FÍSICA A

Aula 17

	0	1	2	3	4	5	6	7	8	9
0		c	c	54	a	a	b	b	54	c
1	d	d	a	b	75	e	d	e		

01. c

$6 \cdot R_A - 100 \cdot 4 - P \cdot 3 - 500 \cdot 1 = 0$

$1\,200 - 400 - 3 \cdot P - 500 = 0$

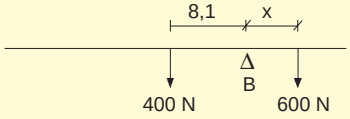
$P = 100$ kN

02. c

- $R_B \cdot x = F \cdot 2x$; $R_B = 2F$
- $R_A \cdot x = F \cdot x$; $R_A = F$

$\therefore \; R_B = 2 \cdot R_A$

03.



$600 \cdot x = 400 \cdot 8{,}1$

$x = 5{,}4$ m $= 54$ dm

04. a

$v^2 = v_o^2 + 2a\,\Delta x$

$5^2 = 0^2 + 2 \cdot a \cdot 25$

$a = 0{,}5$ m/s^2

$F = m \cdot a$

$F = 6 \cdot 0{,}5 = 3$N

05. a

Como não há atritos, o bloco A permanecerá em repouso. Assim, a aceleração dos blocos B e C será:

$P_C = (m_B + m_C) \cdot a$

$m \cdot g = 2\,m \cdot a$

$a = g/2$

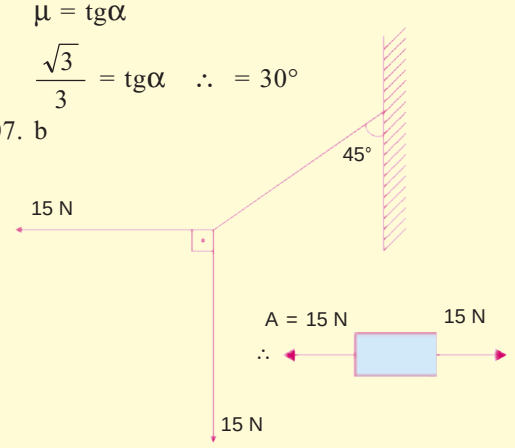
06. b

Velocidade constante, portanto:

$\mu = \text{tg}\alpha$

$\frac{\sqrt{3}}{3} = \text{tg}\alpha \quad \therefore \quad = 30°$

07. b



08. 02 + 04 + 16 + 32 = 54

09. c

$R = m \cdot a$; $A = m \cdot a$; $\mu \cdot N = m \cdot a$; $\mu \cdot m \cdot g = m \cdot a$; $0{,}4 \cdot 10 = a$; $|a| = 4$ m/s^2

$v^2 = v_o^2 + 2a\,\Delta x$; $0^2 = 10^2 + 2 \cdot (-4) \cdot \Delta x$; $\Delta x = 12{,}5$ m

10. d

Resultante centrípeta, mesmo que o movimento fosse uniforme.

11. d

12. a

$R_c = m \cdot a_c$

$T = m \cdot \frac{v^2}{r}$

$9 = 2 \cdot \frac{v^2}{2}$

$|v| = 3$ m/s

13. b

$\tau = F \,.\, \Delta x \cdot \cos 90° \quad \therefore \quad \tau = 0$

14. $P = 1$ HP $= 746$W

$= \frac{|\tau|}{\Delta}$

$= \frac{\cdot}{\Delta}$

$746 = \frac{\cdot}{\Delta}$

$\Delta t = 75$ s

15. e

Pois $\alpha = 90°$

16. d

$F = m \cdot a = 8 \cdot 10 = 80$ N

$\tau \overset{N}{=}$ área $=$ —— —— $= 160$ J

17. e

1W = — ——— ———

∴ 1W = 1 ———

Aula 18

	0	1	2	3	4	5	6	7	8	9
0		a	a	d	b	a	c	d	c	e
1	b	d	d	25	b	b	12			

01. a

02. a

03. d

$E_p = m \cdot g \cdot h$

$600 = 5 \cdot 10 \cdot h$

$h = 12$ m

04. b

$h = \frac{1}{2} gt^2 = \frac{1}{2} \cdot 10 \cdot 1^2 = 5 \text{ m}$

$E_p = m \cdot g \cdot h = 2 \cdot 10 \cdot 5 = 100 \text{ J}$

05. a

$E_p = \frac{1}{2} k \cdot x^2$

$16 = \frac{1}{2} \cdot 800 \cdot x^2$

$x = 0{,}2 \text{ m} = 20 \text{ cm}$

06. c

$E_c = \frac{1}{2} mv^2$

$E_c = f(v)$

} eq. 2º grau

07. d

$\Delta E_p = \frac{1}{2} k \cdot x_B^2 - \frac{1}{2} k \cdot x_A^2 = \frac{k}{2} (x_B^2 - x_A^2)$

08. c

$k_A = k_B$

$\frac{1}{2} \cdot m_A \cdot v_A^2 = \frac{1}{2} m_B \cdot v_B^2$

$4\, m_B \cdot v_A^2 = m_B \cdot v_B^2$

$\therefore v_B = 2\, v_A$

09. e

$v^2 = 2\, g \cdot \Delta h$

$6^2 = 2 \cdot 10 \cdot \Delta h$

$\Delta h = 1{,}8 \text{ m}$

$E_c = \frac{1}{2} m \cdot v^2$

$2 = \frac{1}{2} \cdot m \cdot 6^2$

$m \cong 0{,}11 \text{ kg}$

10. b

11. d

$\tau_R = \frac{1}{2} m \cdot v^2 - \frac{1}{2} m \cdot v_o^2$

$\tau_R = \frac{1}{2} \cdot 800 \cdot 20^2 - \frac{1}{2} \cdot 800 \cdot 10^2$

$\tau_R = 1{,}2 \cdot 10^5 \text{ J}$

12. d

$\tau^R = \frac{1}{2} m \cdot v^2 - \frac{1}{2} m \cdot v_o^2$

$- A \cdot \Delta x = \frac{1}{2} \cdot m \cdot v^2 - \frac{1}{2} \cdot m \cdot v_o^2$

$- A \cdot 2 = \frac{1}{2} \cdot 5 \cdot 0^2 - \frac{1}{2} \cdot 5 \cdot 4^2$

$A = 20 \text{ N}$

13. $- A \cdot \Delta x = \frac{1}{2} \cdot m \cdot v^2 - \frac{1}{2} \cdot m \cdot v_o^2$

$- A \cdot 1 = \frac{1}{2} \cdot 5 \cdot 10^{-3} \cdot 0^2 - \frac{1}{2} \cdot 5 \cdot 10^{-3} \cdot 100^2$

$A = 25 \text{ N}$

14. b

$\tau_R = E_c^f - E_c^i$

$- A \cdot \Delta x = E_c^f - \frac{1}{2} \cdot m \cdot v_o^2$

$- \mu \cdot m \cdot g \cdot \Delta x = E_c^f - \frac{1}{2} \cdot m \cdot v_o^2$

$- 0{,}6 \cdot 6 \cdot 10 \cdot 5 = E_c^f - \frac{1}{2} \cdot 6 \cdot 10^2$

$E_c^f = 120 \text{ J}$

15. b

$\tau_R = \Delta E_c$

$F \cdot \Delta x = \Delta E_c$

$40 \cdot \Delta x = 80$

$\Delta x = 2 \text{ m}$

16. $\tau_R = \frac{1}{2} \cdot m \cdot v^2 - \frac{1}{2} \cdot m \cdot v_o^2$

área $= \frac{1}{2} \cdot m \cdot v^2 - \frac{1}{2} \cdot m \cdot v_o^2$

$650 = \frac{1}{2} \cdot 10 \cdot v^2 - \frac{1}{2} \cdot 10 \cdot (\sqrt{\ \ })^2$

$v = 12 \text{ m/s}$

Aula 19

	0	1	2	3	4	5	6	7	8	9
0		e	b	e	c	b	a	d	e	04
1	a	c	c	b	e	a	*			

01. e

02. b

03. e

04. c

$E_c = E_p$

$E_c = m \cdot g \cdot h$

$20 = 0{,}1 \cdot 10 \cdot h \quad \therefore \quad h = 20 \text{ m}$

05. b

$\frac{1}{2} \cdot m \cdot v^2 = m \cdot g \cdot h$

$v = \sqrt{2\, g\, h}$

06. a

$\frac{1}{2} \cdot m \cdot v_o^2 = m \cdot g \cdot h$

$\frac{1}{2} \cdot 2\, v_o^2 = 2 \cdot 10 \cdot 20 \quad \therefore \quad v_o = 20 \text{ m/s}$

07. d

$E_c^Q = E_p^p$

$E_c^Q = m \cdot g \cdot h = 70 \cdot 10 \cdot 5 = 3{,}5 \cdot 10^3 \text{ J}$

e

$E_c = \frac{1}{2} \cdot m \cdot v^2$

$3{,}5 \cdot 10^3 = \frac{1}{2} \cdot 70 \cdot v^2 \quad \therefore \quad v = 10 \text{ m/s}$

08. e

$m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot x^2$

$0{,}5 \cdot 10 \cdot h = \frac{1}{2} \cdot 4 \cdot 10^2 \cdot 0{,}1^2$

$h = 0{,}4$ m

09. $\frac{1}{2} \cdot k \cdot x^2 = \frac{1}{2} \cdot m \cdot v^2$

$40 \cdot x^2 = 1{,}6 \cdot 0{,}2^2$

$x = 0{,}04$ m $= 4$ cm

10. a

$\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot x^2$

$1 \cdot v^2 = 100 \cdot 0{,}2^2$

$v = 2$ m/s

11. c

Como em R a velocidade é nula, então $E_c^R = 0$. Assim, a energia mecânica em R é igual à energia potencial: $E_m^R = E_p^R = 30$ J. Logo, em P, como está à metade da altura de R: $E_p^p = \frac{30}{2} = 15$ J

Como: $E_m^p = E_c^p + E_p^p$

$30 = E_c + 15$

$E_c^p = 15$ J

12. c

$E_m = E_c + E_p = 2 \cdot 10^2 + 2{,}5 \cdot 10^3 = 27 \cdot 10^2$ J

No solo: $E_p = 0 \quad \therefore \quad E_c = E_m = 27 \cdot 10^2$ J

assim: $E_c = \frac{1}{2} m \cdot v^2$

$27 \cdot 10^2 = \frac{1}{2} \cdot 6 \cdot v^2$

$v = 30$ m/s

13. b

$E_p = m \cdot g \cdot h = 0{,}2 \cdot 10 \cdot 20 = 40$ J

$\therefore \quad E_m = E_c + E_p$

$50 = E_c + 40$

Ec = 10 J (ao atingir 20 m)

$\therefore \quad \frac{1}{2} \cdot m \cdot v^2 = 10$

$\frac{1}{2} \cdot 0{,}2 \cdot v^2 = 10$

$v = 10$ m/s

14. e

Pois B e D estão à meia altura $\left(\frac{h}{2}\right)$

15. a

$E_p = m \cdot g \cdot h \rightarrow E_p \cdot \Delta h$ (reta)

Como: $E_m^{cte} = E_c + E_p$ então, se E_p aumenta E_c diminui na mesma proporção.

16. a. 40 m

30 m + 10 m = 40 m

b. $6{,}0 \cdot 10^2$ N/m

$\frac{1}{2} \cdot k \cdot x^2 = \underbrace{m \cdot g} \cdot h$

$\frac{1}{2} \cdot k \cdot 10^2 = 750 \cdot 40$

$k = 600 = 6 \cdot 10^2$ N/m

Aula 20

	0	1	2	3	4	5	6	7	8	9
0		d	90	04	b	*	e	10	b	a
1	*	b	06	d	c	10				

01. d

$E_c = E_p$

$\frac{1}{2} \cdot m \cdot v^2 = m \cdot g \cdot h$

$\frac{1}{2} \cdot v^2 = g \cdot R$

$v^2 = 2 \cdot 10 \cdot 0{,}45$

$\therefore \quad v = 3$ m/s

02. 90

02 + 08 + 16 + 64

03. $E_c = E_p$

$\frac{1}{2} \cdot m \cdot v^2 = m \cdot g \cdot h$

$\frac{1}{2} \cdot v^2 = 10 \cdot 0{,}8$

$v = 4$ m/s

04. b

$E_c = E_p$

$\frac{1}{2} \cdot m \cdot v^2 = m \cdot g \cdot h$

$\frac{1}{2} \cdot v^2 = g \cdot R$

$v^2 = 2 \cdot 10 \cdot R \quad \therefore \quad v^2 = 20\,R$

Logo: $R_c = m \cdot \frac{v^2}{R}$

$N - P = \frac{20\,R}{R}$

$N - 50 = 5 \cdot 20$

$N = 150$ N

05. a

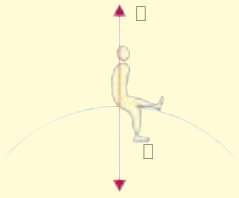
$E_c^L + E_p^L = E_p^J$

$\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot R = m \cdot g \cdot h$

$\frac{1}{2} \cdot v^2 + 10 \cdot 5{,}4 = 10 \cdot 7{,}2$

$\therefore \quad v = 6$ m/s

b.



Vertical para cima $(\vec{N})$.

$$P - N = m \cdot \frac{v^2}{r}$$

$$150 - N = 15 \cdot \frac{6^2}{5{,}4}$$

$$N = 50 \text{ N}$$

06. e

$v_B^{min} = \sqrt{R\,g}$ ou $v_B^2 = R \,.\, g$

$\therefore \quad E_c^A = E_c^B + E_p^B$

$$\frac{1}{2} \cdot m \cdot v_A^2 = \frac{1}{2} \cdot m \cdot v_B^2 + m \cdot g \cdot 2\,R$$

$$\frac{1}{2}\, v_A^2 = \frac{1}{2} \cdot R\,g + 2\,R\,g$$

$$\frac{1}{2} \cdot v_A^2 = \frac{5}{2} \cdot R\,g \quad \therefore \quad v_A = \sqrt{5\,R\,g}$$

(vide exercício resolvido em aula).

07. $h = \frac{5}{2} R \quad \therefore \quad h = \frac{5}{2} \cdot 4 = 10$ m

(vide exercício resolvido em aula).

08. b

$$\frac{1}{2} \cdot k \cdot x^2 = m \cdot g \cdot R$$

$$\therefore x = \sqrt{\frac{2\,.\,m\,.\,g\,.\,R}{k}}$$

09. a

$E_c^B = E_c^A$

$$\frac{1}{2} \cdot m \cdot v_B^2 = m \cdot g \cdot h$$

$$\frac{1}{2} \cdot v_B^2 = 10 \cdot 1$$

$v_B^2 = 20$

$E_m^C = E_m^B + \tau_A$

$$\frac{1}{2}\, m \cdot v_c^2 = \frac{1}{2} \cdot m \cdot v_B^2 + \tau_A$$

$$\frac{1}{2} \cdot 2 \cdot v_c^2 = \frac{1}{2} \cdot 2 \cdot 20 + \tau_A$$

$v_c^2 = 20 - \mu \cdot N \cdot \Delta x$

$v_c^2 = 20 - 0{,}2 \cdot 20 \cdot 1$

$\therefore \quad v_c = 4$ m/s

10. $E_m^f = E_m^i + \tau_A$

$m \cdot g \cdot h_f = m \cdot g \cdot h_i + \tau_A$

$2 \cdot 10 \cdot 4 = 2 \cdot 10 \cdot 5 + \tau_A$

$\tau_A = -20$ J

11. b

$E_m^f = E_m^i + \tau_A$

$$\frac{1}{2} \cdot m \cdot v^2 = m \cdot g \cdot h + \tau_A$$

$$\frac{1}{2} \cdot 2 \cdot 10^2 = 2 \cdot 10 \cdot 12 + \tau_A$$

$\tau_A = -140$ J

12.

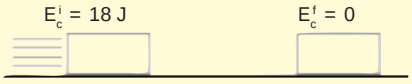
$E_m^i = E_p = m \cdot g \cdot h = m \cdot 10 \cdot 2{,}7 = 27$ m

Perde $\frac{1}{3}$ de energia, portanto restam $\frac{2}{3}$:

$$E_m^f = \frac{2}{3}\, E_m^i = \frac{2}{3} \cdot 27 \text{ m} = 18 \text{ m}$$

Como: $E_m^f = E_c \quad \therefore \quad 18\ m = m\frac{v^2}{2} \quad \therefore \quad v = 6$ m/s

13. d



$E_m^f = E_m^i + \tau_A$

$E_c^f = E_c^i - A \cdot \Delta x$

$o = 18 - A \cdot 2$

$\therefore \quad A = 9$ N

14. c

$E_c^f = E_p^i - A \cdot \Delta x$

$$o = \frac{1}{2} \cdot k \cdot x^2 - A \cdot \Delta x$$

$$o = \frac{1}{2} \cdot 1{,}0 \cdot 10^3 \cdot 0{,}2^2 - 10 \cdot \Delta x \quad \therefore \quad \Delta x = 2 \text{ m}$$

15. 10

02 + 08

Velocidade constante $\rightarrow R = 0$

Como há atrito, a energia mecânica $(E_c + E_p)$ não permanece constante.

Testes complementares

	0	1	2	3	4	5	6	7	8	9
0		b	a	d	a	a	14	a	37	d
1	c									

01. b

$$\frac{E_A}{E_B} = \frac{\frac{1}{2} \cdot m \cdot v_A^{\,2}}{\frac{1}{2} \cdot m \cdot v_B^{\,2}} = \left(\frac{v_A}{v_B}\right) = \left(\frac{20}{30}\right)^2 = \frac{4}{9}$$

02. a

E_c = função do 2º grau

$x = 0 \rightarrow E_c$ máxima

$x = 1 \rightarrow E_c$ nula

03. d

Alcance máximo: $A = \frac{v_0^{\,2}}{g}$

$$80 = \frac{v_0^{\,2}}{10} \quad \therefore \quad v_0^{\,2} = 800$$

$$E_c = \frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot 7 \cdot 800$$

$E_c = 2\,800$ J

Valor mais próximo: 3 000 J

04. a

$\tau = \Delta E_c$

$\tau = E_c^f - E_c^i$

$\tau = 0 - \frac{1}{2} mv^2$

$\tau = -\frac{1}{2} mv^2$

05. a

- $E_c^B = Ep^A$ $\qquad R = \frac{1}{3}h \therefore h = 3R$

  $E_c^B = m \cdot g \cdot h = mg3R = 3\ mgR$

- $E_c^c + E_p^c = E_p^A$

  $E_c^c = 3mgR - mgR = 2mgR$

- $E_c^D + E_p^D = E_p^A$

  $E_c^D = 3mgR - mg2R = mgR$

06. 02 + 04 + 08 = 14

01. Falsa

$Py = Pt = P \cdot \text{sen } 30° = 200 \cdot \frac{1}{2} = 100\ N$

16. Falsa

A energia potencial "cresce", pois a altura "cresce".

07. a

$E_m = \text{constante} = E_c + E_p$

08. 01 + 04 + 32 = 37

01. Verdadeira – desde que se considere que em nenhum instante os atritos sejam despresívos.

02. Falsa

$E_c = E_p$

$\frac{1}{2} mv^2 = mgh$

$v^2 = 2 \cdot 10 \cdot 10$

$v = 10\sqrt{2}$ m/s

04. Verdadeira

$F = kx$

$p = k \cdot x$

$700 = 100 \cdot x$

$x = 7\ m$

$d = 10 + 7 = 17\ m$

08. Falsa – há as forças peso e atrito.

16. Falsa – é dessipada devido ao atrito.

32. Verdadeira.

09. d

$E_c^i = E_c^f + E_p^f$

$\frac{1}{2} \cancel{m} \cdot 10^2 = \frac{1}{2} \cdot \cancel{m} \cdot 5^2 + \cancel{m} \cdot g \cdot h$

$50 = 12{,}5 + 10 \cdot h$

$h = 3{,}75\ m$

10. c

$E_m^i = E_p = m \cdot g \cdot h = 0{,}2 \cdot 10 \cdot (5 - 0{,}5) = 9\ J$

$E_m^{diss} = 9 - 7 = 2\ J$

Anotações