

$$1) \quad W = mg \rightarrow g = \frac{W}{m} = \frac{18}{1.2} = \boxed{15 \frac{m}{s^2}}$$

$$2) \quad \rho = \frac{m}{V} \rightarrow m = \rho V$$

$$F_g = G \frac{m_1 m_2}{r^2} \rightarrow g = G \frac{m_p}{r^2} = G \frac{\rho \frac{4}{3} \pi r^3}{r^2}$$

$$g = \frac{4}{3} G \rho \pi r$$

$g \propto r$  so if  $r$  doubles,  
 $g$  doubles

$$\boxed{g = 20 \frac{m}{s^2}}$$

$$3) \quad g_1 = 5 \frac{m}{s^2}$$

$$g = G \frac{m}{r^2} \quad \text{Inverse square relation}$$

$$W = mg_2$$

$$g_2 = \frac{1}{36} g_1 \quad 6r \rightarrow \frac{1}{36} g$$

$$W = 50 \left( \frac{5}{36} \right) = \boxed{6.94 \text{ N}}$$

$$4) \quad g = G \frac{m}{r^2}$$

stacked eq's  
divide out and  
cross multiply

$$g_e = G \frac{m_e}{r_e^2} = 10$$

$$g_{pt} = G \frac{0.2 m_e}{(0.7 r_e)^2} = g_{pt}$$

$$g_{pt} = 10 \left( \frac{0.2}{0.7^2} \right) = \boxed{4.08 \frac{m}{s^2}}$$

$$5) \quad W = F_g = G \frac{m_1 m_2}{r^2}$$

Stacked eq's

$$F_e = mg$$

$$m = \frac{F_e}{g} = \frac{44.8}{10}$$

$$\boxed{= 4.48 \text{ kg}}$$

$$F_e = G \frac{m_p m_e}{r_e^2}$$

$$F_{pH} = G \frac{m_p (1.5 m_e)}{(0.4 r_e)^2}$$

$$F_e = \left( \frac{0.4^2}{1.5} \right) F_{pH}$$

$$F_e = 0.107 (420) = 44.8 \text{ N}$$

$$6) \quad g = G \frac{m}{r^2}$$

$$g_e = G \frac{m_e}{r_e^2} = 10$$

$$g_{pH} = G \frac{0.5 m_e}{r_{pH}^2} = 4$$

$$r_{pH}^2 = \frac{5}{4} r_e^2$$

$$r_{pH} = \sqrt{\frac{5}{4}} r_e$$

$$\boxed{r_{pH} = 7.16 \times 10^6 \text{ m}}$$