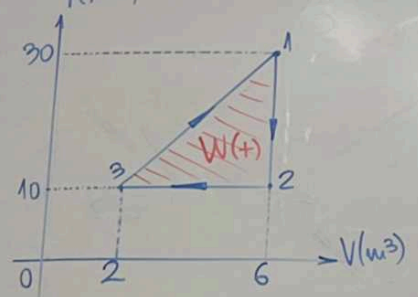
① P(kPa)



$W = \frac{4 \times 20}{2} = 40\,kJ$

② PROC. ISOBÁRICO (P = CONSTANTE)

$W = P.\Delta V = R.\Delta T.n$

- $i = 3$
- $Q = 25\,J$
- $W = ?$

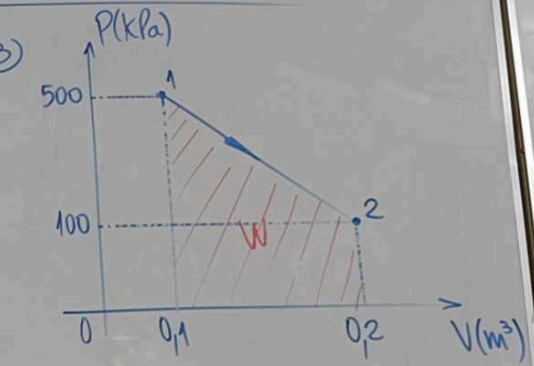
$\Delta U = \frac{i}{2}(R\Delta T.n) = \frac{i}{2}W = \frac{3}{2}W$

$Q = W + \Delta U$

$25 = W + \frac{3}{2}W$

$W = 10\,J$

③ P(kPa)



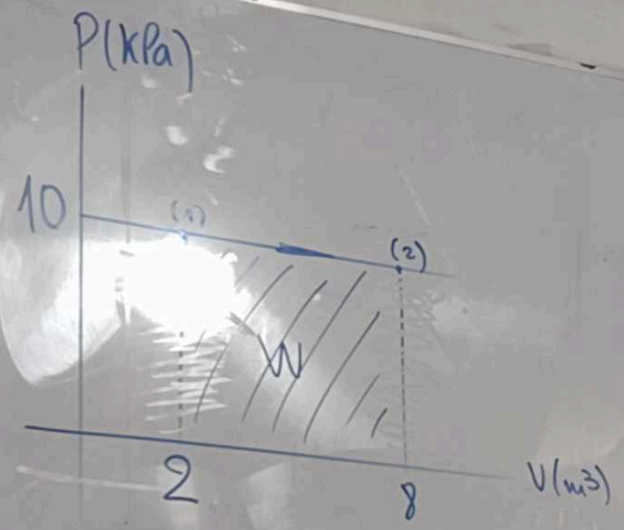
$W = \left(\frac{B+b}{2}\right).h$

$W = \left(\frac{500+100}{2}\right).0,1$

$W = 30\,kJ = 3 \times 10^4\,J$

④

④



✓ $W = 6 \times 10 = 60\,kJ$

✓ $Q = +100\,kJ$

✓ $Q = W + \Delta U$

$100 = 60 + \Delta U$

$\Delta U = 40\,kJ$ ✶

⑤ $C_p = 29{,}1 \frac{J}{mol.k}$

✓ $\gamma = \frac{i+2}{i}$

✓ $C_p = \left(\frac{i+2}{2}\right)R$; $C_v = \frac{i}{2}R$; $C_p - C_v = R = 8{,}31 \frac{J}{mol.k}$

$29{,}1 = \left(\frac{i+2}{2}\right).8{,}31$

$i = 5$ ✶

✓ $\gamma = \frac{5+2}{5} = 1{,}4$ ✶

Proc. Isobárico

(7) $P = 2\,ATM = 2 \times 10^5\,Pa = 200\,kPa$

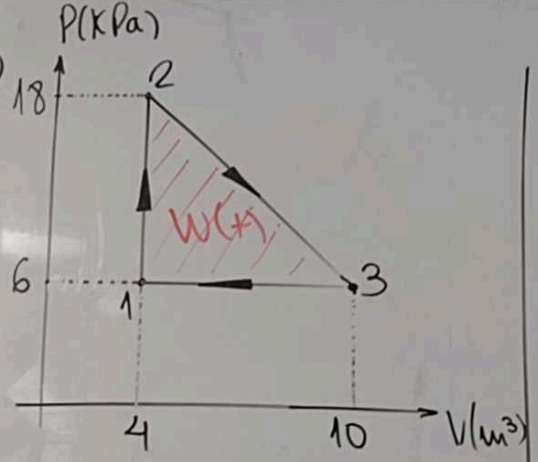
$\Delta V = 0{,}5\,m^3$

$W = P \cdot \Delta V$

$W = 200(0{,}5)$

$W = 100\,kJ$

(8)



$W = \frac{6 \times 12}{2} = 36\,kJ$

$\Delta U = 0$

$Q = W + \Delta U$

$Q = 36\,kJ$

Proc. Isócoro

(9) $V = \text{Constante}\ (W = 0)$

$Q = -72\,cal \times \frac{1\,J}{0{,}24\,cal} = -300\,J$

$\Delta U = ?$

$Q = W + \Delta U$

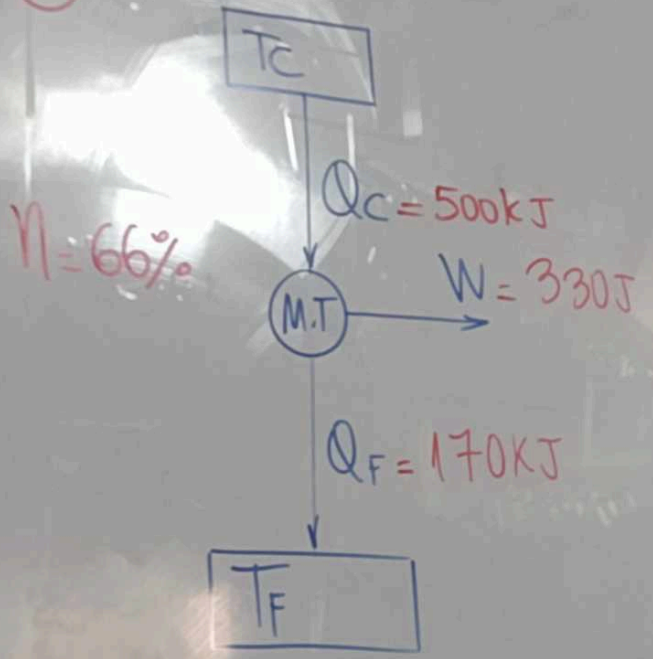
$-300 = 0 + \Delta U$

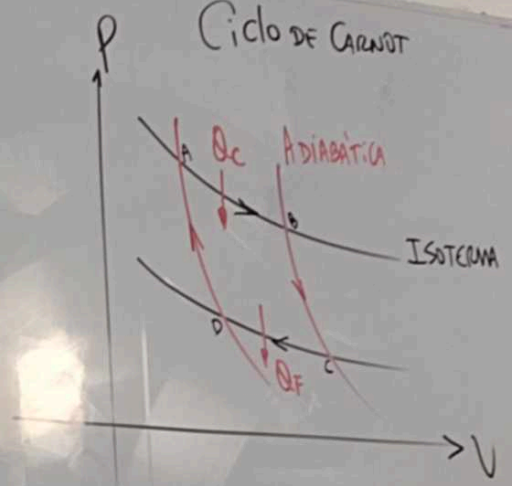
$\Delta U = -300\,kJ$

$= (W = 0)$

$\times \frac{1\,J}{0{,}24\,cal} = -30\,0\,J$

(10)





$$\eta = \frac{W}{Q_C} \times 100\%$$

$$66\% = \frac{W}{500} \times 100\%$$

$$W = 330KJ$$

$CS = \langle -8, -7] \cup [8,$

(11)

$T_C = 527°C + 273 = 800K$

$Q_C = 500kJ$

$\eta = 49\%$ — M.T → $W = 245kJ$

$Q_F = 255kJ$

T_F

$\frac{T_F}{800} = 0,51$

$T_F = 408K$

1) $\eta = \left(1 - \frac{T_F}{T_C}\right) \cdot 100\%$

$49\% = \left(1 - \frac{T_F}{800}\right) 100\%$

$0,49 = 1 - \frac{T_F}{800}$

2) $\frac{Q_C}{T_C} = \frac{Q_F}{T_F}$

$\frac{500}{800} = \frac{Q_F}{408}$

$Q_F = 255kJ$

$\eta = \frac{W}{Q_C} \times 100\%$

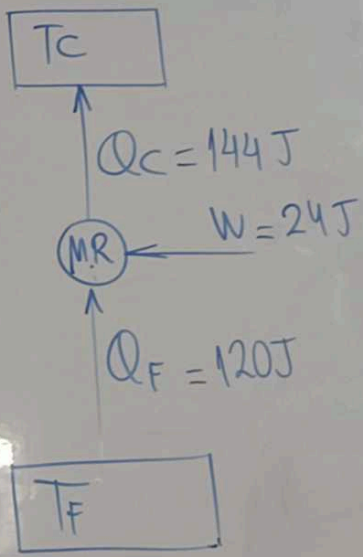
$49\% = \frac{W}{500} \times 100\%$

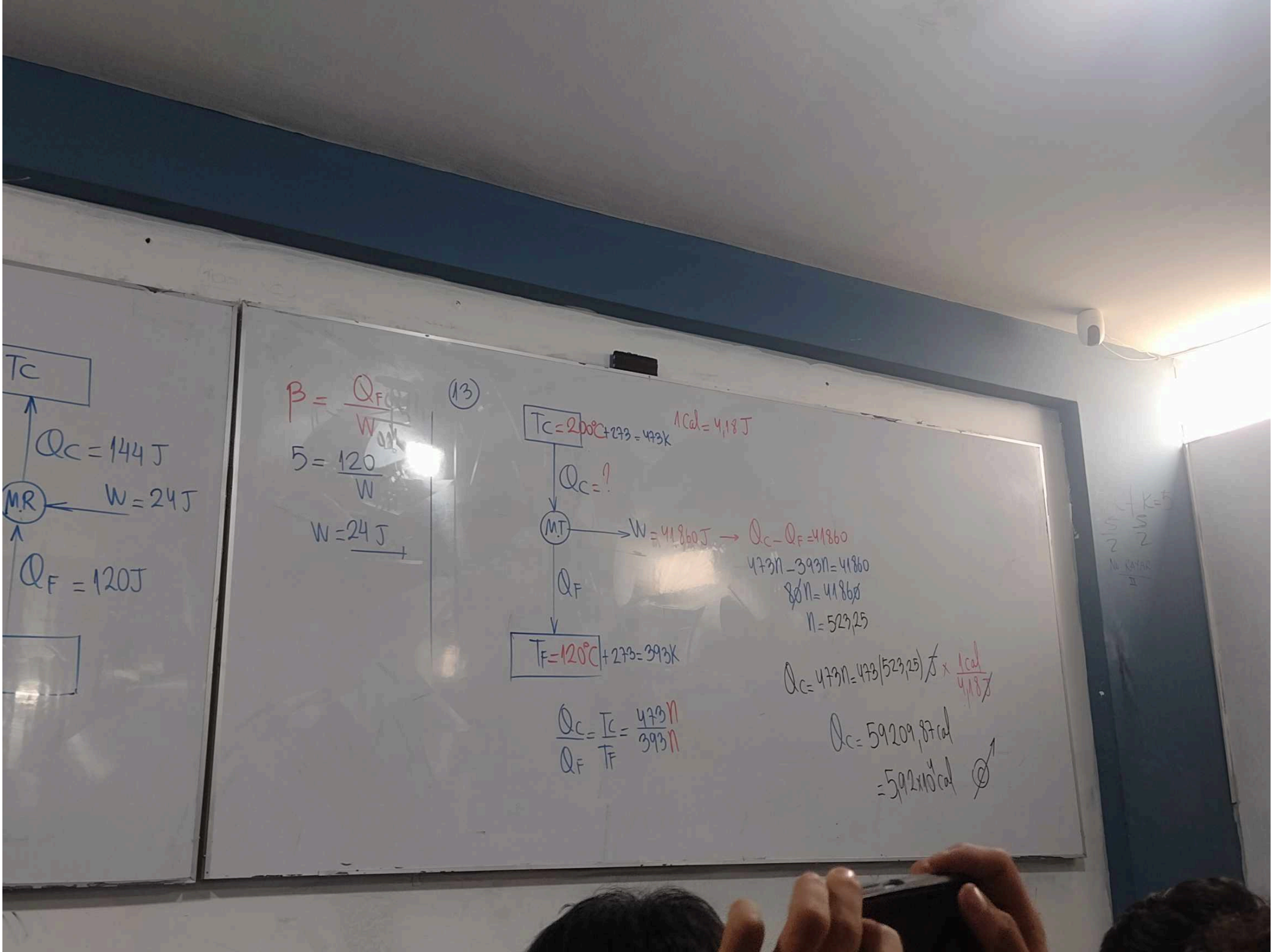
$W = 245kJ$

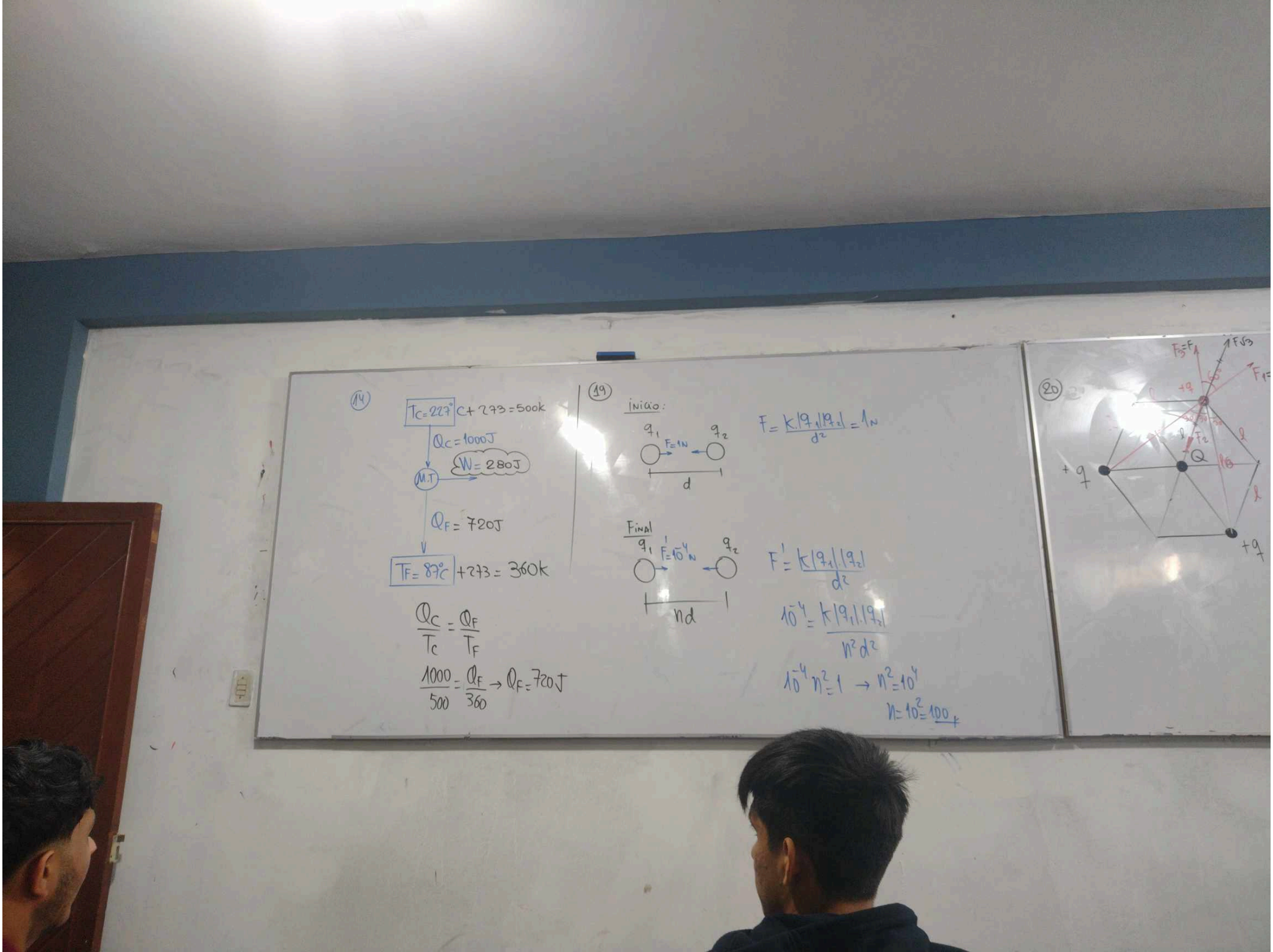
$\eta_{IDEAL} = \eta_{CARNOT} = \left(1 - \frac{T_F}{T_C}\right) \cdot 100\%$

$\eta_{REAL} = \left(1 - \frac{Q_F}{Q_C}\right) \cdot 100\% = \frac{W}{Q_C} \cdot 100\%$

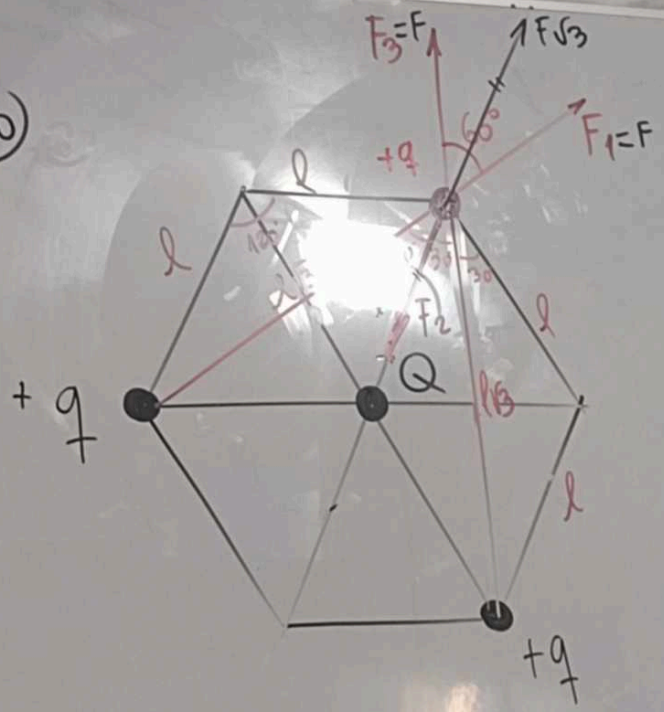
(12)




Tc
Qc = 144 J
M.R
W = 24 J
QF = 120J
β = QF / W
5 = 120 / W
W = 24 J
13
Tc = 200°C + 273 = 473K
1 Cal = 4,18 J
Qc = ?
M.T
W = 41860 J → Qc − QF = 41860
473n − 393n = 41860
80n = 41860
n = 523,25
QF
TF = 120°C + 273 = 393K
Qc / QF = Tc / TF = 473n / 393n
Qc = 473n = 473(523,25) J × 1 cal / 4,18 J
Qc = 59209,87 cal
= 5,92 × 10⁴ cal


14
$T_C = 227°C + 273 = 500K$
$Q_C = 1000J$
W = 280J
M.T
$Q_F = 720J$
$T_F = 87°C + 273 = 360K$
$\frac{Q_C}{T_C} = \frac{Q_F}{T_F}$
$\frac{1000}{500} = \frac{Q_F}{360} \rightarrow Q_F = 720J$
19
Início:
q_1 $F=1N$ q_2
d
$F = \frac{k|q_1||q_2|}{d^2} = 1N$
Final
q_1 $F=10^{-4}N$ q_2
nd
$F' = \frac{k|q_1||q_2|}{d^2}$
$10^{-4} = \frac{k|q_1||q_2|}{n^2 d^2}$
$10^{-4} n^2 = 1 \rightarrow n^2 = 10^4$
$n = 10^2 = 100$
20
$F_3 = F$
$F\sqrt{3}$
$F_1 =$
+q
Q
F_2
+q
+q

(20)



$$F_1 = \frac{K \cdot q^2}{(l\sqrt{3})^2} = F_3 = F$$

$$F_2 = F\sqrt{3}$$

$$\frac{K \cdot Q q}{l^2} = \frac{K q}{3l^2} \cdot \sqrt{3}$$

$$Q = \frac{-q\sqrt{3}}{3}$$