A 54 kg climber hangs motionless on a rope. What is the tension on the rope?

$F_{net} = m \cdot a$

$= 54 \cdot 9.8$

$= 529.2$

A different climber with a mass of 81 kg hangs on the same rope. What is the tension on the rope now?

$F_{net} = m \cdot a$

$= 81 \cdot 9.8$

$= 793.8$

Consider a 4kg block of Cadmium using the spring and ball model. What is the mass of a single "ball" in the model? 1 mol Cd = 112 grams.

Want $\frac{\text{grams}}{\text{atoms}} \rightarrow \frac{112 \text{ grams}}{1 \text{ mol}} \cdot \frac{1 \text{ mol}}{6.02e23 \text{ atoms}} = 1.86e-25 \frac{\text{grams}}{\text{atom}}$

The diameter of a copper atom is 2.28e-10m. The mass of 1 mol of copper is 64 grams. Assume the spring and ball model. What is the mass of one copper atom?

$\frac{64 \text{ grams}}{1 \text{ mol}} \cdot \frac{1 \text{ mol}}{6.02e23 \text{ atoms}} \cdot \frac{1 \text{ kg}}{1000 \text{ grams}} = 1.0631e-25$

How many copper atoms are there in a cubical block of copper that is 2.4 cm?

$$2.4\ cm \cdot \frac{1\ m}{100\ cm} \cdot \frac{1\ atom}{2.28e{-}10\ m} = 1.053e8\ \text{atom side length}$$

$$V = (1.053e8)^3 = 1.166e24\ \text{atoms}$$

What is the mass of the block?

$$1.166e24\ atoms \cdot \frac{1\ mol}{6.02e23\ atoms} \cdot \frac{64\ grams}{1\ mol} \cdot \frac{1\ kg}{1000\ grams} = 0.12400\ kg$$

One mole gallium has a mass of 70 grams. Its density is $5.9\ \frac{g}{cm^3}$. What is the approximate diameter of one atom in a block of gallium.

$$\frac{5.9\ grams}{1\ cm^3} \cdot \frac{(100\ cm)^3}{(1\ m)^3} = 5.9e6\ \frac{g}{m^3}\ \text{density}$$

$$5.9e6\ \frac{grams}{m^3} \cdot \frac{1\ mol}{70\ grams} \cdot \frac{6.02e23\ atoms}{1\ mol} = 5.074e28\ \frac{atoms}{m^3}$$

$$L = \sqrt[3]{5.074e28\ \frac{atoms}{m^3}}$$

$$= 3.702e9\ \frac{atom}{m}$$

$$= 2.701e{-}10\ \frac{m}{atom}$$