Possible Answers March 2006

NATIONAL DEPARTMENT OF EDUCATION

PHYSICAL SCIENCE (SG) – PAPER 1 / *NATUUR- en SKEIKUNDE (SG) – VRAESTEL 1*

QUESTION 1 / *VRAAG 1*

1.1	B	1.2	D	1.3	A	1.4	C	1.5	A
1.6	D	1.7	D	1.8	A	1.9	C	1.10	C
1.11	B	1.12	C	1.13	C	1.14	B	1.15	A

[15 x 3 = 45]

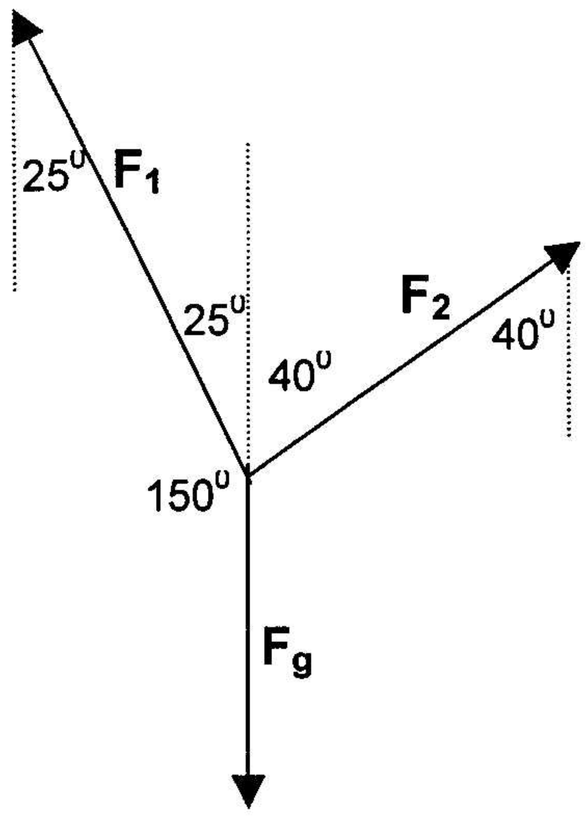
QUESTION 2 / *VRAAG 2*

2.1

If three forces acting at a point are in equilibrium, they can be represented in magnitude and direction by the three sides of a triangle taken in order. **OR**
If the three forces acting at a point are placed head-to-tail, (one after the other), they will form a closed triangle (triangle where the resultant is zero).
As drie kragte wat op 'n punt inwerk in ewewig is kan hulle voorgestel word in grootte en rigting as die drie sye van 'n geslote driehoek in orde geplaas – kop-aan-stert
As drie kragte wat op 'n punt inwerk kop-aan-stert geplaas word sal hulle 'n geslote driehoek vorm.

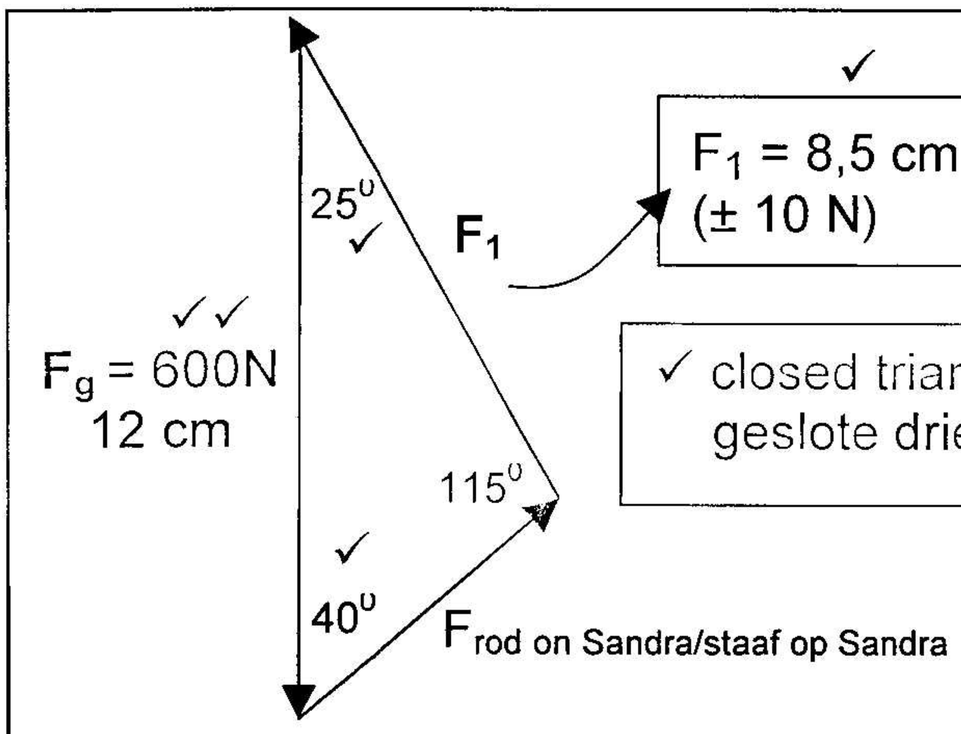
(3)

2.2



- ✓ F_1 = Tension in rope + direction
  F_1 = Spanning in tou + rigting
- ✓ F_2 = $F_{rod\ on\ Sandra}$ + direction
  $F_{staaf\ op\ Sandra}$ + rigting
- ✓ F_g = $F_{earth\ on\ Sandra}$ / Weight / gravitational force
  $F_{aard\ op\ Sandra}$ / gewig /
- ✓ two angles / *twee hoeke*

2.3 **CONSTRUCTION / SKAALTEKENING** **CALCULATION / BEREKEN**



✓ $F_1 = 8,5$ cm = 425 N (± 10 N)

✓ closed triangle
geslote driehoek

✓ angles in correct order
✓ closed triangle
hoeke in regte orde
geslote driehoek

$$\frac{F_1 \checkmark}{\sin 40^0} = \frac{\overset{\checkmark\checkmark}{600}}{\sin 115^0}$$

$$F_1 = \frac{600 \times \sin 40^0}{\sin 115^0}$$

$$= 425,54\,N \checkmark$$

(6)
[13]

QUESTION 3 / *VRAAG 3*

3.1 Anusha ✓ (1)

3.2 covered the same distance ✓ in the shortest time ✓
selfde afstand afgelê in die kortste tyd (2)

3.3 rate of change in velocity ✓✓
tempo van verandering van snelheid (2)

3.4

$$s = ut + at^2 \checkmark$$

$$\overset{\checkmark}{18} = \overset{\checkmark}{0} + \frac{1}{2}(a)(4)^2 \overset{\checkmark}{}$$

$$a = \frac{2 \times 18}{4^2}$$

$$= 2,25\,m.s^{-2} \checkmark$$

(5)

3.5

$$v = u + at \checkmark$$
$$= 0 + (2,25)(4) \checkmark \checkmark$$
$$= 9\ m.s^{-1} \checkmark$$

$$v^2 = u^2 + 2as \checkmark$$
$$= 0 + 2(2,25)(18) \checkmark \checkmark$$
$$= 81$$
$$v = 9\,m.s^{-1} \checkmark$$

$$s = \left(\frac{u+v}{2}\right)t \checkmark$$
$$18 = \left(\frac{0+v}{2}\right)(4) \checkmark \checkmark$$
$$v = 9 m.s^{-1} \checkmark$$

(5)
[15]

QUESTION 4 / *VRAAG 4*

4.1

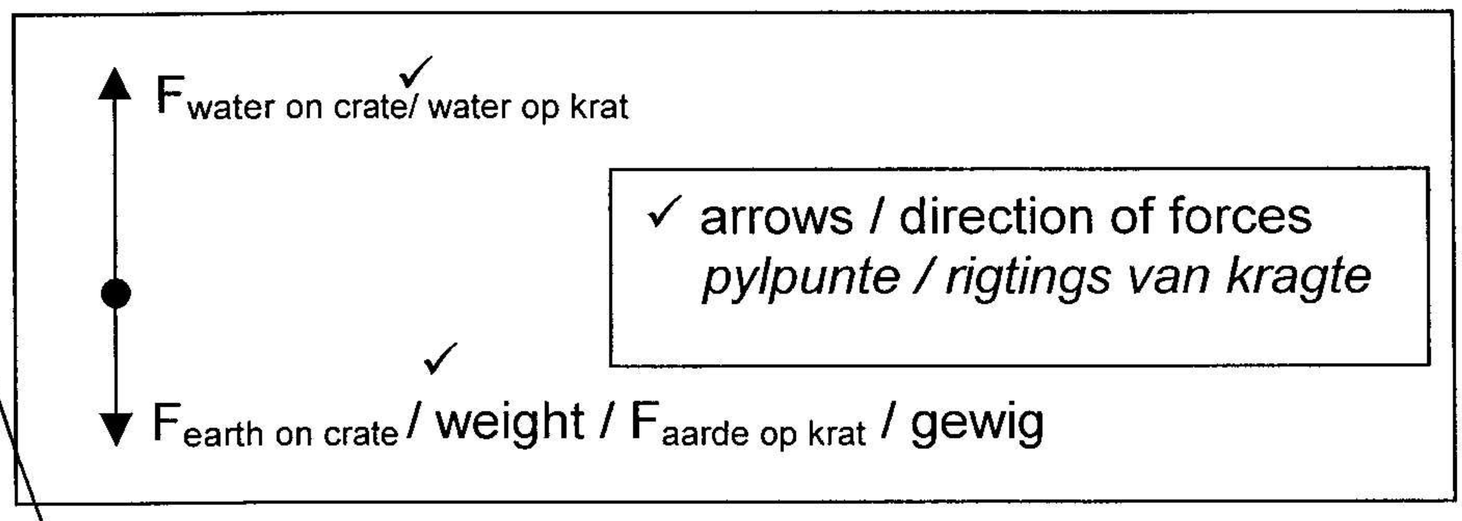
$v^2 = u^2 + 2as$ ✓
✓ ✓ ✓
$0 = 21^2 + 2(a)(1,5)$

$a = \frac{0^2 - 21^2}{2 \times 1,5}$

$= -147\ m.s^{-2}$ ✓

(5)

4.2



(3)

4.3

Down +ve

$F_{res} = F_{water} + F_g$ ✓
$ma = F_{water} + F_g$
✓ ✓ ✓ ✓
$300(-147) = F_{water} + (300)(10)$
$F_{water} = -44\ 100 - 3\ 000$ ✓
$= -47\ 100\ N$

OR

up +ve

$F_{res} = F_{water} + F_g$ ✓
$ma = F_{water} + F_g$
✓ ✓ ✓ ✓
$300(147) = F_{water} + (300)(-10)$
$F_{water} = 44\ 100 + 3000$
$= 47\ 100\ N$ ✓

a & g --> opp. signs

(6)

4.4

$\Delta E_k = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$
✓ ✓ ✓
$= \frac{1}{2}(300)(0)^2 - \frac{1}{2}(300)(21)^2$
$= 66\ 150\ J$ ✓

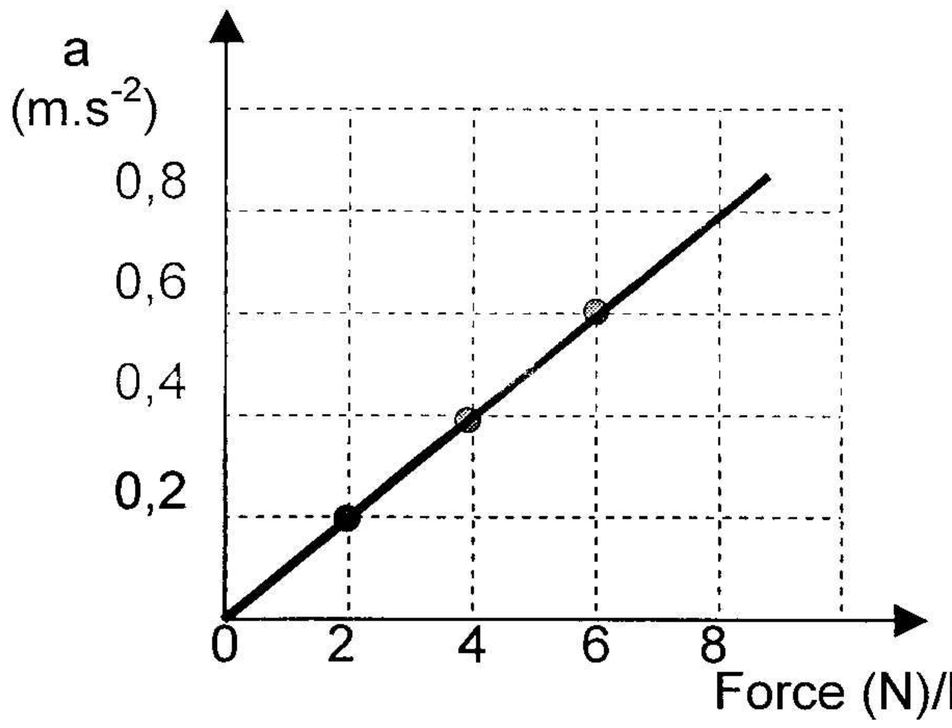
$\Delta E_k = 0 - \frac{1}{2}mu^2$ ✓
$= 0 - \frac{1}{2}(300)(21)^2$ ✓ ✓
$= 66150\ J$ ✓

(4)

[18]

QUESTION 5 / *VRAAG 5*

5.1



✓ Label of axes + scale of axes
✓✓ plotting of points
✓ sketching of str. line

✓*Benoem asse + skaal op asse*
✓✓ *stip van punte*
✓ *trek van reguitlyn*

(4)

5.2

acceleration is directly proportional to the resultant force. ✓✓
Versnelling is direk eweredig aan die resulterende krag

(2)

5.3

$$\text{grad} = \frac{1}{m} = \frac{\Delta a}{\Delta F} \quad \checkmark$$

$$= \frac{(0,6 - 0,2)\,\text{kg.m.s}^{-2}}{(6 - 2)\,\text{m.s}^{-2}} \checkmark$$

$$= 0,1 \quad \checkmark$$

$$\therefore \; m = 10\ \text{kg}$$

(4)

5.4

When a resultant for acts on an object, the object will accelerate ✓ in the direction of the resultant force. The acceleration is directly proportional ✓ to the (resultant) force and inversely proportional ✓ to the mass.
Wanneer 'n resulterende krag op 'n voorwerp inwerk sal die voorwerp versnel ✓ in die rigting van die resulterende krag. Die versnelling is direk eweredig aan die resulterende krag ✓en omgekeerd eweredig aan die massa ✓.

(3)

[13]

QUESTION 6 / *VRAAG 6*

6.1

Newton first law of motion. ✓✓
A body remains in a state of rest or continues to travel at constant velocity ✓ (constant speed in a straight line) unless acted on by an external non-zero resultant force. ✓

NOT inertia / **Nie** traagheid **nie**

Newton se eerste bewegingswet ✓
'n Liggaam sal in sy toestand van rus bly ✓ *of teen 'n konstante snelheid* ✓ *voort beweeg tensy 'n nie-zero resulterende krag* ✓ *daarop inwerk*

(4)

6.2

$p_{before/voor} = p_{after/na}$ } ✓
$mu = m_1v_1 + m_2v_2$
✓ ✓ ✓✓
$(160)(2) = (60)(2,5) + (100)\,v$
$320 = 150 + 100v$
$v = \frac{150}{100}$
$= 1,7\ m.s^{-1}$ ✓

✓
$= 1,7\ m.s^{-1}$; original direction of motion/ right
oorspronklike rigting van beweging / regs

(7)

6.3

Conservation of Momentum ✓

In an isolated ✓ system where no external forces exist, the total ✓ momentum remains ✓ constant in magnitude and direction. OR

In an isolated ✓ system where no external forces exist, the total ✓ momentum before collision equals ✓ the total momentum after collision.

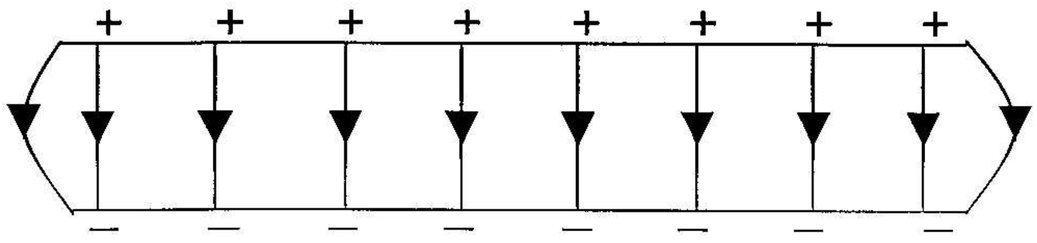
Behoud van momentum ✓
In 'n geisoleerde sisteem ✓ *waar geen eksterne kragte inwerk nie, sal die totale liniêre momentum* ✓ *behoue bly in grootte en rigting* ✓. *OF*
In 'n geisoleerde sisteem waar geen eksterne kragte inwerk nie is die totale momentum voor 'n botsing gelyk aan die totale momentum na die botsing.

(4)

[15]

QUESTION 7 / *VRAAG 7*

7.1



✓ parallel lines evenly spaced
parallelle lyne eweredig
✓ direction of E-field
rigting van E-veld
✓ start and end on plates
begin en eindig op plate
✓ end effects
rand effekte

(4)

7.2 no. of $e^- = \frac{8 \times 10^{-19}}{1,6 \times 10^{-19}}$ ✓ ✓
= 5 electrons ✓

(3)

7.3 $W = VQ$ ✓
✓ ✓
$= (4000)(8 \times 10^{-19})$
$= 3,2 \times 10^{-15}$ J ✓

(4)

[11]

QUESTION 8 / *VRAAG 8*

8.1

The potential difference across a resistor is directly proportional to the current passing through it provided the temperature remains the same. **OR**
The ratio of potential difference to current is a constant provided the temperature remains the same.
Die potensiaalverskil ✓✓ oor 'n resistor is direk eweredig ✓aan die stroom in die resistor mits die temperatuur dieselfde bly. OF
Die verhouding van die potensiaalverkil tot stroom is konstant mits die temperatuur konstant bly.

(3)

8.2

$V_{4\Omega} = I_{4\Omega} R_{4\Omega}$ ✓
$= (1,5)(4)$ ✓ ✓
$= 6\ V$ ✓

(4)

8.3

$V_L = I_{cir} R_L$
✓✓ ✓
$24 - 6 = 1,5\ R_L$
$18 = 1.5\ R_L$
$R_L = 12\ \Omega$ ✓

(4)

8.4

$V_{total} = I_{cir} R_{cir}$
✓ ✓
$24 = (1,6)R_{cir}$
$R_{cir} = 15\ \Omega$ ✓

(3)

8.5

$R_p = 15 - 12 = 3\ \Omega$ ✓ ✓

(2)

8.6

$\frac{1}{R_p} = \frac{1}{r} + \frac{1}{X}$ ✓
$\frac{1}{X} = \frac{1}{3}^{\checkmark} - \frac{1}{4}$ ✓
$= \frac{1}{12}$
$X = 12\Omega$ ✓

(4)
[20]

Total: Question 1	**45**
Total: Question 2 – 8	**105**
Grand Total:	**150**