Name: _____ Date: _____

A Feather and a Hammer Fall Together on the Moon

Circle group

Drop a hammer and a feather from the same height. The hammer hits the ground first. For a long time, people thought heavy things fall faster. The truth is more interesting. The difference comes from air.

A falling object has to push air out of its way. The air pushes back. This push is called air resistance. A hammer is small and heavy. The push is tiny next to the pull of gravity. A feather is wide and very light. The same push is a big deal. The feather floats down slowly.

Take away the air, and the story changes. Scientists have pumped the air out of tall chambers. They dropped a feather and a heavy ball at the same moment. They land together. Gravity makes all falling objects speed up at the same rate. It does not matter how much they weigh, if nothing else pushes on them.

Astronauts on the Moon showed this too. The Moon has almost no air. An astronaut let go of a hammer and a feather at the same time. Both fell the same way. They touched the dust together. It was a clear sign that gravity treats a feather and a hammer alike.

Questions

1. What is air resistance?

_____

_____

2. Why does a feather fall slowly on Earth?

_____

_____

3. What did scientists do in the tall chambers?

_____

_____

4. Why was the Moon a good place for this test?

_____

_____

5. A flat sheet of paper falls slower than the same sheet crumpled into a ball. Why?

_____

_____

6. How does gravity treat falling objects when nothing else pushes on them?

_____

_____

Words to know

resistance: a push that works against movement
gravity: the pull that draws objects toward a planet or moon
chamber: a closed room or space built for a purpose
astronaut: a person who travels in space

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

A Feather and a Hammer Fall Together on the Moon

Triangle group

Drop a hammer and a feather from the same height, and the hammer hits the ground first. For a long time people took that to mean heavier things fall faster. The truth is more interesting. The difference comes from air.

As an object falls, it has to push air out of its way, and the air pushes back. This push is called air resistance. A hammer is compact and heavy, so the push is small compared with the pull of gravity on it. A feather is wide and very light, so the same push is a big deal. The feather floats down slowly, tossed around by moving air.

If you remove the air, the story changes. Scientists have pumped the air out of tall chambers and dropped a feather and a heavy ball at the same moment. They land together. Gravity makes every falling object speed up at the same rate, no matter how much it weighs, as long as nothing else is pushing on it.

Astronauts on the Moon showed this on a much bigger stage. The Moon has no air to speak of, so when an astronaut let go of a hammer and a feather at the same time, both fell in the same way and touched the dust together. It was a clear sign that gravity treats a feather and a hammer alike.

Questions

1. What is air resistance?

_____

_____

2. Why does a feather fall slowly on Earth?

_____

_____

3. What did scientists do in the tall chambers?

_____

_____

4. Why was the Moon a good place to test this?

_____

_____

5. A flat sheet of paper falls more slowly than the same sheet crumpled into a ball. Why?

_____

_____

6. How does gravity treat falling objects when nothing else pushes on them?

_____

_____

Words to know

resistance: a push that works against movement
gravity: the pull that draws objects toward a planet or moon
chamber: a closed room or space built for a purpose
astronaut: a person who travels in space
compact: packed closely into a small shape

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

A Feather and a Hammer Fall Together on the Moon

Square group

Drop a hammer and a feather from the same height, and the hammer will strike the ground well before the feather does. For many centuries people took that observation to mean that heavier objects naturally fall faster. The truth turns out to be far more interesting, because the difference comes entirely from the air.

As an object falls, it has to push the air out of its way, and the air pushes back against it. This push is called air resistance. A hammer is compact and heavy, so the push is small compared with the pull of gravity acting on it. A feather, however, is wide and extremely light, so the very same push becomes a major factor. The feather drifts down slowly, tossed about by the moving air.

If the air is removed, the story changes completely. Scientists have pumped the air out of tall chambers and then released a feather and a heavy ball at the same moment, and the two objects land together. Gravity makes every falling object speed up at the same rate, no matter how much it weighs, provided that nothing else is pushing against it.

Astronauts on the Moon demonstrated this principle on a much grander stage. The Moon has no air to speak of, so when an astronaut released a hammer and a feather at the same instant, both fell in exactly the same way and touched the dust together. It was a clear sign that gravity treats a feather and a hammer alike.

Questions

1. What is air resistance?

_____

_____

2. Why does a feather fall so slowly on Earth?

_____

_____

3. What did scientists do inside the tall chambers?

_____

_____

4. Why was the Moon such a good place to demonstrate this principle?

_____

_____

5. A flat sheet of paper falls more slowly than the same sheet crumpled into a ball. Why does that happen?

_____

_____

6. How does gravity affect all falling objects when nothing else is pushing against them?

_____

_____

Words to know

resistance: a push that works against movement
gravity: the pull that draws objects toward a planet or moon
chamber: a closed room or space built for a purpose
astronaut: a person who travels in space
compact: packed closely into a small shape

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: A Feather and a Hammer Fall Together on the Moon

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: A Feather and a Hammer Fall Together on the Moon

Easier · 200 words · Flesch-Kincaid grade 2.7

1. The push of air against an object as it moves through it.
2. It is wide and very light, so the push of the air matters a lot.
3. They pumped out the air and dropped a feather and a heavy ball together, and they landed at the same time.
4. It has almost no air to push back on falling objects.
5. The flat sheet is wider, so the air pushes on it more.
6. It speeds them all up at the same rate, no matter their weight.

Triangle: A Feather and a Hammer Fall Together on the Moon

This passage · 226 words · Flesch-Kincaid grade 4.9

1. The push of air against an object as it moves through it.
2. It is wide and very light, so the push of the air matters a lot.
3. They pumped out the air and dropped a feather and a heavy ball together, and the two landed at the same time.
4. It has almost no air to push back on falling objects.
5. The flat sheet is wider, so the air pushes against it more.
6. It speeds them all up at the same rate, no matter their weight.

Square: A Feather and a Hammer Fall Together on the Moon

Harder · 251 words · Flesch-Kincaid grade 8.1

1. The push of the air against an object as it moves through it.
2. It is wide and extremely light, so the push of the air becomes a major factor.
3. They pumped out the air and released a feather and a heavy ball together, and the two landed at the same time.
4. It has no air to speak of, so nothing pushes back against falling objects.
5. The flat sheet is wider, so the air pushes against it more.
6. It speeds them all up at the same rate, no matter how much they weigh.