

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

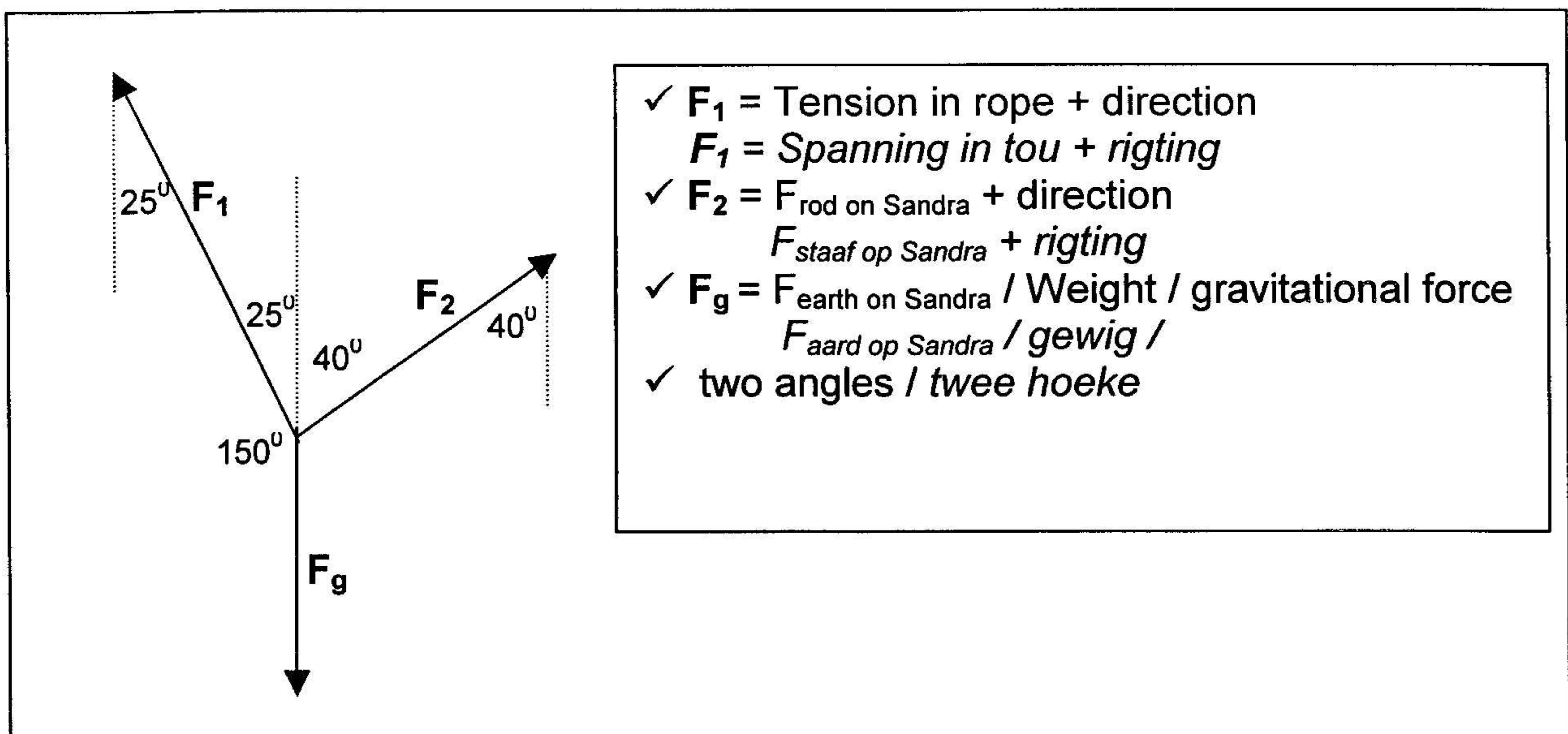
If three forces acting at a point are in equilibrium, they can be represented in magnitude and direction by the three sides of a triangle taken in order. **OR** If the three forces acting at a point are placed head-to-tail, (one after the other), they will form a closed triangle (triangle where the resultant 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



2.3 CONSTRUCTION / SKAALTEKENING

CALCULATION / BEREKEN

$F_1 = 8,5 \text{ cm} = 425 \text{ N}$
 $(\pm 10 \text{ N})$

✓ closed triangle
 geslote driehoek

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

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

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

$$= 425,54 \text{ N} \checkmark$$

(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

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

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

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

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

(5)

3.5

$$v = u + at \checkmark$$

$$= 0 + (2,25)(4) \checkmark$$

$$= 9 \text{ m.s}^{-1} \checkmark$$

$$v^2 = u^2 + 2as \checkmark$$

$$= 0 + 2(2,25)(18) \checkmark$$

$$= 81 \checkmark$$

$$v = 9 \text{ m.s}^{-1} \checkmark$$

$$s = \left(\frac{u+v}{2}\right)t \checkmark$$

$$18 = \left(\frac{0+v}{2}\right)(4) \checkmark$$

$$v = 9 \text{ m.s}^{-1} \checkmark$$

(5)
[15]

QUESTION 4 / VRAAG 4

4.1

$$v^2 = u^2 + 2as \quad \checkmark$$

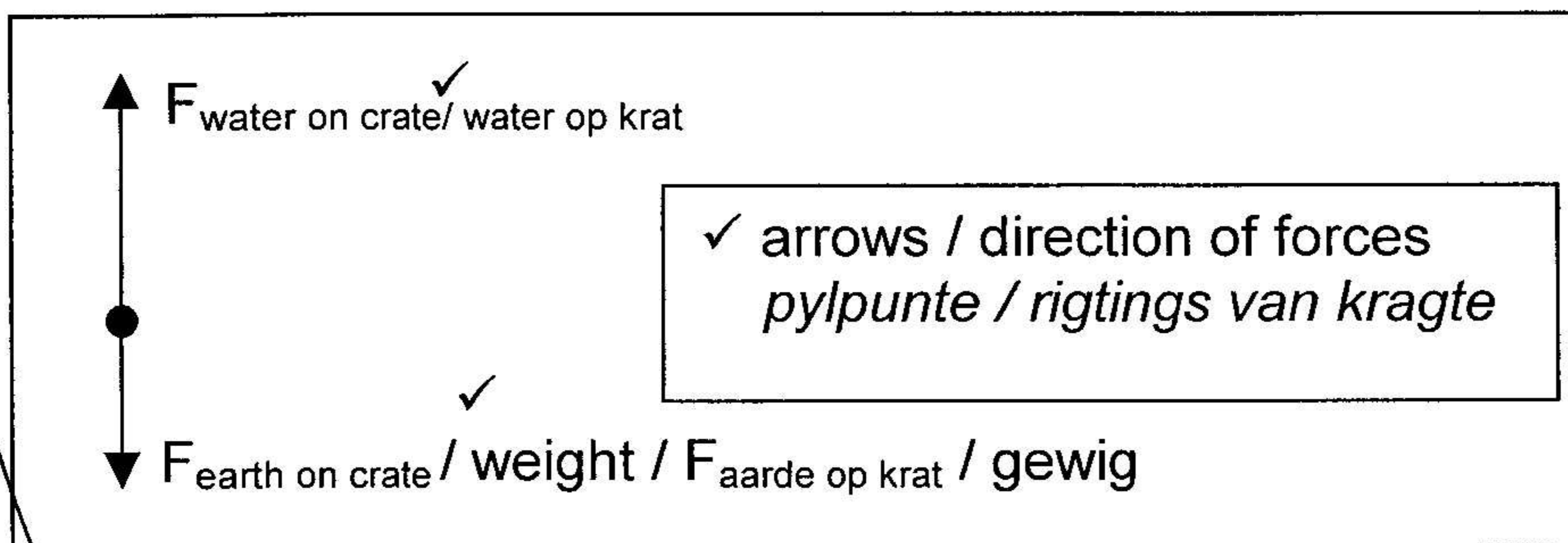
$$0 = 21^2 + 2(a)(1,5) \quad \checkmark$$

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

$$= -147 \text{ m.s}^{-2} \quad \checkmark$$

(5)

4.2



(3)

4.3

Down +ve

$$F_{\text{res}} = F_{\text{water}} + F_g \quad \checkmark$$

$$ma = F_{\text{water}} + F_g \quad \checkmark$$

$$300(-147) = F_{\text{water}} + (300)(10) \quad \checkmark$$

$$F_{\text{water}} = -44\,100 - 3\,000 \quad \checkmark$$

$$= -47\,100 \text{ N} \quad \checkmark$$

OR

up +ve

$$F_{\text{res}} = F_{\text{water}} + F_g \quad \checkmark$$

$$ma = F_{\text{water}} + F_g \quad \checkmark$$

$$300(147) = F_{\text{water}} + (300)(-10) \quad \checkmark$$

$$F_{\text{water}} = 44\,100 + 3\,000 \quad \checkmark$$

$$= 47\,100 \text{ N} \quad \checkmark$$

(6)

a & g --> opp. signs

4.4

$$\Delta E_k = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$$

$$= \frac{1}{2}(300)(0)^2 - \frac{1}{2}(300)(21)^2$$

$$= 66\,150 \text{ J} \quad \checkmark$$

$$\Delta E_k = 0 - \frac{1}{2}mu^2$$

$$= 0 - \frac{1}{2}(300)(21)^2$$

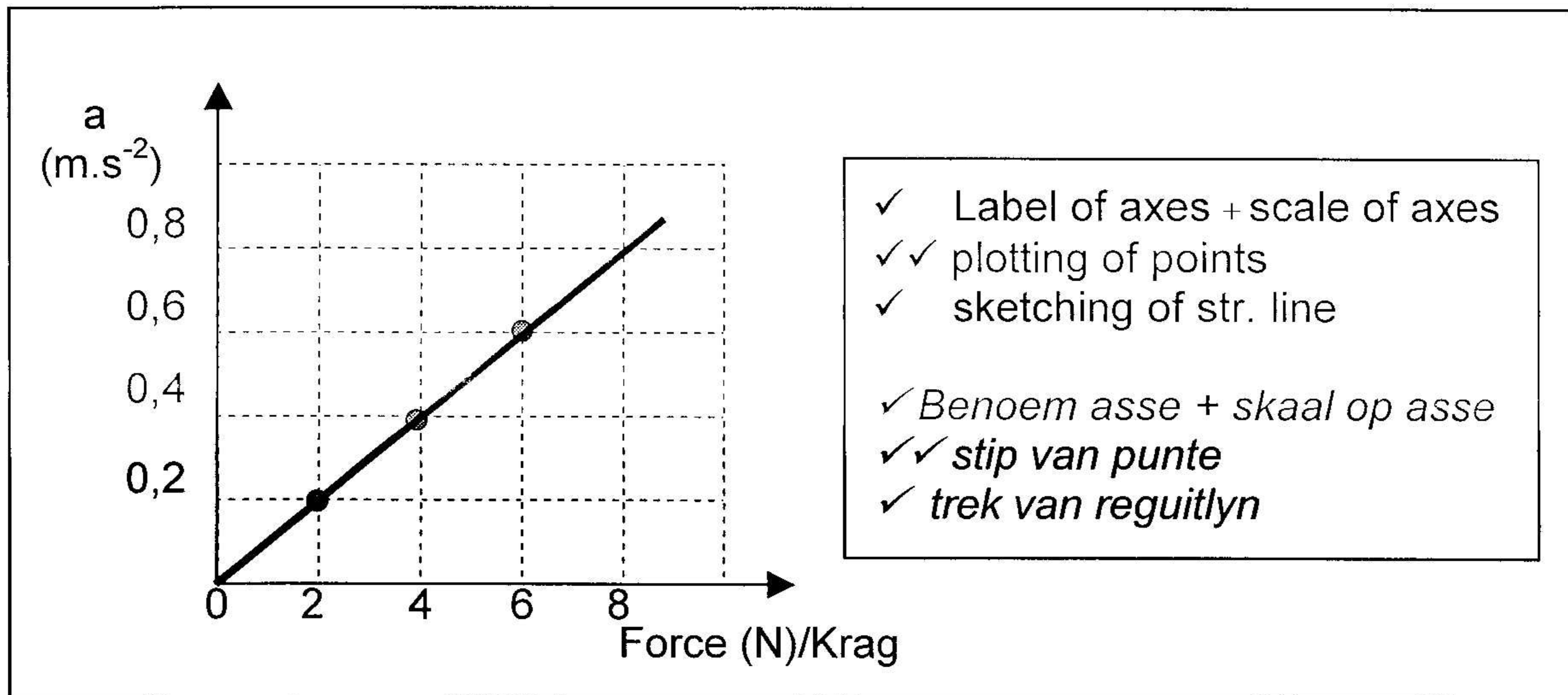
$$= 66\,150 \text{ J} \quad \checkmark$$

(4)

[18]

QUESTION 5 / VRAAG 5

5.1



(4)

5.2

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

(2)

5.3

$$\begin{aligned}
 \text{grad} &= \frac{1}{m} = \frac{\Delta a}{\Delta F} \quad \checkmark \\
 &= \frac{(0,6 - 0,2) \text{ kg.m.s}^{-2}}{(6 - 2) \text{ m.s}^{-2}} \quad \checkmark \\
 &= 0,1 \quad \checkmark \\
 \therefore m &= 10 \text{ kg}
 \end{aligned}$$

(4)

5.4

When a resultant force 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)

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

$$\begin{aligned}
 & \left. \begin{aligned}
 p_{\text{before/voor}} &= p_{\text{after/na}} \\
 m_1 v_1 + m_2 v_2 & \\
 \end{aligned} \right\} \checkmark \\
 & \checkmark \quad \quad \quad \checkmark \quad \quad \quad \checkmark \checkmark \\
 (160)(2) &= (60)(2,5) + (100) v \\
 320 &= 150 + 100v \\
 v &= \frac{150}{100} \\
 &= 1,7 \text{ m.s}^{-1} \checkmark \\
 & \text{= } 1,7 \text{ m.s}^{-1} \text{ ; original direction of motion/ right} \\
 & \text{ oorspronklike rigting van beweging / regs}
 \end{aligned}$$

(7)

6.3

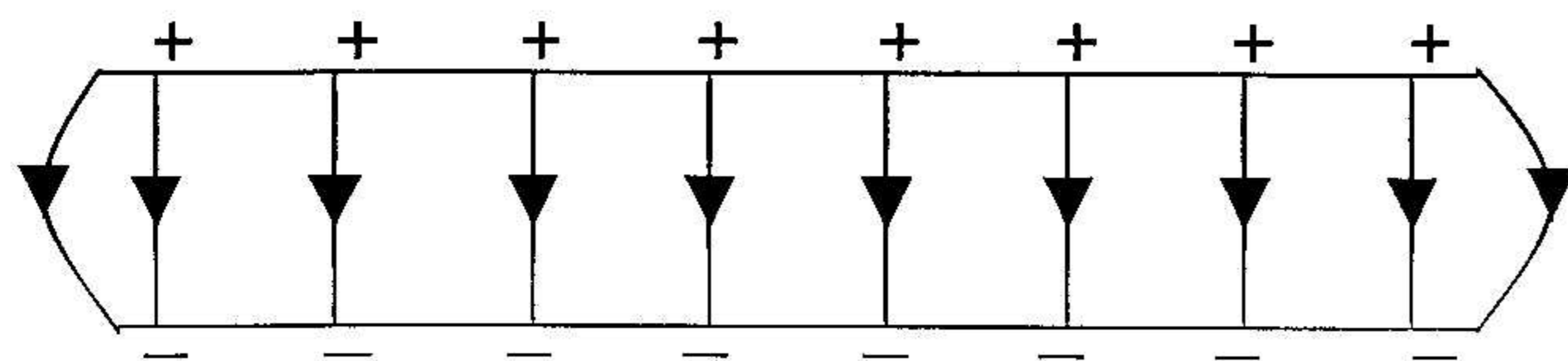
Conservation of Momentum ✓
 In an isolated system where no external forces exist, the total momentum remains constant in magnitude and direction. OR
 In an isolated system where no external forces exist, the total momentum before collision equals the total momentum after collision.
*Behoud van momentum ✓
 In 'n geïsoleerde sisteem ✓ waar geen eksterne kragte inwerk nie, sal die totale liniêre momentum ✓ behoue bly in grootte en rigting ✓. OF
 In 'n geïsoleerde 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
parallele 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

$$\begin{aligned} \text{no. of } e^- &= \frac{8 \times 10^{-19}}{1,6 \times 10^{-19}} \\ &= 5 \text{ electrons} \end{aligned}$$

(3)

7.3

$$\begin{aligned} W &= VQ \\ &= (4000)(8 \times 10^{-19}) \\ &= 3,2 \times 10^{-15} \text{ J} \end{aligned}$$

(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

$$\begin{aligned}
 V_{4\Omega} &= I_{4\Omega} R_{4\Omega} \\
 &= (1,5)(4) \\
 &= 6 \text{ V}
 \end{aligned}$$

(4)

8.3

$$\begin{aligned}
 V_L &= I_{\text{cir}} R_L \\
 24 - 6 &= 1,5 R_L \\
 18 &= 1,5 R_L \\
 R_L &= 12 \Omega
 \end{aligned}$$

(4)

8.4

$$\begin{aligned}
 V_{\text{total}} &= I_{\text{cir}} R_{\text{cir}} \\
 24 &= (1,6) R_{\text{cir}} \\
 R_{\text{cir}} &= 15 \Omega
 \end{aligned}$$

(3)

8.5

$$R_p = 15 - 12 = 3 \Omega$$

(2)

8.6

$$\begin{aligned}
 \frac{1}{R_p} &= \frac{1}{r} + \frac{1}{X} \\
 \frac{1}{X} &= \frac{1}{3} - \frac{1}{4} \\
 &= \frac{1}{12} \\
 X &= 12 \Omega
 \end{aligned}$$

(4)

[20]

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