Q 02

The masses and radii of the earth and moon are (M_1, R_1) and (M_2, R_2) respectively. Their centres are at a distance 'r' apart. Find the minimum escape velocity for a particle of mass 'm' to be projected from the middle of these two masses: **[Aug. 31, 2021 (I)]**

(a) $V = \frac{1}{2}\sqrt{\frac{4G(M_1+M_2)}{r}}$

(b) $V = \sqrt{\frac{4G(M_1+M_2)}{r}}$

(c) $V = \frac{1}{2}\sqrt{\frac{2G(M_1+M_2)}{r}}$

(d) $V = \frac{\sqrt{2G}(M_1+M_2)}{r}$

(b) Total energy at middle point
= K.E + P.E of M_1 & m + P.E of M_2 & m
To get escape velocity total energy should be zero.

$$\frac{1}{2}mV^2 - \frac{GM_1m}{r/2} - \frac{GM_2m}{r/2} = 0$$

$$\Rightarrow \frac{1}{2}mV^2 = \frac{2Gm}{r}(M_1+M_2)$$

$$\therefore V = \sqrt{\frac{4G(M_1+M_2)}{r}}$$