$$\Rightarrow \boxed{v_A^2 = 2MG \frac{r_2}{r_1} \frac{1}{(r_1+r_2)}}$$

$$v_B^2 = \left(\frac{r_1}{r_2}\right)^2 v_A^2 \Rightarrow \boxed{v_B^2 = 2MG \frac{r_1}{r_2} \frac{1}{(r_1+r_2)}}$$

$$\Delta v_1 = v_A - v_1 = \sqrt{\frac{MG}{r_1}} \sqrt{\frac{2r_2}{(r_1+r_2)}} - \sqrt{\frac{MG}{r_1}}$$

$$\Rightarrow \boxed{\Delta v_1 = \sqrt{\frac{MG}{r_1}} \left[\sqrt{\frac{2r_2}{(r_1+r_2} - 1 \right]}$$

$$\Delta v_2 = v_2 - v_B = \sqrt{\frac{MG}{r_2}} - \sqrt{\frac{MG}{r_2}} \sqrt{\frac{2r_1}{(r_1+r_2)}}$$

$$\Rightarrow \boxed{\Delta v_2 = \sqrt{\frac{MG}{r_2}} \left[1 - \sqrt{\frac{2r_1}{(r_1+r_2)}} \right]}$$