

OUTREACH TO SPACE DISCOVERY QUESTIONS

Aim For Orbit:

- What happens if you put too much energy into your launch?
- What happens if you put too little energy into your launch?
- What happens if you put just enough energy into your launch?

Challenge Question

What speed do you need to exceed to escape Earth's gravity?

Big Dipper:

- What is the "true" shape of the Big Dipper?
- What Big Dipper star is closest to Earth? How far is it?
- What Big Dipper star is farthest away from Earth? How far is it?

Challenge Question

Will the Big Dipper's shape, as seen from Earth, always be the same?

Different Worlds, Different Weights:

- Would you be heavier on Jupiter or Saturn?
- Why does Earth have stronger gravity than Mercury?

Challenge Question

Which planet is light enough that it could float on water?

Glove Box:

- Why would you need pressurized gloves when working in space?
- How quickly can you fasten/unfasten the plate?

Challenge Question

What does NASA call it when an astronaut works in space outside a spacecraft?

Gravity Well:

- Does the ball roll fastest near the center of the well or at the edge?
- If you stop the ball then let it go, what happens? Why?

Challenge Question

What astronomical object has the steepest gravity well?

Mars Rocket:

- What is a "launch window?"
- In what ways do the orbits of Mars and Earth differ?

Challenge Question

What else could effect a decision about when to launch?

Pressure Suit:

- Why would your body balloon in space if you weren't in a space suit?
- How high an altitude can you reach by pumping air out of the chamber?

Challenge Question

What would happen to your blood if you weren't in a space suit in space?

Rocket Launch:

- Cars move when their wheels turn and push against the road. In space there is nothing to push against; how do rockets move then?

Challenge Question

List different types of rocket propulsion

Space Colony:

- What would people need in a space colony?
- From what would they need protection?

Challenge Question

If you could live in a space colony or the Moon or Mars, which would you choose? Why?

Star Spectrum:

- What element does the left button show?
- What element does the middle button show?
- What element does the right button show?

Challenge Question

Explain the difference between emission and absorption spectra.

Steering with Thrust:

- In what three ways does a spacecraft spin?
- In what three ways does a spacecraft move?

Challenge Question

In what ways would flying aircraft and spacecraft be different?
In what ways would they be the same?

Sunspotter Telescope:

- Can you see sunspots on the Sun?
- Why shouldn't you look directly at the Sun?

Challenge Question

How long is the sunspot cycle

OUTREACH TO SPACE DISCOVERY ANSWERS

Aim For Orbit:

- What happens if you put too much energy into your launch?
You would sail off into outer space.
- What happens if you put too little energy into your launch?
You would fall back to Earth.
- What happens if you put just enough energy into your launch?
You will go into orbit.

Challenge Question

What speed do you need to exceed to escape Earth's gravity?
About 11.2 kilometers (7 miles) per second. This is called "escape velocity."

Big Dipper:

- What is the "true" shape of the Big Dipper?
It has no "true" shape. What we see depends on where we are in space.
- What Big Dipper star is closest to Earth? How far is it?
Mizar is 28 light years away.
- What Big Dipper star is farthest away from Earth? How far is it?
Dubhe is 124 light years away.

Challenge Question

Will the Big Dipper's shape, as seen from Earth, always be the same?
No. Over thousands of years the stars very gradually move to a different position. This is called "proper motion."

Different Worlds, Different Weights:

- Would you be heavier on Jupiter or Saturn?
Jupiter, theoretically. But, of course, you can be "on" either since they are gas giants.
- Why does Earth have stronger gravity than Mercury?
Because Earth has more mass.

Challenge Question

Which planet is light enough that it could float on water?
Although is the second largest planet, Saturn has a density less than that of water, and thus would float.

Glove Box:

- Why would you need pressurized gloves when working in space?
Because the lack of air (pressure) would cause your hands to balloon and the gasses in your blood to boil. Ouch!
- How quickly can you fasten/unfasten the plate?
Answers will vary.

Challenge Question

What does NASA call it when an astronaut works in space outside a ship?
A spacewalk.

Gravity Well:

- Does the ball roll fastest near the center of the well or at the edge?
Near the center.
- If you stop the ball then let it go, what happens? Why?
It will roll straight down the center. The ball has no orbital motion to slow its descent.

Challenge Question

What astronomical object has the steepest gravity well?
A black hole.

Mars Rocket:

- What is a "launch window?"
The period of time in which a rocket must be launched to reach particular destination.
- In what ways do the orbits of Mars and Earth differ?
The orbit of Mars is larger than that of Earth. Mars orbits the Sun more slowly than Earth does.

Challenge Question

What else could effect a decision about when to launch?
Three possibilities are: launch site weather, technical problems, and astronaut illness.

Pressure Suit:

- Why would your body balloon in space if you weren't in a space suit?
You don't have outside pressure to balance your inner air pressure.
- How high an altitude can you reach by pumping air out of the chamber?
Answers will vary.

Challenge Question

What would happen to your blood if you weren't in a space suit in space?
It would boil.

Rocket Launch:

- Cars move when their wheels turn and push against the road. In space there is nothing to push against; how do rockets move then?

Check out Newton's Third Law of Motion: For every action, there is an equal and opposite reaction. When gasses are expelled from the rear of the rocket, the rocket, in reaction, moves the other way.

Challenge Question

List some different types of rocket propulsion

Chemical, ion or nuclear repulsion. Ground-based laser. Systems that tap into the power of solar wind, planetary magnetism, gravity.

Space Colony:

- What would people need in a space colony?
Food, water, shelter, to name the basics.
- From what would they need protection?
Radiation from space for one (and maybe The Borg®).

Challenge Question

If you could live in a space colony or the Moon or Mars, which would you choose? Why?

Answers will vary.

Star Spectrum:

- What element does the left button show?
Mercury.
- What element does the middle button show?
Neon.
- What element does the right button show?
Helium.

Challenge Question

Explain the difference between emission and absorption spectra.

When a star gives off light and we see the light and its spectra that is emission. When some of the light is absorbed by intervening matter, that is absorption. The elements that absorb light leave tell-tale black absorption lines in the spectra.

Steering with Thrust:

- In what three ways does a spacecraft spin?
Roll, pitch, yaw.
- In what three ways does a spacecraft move?
Forward & backward, side to side, up and down.

Challenge Question

In what ways would flying aircraft and spacecraft be different?

*Aircraft need air to fly through. A spacecraft doesn't.
Maneuvering the crafts would require some extra skills.*

In what ways would they be the same?

*Both can use thrust (jet engines) to propel them forward.
Both might cause you to lose your lunch.*

Sunspotter Telescope:

- Can you see sunspots on the Sun today?
Answers will vary.
- Why shouldn't you look directly at the Sun?
The light will burn your retinas if you stare longer than a few seconds.

Challenge Question

How long is the sunspot cycle?

About 11 years.

IMAGE CREDITS

Aim for Orbit activity: Wikipedia Commons.
Constellation Drawings: OTS Collaboration.
Glove Box: NASA.
Mars Rocket: Lakeview Museum.
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