26) $m = 2\,kg$
$h = 40cm = 0,4\,m$
$k = 1960\,N/m$
$x = ?$
Solve: $mgh = \frac{1}{2}kx^2$
$\Leftrightarrow 2 \cdot 9,8 \cdot 0,4 = 1960 \cdot x^2$
$\Leftrightarrow x^2 = 0,001$
$\Leftrightarrow x \approx 0,0316\,m$
So the maximum distance is 3,16 cm

30) $m = 2\,kg$
elastic energy $= \frac{1}{2}kx^2$
Kinetic energy $= \frac{1}{2}mv^2$
$\Leftrightarrow mgh = \frac{1}{2}kx^2 + \frac{1}{2}kv^2$
a) $h = 0,1\,m$
$\Leftrightarrow 2 \cdot 9,8 \cdot 0,1 = \frac{1}{2}(100)x^2 + \frac{1}{2}(100)v^2$
$\Leftrightarrow 100x^2 + v^2 - 1,96 = 0$
$U_{gh} = U_k + U_g + U_s$
$mgx = \frac{1}{2}mv^2 + mgy + \frac{1}{2}kx^2$

$\Leftrightarrow mgy = \frac{1}{2}mv^2 + mg(y - d\sin\theta) + \frac{1}{2}kd^2$
$\Leftrightarrow 0 = \frac{1}{2}mv^2 - mgd\sin\theta + \frac{1}{2}kd^2$
$\Leftrightarrow 2mgd\sin\theta = (\frac{1}{2}mv^2 + \frac{1}{2}kd^2)2$
$\Leftrightarrow 2mgd\sin\theta = mv^2 + kd^2$
$\Leftrightarrow \sqrt{\frac{2mgd\sin\theta - kd^2}{m}} = v$
$\Leftrightarrow \sqrt{\frac{2(2)(9,8)(0,1)\sin 30 - 100(0,1)^2}{2}} = v$
$\Leftrightarrow v = 0,9\,m/s$
b) $mgx = mgd\sin\theta + \frac{1}{2}kx^2$
$\Leftrightarrow d = \frac{2mg\sin\theta}{k} = \frac{2(2)(9,8)\sin 30}{100}$
$= 0,2\,m$
c) $F_s = kd \Leftrightarrow \sum F = ma$
$\Leftrightarrow kd - mg\sin\theta = a$
$\Leftrightarrow \frac{100(0,2) - 2(9,8)\sin(30)}{2} = a = 6,1\,m/s^2$

39. at $x = 6,5\,m$ $K_A = \frac{1}{2}mv^2 = \frac{1}{2}(6)(5)^2$
$E_A = U_A + K_A$
$E_A = U_A + K_A = 15J + 37J = 37J$
at $x = 10\,m$ $U_B = 35J$
$\Leftrightarrow 37 = 35 + K_B$
$\Leftrightarrow K_B = 2J$
$v = \sqrt{\frac{2K_B}{m}} = \sqrt{\frac{2(2)}{0,6}} = 2,1\,m/s$
b) the force acting on the particle
$F_x = -\left(\frac{35J - 15J}{2 - 4}\right) = 10\,N$
c) magnitude $F_x > 0$ $\Rightarrow$ the force point is in $+x$
d) at $x = 7m$ $U_C = 45J$
between 5 and 6 m $5 \le x \le 6$
$U_{BC} - 15 = 30(x - 5)$
$37 - 15 = 30(x - 5)$
$\Rightarrow x = 5,7\,m$
at $x = 5m$ the force acting on particle is
$F_x = \frac{\Delta U}{\Delta x} = -\frac{(45J - 15J)}{6m - 5m} = -30\,N$

56) $U_i + K_i = U_f + K_f + \Delta E$
$\Delta E = K_i - K_f + U_i + U_f$
$\frac{1}{2}kd^2 = 0 - 0 + \frac{1}{2}kx^2 - 0$
$U_k(2)\,(9,8)\,(0,5) = \frac{1}{2}(100)(0,15$
$\Rightarrow \Delta U_k = 0,15$

57) $U_k + K_i = U_f + K_f + \Delta E$
$\Leftrightarrow K_i = 0 + mgh + U_k + (mg)d$
$\Leftrightarrow \frac{mv_i^2}{2} = mg(h + d)$
$d = \frac{v_i^2}{2g} - \frac{h}{N} \Rightarrow d = \frac{(6)^2}{2(9,8)} - \frac{1}{0,8}$
$= 1,2\,m$