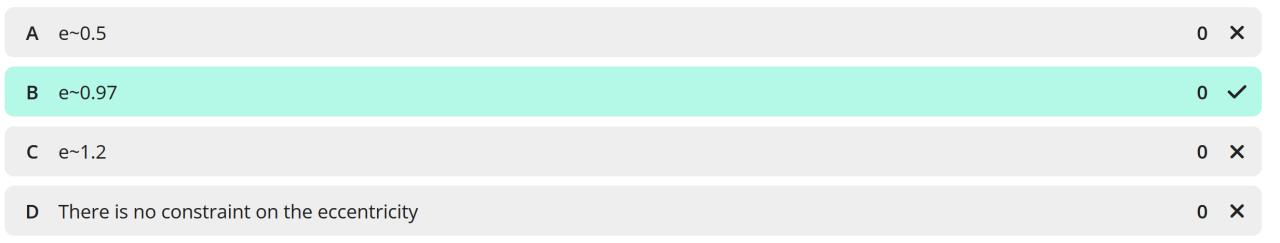
#### Which statement on the gravity assist is false?

A The magnitude of the arrival and departure hyperbolic excess velocity are the same at the SOI	0 <b>X</b>
B The magnitude and direction of the heliocentric velocities before and after flybys are different	0 X
C The magnitude and direction of the heliocentric velocities before and after flybys are the same	0 🗸
D The geometry of the flyby defines whether the heliocentric velocity will be increased or decreased	0 ×

#### Which statement on the gravity assist is false?

A The heliocentric trajectory of a spacecraft can be deflected	0 ×
B The magnitude of the heliocentric velocity is changed	0 ×
C Significant delta v savings can be made with respect to a Hohman transfer	0 ×
D Time of flight to the destination is shorter than Hohman transfer	0 🗸

In a simple Moon trajectory where we neglect the Moon's gravity, what is the orbit's minimum eccentricity to reach the Moon from a ~320 km altitude parking orbit?



# In a simple Moon trajectory where we neglect the Moon's gravity, what is the minimum injection speed?

A v is slightly less than the escape velocity	0 🗸	
B v must be larger than the escape velocity	0 ×	
C v ~7.7 km/s	0 ×	
D v~1 km/s	0 ×	

### What is a free-return trajectory?

A A trajectory with a powered flyby of the Moon which implies a geocentric hyperbolic orbit	0 ×
<b>B</b> A trajectory around the Moon that requires no delta v at perilune to return to the Earth	0 🗸
C There is no such thing as a free-return trajectory	0 X
<b>D</b> The return trajectory on a parabolic orbit to the Moon's SOI	0 ×

#### Which of these equations is not a form of the Tsiolkovsky equation?

$$\Delta v = v_e \ln \left( \frac{m_i}{m_f} \right) . \tag{0}$$

$$B \quad \Delta v = I_{sp} g_0 \ln \left( \frac{m_i}{m_f} \right) \quad .$$

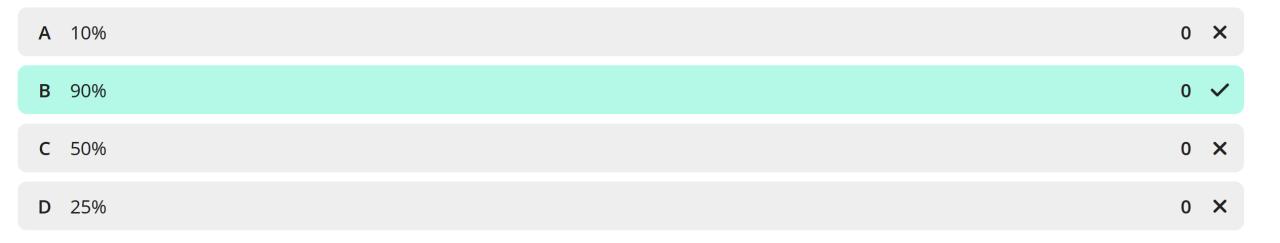
$$C m_p = m_i \left[ 1 - exp \left( -\frac{\Delta v}{I_{sp} g_0} \right) \right] .$$

$$I_{sp}g_0 = V_e .$$

## Which statement on the Isp is false?

A It is the thrust / Sea-level weight of flow consumption ratio	0 <b>X</b>
B It is the amount of seconds a given propellant can accelerate its own initial mass at g0	0 <b>X</b>
C A high Isp always implies a high thrust	0 🗸
D It is an important performance parameter for a given engine/propellant combination	0 X
E The Isp and the thrust F are large if and only if the mass flow (mdot) is large	0 ×

What is the fraction of propellant mass w.r.t. the total mass for a ~10 km/s Delta v (which corresponds to Delta v needed to reach LEO from the surface)?



# What are the typical values of Isp and thrust for electrical propulsion?

A 2500s/5mN	0 🗸
B 327s/2.75MN	0 <b>X</b>
C 450s/1MN	0 ×
<b>D</b> 800s/220kN	0 ×