Summer Assignment, AP Physics 2 (Review)

Review

*** Pick up a book from Mrs. Stanescu- Rm. 144 (Science Wing) before the end of the year**

***Review the following topics in the book, and make a 1 page summary for each topic.**

Review Topics

1. **Forces and Newton's Laws (Chapter 4)**
2. **Circular Motion (Chapter 7, Section1)**
3. **Energy (Chapter 5)**
4. **Momentum (Chapter 6)**
5. **Waves (Chapter 11, Sections 3,4)**
6. **Electricity (Chapter 16, Sections 1,2)**

Assignment Write-up

***The assignment is a combination of multiple choice and short answer questions; for this assignment, you will need to briefly explain your answers FOR BOTH PARTS!!!**

Grading

***Summer Assignment is due on the first day of class, and will be graded for an honest attempt; however** ONLY PARTIAL CREDIT WILL BE GIVEN FOR SOLUTIONS THAT ARE NOT NEAT, ORGANIZED, AND/OR DON'T SHOW WORK/ EXPLANATIONS.

Part I - Multiple Choice

1. Which of the following is the cause of an acceleration?
   a. speed
   b. inertia
   c. force
   d. velocity

2. Which of the following statements does *not* describe force?
   a. Force causes objects at rest to remain stationary.
   b. Force causes objects to start moving.
   c. Force causes objects to stop moving.
   d. Force causes objects to change direction.

3. Which of the following forces are forces that result from the contact between two objects? Select all that apply.
   a. gravitational force
   b. normal force
   c. centripetal force
   d. electric force

4. A newton is equivalent to which of the following quantities?
   a. kg
   b. kg•m/s
   c. $kg•m/s^2$
   d. $kg•(m/s)^2$

5. A free-body diagram represents all of the following *except:*
   a. the object.
   b. forces as vectors.
   c. forces exerted by the object.
   d. forces exerted on the object.

6. A car goes forward along a level road at constant velocity. The additional force needed to bring the car in equilibrium is:
   a. greater than the normal force times the coefficient of static friction.
   b. equal to the normal force times the coefficient of static friction.
   c. the normal force times the coefficient of kinetic friction.
   d. zero.

7. A single force acts on an object. The components of this force act along the $+x$-axis and the $-y$-axis. The single force that will bring the object into equilibrium has components that act along the
   a. $+x$-axis and $+y$-axis.
   b. $+x$-axis and $-y$-axis.
   c. $-x$-axis and $+y$-axis.
   d. $-x$-axis and $-y$-axis.

8. Two perpendicular forces, one of 45.0 N directed upward and the other of 60.0 N directed to the right, act simultaneously on an object with a mass of 35.0 kg. What is the magnitude of the resultant acceleration of the object?
   a. $2.14\ m/s^2$
   b. $3.00\ m/s^2$
   c. $5.25\ m/s^2$
   d. $1.41\ m/s^2$

9. A ball is dropped from a person's hand and falls to Earth. Identify an action-reaction pair in this situation.
   a. The hand exerts a force on the ball; Earth exerts a force on the hand.
   b. Earth exerts a force on the ball; the hand exerts a force on Earth.
   c. Earth exerts a force on the hand; the hand exerts a force on the ball.
   d. Earth exerts a force on the ball; the ball exerts a force on Earth.

10. If the sign of work is negative,
   a. the displacement is perpendicular to the force.
   b. the displacement is in the direction opposite the force.
   c. the displacement is in the same direction as the force.
   d. no work is done.

11. In which of the following scenarios is no net work done?
   a. A car accelerates down a hill.
   b. A car travels at constant speed on a flat road.
   c. A car decelerates on a flat road.
   d. A car decelerates as it travels up a hill.

12. Which of the following formulas would be used to directly calculate the kinetic energy of an object with mass m bouncing up and down on a spring with spring constant k?
   a. $KE = \frac{1}{2}kx^2$
   b. $KE = -\frac{1}{2}kx^2$
   c. $KE = \frac{1}{2}mv^2$
   d. $KE = -\frac{1}{2}mv^2$

13. If friction is the only force acting on an object during a given physical process, which of the following assumptions can be made in regard to the object's kinetic energy?

a. The kinetic energy decreases.
b. The kinetic energy increases.
c. The kinetic energy remains constant.
d. The kinetic energy decreases and then increases.

14. Gravitational potential energy is always measured in relation to:
a. kinetic energy.
b. mechanical energy.
c. total potential energy.
d. a zero level.

15. The equation for determining gravitational potential energy is $PE_g = mgh$. Which factor(s) in this equation is (are) *not* intrinsic to an object?
a. m
b. g
c. h
d. both g and h

16. Which of the following is a true statement about the conservation of energy?
a. Potential energy is always conserved.
b. Kinetic energy is always conserved.
c. Mechanical energy is always conserved.
d. Total energy is always conserved.

17. A roller coaster climbs up a hill at 4 m/s and then zips down the hill at 30 m/s. The momentum of the roller coaster
a. is greater up the hill than down the hill.
b. is greater down the hill than up the hill.
c. remains the same throughout the ride.
d. is zero throughout the ride.

18. A rubber ball moving at a speed of 5 m/s hit a flat wall and returned to the thrower at 5 m/s. The magnitude of the momentum of the rubber ball:
a. increased.
b. decreased.
c. remained the same.
d. was not conserved.

19. A ball with a momentum of 4.0 kg•m/s hits a wall and bounces straight back without losing any kinetic energy. What is the change in the ball's momentum?
a. –8.0 kg•m/s
b. –4.0 kg•m/s
c. 0.0 kg•m/s
d. 8.0 kg•m/s

20. In a two-body collision,
a. momentum is always conserved.
b. kinetic energy is always conserved.
c. neither momentum nor kinetic energy is conserved.
d. both momentum and kinetic energy are always conserved.

21. When an object is moving with uniform circular motion, the object's tangential speed:
a. is circular.
b. is perpendicular to the plane of motion.
c. is constant.
d. is directed toward the center of motion.

22. When an object is moving with uniform circular motion, the centripetal acceleration of the object:
a. is circular.
b. is perpendicular to the plane of motion.
c. is zero.
d. is directed toward the center of motion.

23. What term describes a change in the speed of an object in circular motion?
   a. tangential speed
   b. tangential acceleration
   c. centripetal acceleration
   d. centripetal force

24. Which of the following can be a centripetal force?
   a. friction
   b. gravity
   c. tension
   d. all of the above

25. The centripetal force on an object in circular motion is:
   a. perpendicular to the plane of the object's motion.
   b. in the plane of the object's motion and perpendicular to the tangential speed.
   c. in the plane of the object's motion and in the same direction as the tangential speed.
   d. in the plane of the object's motion and in the direction opposite the tangential speed.

26. When a car makes a sharp left turn, what causes the passengers to move toward the right side of the car?
   a. centripetal acceleration
   b. centripetal force
   c. centrifugal force
   d. inertia

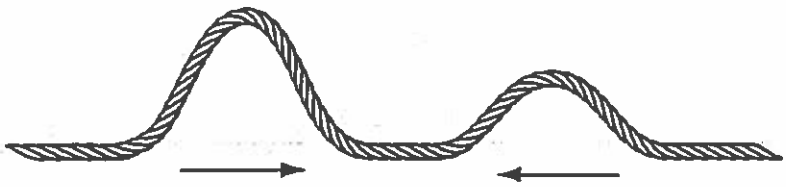
27. Which of the following most affects the wavelength of a mechanical wave moving through a medium? Assume that the frequency of the wave remains constant.
   a. the nature of the medium
   b. the amplitude
   c. the height of a crest
   d. the energy carried by the wave

28. Suppose that two sound waves passing through the same medium have different wavelengths. Which of the following is most likely to be the reason for the differing wavelengths?
   a. the nature of the medium
   b. differences in amplitude
   c. differences in frequency
   d. the type of wave

29. When a mechanical wave's amplitude is tripled, the energy the wave carries in a given time interval is increased by a factor of:
   a. 3.
   b. 6.
   c. 9.
   d. 18.

30. Two mechanical waves can occupy the same space at the same time because waves:
   a. are matter.
   b. are displacements of matter.
   c. do not cause interference patterns.
   d. cannot pass through one another.

31. Two waves traveling in opposite directions on a rope meet and undergo complete destructive interference. Which of the following best describes the waves a moment after the waves meet and coincide?
   a. The waves no longer exist.
   b. The waves continue unchanged.
   c. The waves reflect and travel backward.
   d. A single wave continues along the rope.



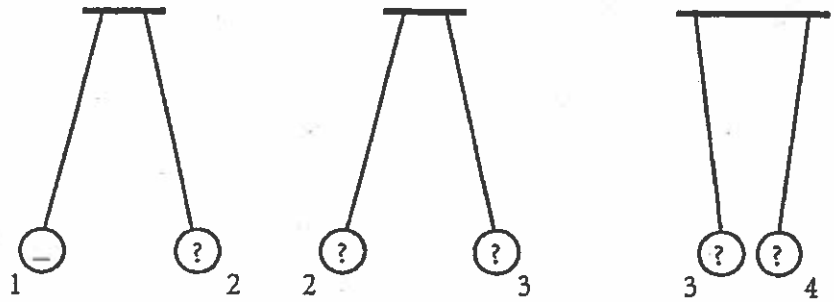
32. Which of the following types of interference will occur when the pulses in the figure above meet?

a. no interference
b. constructive interference
c. destructive interference
d. total interference

33. Waves arriving at a fixed boundary are
a. neither reflected nor inverted.
b. reflected but not inverted.
c. reflected and inverted.
d. inverted but not reflected.

34. Waves arriving at a free boundary are
a. neither reflected nor inverted.
b. reflected but not inverted.
c. reflected and inverted.
d. inverted but not reflected.

35. Electric charge is
a. found only in a conductor.
b. conserved.
c. found only in insulators.
d. not conserved.



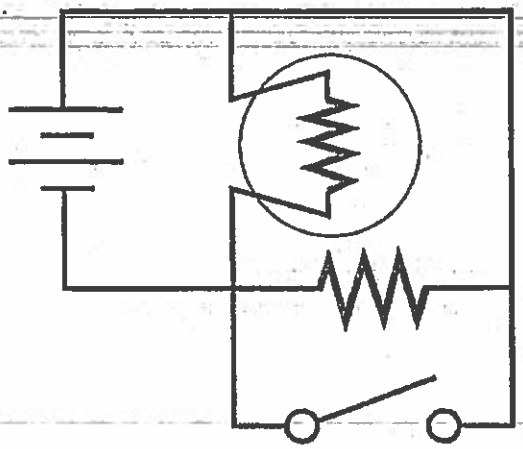
36. In the diagram shown above, the circles represent small balls that have electric charges. Ball 1 has a negative charge, and ball 2 is repelled by ball 1. Next, you see that ball 2 repels ball 3 and that ball 3 attracts ball 4. What is the electric charge on ball 4?
a. Ball 4 may have either a positive or negative charge.
b. Ball 4 has a negative charge.
c. Ball 4 has a positive charge.
d. It is not possible to determine the charge on ball 4.

37. Which of the following is *not* true for both gravitational and electric forces?
a. The inverse square distance law applies.
b. Forces are proportional to physical properties.
c. Potential energy is a function of distance of separation.
d. Forces are either attractive or repulsive.

38. Two point charges, initially 2 cm apart, are moved to a distance of 10 cm apart. By what factor does the resulting electric force between them change?
a. 25
b. 5
c. $\frac{1}{5}$
d. $\frac{1}{25}$

39. Two positive charges, each of magnitude q, are on the y-axis at points $y = +a$ and $y = -a$. Where would a third positive charge of the same magnitude be located for the net force on the third charge to be zero?
a. at the origin
b. at $y = 2a$
c. at $y = -2a$
d. at $y = -a$

40.

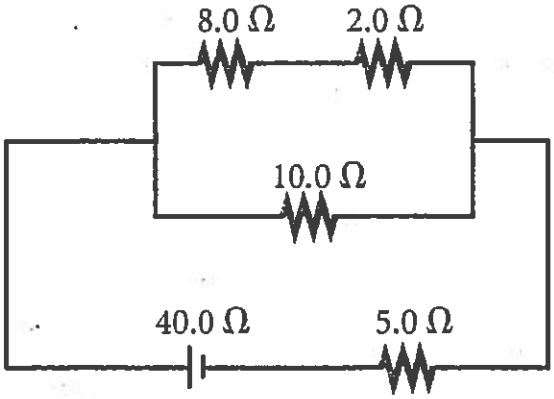


What happens when the switch is closed in the circuit shown above?

a. The lamp lights because current from the battery flows through the lamp.
b. Current from the battery flows through the resistor.
c. Current from the battery flows through both the lamp and the resistor.
d. The lamp goes out, because the battery terminals connect to each other.

41. How does the potential difference across the bulb in a flashlight compare with the terminal voltage of the batteries used to power the flashlight?

a. The potential difference is greater than the terminal voltage.
b. The potential difference is less than the terminal voltage.
c. The potential difference is equal to the terminal voltage.
d. It cannot be determined unless the internal resistance of the batteries is known.



42. Rank the currents flowing through each of the resistors in the circuit above.

a. I(10)>I(8)>I(5)>I(2)
b. I(5)>I(10)=I(8)=I(2)
c. I(5)>I(10)>I(8)>I(2)
d. They are all the same.

Short Answer

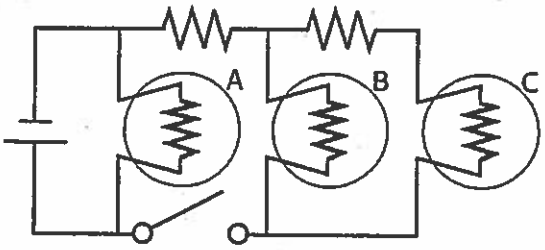
43. Distinguish between mass and weight.

44. A pendulum is raised 1.5 cm and allowed to fall. If air resistance is negligible, how high will the pendulum rise on the other side? Explain your answer.

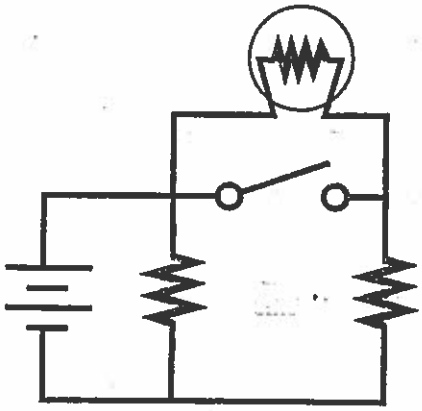
45. Is it possible for a spaceship traveling with constant velocity to experience a change in momentum? Explain your answer.

46. A boat produces a wave as it passes an aluminum can floating in a lake. Explain why the can is not moved along in the direction of wave motion.

47. Explain what happens when you vigorously rub your wool socks on a carpeted floor, touch a metal doorknob, and get a shock.



48. Which bulb or bulbs will have a current in the schematic diagram shown above?



49. In the circuit shown above, what will happen when the switch is closed? Explain.

Problem

50. An elevator weighing 2.00×10^5 N is supported by a steel cable. What is the tension in the cable when the elevator is accelerated upward at a rate of 3.00 m/s^2? ($g = 9.81$ m/s^2) Draw a force diagram, and show all your work.