BitWith Bite

PHYSICS WORKSHEET

Simple Harmonic Motion

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

SCORE ___ / 20

Name _____ Class _____ Date _____

AFTER THIS WORKSHEET YOU CAN

✓ Understand: Defining Condition for SHM ✓ Understand: Mass on a Spring

✓ Understand: Simple Pendulum (Small Angles) ✓ Understand: Position, Velocity, and Acceleration in SHM

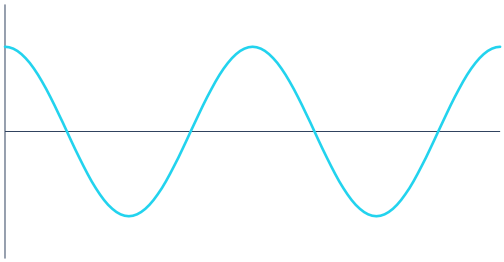
Section A · Concept Check • BEGINNER 4 × 1 = 4

1 A 4 kg mass on a spring with k=16 N/m. Find the period.

2 Find the period of a pendulum with length 2.45m (g=9.8).

3 A spring's period is measured at 4s with a 2kg mass. Find its spring constant k.

4 Why does the period of a simple pendulum NOT depend on its mass?



SHM: displacement x(t) = A cos(ωt)

Section B · Problem Solving • INTERMEDIATE 4 × 3 = 12

5 Why does the period of a mass-spring system depend on mass, but a pendulum's period does not?

6 At what point in SHM is potential energy at its maximum?

7 If a pendulum's length is quadrupled, how does its period change?

8 If a spring's spring constant k is quadrupled (mass unchanged), how does the period change?

Section C · Challenge

• CHALLENGE 2 × 2 = 4

9 What shape does a graph of position vs. time take for an object in SHM?

10 Why is SHM considered the most 'fundamental' type of oscillation in physics?

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 = T=2*pi*sqrt(4/16)=2*pi*0.5=pi≈3.14s 2 = T=2*pi*sqrt(2.45/9.8)=2*pi*0.5=pi≈3.14s 3 = 4=2*pi*sqrt(2/k), solve: sqrt(2/k)=4/(2pi)≈0.637, 2/k≈0.405, k≈4.94 N/m 4 = Mass cancels out of the pendulum equation T=2*pi*sqrt(L/g), leaving only length and gravity as factors | 5 = In a spring system, inertia (mass) directly resists the spring's restoring force, while a pendulum's restoring force is gravity acting on the same mass that provides the inertia, causing mass to cancel out 6 = At the maximum displacement (the extremes of motion) 7 = It doubles, since period is proportional to the square root of length 8 = It is halved, since period is inversely proportional to the square root of k | 9 = A sine or cosine wave 10 = Its simple proportional relationship between force and displacement makes it mathematically tractable and it appears as an approximation in many real physical systems