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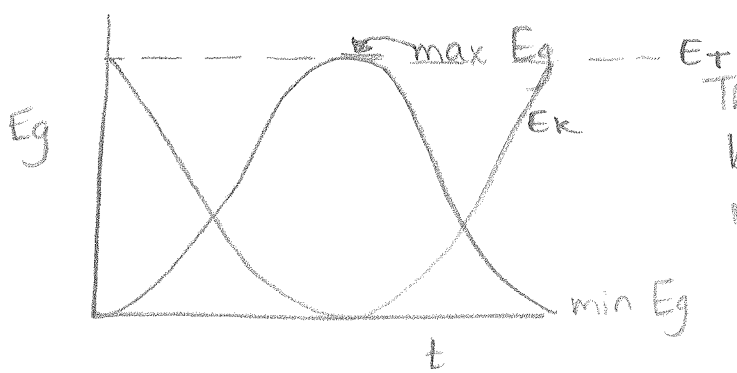
1a) $h_{max} = ?$ → at h_{max}, $v = 0\,m/s$

	Before	h max
E_g	mgh $0\,J$	$E_T - E_K$ $= 60.5m$
E_K	$\frac{1}{2}mv^2 = \frac{1}{2}m(11)^2$ $= 60.5m$	$\frac{1}{2}mv^2$ $0\,J$
E_T	$E_K + E_g$ $= 60.5m$	→ $60.5m$
h	$0m$	$E_g = mgh \Rightarrow h = \frac{E_g}{mg} = \frac{60.5\cancel{m}}{9.8\cancel{m}} = 6.2m$
v	$11\,m/s$ (given)	$0\,m/s$

b)



The graph is a quadratic because $h = v_1 t + \frac{1}{2}at^2$, which is how Eg will change.

c) See graph

E_T is constant for the system
$E_{K}max$ occurs at $E_{g}min$ and vice versa.
At any point in time, $E_g + E_K = E_T$

2a) Just before it hits the ground.

b) On the branch

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3a) The energy is conserved. This is because the energy of the system is constant.

b) All of the initial E_k is converted to heat, sound, by friction.

4a) $m = 110 kg$
$h = 210 m$
$W = ?$

$W = Fd$
$W = mgd$
$W = mgh = E_g$
$W = (110 kg)(9.8 N/kg)(210 m)$
$W = 226380 J$
$W = 2.26 \times 10^5 J$

b) $v = ?$ Because $v_i = 0 m/s$, $E_T = 226380 J$. At the bottom of the hill, $E_g = 0 J$ $\therefore E_k = E_T$

$$E_k = E_T = \frac{1}{2} m v^2$$

$$v = \sqrt{\frac{2E_T}{m}}$$

$$v = \sqrt{\frac{2(226380 J)}{110 kg}}$$

$$v = 64.2 m/s$$

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5. $m = 62\,kg$ * There are many ways to solve this *
$v_1 = 8.1\,m/s$
$\Delta h = 3.7\,m$

On the ledge:

$E_K = \frac{1}{2} m v^2$

$= \frac{1}{2}(62\,kg)(8.1\,m/s)^2$

$= 2033.91\,J$

$E_g = mgh$
$= (62\,kg)(9.8\,N/kg)(3.7\,m)$
$= 2248.12\,J$

$E_T = E_K + E_g$
$= 2033.91\,J + 2248.12\,J$
$= 4282.03\,J$

At the moment she hits the ground:
$h = 0\,m \rightarrow E_g = mgh = 0\,J$

$E_K = E_T - E_g = E_T$

$\frac{1}{2} m v^2 = E_T$

$v = \sqrt{\frac{2E_T}{m}}$

$v = \sqrt{\frac{2(4282.03\,J)}{62\,kg}}$

$v = 12\,m/s$

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6. $\theta = 40°$
$h = 3.5 m$
$V_i = ?$

To go through the hoop:

$$E_T = E_k + E_g$$

$\therefore$ at the top of the jump, $v = 0 m/s$

$$E_T = mgh$$

At the bottom, $h = 0 m$

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

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

$$gh = \frac{1}{2}v^2$$

$$v = \sqrt{2gh}$$

$$v = \sqrt{2(9.8 N/kg)(3.5 m)}$$

$$v = 8.28 m/s$$
$$v = 8.3 m/s$$

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7. $m = 640 kg$

a) Yes

b) $h_A = 30.0 m$
$v_A = 0 m/s$
$E_T = ?$

$E_T = E_{gA} + E_{kA}$

$E_T = mgh_A + \frac{1}{2}mv_A^2$

$E_T = (640 kg)(9.8 N/kg)(30.0 m) + \frac{1}{2}(640 kg)(0 m/s)^2$

$E_T = 188160 J$

$E_T = 1.9 \times 10^5 J$

c) E_T is constant $\rightarrow E_T = 1.9 \times 10^5 J$

d) $v_B = ?$
$v_C = ?$

	B	C
E_g	mgh 94080 J	0 J = mgh
E_k	$E_T - E_g$ 94080 J	$E_T - E_g$ = 188160 J
E_T	188160 J	188160 J
h	15 m	0 m
v	$\sqrt{\frac{2E_k}{m}} = 17 m/s$	$\sqrt{\frac{2E_k}{m}} = 24 m/s$

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7e)

	A	B	C
E_g	mgh = 188160 J	mgh = 94080 J	mgh 0 J
E_k	$\frac{1}{2}mv^2$ = 46080 J	$E_T - E_g$ 140160 J	$E_T - E_g$ 234240 J
E_T	$E_g + E_k$ 234240 J	→ 234240 J	→ 234240 J
h	30.0 m	15. m	0 m
v	12 m/s	$\sqrt{\frac{2E_k}{m}} = 21$ m/s	$\sqrt{\frac{2E_k}{m}} = 27$ m/s

8) m = 52 kg
t = 24 s
h = 18 m
p = ?

$P = \frac{W}{t}$

$P = \frac{mgh}{t}$

$P = \frac{(52\,kg)(9.8\,N/kg)(18\,m)}{(24\,s)}$

$P = 382.2\,W$

$P = 3.8 \times 10^2\,W$