BitWith Bite

PHYSICS WORKSHEET

Resonance

Chapter: Waves · Level ★★☆ · Time: 30 min

SCORE ___ / 20

Name _____ Class _____ Date _____

AFTER THIS WORKSHEET YOU CAN

✓ Understand: Natural Frequency ✓ Understand: Resonance Condition

✓ Understand: Everyday Examples of Resonance ✓ Understand: Resonance and Structural Engineering

Section A · Concept Check

• BEGINNER 4 × 1 = 4

1 Why does a radio tuner let you select one specific station out of many broadcast frequencies?

2 Why did the Tacoma Narrows Bridge (a famous historical example) collapse dramatically in wind?

3 Why does opera-singer glass-breaking require a sustained note rather than a brief one?

4 What would happen to resonant amplitude growth if a system had zero damping at all (a purely theoretical case)?

Section B · Problem Solving

• INTERMEDIATE 4 × 3 = 12

5 Why do soldiers traditionally break step (stop marching in unison) when crossing a bridge?

6 A tuning fork vibrates at its natural frequency when struck. What happens if you place it near another tuning fork with the same natural frequency?

7 Why is 'damping' often deliberately added to engineered structures like buildings in earthquake-prone areas?

8 What determines a system's natural frequency (in general terms)?

Section C · Challenge

• CHALLENGE 2 × 2 = 4

9 Why might a car exhibit unusual vibration or rattling at one specific speed but not others?

10 What is the key difference between simply applying a force to a system versus applying a force AT its resonant frequency?

Reflection — the most useful thing I learned: _____

A ___/4 B ___/12 C ___/4 **Total ___/20**

Teacher's Signature

Parent's Signature

✂ ANSWER KEY — FOLD OR CUT BEFORE HANDING OUT

1 = The tuner circuit's natural frequency is adjusted to resonate specifically with the desired station's frequency, amplifying that signal over others 2 = Wind-induced oscillations matched (or closely matched) the bridge's natural frequency, causing resonance and a catastrophic buildup of oscillation amplitude 3 = Building up enough resonant energy in the glass takes time, so a sustained matching frequency allows the amplitude to grow large enough to break it 4 = Amplitude could theoretically grow without bound as long as the driving force continued at the resonant frequency | 5 = To avoid accidentally driving the bridge at its natural frequency through synchronized footsteps, which could cause dangerous resonance 6 = The second tuning fork can begin vibrating too, due to resonance from the sound waves matching its natural frequency 7 = To reduce the amplitude of resonant oscillations during an earthquake, protecting the structure from potentially catastrophic vibration 8 = Its physical properties, such as mass, stiffness, length, or tension, depending on the type of system | 9 = That speed's engine or wheel rotation frequency likely matches a natural resonant frequency of some car component, amplifying the vibration 10 = Applying force at the resonant frequency causes energy to build up efficiently over time, producing much larger oscillations than the same force applied at a non-matching frequency