Physics 122 – Review Sheets

1. Two charges of +20 μC and +300 μC are placed on 2 metal spheres located 80.0 cm apart. What is the force they exert on each other? (84 N attraction)

2. Two metal spheres having charges of +44 μC and -16 μC are allowed to touch and are then placed 45 cm apart. What force do they now exert on each other? (8.7 N)

3. What does a positive charge on an object mean?

4. A charge of +2.5 μC experiences a force of 0.080 N east. What is the electric field? (3.2×10^4 N East)

5. A cannonball is fired at an angle of 60° to the ground with a speed of 100 m/s. How high will the ball go? (383 m)

6. How do we add vectors?

7. What is the gravitational field strength at a point in the Earth's gravitational field where a 10.0 kg mass weighs 85.0 N? (8.50 m/s^2)

8. A box weighing 540 N is pulled across the floor at a constant speed by means of a rope that makes an angle of 40° to the horizontal. The applied force is 100 N. What is the coefficient of friction?

9. Of what is weight a measure?

10. How do like charges behave? Opposite?

11. Compare and contrast electrical and gravitational fields.

12. How many electrons are moved by a 1.5 V cell when 9.0 J of energy is expended? (3.7×10^{19})

13. A package in an airplane traveling at 200 m/s is dropped from an altitude of 500 m.
    a. How long does it take the package to reach the ground? (10.1 s)
    b. What is the range of the package (2.0 km)

14. An inclined plane makes an angle of 24° to the ground. A crate that weighs 200 N is to be moved up the plane, whose coefficient of friction is 0.300. What force is needed to move the crate up at a constant speed? What force would be needed to accelerate the crate up at a rate of 3.00 m/s^2? (136 N, 197 N)

15. A cannon is fired horizontally off a cliff with a launch speed of 100 m/s. If the cliff is 50.0 m high, what is the range of the projectile? (319 m)

16. How much would a 200 kg satellite weigh at a location 2.5×10^5 m away from the Earth's surface (1.8×10^3 N)

17. What is the coefficient of friction between the tires of a 200 kg car and the pavement if the car is traveling 10.0 m/s around a 30 m radius turn? (0.34)

18. How far from a charge of 5.8 mC would the electric field intensity be 200 N/C? (511 m)

19. What is the potential difference of a battery if 24 J of energy is needed to move 4.0 C from the anode to the cathode? (6.0 V)

20. If glass is rubbed with silk, what charge will each material have?

21. A 12.0 W lamp operates on a 6.0 V circuit. What current flows through it? How much energy would be used in 5.0 min.? (2.0 A, 3.6×10^3 J)

22. Sketch the electric field lines around a negative source charge. Draw in the equipotential lines.

23. Calculate Kepler's constant for Neptune using one of the moons (1.76×10^{14} m^3/s^2)

24. The force of attraction between 2 identical objects is 20 N. If one mass is doubled and the other is tripled, what would the new force of attraction be? (120 N)

25. The planet Neptune has an orbital radius of 4.5×10^{12} m as it orbits the sun. What are its period and orbital speed? (5.3×10^9 s, v=5.4×10^3 m/s)

26. What current flows through a 20 Ω electric heater when it is operating on a 120 V line? How much heat energy develops in 30 s?

27. Satellite broadcast TV requires a satellite to be in a geosynchronous orbit. Calculate the period and altitude of this satellite. (8.64×10^4 s, 3.59×10^7 m)

28. A car is rounding a curve on a level road. The radius of curvature is 55.0 m and the coefficient of friction is 0.530. What is the maximum speed (in km/h) at which the car can make the turn? (60.9 km/h)

29. A 3.0 Ω and 5.0 Ω resistor are in series. The current through the 5.0 Ω resistor is measured to be 2.0 A. What is the potential difference of the source? (16 V)

30. A satellite weighs 7.0 kN on Earth. It is put into orbit 200 km above the surface of Mars. Calculate
    a. The mass of the satellite (710 kg)
    b. The weight of the satellite in orbit. (2.3 kN)

31. What is a resistor?

32. A 12.5 g bullet is shot into a ballistic pendulum that has a mass of 3.45 kg. The pendulum rises a distance of 9.55 cm above the resting position. What was the speed of the bullet? (379 m/s)

33. Car A (1750 kg) traveling South collides with Car B (1450 kg) traveling East. The cars lock together and move off at 35.8 km/h [E31.6°S] What was the speed of each car before the collision? (18.7 m/s, 9.52 m/s)

34. You swing a yo-yo, with a mass of 225 g, in a vertical circle. The string has a length of 1.2 m.
    a. What is the minimum speed at which you can swing the yo-yo? (3.4 m/s)
    b. What is the tension of the string at the top and bottom of the circle at this speed? (0N, 4.4 N)

35. A 52 g golf ball traveling east at 2.1 m/s collides with a 155 g billiard ball at rest. After the collision, the golf ball rolls back at 1.04 m/s. Was the collision elastic? If not, how much energy was lost?

36. Two masses (17 kg and 8.5 kg) are connected as an Atwood's machine. What is the acceleration of the masses? What is the tension on the rope? (3.3 m/s^2, 110 N)

37. State Kepler's laws.

38. State Newton's laws and given an example of the application of each.