Periodic Motion - Pendulum

Practice Problems

① $l = 0.45\,m$
$T = ?$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T = 2\pi\sqrt{\frac{0.45\,m}{9.81\,m/s^2}}$$

$$T = 1.35\,s$$

The period is 1.35 s.

② $l = ?$
$T = 4.0\,s$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T^2 = \frac{4\pi^2 l}{g}$$

$$\frac{T^2 g}{4\pi^2} = l$$

$$\frac{(4.0\,s)^2(9.81\,m/s^2)}{4\pi^2} = l$$

$$3.98\,m = l$$

The length of the pendulum is 3.98 m

③ T = pendulum swings across clock and back = 2 swings
$= 1.0\,s$
$l = ?$

$$l = \frac{T^2 g}{4\pi^2}$$

$$l = \frac{(1.0\,s)^2(9.81\,m/s^2)}{4\pi^2}$$

$$l = 0.25\,m$$

The length of the pendulum is 0.25 m

④ Earth
$T = 0.36s$
$l = ?$

$$l = \frac{T^2 g}{4\pi^2}$$

$$l = \frac{(0.36s)^2 (9.81\ m/s^2)}{4\pi^2}$$

$$l = 0.032\ m$$

Moon
$l = 0.032m$
$g = 1.62 m/s^2$
$T = ?$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T = 2\pi\sqrt{\frac{(0.032m)}{(1.62\ m/s^2)}}$$

$$T = 0.88s$$

The period on the moon would be 0.88s