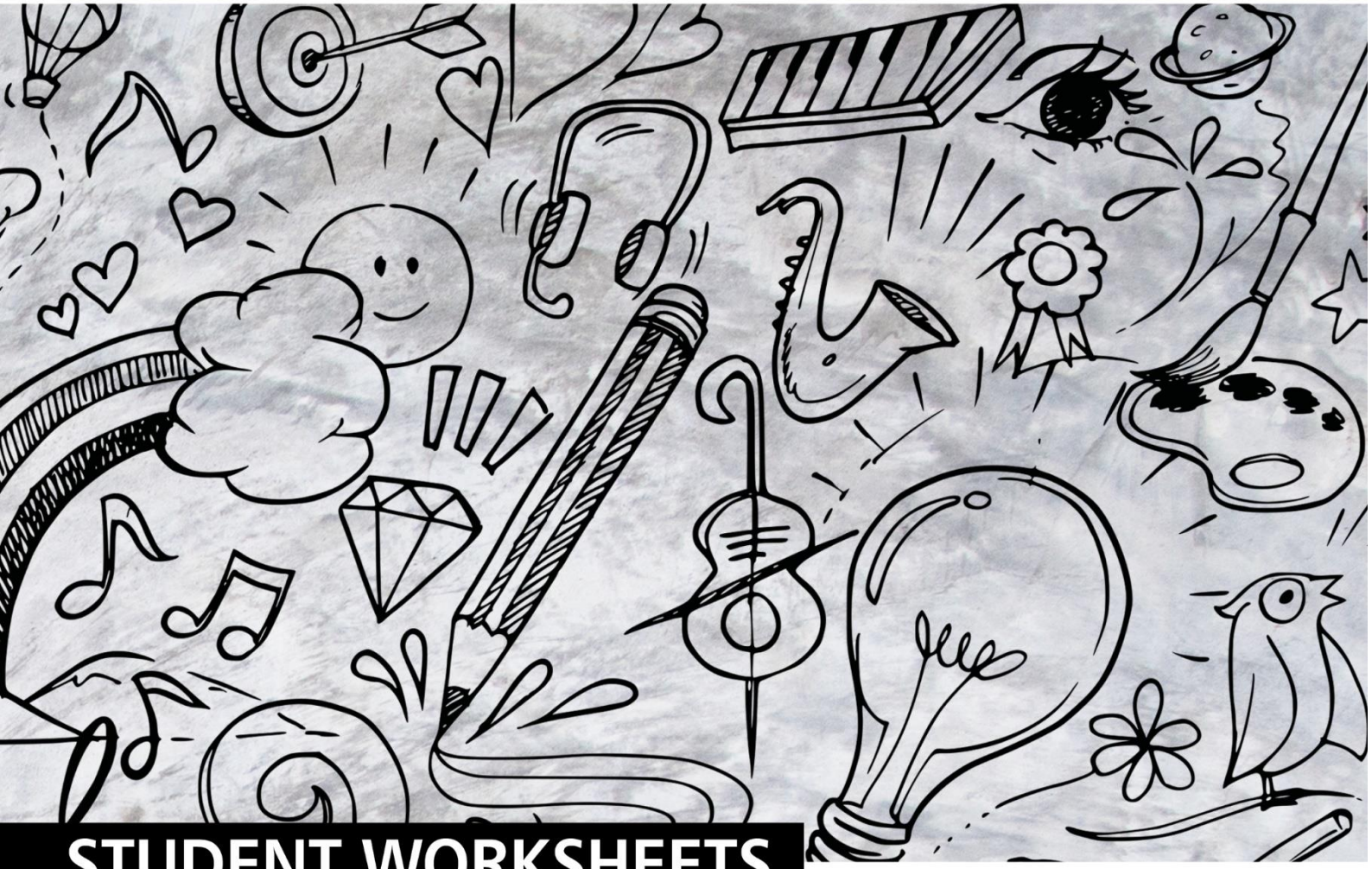
Epistemic Insight

Essential Experiences in Science

INVESTIGATING BIG QUESTIONS



STUDENT WORKSHEETS

APPENDIX

University of BRISTOL

CIEC CENTRE for INDUSTRY EDUCATION COLLABORATION

UNIVERSITY OF HULL

University of Roehampton London

Canterbury Christ Church University

Contents

Why do spinners spin?

Paper drop exercise.

1. Take 2 sheets of A4 paper (watch out for paper cuts!)

2. Scrunch one into a ball and keep the other one flat.

3. Predict what you will observe when you drop them from the same height.

4. Observe what happens and see if you were right! (Do this a few more times – is the outcome the same?)

4. Record your observations after each drop.

You are about to drop a scrunched up and flat sheet of paper – which will hit the ground first, what's your prediction?

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Now try the investigation twice and write down your observations

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Try dropping two scrunched up balls, what do you observe now?

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What have you found out?

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Spinner Activity

Investigation:

1. Can you change how fast a spinner spins?
2. You will need two copies of the spinner template.
3. Cut them out, cutting along the solid lines only (careful with the scissors!)
4. Fold along the dotted lines (section A folds towards you, section B folds away).
5. Explore dropping the spinners and observe them falling and spinning. How many rotations do they do, is the result always the same?)
6. Record your observations in the table on the next page (first box).
7. What happens if you add a paperclip to one spinner (at the bottom, like in the photo!) Will it spin faster/slower/the same/different direction? Predict what you think you'll observe.
8. Now try it out!
9. What happens if you add MORE paperclips?

Investigate	General observations	Comparison – which hit the ground first, did one spin faster?
Two spinners Dropped from the same height		
Repeat		
Add a paperclip to one of them		
Repeat		
Add more paperclips		

What have you found out?

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Challenges

Can you make: i) a spinner that falls slowly, ii) a spinner that falls quickly, iii) a spinner that spins more quickly Did you solve the challenges, if so how?

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How do clouds stay up?

Observing water droplets

1. You will need some water in a container, a straw or pipette, and a penny

2. Predict what you will observe when you place a droplet of water onto the penny – use the pipette or straw for this.

3. Observe what happens and see if you were right! (Do this a few more times – is the outcome the same?)

4. Record your observations at each step.

My prediction: You are about to place a droplet of water onto the penny, record your prediction here? Some key questions to think about are:

- Will the water cover the surface of the penny?
- Will it stay on the penny?
- What shape will the water be?

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- Draw what you think the penny will look like once you've placed one droplet of water on it.

My observations

Now try the investigation and write down your observations

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Is it what you were expecting?

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What have you found out?

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Now predict what will happen if you place another water droplet close to the first one on the penny. Record your prediction here?

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My prediction: Draw what you think the penny will look like once you've placed another droplet of water on it?

My observations

Now try the investigation and write down your observations

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What do you notice?

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How many drops of water are on the penny now?

Challenge: Predict how may water droplets you can you fit onto the penny.

Write your prediction in the cloud. Then test it out!

What did you observe?

Were you correct? Write your observations here.

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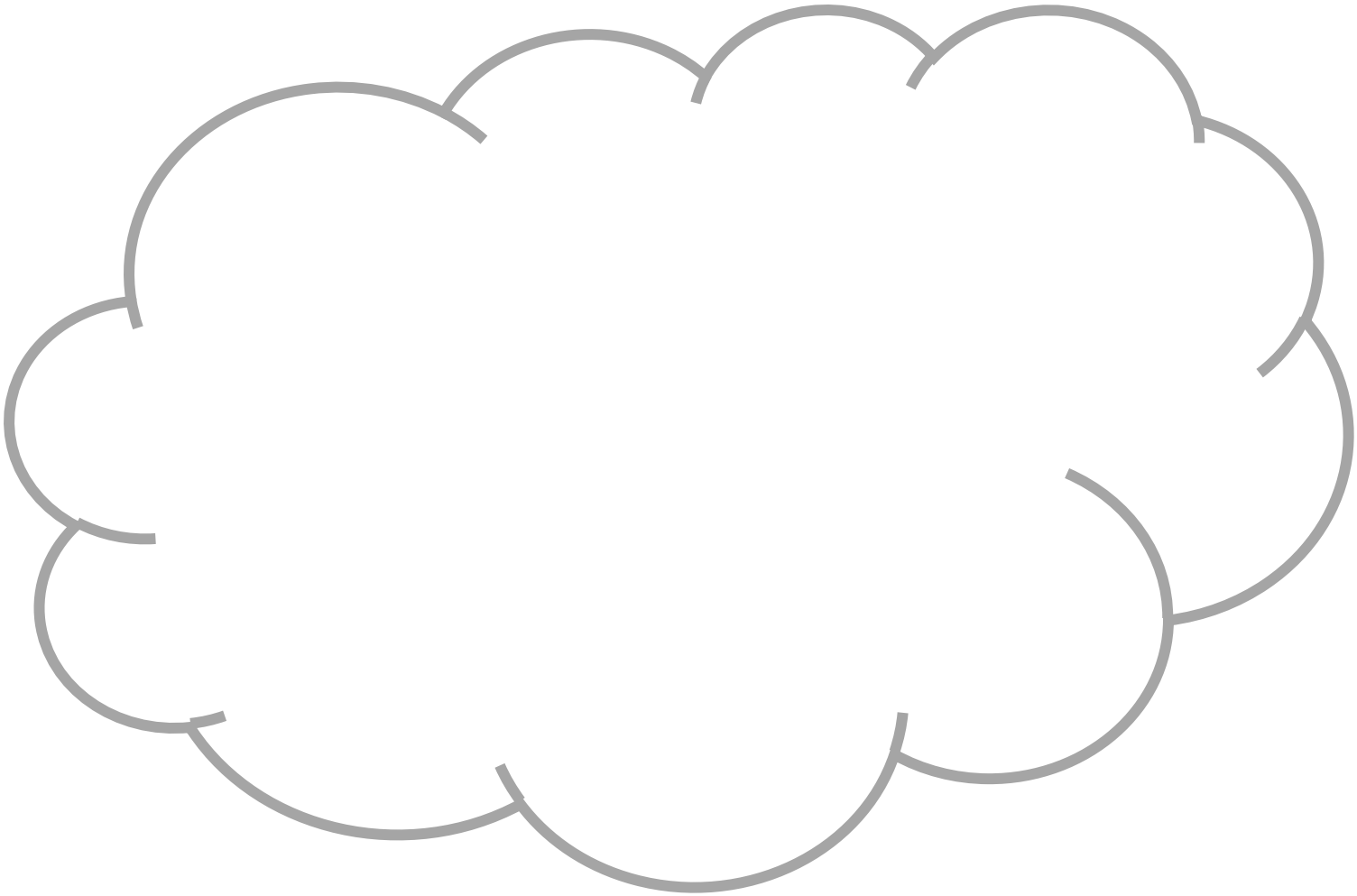
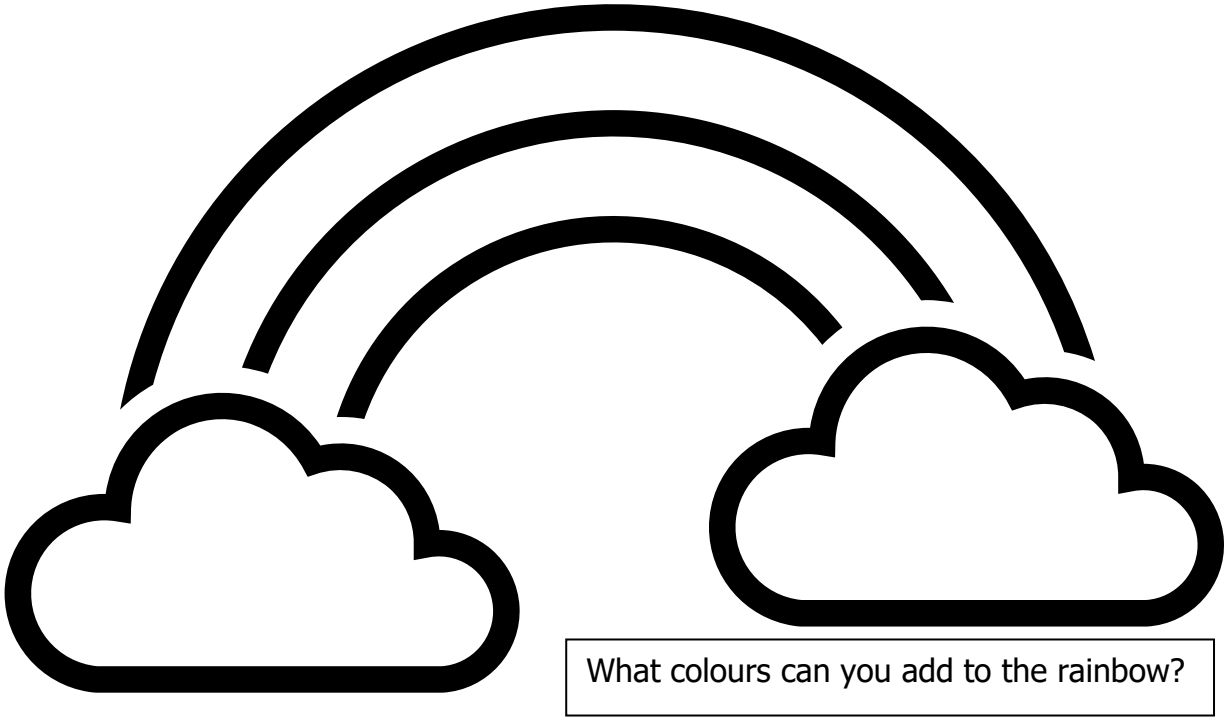
Write what you know about clouds below. Here are some questions to consider:

- What are they made of?
- What is the effect of gravity on clouds?
- What is the effect of gravity on raindrops?
- What changes must happen to the water in the clouds?



Why is the sky blue?

- **What are rainbows made of?**
- **Where do the colours come from?**
- **Are the colours there when we can't see them?**



What colours can you add to the rainbow?

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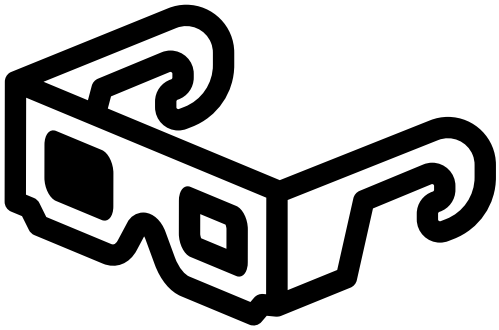

You are about to use the diffraction glasses – what do you think you will see when you look at red paper through the glasses? What's your prediction?

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Now put on the glasses and look at the red paper, write down your observations

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What do you think you will see when you look at purple paper through the glasses? What's your prediction?

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Now put on the glasses and look at the purple paper, write down your observations

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What about if you look at white paper or black paper through the glasses? What do you predict?

White paper

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Black paper

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What did you observe? What have you found out?

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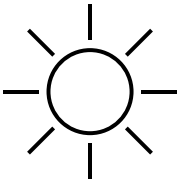
How do we make sense of the weather?

How does the weather make me feel and affect what I do?

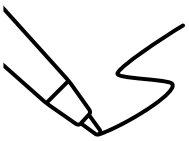
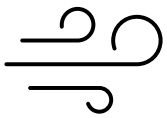
Compare two or more types of weather in the table below. Either draw a picture or write how the weather make you feel and affects what you do.

	Thunder and lightning 	**Hot sunny weather** 	**Severely windy weather** 	**Snow and ice** 	**Heavy rainfall and flooding** 
How does the weather make me feel?					
Are there any dangers?					
How can I protect myself?					

Windsock activity

Please write down your observations of the windsock at three different times during the day, such as morning midday and afternoon.

Observations of my windsock:

	Time of observation 	**Draw a picture of what your windsock looks like!** 	**Words to describe what the windsock looks like** 	**What does this tell us about the strength and direction of the wind?** 
1.				
2.				
3.				

Living and traveling in space

How big is Space – Being a scientist!

Imagine if we reduced the Sun to the size of a full stop, what distance would all of the planets in our solar system be from the Sun and one another?

You will need a piece of paper, a ruler and a pen or pencil. Tear your piece of A4 paper into 9 pieces.

1. On one of the pieces put a Full Stop and write The Sun. On the other pieces copy the names of the planets listed in the table below.

2. Across your floor, use the information in the table to measure the relative model distance to each planet from your full stop Sun. Place each planet's label at the measured point.

Planets	Actual Distance from Sun (in million km)	Relative Model Distance (in cm)
Mercury	58	5.8 cm
Venus	108	10.8 cm
Earth	150	15 cm
Mars	228	22.8 cm
Jupiter	778	77.8 cm
Saturn	1420	142 cm
Uranus	2870	287 cm
Neptune	4480	448 cm

Challenge: Thinking about the model:

Currently, it would take six months for a rocket to travel from the Earth to Mars. Using your Full Stop model of the solar system to help your thinking,

In the future will people travel and live in space? How has the solar system model helped to answer the big question?

Think about how long it would take for a rocket to travel to more distant planets, and what might be the challenges?

How many issues and ideas can you think of?

I have been thinking like a scientist!

Record your findings, thoughts, drawings, images from your science investigations here…

In the future will people travel and live in space? How can the history sources and investigating the past help answer the big question?

I have been thinking like a historian!

Record your sources from the past? Who wrote them? Why? What do the sources tell you about space exploration?

Record your findings, thoughts, drawings, images from your history investigations here…