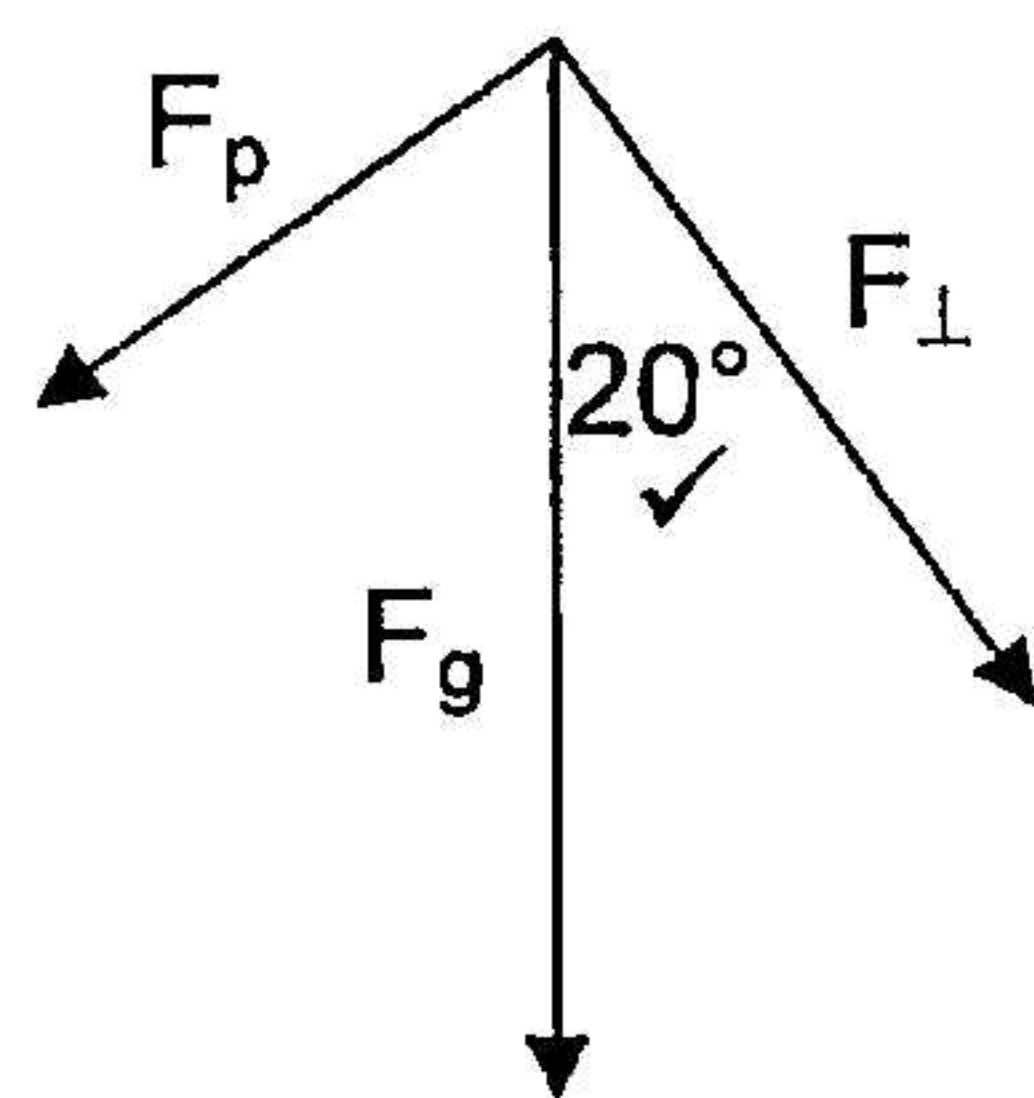


NATIONAL DEPARTMENT OF EDUCATION**PHYSICAL SCIENCE (SG) – PAPER 1 / NATUUR -en SKEIKUNDE (SG) – VRAESTEL 1****QUESTION 1 / VRAAG 1**

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

[15 x 3 = 45]**QUESTION 2 / VRAAG 2**

2.1

**NOT W for weight**

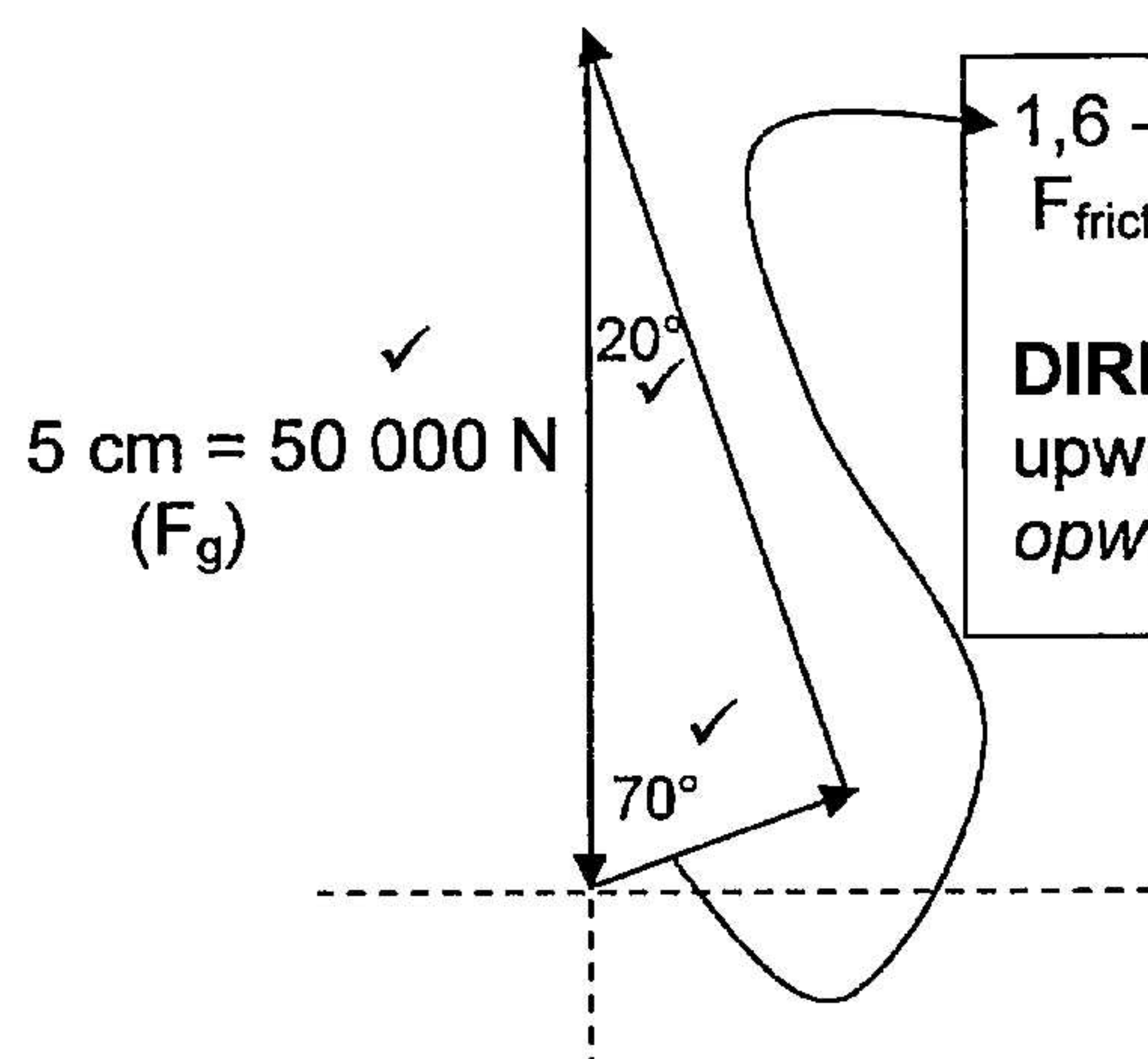
(If arrows missing : -1 max)

✓ orientation of 3 forces

✓ F_g : force of earth on truck / force of gravity / weight✓ F_p : parallel component of weight✓ $F_{\perp}$: perpendicular component of weight

(4)

2.2



1,6 – 1,8 cm = 16 000 – 18 000 N ✓
 $F_{\text{friction}} = F_{\text{parallel}}$ (magnitude / grootte) ✓

DIRECTION / RIGTING : 20° to the horizontal, ✓
 upwards to the right / 20° met die horisontaal
 opwaarts na regs (70° with vertical) ✓

or calculation / of berekening :

$$F_{\text{friction}} = F_{\parallel} \text{ (in magnitude / in grootte)}$$

$$F_{\parallel} = 50\,000 \cdot \cos 70^{\circ} \quad \text{or} \quad (50\,000 \cdot \sin 20^{\circ})$$

$$= 17\,101 \text{ N. parallel and upwards along the plane /}$$

parallel en opwaarts langs vlak

(5)

[9]

QUESTION 3 / VRAAG 3

3.1

$$s = ut + \frac{1}{2}at^2$$

$$20 = 0 + \frac{1}{2}(10)t^2$$

$$t = \sqrt{4}$$

$$= 2 \text{ s}$$

(5)

3.2

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

$$= 0 + 2 \cdot 10 \cdot 20$$

$$v = \sqrt{400}$$

$$= 20 \text{ m.s}^{-1}$$

$$v = u + at$$

$$= 0 + (10)(2)$$

$$= 20 \text{ m.s}^{-1}$$

(3)

3.3

$$s = vt$$

$$= 4 \cdot 2$$

$$= 8 \text{ m}$$

$$8 \text{ m} < 12 \text{ m}$$

$$t = \frac{s}{v}$$

$$= \frac{12}{4}$$

$$= 3 \text{ s}$$

$$3 \text{ s} > 2 \text{ s}$$

$$v = \frac{s}{t} = \frac{12}{2}$$

$$= 6 \text{ m.s}^{-1}$$

$$6 \text{ m.s}^{-1} > 4 \text{ m.s}^{-1}$$

(3)

3.4

Distance left and time to accelerate:

$$s = 12 \text{ m}; \quad t = 2 \text{ s.}$$

$$s = ut + \frac{1}{2}at^2$$

$$12 = (4)(2) + \frac{1}{2}a(2)^2$$

$$a = 2 \text{ m.s}^{-2}$$

(5)

[16]

QUESTION 4 / VRAAG 4

- 4.1 A resultant force acting on a mass produces an acceleration in the direction of the force. The acceleration is directly proportional the resultant force and is inversely proportional to the mass.

As 'n resulterende krag op 'n massa inwerk versnel die massa in die rigting van krag. Die versnelling is direk eweredig aan die resulterende krag en omgekeerd eweredig aan die massa.

(3)

4.2

$$\begin{aligned} F_{\text{res}} &= ma \\ &= 750 \cdot 0.4 \\ &= 300 \text{ N} \end{aligned}$$

(4)

4.3

up +

$$\begin{aligned} F_{\text{res}} &= F_g + F_{\text{applied}} \\ ma &= mg + F_{\text{applied}} \\ (750)(0.4) &= 750(-10) + F_{\text{applied}} \\ F_{\text{applied}} &= 7\,800 \text{ N} \end{aligned}$$

down +

$$\begin{aligned} F_{\text{res}} &= F_g + F_{\text{applied}} \\ ma &= mg + F_{\text{applied}} \\ (750)(-0.4) &= 750(10) + F_{\text{applied}} \\ F_{\text{applied}} &= -7\,800 \text{ N} \\ &= 7\,800 \text{ N} \end{aligned}$$

a & g
opp.
signs

(5)

- 4.4 Decreases / Afneem

(2)

[14]

QUESTION 5 / VRAAG 5

5.1

✓ In an isolated system, the sum of the gravitational potential energy and the kinetic energy remains constant. ✓

(3)

5.2

$$\begin{aligned} E_p &= mgh \checkmark \\ &= (2)(10)(1,5) \checkmark \\ &= 30 \text{ J } \checkmark \end{aligned}$$

(4)

5.3 30 J ✓✓

(2)

5.4.1 Work done against friction / *Arbeid verrig teen wrywing* ✓✓

(2)

5.4.2 No / Nee ✓

(1)

[12]

QUESTION 6/ VRAAG 6

6.1

Conservation of Momentum ✓

In an isolated system the total momentum remains a constant in magnitude and direction, ✓ or

In an isolated system the total momentum before impact is equal to the total momentum after impact. ✓

In 'n geïsoleerde sisteem bly die linieêre momentum behoue in grootte en rigting

(4)

6.2

right +

$$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2 \quad \checkmark$$

$$0 = 0,025 \times v_1 + 0,4 \times 0,2 \quad \checkmark$$

$$v_1 = -3,2 \text{ m.s}^{-1} \quad \checkmark$$

$$= 3,2 \text{ m.s}^{-1} \quad \checkmark \quad \text{left}$$

OR

left +

$$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2 \quad \checkmark$$

$$0 = 0,025 \times v_1 + (0,4)(-0,2) \quad \checkmark$$

$$v_1 = +3,2 \text{ m.s}^{-1} \quad \checkmark$$

(5)

6.3 left/ opposite direction of rolling cannon/ direction of ball. ✓✓

(2)

6.4

right +ve

$$F_f = F_{\text{res}} = ma \quad \checkmark$$

$$= (0,4) \cdot (-0,05) = -0,02 \text{ N} \quad \checkmark$$

= 0,02 N opposite to direction of motion / teenoorgestelde
rigting van beweging

left +ve

$$F_f = F_{\text{res}} = ma \quad \checkmark$$

$$= (0,4) \cdot (0,05) \quad \checkmark$$

= 0,02 N opposite to direction of motion / teenoorgestelde
rigting van beweging

(4)

[15]

QUESTION 7/ VRAAG 7

7.1

The force of attraction or repulsion which one charge exerts on the other is
directly proportional to the product of the charges and is inversely
proportional to the square of the distance between them.

(4)

7.2

$$\begin{aligned}
 F &= \frac{kQ_1Q_2}{r^2} \checkmark \\
 &= \frac{(9 \times 10^9)(8 \times 10^{-9})(4 \times 10^{-9})}{(0,2)^2} \checkmark \\
 &= 7,2 \times 10^{-6} \text{ N}, \text{ towards X / attraction / left}
 \end{aligned}$$

(6)

7.3

$$\begin{aligned}
 E &= \frac{kQ}{r^2} \checkmark \\
 &= \frac{(9 \times 10^9)(4 \times 10^{-9})}{(0,2)^2} \checkmark \\
 &= 900 \text{ N.C}^{-1} \checkmark
 \end{aligned}$$

$$\begin{aligned}
 E &= \frac{F}{q} \checkmark \\
 &= \frac{7,2 \times 10^{-6}}{8 \times 10^{-9}} \checkmark \\
 &= 900 \text{ N.C}^{-1} \checkmark
 \end{aligned}$$

(4)

7.4

$$\begin{aligned}
 \text{New charge} &= \frac{+8 \text{ nC} + (-4) \text{ nC}}{2} \checkmark \\
 &= \frac{+4 \text{ nC}}{2} \checkmark \\
 &= +2 \times 10^{-9} \text{ C}
 \end{aligned}$$

(3)

[17]

QUESTION 8/ VRAAG 8

8.1 12 V ✓✓ (2)

8.2 12 V ✓✓ (2)

8.3.1 $V_1 = 12 \text{ V}$ ✓✓ ; V_1 measures emf of battery / V_1 meet die emk van battery ✓✓ (3)

8.3.2 $V_1 = 0 \text{ V}$ ✓ ; no resistance in conducting wire therefore no work done in moving charges / geen weerstand in geleier nie ✓✓ (3)

8.4

$$\begin{aligned}\frac{1}{R_p} &= \frac{1}{R_6} + \frac{1}{R_3} \\ &= \frac{1}{6} + \frac{1}{3} \\ &= \frac{1}{2} \\ R_p &= 2 \Omega\end{aligned}$$

$$\begin{aligned}R_p &= \frac{\text{product}}{\text{sum}} \\ &= \frac{(6 \times 3)}{(6 + 3)} \\ &= 2 \Omega\end{aligned}$$

(4)

8.5

$$\begin{aligned}I_{\text{Cir}} &= \frac{V_{\text{Cir}}}{R_{\text{Cir}}} \\ &= \frac{12}{3} \\ &= 4 \text{ A}\end{aligned}$$

+ 1 Ω

(4)

8.6

$$\begin{aligned}W &= I^2 R t \\ &= 4^2 \cdot 1 \cdot 90 \\ &= 1440 \text{ J}\end{aligned}$$

$$\begin{aligned}V_1 &= IR = 4 \cdot 1 = 4 \text{ V} \\ \therefore W &= \frac{V^2}{R} t \\ &= \frac{4^2 \cdot 90}{1} \\ &= 1440 \text{ J}\end{aligned}$$

$$\begin{aligned}W &= V I t \\ &= 4 \cdot 4 \cdot 90 \\ &= 1440 \text{ J}\end{aligned}$$

(4)

[22]**TOTAL : 150 : TOTAAL**