

Name:
Group Name:

Exploring Black Holes

Student Journal

Find the Quasar

1. Based on this picture, can you tell which objects are nearby and which objects are far away? Explain.

2. Which one do you think is the quasar: something that looks like a star and radiates more light than an entire galaxy? Explain.

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The First Quasar

1. Why do you think quasar 3C-273 was such a surprise to astronomers?

2. Why do you think astronomers explain observations of quasars using a model of a black hole?

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What is Escape Velocity?

1. Based on your experiments, how would you explain the idea of escape velocity?

Why do Astronomers Think Black Holes Exist?

Hurricane vs. galaxy

1. What do the hurricane and galaxy have in common?

2. How is the gas distributed?

3. Where do you think the gas is moving the fastest?

4. What are the biggest differences between the galaxy and hurricane?

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Do objects exist with an escape velocity equal to the speed of light?

1. We have worked with an experiment and talked about Earth having an escape velocity of 11.2 km/s. So, if you could throw a baseball up to the sky so that it is moving at 11.2 km/s, what would happen?

2. What would happen to the escape velocity if we could squish the Earth, and make it much smaller?

3. What does an object look like if its escape velocity is the speed of light?

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Black Holes – How Big Do They Get?

Structure of a Black Hole

1. What is the key physical property of the event horizon?

2. Could a spacecraft orbit a black hole?

Birth of Supermassive Black Holes: Battle of the Bulge

1. Where do astronomers think super-massive black holes lie?

2. Where is the bulge of a galaxy?

3. How super is super-massive – what is the mass of these big black holes?

4. What are the observation clues that strongly support this model of super-massive black holes?

5. How do you think a super-massive black hole could form?

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They Might Be Black Holes

Observations or Calculation	Little support	Significant support	Strong support