

Given:

lift off mass (M_l) = 100 kg.

fuel mass (M_f) = 50 kg.

$I_{sp} = 150$ seconds.

final mass (M_f) = 100 - 50 = 50 kg.

from initial to zero velocity when complete fuel is burnt.

$$V_2 - 0 = g \times I_{sp} \times \ln \left[\frac{M_l}{M_f} \right] = 9.81 \times 150 \times \ln \left(\frac{100}{50} \right)$$

$$V = 1019.96 \text{ m/s} \approx 1020 \text{ m/s.}$$

$$\boxed{V = 1020 \text{ m/s}}$$

Height = 20,000 m.

$$V = \frac{h}{t}$$

$$t = \frac{20,000}{1020}$$

$$\boxed{t = 19.6078 \text{ seconds}}$$

We use the existing relations to solve this problem.

The final answer is clearly mentioned in the box of image.

NOTE: