

HW #1 – Due February 2nd

Chapters 1-3; worth 8 points total.

Questions

1. What do we mean when we say that a scientific hypothesis must be testable?
2. Define the following in terms of their scientific meaning: a fact, a hypothesis, a law and a theory.
3. How is the printing press like the Internet in terms of the history of science?
4. Describe the scientific method. Is it the only approach to doing science?
5. Where would your weight be greater, Earth or the Moon? Where would your mass be greater?
6. What is a scalar? Give three examples of scalar quantities.
7. What is a vector? Give three examples of vector quantities.
8. Consider a pair of forces, one of 50 N and a second of 40 N. What is the maximum net force possible? What is the minimum net force possible? Illustrate your answers.
9. If an object is in motion at a constant velocity can we state that there are no forces at all acting on the object?
10. How does the direction of motion compare to the direction of the friction force?
11. A 400 kg bear slides down a tree at a constant velocity. What is the total frictional force on that bear?
12. A box is pushed across a floor by a 200 N force at a constant velocity. What is the net force on the box? What is the total frictional force?
13. How much tension is in a rope that holds a 30 N bag of flour?
14. A painter with a weight of 200 lbs. is standing on a scaffold. The ropes on either end of the scaffold have a tension of 500 lbs. each. What is the weight of the scaffold?
15. How are a) speed and velocity, and b) velocity and acceleration similar and/or different from each other?
16. What is necessary to produce acceleration in an object?
17. What is the acceleration of an object free-falling near the Earth's surface?
18. A biologist is aiming his tranquilizer dart gun at a monkey hanging from a tree limb. Just as the hunter fires his gun, the monkey lets go and falls towards the ground. Where should the hunter aim in order to be sure to hit the monkey? Explain your answer.
19. When you toss a ball upward, by how much does its upward speed decrease each second?
20. A ball is thrown straight up into the air at a speed of 20 m/s. What is the velocity of the ball at its highest point? What is the velocity as the ball an instant before it returns to your hand?
21. State Newton's Laws of Motion.
22. What is the relationship between a) Force and Acceleration and b) Mass and Acceleration in Newton's 2nd Law of Motion?
23. Do action and reaction forces act in succession, or simultaneously? Explain.
24. What is the acceleration if a vehicle increases its speed from 10 m/s to 20 m/s in 2s?
25. What kind of path would the planets follow if the gravitational attraction of the Sun were suddenly turned off?
26. What is the acceleration of a 20 kg object pushed horizontally with an 80 N force? Assume no friction.
27. Explain what would change in Question 26 if there were a frictional force of 40 N?
28. A 60 kg student is standing on a skateboard near a wall and pushes on the wall with a force of 120 N. How hard does the wall push back on the student? What is the student's acceleration?