Summer Work for AP Physics I Review Chp 2 PPT. Answer all questions and problems below in detail. Justify your answers. This will be a graded assignment due the first day of class.

# **CHAPTER 2: Describing Motion: Kinematics in One**

# Dimension

## Questions

- **1.** Does a car speedometer measure speed, velocity, or both?
- **3.** When an object moves with constant velocity, does its average velocity during any time interval differ from its instantaneous velocity at any instant?
- 5. If one object has a greater speed than a second object, does the first necessarily have a greater acceleration? Explain, using examples.
- 7. Can an object have a northward velocity and a southward acceleration? Explain.
- 9. Give an example where both the velocity and acceleration are negative.
- Can an object be increasing in speed as its acceleration decreases? If so, give an example. If not, explain.
- 13. As a freely falling object speeds up, what is happening to its acceleration due to gravity does it increase, decrease, or stay the same?
- **15.** You travel from point A to point B in a car moving at a constant speed of 70 km/h. Then you travel the same distance from point B to another point C, moving at a constant speed of 90 km/h. Is your average speed for the entire trip from A to C 80 km/h? Explain why or why not.

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- **17.** Which one of these motions is *not* at constant acceleration: a rock falling from a cliff, an elevator moving from the second floor to the fifth floor making stops along the way, a dish resting on a table?
- **19.** Can an object have zero velocity and nonzero acceleration at the same time? Give examples.

## **Problems**

[The Problems at the end of each Chapter are ranked I, II, or III according to estimated difficulty, with (I) Problems being easiest. Level III are meant as challenges for the best students. The Problems are arranged by Section, meaning that the reader should have read up to and including that Section, but not only that Section — Problems often depend on earlier material. Finally, there is a set of unranked "General Problems" not arranged by Section number.]

#### 2–1 to 2–3 Speed and Velocity

- 1. (I) What must be your car's average speed in order to travel 235 km in 3.25 h?
- **3.** (I) If you are driving 110 km/h along a straight road and you look to the side for 2.0 s, how far do you travel during this inattentive period?
- 5. (I) A rolling ball moves from  $x_1 = 3.4$  cm to  $x_2 = -4.2$  cm during the time from  $t_1 = 3.0$  s to  $t_2 = 6.1$  s. What is its average velocity?
- 7. (II) You are driving home from school steadily at 95 km/h for 130 km. It then begins to rain and you slow to 65 km/h. You arrive home after driving 3 hours and 20 minutes. (*a*) How far is your hometown from school? (*b*) What was your average speed?
- 9. (II) A person jogs eight complete laps around a quarter-mile track in a total time of 12.5 min.Calculate (a) the average speed and (b) the average velocity, in m/s.
- 11. (II) Two locomotives approach each other on parallel tracks. Each has a speed of 95 km/h with respect to the ground. If they are initially 8.5 km apart, how long will it be before they reach each other?

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- 15. (III) A bowling ball traveling with constant speed hits the pins at the end of a bowling lane 16.5 m long. The bowler hears the sound of the ball hitting the pins 2.50 s after the ball is released from his hands. What is the speed of the ball? The speed of sound is 340 m/s.
- 17. (I) A sprinter accelerates from rest to 10.0 m/s in 1.35 s. What is her acceleration (*a*) in  $\text{m/s}^2$ , and (*b*) in  $\text{km/h}^2$ ?
- 19. (II) A sports car moving at constant speed travels 110 m in 5.0 s. If it then brakes and comes to a stop in 4.0 s, what is its acceleration in  $m/s^2$ ? Express the answer in terms of "g's," where  $1.00 g = 9.80 m/s^2$ .

### 2–5 and 2–6 Motion at Constant Acceleration

- **21.** (I) A car accelerates from 13 m/s to 25 m/s in 6.0 s. What was its acceleration? How far did it travel in this time? Assume constant acceleration.
- 23. (I) A light plane must reach a speed of 33 m/s for takeoff. How long a runway is needed if the (constant) acceleration is  $3.0 \text{ m/s}^2$ ?
- **25.** (II) A car slows down uniformly from a speed of 21.0 m/s to rest in 6.00 s. How far did it travel in that time?
- 27. (II) A car traveling 85 km/h strikes a tree. The front end of the car compresses and the driver comes to rest after traveling 0.80 m. What was the average acceleration of the driver during the collision? Express the answer in terms of "g's," where 1.00  $g = 9.80 \text{ m/s}^2$ .

### 2–7 Falling Objects [neglect air resistance]

- **33.** (I) A stone is dropped from the top of a cliff. It hits the ground below after 3.25 s. How high is the cliff?
- **35.** (I) Estimate (*a*) how long it took King Kong to fall straight down from the top of the Empire State Building (380 m high), and (*b*) his velocity just before "landing"?

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39. (II) A helicopter is ascending vertically with a speed of 5.20 m/s. At a height of 125 m above the Earth, a package is dropped from a window. How much time does it take for the package to reach the ground? [*Hint*: The package's initial speed equals the helicopter's.]