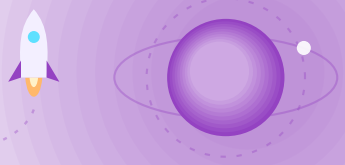
LESSON T2-03 · TIER 2 · PROPELLANT & STAGING

Shed the Dead Mass

HIGH SCHOOL (9–12)



Name _____ Date _____ Class / Period _____

Drop what you do not need

Once a tank is empty it is only dead weight: the engine still has to lift it, and it gives nothing back. Rockets drop their empty stages to get lighter. That is called staging.

Mission goal: fly the rocket past {gateKm} kilometres and drop its empty first stage on the way.

1 LOOK

OBSERVE BEFORE YOU TOUCH A CONTROL

What does the empty stage cost?

- Our rocket weighs _____ kg at liftoff. Its mass budget is _____ kg, so nothing may be added.
- When the first tank is empty, the first stage still weighs _____ kg. The second engine will push with the same force whether the empty stage is still there or not.

Write the numbers shown in the sim in the blanks above, then record what you notice:

2 PREDICT

COMMIT TO A HYPOTHESIS FIRST

Prediction 1. The first tank is empty and the second engine is about to fire. What happens to how fast the rocket speeds up if we drop the empty first stage first?

Hint: Acceleration is the push divided by the mass. The second engine pushes with the same force either way.

□ It speeds up slower

□ No change

□ It speeds up faster

Because...

3 EXPERIMENT

CHANGE ONE VARIABLE AT A TIME

Step 1. Press **[Space]** to light the first engine and **[Z]** for full throttle. When the tank runs dry, press **[Space]** to drop the empty stage, then press **[Space]** again to light the second engine. Climb past _____ kilometres.

Trial	What I changed	What I measured / saw	Matched my prediction?
1			Yes · No · Partly

2			Yes · No · Partly
3			Yes · No · Partly

4 EXPLAIN

CLAIM · EVIDENCE · REASONING

Claim — What did you find out? (answer the mission goal in one sentence)

Evidence — Which numbers or observations from the sim support your claim?

Reasoning — Which science idea connects your evidence to your claim?

Self-check: □ I made a prediction before experimenting □ I used numbers from the sim □ I explained *why*, not just *what*