basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 11

TECHNICAL SCIENCES: P1
TEGNIESE WETENSKAPPE: V1

EXEMPLAR/*MODEL* 2017

MEMORANDUM

MARKS/*PUNTE*: 150

This memorandum consists of 10 pages.
Hierdie memorandum bestaan uit 10 bladsye.

QUESTION 1/*VRAAG* 1

1.1 B ✓✓

1.2 C ✓✓

1.3 A ✓✓

1.4 D ✓✓

1.5 C ✓✓

1.6 C ✓✓

1.7 C ✓✓

1.8 A ✓✓

1.9 C ✓✓

1.10 C ✓✓ (2 x 10) **[20]**

QUESTION 2/*VRAAG* 2

2.1 A resultant is the single vector that indicates the magnitude and direction✓ of the combined effect of two or more vectors✓. (2)

2.2 A – Right/horizontal/positive/x- axis ✓

B – 1st quadrant ✓

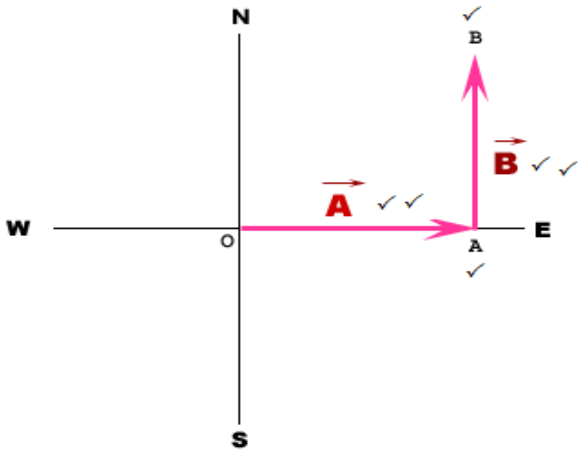
C – origin/starting ✓ (3)

2.3 F_R = F1 + F2 ✓

= 100 N + 80 N ✓

= 180 N ✓ (3)

2.4



No scale required (6)

2.5

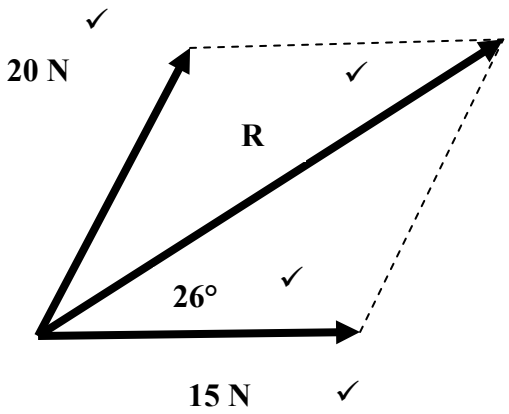
$$R^2 = AB^2 + BC^2 \quad ✓$$
$$R^2 = 40^2 + 10^2 \quad ✓$$
$$R^2 = 1600 + 100 \quad ✓$$
$$R = \sqrt{17} \quad ✓✓$$
$$R = 4{,}12m \quad ✓$$

(6)

[20]

QUESTION 3/*VRAAG* 3

3.1



R = 60 mm = 30 N✓ 26° North from East ✓ (6)

c

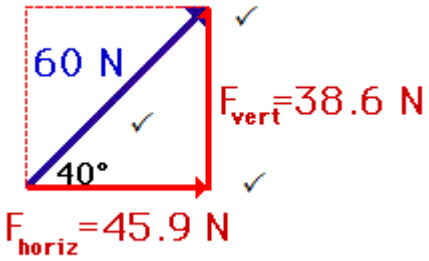
3.2.1 **Horizontal Component**

$F_x = F\cos\theta$ ✓
$= 60\cos 40°$ ✓
$= 45.9$ N ✓ (3)

3.2.2 **Vertical Component**

$Fy = F\sin 40\theta$ ✓
$= 60\sin 40°$ ✓
$= 38.6$ N ✓ (3)

3.2.3



(3)
[15]

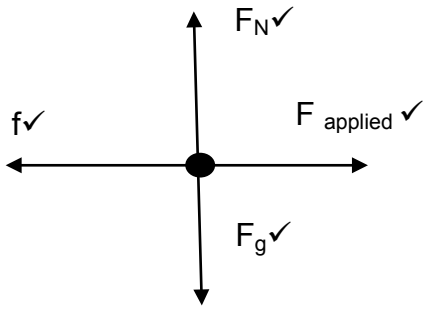
QUESTION 4/*VRAAG* 4

4.1 Frictional force is a force that opposes (acts against) the motion✓ (or attempted motion) of an object. ✓ (2)

4.2 $N = 3 \times 9.8$✓
$= 29.4$ N✓

$f_{s(max)} = \mu_s N$
$= 0.35 \times 29.4$ N✓
$= 10.29$ N✓ to the left✓ (5)

4.3



(4)

c

4.4 $\mu_k = \frac{fk}{F\text{N}} = \frac{40}{100}$ ✓ $= 0,4$ ✓

N = 3 x 9.8
= 29.4 N

$f_k = \mu_k N$
= 0,4 x 29,4✓
= 11,76 N✓ to the left✓

(5)
[16]

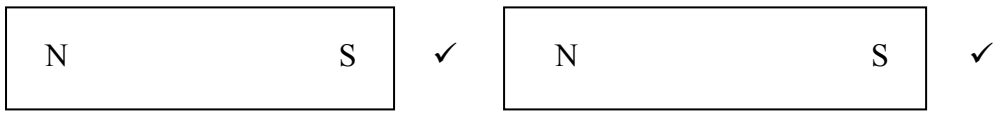
QUESTION 5/*VRAAG* 5

5.1 A magnetic field is a region in space where another magnet or ferromagnetic material will experience a force. ✓ It is represented with magnetic field lines.✓. (2)

5.2.1 - Direction lines at south pole are incorrect ✓
- Magnetic fields should be equally apart ✓
- Magnetic fields lines should not cross each other ✓ (3)

5.2.2 Compass ✓ (1)

5.2.3



(2)

5.3 When charged particles from the sun✓ reach the magnetic field of the earth (magnetosphere) ✓ the particles follow the magnetic field lines to the north pole. ✓ When they collide with particles in the atmosphere, light is given off. ✓ (4)

5.4 The magnetic field of the earth is constantly changing ✓whereas the magnetic field of a magnet is constant. ✓ (2)

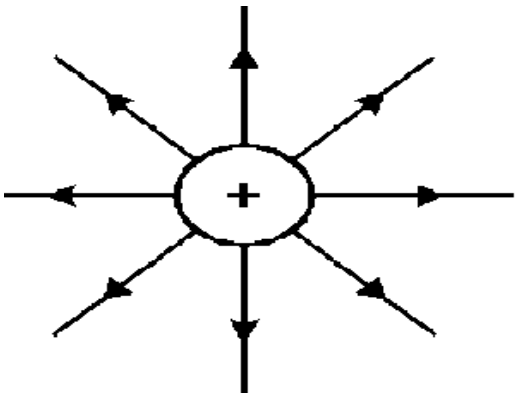
5.5 Magnetic north is the direction indicated by a magnetic compass and therefore the point where the magnetic field lines points vertically downwards. ✓
The geographic north pole on the other hand is where the lines of longitude converge in the north. ✓

OR

The geographic north pole is about 11,51° away from the direction of the magnetic north pole. ✓✓ (2)

QUESTION 6/*VRAAG* 6

6.1



Marking criteria/*Nasienriglyne:*	
Correct pattern of field lines. *Korrekte patroon van veldlyne.*	✓
Correct arrow direction. *Korrekte pylrigting.*	✓

(2)

6.2

The magnitude of the electrostatic force exerted by one point charge on another point charge ✓ is directly proportional to the (product of the) magnitudes of the charges ✓

is directly proportional to the (product of the) magnitudes of the charges ✓
and inversely proportional to the square of the distance between them. ✓
Die grootte van die elektrostatiese krag wat een puntlading op 'n ander uitoefen ✓
is direk eweredig aan produk van die grootte van die ladings
en omgekeerd eweredig aan kwadraat van die afstand tussen hulle). ✓

OR/*OF*

The electrostatic force that one charge exerts on another
is directly proportional to the product of the charges
and inversely proportional to the square of the distance between their centres.
Die elektrostatiese krag wat een lading op 'n ander uitoefen
is direk eweredig aan die produk van die ladings
en omgekeerd eweredig aan die kwadraat van die afstand tussen hul middelpunte.

(2)

6.3

$$F = \frac{kQ_1Q_2}{r^2} \checkmark$$

$$= \frac{(9\times10^{9})(3\times10^{-9})(5\times10^{-9})}{0{,}05^2} \checkmark$$

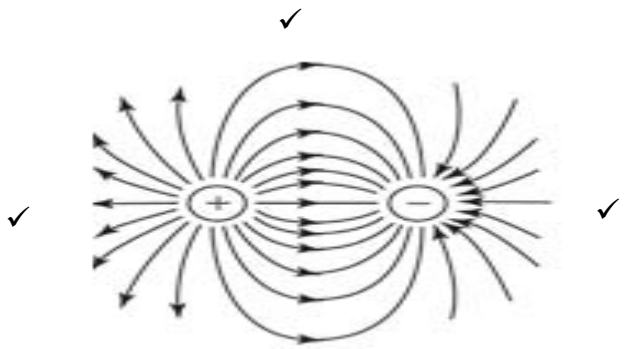
$$= 5{,}4 \times 10^{-5}\ \text{N} \checkmark$$

(4)

6.4.1 An electric field is a region of space in which an electric charge experiences a force. ✓✓
OR

Force experienced per unit charge ($E = \frac{F}{Q}$) ✓✓ (2)

6.4.2



(3)

6.4.3

E(due to x)

$E = \frac{kQx}{r^2}$ ✓

$= \frac{9\times10^{9}.4\times10^{-9}}{0{,}10^{2}}$ ✓ ✓

= 3 600 N.C^{-1} to the right ✓

E(due to y)

$E = \frac{kQy}{r^2}$

$= \frac{9\times10^{9}.2\times10^{-9}}{0{,}02^{2}}$ ✓ ✓

= 45 000 N.C^{-1} to the left ✓

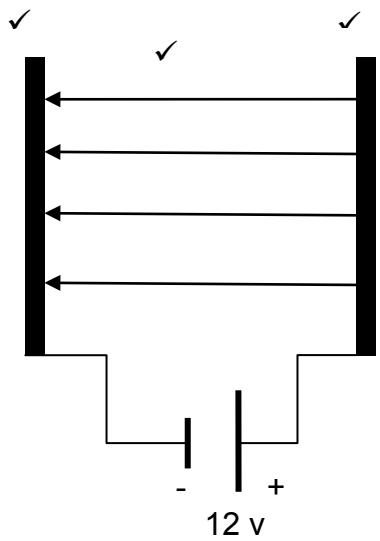
E_{net} = 3 600 – 45 000
= 41 400 N.C^{-1} to the left ✓ (7)

6.4.4 F = QE✓
= - 1,6 x 10^{-19} . 41400 ✓
= - 6,624 x 10^{-15}
= 6,624 x 10^{-15} to the left ✓ (3)

[23]

QUESTION 7/*VRAAG 7*

7.1



(3)

7.2 The electric field is uniform between the plates. ✓ (1)

7.3 $E = \frac{v}{d}$

$= \frac{12v}{16cm}$ ✓

$= \frac{12v}{0,16m}$ ✓ ✓

$= 75\ N.C^{-1}$ ✓ (4)

[8]

QUESTION 8/*VRAAG 8*

8.1 The potential difference across a conductor is directly proportional to the current in the conductor ✓at constant temperature.✓
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur.
OR/*OF*
Provided temperature and other physical conditions are constant✓, the potential difference across a conductor is directly proportional to the current✓.
Mits die temperatuur en ander fisiese toestande konstant is, is die potentsiaalverskil oor 'n geleier direk eweredig aan die stroom. (2)

8.2.1 **<u>OPTION 1/*OPSIE 1*</u>**

$V_1 = IR_{6\Omega}$✓
$= 0,6\ (6)$ ✓
$= 3,6\ V$

$I_{4\Omega} = \frac{3,6}{4}$ ✓

$\therefore I_{4\Omega} = 0,9\ A$✓

(4)

c

OPTION 2/*OPSIE 2*

$V = IR$✓
$(0,6)(6) = I_{4\Omega}(4)$ ✓
$I_{4\Omega} = \frac{(0,6)(6)}{4}$ ✓
$= 0,9$ A✓ (4)

8.2.2 **POSITIVE MARKING FROM QUESTION 8.2.1**
POSITIEWE NASIEN VANAF VRAAG 8.2.1

$I_{tot} = I_{6\Omega} + I_{4\Omega}$
$= (0,6 + 0,9)$ ✓
$I_{tot} = 1,5$ A✓ (2)

8.2.3 **POSITIVE MARKING FROM QUESTION 8.2.1 AND QUESTION 8.2.2**
POSITIEWE NASIEN VANAF VRAAG 8.2.1 EN VRAAG 8.2.2

$V_X = V_{tot} - V_1$
$=(6 - 3,6)$ ✓
$=2,4$ V
$V = IR$✓
$X = \frac{2,4}{1,5}$
$= 1,6\ \Omega$✓ (3)

8.3 Energy/*Energie* $W = I^2 R\Delta t$✓
For the same time interval ✓$I^2 R\Delta t$ will be greater for the 4Ω resistor than for the 6Ω resistor. ✓
Vir dieselfde tydinterval sal $I^2 R\Delta t$ groter wees vir die 4 Ω-resistor as vir die 6 Ω-resistor.

OR/*OF*

Energy/*Energie* $W = \frac{V^2}{R}\Delta t$ ✓

For the same potential difference and time✓ $\frac{V^2}{R}\Delta t$ is greater for the smaller resistance than for the larger resistance. ✓

Vir dieselfde potensiaalverskil en tyd is $\frac{V^2}{R}\Delta t$ groter vir die kleiner weerstand as vir die groter weerstand. (3)

[14]

QUESTION 9/*VRAAG 9*

9.1 The battery has internal resistance. ✓Drop in potential due to energy used by charges to flow through the battery. ✓
Die battery het interne weerstand. ✓*Val in potensiaalverskil a.g.v. energie gebruik deur ladings om deur battery te beweeg.*✓ (2)

9.2 9.2.1 $I = \frac{V}{R}$ ✓ $= \frac{9}{2}$ ✓ = 4,5 A ✓ (3)

9.2.2 **Option 1/*Opsie 1***

$I_{4\Omega} = \frac{V}{R}$ ✓ $= \frac{9}{4}$ ✓ = 2,25 A

I = 2,25 + 4,5 ✓= 6,75 A ✓

Option 2/*Opsie 2*

$\frac{1}{R_T} = \frac{1}{R_2} + \frac{1}{R_4}$ ✓ $= \frac{1}{2} + \frac{1}{4}$ =1,33 Ω ✓

$I = \frac{V}{R} = \frac{9}{1,33}$ ✓ = 6,75 A ✓ (6,75 A to 6,77 A) (3)
[8]

QUESTION 10/*VRAAG 10*

10.1 Current✓ (1)

10.2.1 0,64 : 4✓✓✓ (3)

10.2.2 The conducting wire was heating up. ✓✓ (2)

10.3 Gradient = $\frac{y}{x}$ ✓

$= \frac{0,64}{4}$

= 0,16✓

$R = \frac{1}{0,16}$ ✓

= 6,25 Ω✓ (4)
[10]

TOTAL/*TOTAAL*: 150