Énergie et puissance - Külling & Noverraz
Corrigés

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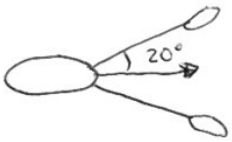
20 mars 2025

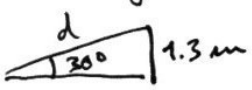
TR12



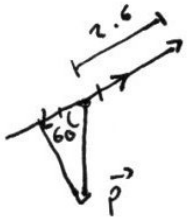
$W = 4 \cdot 10^4 \cdot \cos(20) \cdot 15000 =$
$563{,}8$ MJ

TR16

1. $W = m \cdot g \cdot \Delta h = 150 \cdot 9.81 \cdot 1.3 \approx 1913$ J

2. 

$\sin(30) = \frac{1.3}{d} \Rightarrow d = \frac{1.3}{\sin(30)} = 2.6$ m



$W = m \cdot g \cdot \cos(60) \cdot d =$
$150 \cdot 9.81 \cdot 0.5 \cdot 2.6 \approx 1913$ J

3. $F_{P//} = \sin(30) \cdot m \cdot g = 0.5 \cdot 150 \cdot 9.81 = 735{,}75$ N
$\Rightarrow$ non !

PU18

1. E_{pot} pour une personne :

$m \cdot g \cdot \Delta h = 75 \cdot 9.81 \cdot 700 = 515025$ J

E_{moteur} en 1 h : $P \cdot t = 285'000 \cdot 3600 = 1.026 \cdot 10^9$ J

Nombre de personnes en 1 h : $\frac{1.026 \cdot 10^9}{515025} = \underline{\underline{1992}}$ pers.

TR51

$E_{el} = 0.2 = m \cdot g \cdot \Delta h \Rightarrow \Delta h = \frac{0.2}{m \cdot g} = \underline{\underline{1 \text{ m}}}$

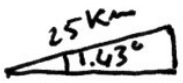
PU27

en 1 h : $W_{frott.} = F_{frott} \cdot d = 27 \cdot 30'000 = 810'000$ J

$P = \frac{E}{t} = \frac{810000}{3600} = \underline{\underline{225 \text{ W}}}$

PU23

$\tan\alpha = \frac{25}{1000} \Rightarrow \alpha = 1.432544°$



en 1h : $\sin(1.432544) = \frac{\Delta h}{25000}$

$\Delta h = 25'000 \cdot \sin(1.432544) = 625$ m

$E_{pot} = m \cdot g \cdot \Delta h = (130000 + 320'000) \cdot 9.81 \cdot 625$
$= 2,759 \cdot 10^9$ J

$E_{moteur} : 1100000 \cdot 3600 = 3.96 \cdot 10^9$ J

$E_{dissipée} : 3,96 \cdot 10^9 - 2,759 \cdot 10^9 \approx 1.2 \cdot 10^9$ J

$F_{frott} = \frac{E_{dissipée}}{d} = \frac{1.2 \cdot 10^9}{25000} = 48'000$ N

MR7

$E_c = 2.1 \cdot 35 \cdot 10^6 = 73.5 \cdot 10^6$ J

$P_c = \frac{E_c}{t} = \frac{73.5 \cdot 10^6}{3600} = 20416,67$ W

$\eta = \frac{P_u}{P_c} = \frac{2000}{20416,67} \approx 9.8\,\%$

TR34

circonférence d'un tour de manivelle :

$0.09 \cdot 2 \cdot \pi = 0,565487$ m

50 tours : $50 \cdot 0.565487 = 28,27433$ m

$W = F \cdot d = 3 \cdot 28,27433 \approx 84.8$ J

TR 24

$\Delta h = \frac{1.6}{2} - 0.1 = 0.7\ m$

$W = m \cdot g \cdot \Delta h = 60 \cdot 10 \cdot 0.7 = 420\ J$

MR32

1) circonférence du tambour : $\pi \cdot 0.4$

⇒ 8,6 m de corde : $\frac{8.6}{\pi \cdot 0.4} = 6,843663$ tours de tambour

⇒ $6.843663 \cdot 183 = 1252,39$ dents au tambour

⇒ $\frac{1252,39}{20} = 62,61951$ tours de manivelle

2) $W_{seau} = m \cdot g \cdot \Delta h = 30 \cdot 9.81 \cdot 8.6 = 2530,98\ J$

$W_{manivelle}\ \frac{2530.98}{0.75} ; 3374.64\ J$

$t = \frac{E}{P} = \frac{3374.64}{35} \simeq 96,4$ sec.

PU11

1) $E = m \cdot g \cdot \Delta h = 1500 \cdot 10 \cdot 3 = 45\,000\ J$

$t = \frac{E}{P} = \frac{45000}{50} = 900$ sec. $= 15$ min

2) $\frac{45\,000}{3000} = 15$ sec

PU 28

1) circonférence de la roue : $0.7 \cdot \pi$
pour 30km : $\frac{30'000}{0.7 \cdot \pi} = 13641,852$ tours de roue
$\Rightarrow \frac{13641.852}{3600} = 3,789$ tours s^{-1}

2) Pignon arrière $3.789 \cdot 13 = 49,262$ dents s^{-1}
$\Rightarrow$ pignon avant $\frac{49.262}{52} = \underline{0.947}$ tours s^{-1}

3) E en 1 s : $160 \cdot 1 = 160$ J
1 tour de pédale : $0.2 \cdot 2 \cdot \pi = 1,2566$ m
$\Rightarrow$ en 1 sec : $0,947 \cdot 1.2566 = 1,190$ m
$F = \frac{W}{d} = \frac{160}{1.190} = \underline{134.4}$ N

MR 38

1) 1 tour de manivelle $\rightarrow$ 12 dents de la roue 1
$\rightarrow \frac{12}{20}$ tour de la roue 2.
$\frac{12}{20} \cdot 4 = \underline{2.4}$ mm d'élévation sur la vis

2) W du cric : $5000 \cdot 0,0024 = 12$ J pour un tour de manivelle.
W de la manivelle = W cric = 12 J
distance parcourue par la manivelle en un tour : $2 \cdot 0.14 \cdot \pi = 0,87965$ m
$W = F \cdot d \Rightarrow F = \frac{W}{d} = \frac{12}{0.87965} \approx \underline{13.6}$ N