14. We follow the method shown in Sample Problem 13-3. Thus,

$$a_g = \frac{GM_E}{r^2} \Rightarrow da_g = -2\frac{GM_E}{r^3}dr$$

which implies that the change in weight is

$$W_{top} - W_{bottom} \approx m\left(da_g\right).$$

But since $W_{bottom} = GmM_E/R^2$ (where R is Earth's mean radius), we have

$$mda_g = -2\frac{GmM_E}{R^3}dr = -2W_{bottom}\frac{dr}{R} = -2(600\text{ N})\frac{1.61\times10^3\text{ m}}{6.37\times10^6\text{ m}} = -0.303\text{ N}$$

for the weight change (the minus sign indicating that it is a decrease in W). We are not including any effects due to the Earth's rotation (as treated in Eq. 13-13).