**PHYSICS 2021 - 22 September 10, 2021**

**Today’s Agenda (Day 18)**

1. HOUSEKEEPING ITEMS

🡪 Request for: toy cars

1. HOMEWORK CHECK:

🡪 Chapter 2 Vocabulary

🡪 Lab – Ball Bounce

🡪 Chapter 2 Notes

1. CLASS ACTIVITY

🡪LAB: Coffee Filter Lab – see p. 3 of document

HOMEWORK:

* READ: Chapter 3 – Accelerated Motion
* COMPLETE: Chapter 3 Vocabulary (shortened template)
* STUDY: Chapter 2 Test

CH 3 – ACCELERATED MOTION

|  |  |  |
| --- | --- | --- |
| Acceleration | Average acceleration | Free fall |
| Velocity-time graph | Instantaneous acceleration | Free fall acceleration |

REMINDERS:

* **TEST: Chapter 2 🡪 Tuesday, September 14**
* Ch 3 Vocabulary – Sept. 16
* **TEST: Chapter 3 🡪 Tuesday, September 21**
* **QUIZ: Ch 3 & 4 Vocabulary** **🡪 Thursday, September 23**

**PHYSICS 2021 - 22 SUMMARY REVIEW**

**CHAPTER 2 SUMMARY REVIEW**

1. The following quantities describe location or its change: position, distance, and displacement. Briefly describe the differences among them.
2. How can you use a clock to find a time interval?
3. How can you use the position-time graphs for two in-line skaters to determine if and when one inline skater will pass the other one?
4. Which equation describes how the average velocity of a moving object relates to its displacement?
5. A walker and a runner leave your front door at the same time. They move in the same direction at different constant velocities. Describe the position-time graphs of each.
6. What does the slope of a position-time graph measure?
7. If you know the time it took an object to travel between two points and the positions of the object at the points, can you determine the object's instantaneous velocity? Its average velocity? Explain.
8. You ride a bike at a constant speed of 4.0 m/s for 5.0 s. How far do you travel?
9. Nora jogs several times a week and always keeps track of how much time she runs each time she goes out. One day she forgets to take her stopwatch with her and wonders if there is a way she can still have some idea of her time. As she passes a particular bank building, she remembers that it is 4.3 km from her house. She knows from her previous training that she has a consistent pace of 4.0 m/s. How long has Nora been jogging when she reaches the bank?
10. You and a friend each drive 50.0 km. You travel at 90.0 km/h; your friend travels at 95.0 km/h. How much sooner will your friend finish the trip?
11. A cyclist traveling along a straight path maintains a constant velocity of 5.0 m/s west. At time t = 0.0 s, the cyclist is 250 m west of point A.
12. Plot a position-time graph of the cyclist’s location from point A at 10.0-s intervals for a total time of 60.0 s.
13. What is the cyclist’s position from point A at 60.0 s?
14. What is the displacement from the starting position at 60.0 s?
15. Both car A and car B leave school when a stopwatch reads zero. Car A travels at a constant 75 km/h, and car B travels at a constant 85 km/h.
16. Draw a position-time graph showing the motion of both cars over 3 hours. How far are the two cars from school when the stopwatch reads 2.0 h? Calculate the distances and show them on your graph.
17. Both cars passed a gas station 120 km from the school. When did each car pass the gas station? Calculate the times and show them on your graph.
18. Convert each of the following time measurements to its equivalent in seconds.

a. 58 ns b. 0.046 Gs c.  9270 ms d. 12.3 ks

1. State the number of significant figures in the following measurements.

a. 3218 kg b. 60.080 kg c. 801 kg d. 0.000534 kg

1. Using a calculator, Chris obtained the following results. Rewrite each answer to each operation using the correct number of significant figures.

a. 5.32 mm + 2.1 mm = 7.4200000 mm

b. 13.597 m × 3.65 m = 49.62905 m2

c. 83.2 kg –12.804 kg = 70.3960000 kg

**PHYSICS 2021 - 22 MINI-LAB**

**AUTUMN LEAVES & PARACHUTES**

**(The Coffee Filter Lab)**

**PURPOSE:**   a) To analyze the motion of falling leaves.

b) To explore terminal velocity

**PROCEDURE:**

1. Drop one coffee filter from a height of 2 m and time how long it takes for the filter to reach the ground.

2. Drop it two more times and find the average time.

3. Repeat this procedure for 2 nested coffee filters, 3 nested filters and 4 nested filters etc. See the table below.

**DATA:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NUMBER OF FILTERS** | **TIME 1** | **TIME 2** | **TIME 3** | **AVERAGE TIME** | **AVERAGE VELOCITY** |
| 1 NESTED |  |  |  |  |  |
| 2 NESTED |  |  |  |  |  |
|  |  |  |  |  |  |
| 4 NESTED |  |  |  |  |  |
| 5 NESTED |  |  |  |  |  |
|  |  |  |  |  |  |
| 7 NESTED |  |  |  |  |  |
| 8 NESTED |  |  |  |  |  |
|  |  |  |  |  |  |
| 10 NESTED |  |  |  |  |  |

**LEAF ANALYSIS:**

1. Create a graph which compares the objects changing mass, measured in number of coffee filters, and the objects resulting average velocity.
2. Next, straighten the graph and create a mathematical model for the behavior of a falling leaf.

**EXTENSION: [**Parachute & Terminal Velocity]

A) Design a procedure that uses a **stopwatch** and a **meter stick** to determine how long it takes an object to reach terminal velocity. Consider how you will know that the object is falling at a steady speed and how you could measure the speed accurately.

B) Use your procedure to find the terminal velocity of a single **coffee filter** and then a combination of filters.

Parachute Analysis

What is the terminal velocity for each case? Does it depend on the mass?

**LEAF QUESTIONS:**

1. Describe the motion of each set of filters just after they have started to fall.  Are they moving with a constant velocity or is their velocity changing?

2. Compare the velocities of each set of filters.  Which is faster?

3. Using the graph:

a. What is the relationship between an object's mass and its velocity as it falls?

b. Predict the average velocity of the 3, 6 and 9 nested filters.

c. Experimentally determine the average velocity of the 3, 6 and 9 filters and determine the percent error.

4. What forces are acting on the filters after they are falling?

5. What is the relative strength of these forces? Are either of these stronger?

6. What is the total amount of force acting on the filter as it falls?

**CONCLUSION**:

Write a paragraph as an answer to the question: **Do falling leaves accelerate or do they move with a constant velocity?**