \times 3}{6 + 3}$ ✓ $= 2 \Omega$
\therefore Resistance = 4 + 2 ✓ $= 6 \Omega$ ✓	\therefore Resistance = 4 + 2 ✓ $= 6 \Omega$ ✓

(4)

11.1.2

$R_T : R_{\text{series}}$	ACCEPTAANVAAR:
$2 \Omega : 4 \Omega$ ✓ \therefore potential difference is also in ratio of Potential verschil is ook in die verhouding $2 : 4$ or $1 : 2$ ✓ $\therefore 12 \text{ V} \div 3 \text{ parts/diele} = 4 \text{ V}$ \therefore Voltage = $2 \times 4 = 8 \text{ V}$ ✓	$R_{4\Omega} = \frac{V_2}{I_T}$ ✓ $4 = \frac{V_2}{2}$ ✓ $\therefore V_2 = 8 \text{ V}$ ✓

(3)

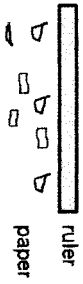


Signature

QUESTION 10 (Start on a new page.)

A neutral plastic ruler becomes charged when it is rubbed with a woollen cloth. After rubbing, the ruler has a charge of $-3,5 \times 10^{-15} \text{ C}$.

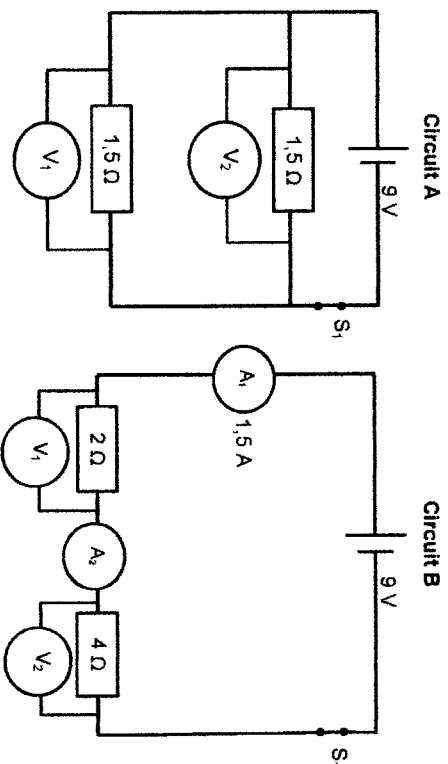
- 10.1 Distinguish between a *neutral object* and a *charged object*. (2)
- 10.2 Does the ruler **GAIN** or **LOSE** electrons? (1)
- 10.3 Calculate the number of electrons transferred during the process of rubbing. (3)
- 10.4 The charged ruler is now brought closer to pieces of paper. The pieces of paper are attracted to the ruler, as shown below. (3)



- 10.4.1 Explain why the pieces of paper are attracted to the ruler. (3)
 - 10.4.2 Name **ONE** application of electrostatics in our daily lives. (1)
- [10]**

QUESTION 11 (Start on a new page.)

Refer to Circuits A and B below and answer the questions that follow.



- 11.1 Define the term *emf*. (2)
- 11.2 Calculate the total resistance of Circuit A. (2)
- 11.3 Consider Circuit B.
 - 11.3.1 Write down the reading on A_2 . (1)
 - 11.3.2 Calculate the reading on V_1 . (3)
- 11.4 If a third resistor ($1,5 \Omega$) is placed in parallel with the existing resistors in Circuit A, would the total current in the circuit **INCREASE**, **DECREASE** or **REMAIN THE SAME**? Explain the answer. (3)

TOTAL: 150

[11]

9.3.1 Magnetic force is inversely proportional ✓ to the distance between two magnets. **OR** If the distance between the magnets increases, the force decreases. **Magnetiese krag is omgekeerd eweredig** ✓ aan die afstand tussen twee magnete. **OF** Indien die afstand tussen die magnete toeneem, sal die krag afneem.

(1)

9.3.2 0,1 N ✓

9.3.3 10 cm ✓

(1)

(1)

(1)

[8]

QUESTION/VRAAG 10

10.1 Neutral object: Has equal amount of both protons and electrons ✓
Charged object: Has either gained or lost electrons. ✓
Neutrale voorwerp: Gelyke hoeveelhede protone en elektrone. ✓
Gelaaiete voorwerpe het elektrone gewen of verloor. ✓

(2)

10.2 Added to ✓/Bygevoeg ✓

(1)

10.3 $n = \frac{Q}{e}$ ✓

$$n = \frac{3 \times 10^{-6}}{1,6 \times 10^{-19}} \checkmark$$

$$= 1,88 \times 10^{13} \checkmark \text{ (elektronselektrone)}$$

(3)

10.4.1 When the charged plastic ruler is brought closer to the uncharged pieces of paper, the paper is polarised. ✓ The negative charges on the paper are repelled by the negative charges on the ruler. ✓ This leaves the side of the paper closest to the ruler positive. ✓
Die stukkes papier word gepolariseer ✓ sodra die gelaaiete liniaal nader gebring word. Die negatiewe ladinge van die papierlyns word afgestoot ✓ deur die negatiewe gelaaiete liniaal. Dit laat die kant van die papier wat na die liniaal toe wys positief ✓ en die papier word aangetrek.

(3)

10.4.2 Photocopier ✓/Fotostaatmasjien ✓
Finger printing/Vingerafdrukke
Spray painting/Spuitverf

(Any one/Enige een)

(1)

[10]

TOTAL/TOTAAL:

150

QUESTION/VRAAG 11

11.1 Work done per charge by the source (battery) ✓ ✓
Die arbeid verrig per eenheidslading deur die bron (battery) ✓ ✓

(2)

$$11.2 \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$= \frac{1}{\frac{3}{2}} + \frac{1}{\frac{1}{2}}$$

$$= \frac{2}{3} + \frac{2}{1}$$

$$= \frac{4}{3}$$

$$\therefore R_p = \frac{3}{4} = 0,75 \Omega \checkmark$$

(2)

11.3.1 1,5A ✓

(1)

11.3.2 $V = IR \checkmark$
 $V = 1,5(2) \checkmark$
 $V = 3V \checkmark$

(3)

11.4 • INCREASE ✓/TOENEEM ✓

• If 1,5 Ω resistor is added, the resistance of the whole circuit decreases ✓
Indien 1,5 Ω resistor bygevoeg word, neem die totale weerstand van die stroombaan af. ✓

• Since $R \propto \frac{1}{I}$, if R decreases, ∴ V is constant and I of the circuit increases ✓
Aangesien $R \propto \frac{1}{I}$, indien R afneem en V konstant bly, sal I van die stroombaan toeneem. ✓

(3)

[11]