

Resonance: upper division college

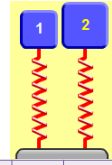
Clicker questions

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Learning Goals: Students will be able to:

- Identify/explain the variables that affect the natural frequency of a mass-spring system.
- Explain the distinction between transient and steady-state behavior in a driven system.
- Identify which variables affect the duration of the transient behavior.
- Recognize the phase relationship between the driving frequency and the natural frequency, especially how the phase is different above and below resonance.
- Give examples the application of real-world systems to which the understanding of resonance should be applied and explain why.

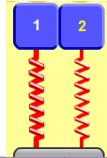
1. Which system will have the lower resonant frequency?



Mass (kg)	2.5	5.0
Spring constant (N/m)	100	100
Driver Amplitude (cm)	2.0	4.0

A) 1 B) 2 C) Same frequency

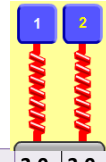
2. Which system will have the higher resonant frequency?



Mass (kg)	5.0	5.0
Spring constant (N/m)	200	100
Driver Amplitude (cm)	2.0	4.0

A) 1 B) 2 C) Same frequency.

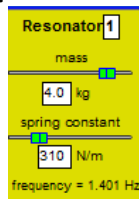
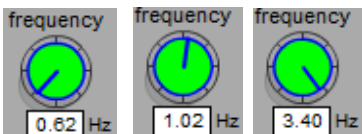
3. Which system will have the lower resonant frequency?



Mass (kg)	3.0	3.0
Spring constant (N/m)	400	400
Driver Amplitude (cm)	0.5	1.5

A) 1 B) 2 C) Same frequency.

4. If the frequency f of the driver is not the same as the resonant frequency, which statement is most accurate?



The steady-state amplitude is ..

- smallest at the highest driver f .
- largest at the highest driver f .
- is largest at driver f nearest the resonant frequency.
- is independent of driver f .

5. Transient behavior will last longer when

- the damping constant is decreased.
- the driving amplitude is increased.
- Both of these.
- None of these. The transient behavior is independent of the damping and the amplitude.

6. Two resonators are driven at the same driving frequency and amplitude. One resonator has a resonant frequency 2 Hz below the driving frequency. The other has a resonant frequency 2 Hz above the driving frequency.

Which resonator has the smallest steady-state amplitude?

- A) The lower frequency resonator.
- B) The higher frequency resonator.
- C) Both have the same steady-state amplitude.