STEM 101
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Name: _____
Period: _____

UNIT: UKULELE

ACT-BASED SCIENCE: COMPARING STRING TENSION AND SOUND QUALITY

OBJECTIVE:

Examine the relationship between **string tension, frequency, and pitch**.

ACT SCORE TARGET: 28-32

MATERIALS NEEDED

- Ukulele
- Tuner or frequency app
- Force meter (or estimated tension chart)

STUDENT DIRECTIONS:

Goal:

Understand how string tension affects the frequency and pitch of sound on a ukulele. Use data collection and scientific reasoning to analyze real-world sound behavior—similar to what's tested in the ACT Science section (target score: 28–32).

Step 1: Set Up Your Experiment

1. **Use a standard ukulele with at least one open string.**
2. **Make sure a force meter, digital tuner, or frequency measurement app is available.**

Step 2: Collect Baseline Data

1. Pluck the open string (without adding tension).
2. Use the digital tuner or app to record the pitch and frequency (Hz).
3. Write down the values on your data sheet.

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Step 3: Apply More Tension

1. Carefully tighten the tuning peg to increase string tension.
2. Use the tuner to measure the new pitch and frequency.
3. Use the force meter (or provided data) to estimate how much tension (in Newtons) was added.
4. Repeat the steps for at least 3 different tension levels.

Trial	Tension (N)	Frequency (Hz)	Observed Pitch)
1			
2			
3			

Step 4: Analyze Your Results

Answer these questions using your data:

- What happened to the **frequency** as the **tension increased**?
- How did the **pitch** change?
- Is the relationship between tension and frequency **direct or inverse**?
- How might this apply to tuning other stringed instruments?

Step 5: Explain the Science

In a short paragraph (3–5 sentences), **explain how tension affects pitch** and why this happens using scientific vocabulary such as:

- Tension
- Frequency
- Wavelength
- Pitch
- Vibration
- Harmonic

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ACT-STYLE QUESTION:

- What happens if you increase the **tension** of a ukulele string?

A. The frequency decreases
B. The frequency increases
C. The wavelength remains the same
D. The pitch lowers