**Physics 2nd Semester Test Review Packet Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Circular Motion**

1. Define:

rotation

revolution

linear speed

rotational speed

2. What is linear speed called when something moves in a circle?

3. When you whirl a can at the end of a string in a circular path, what is the direction of the force that acts on the can?

4. What is the equation for acceleration for uniform circular motion?

5. What is the equation for Centripetal force?

6. Calculate the tangential velocity of an object traveling in a circle with a period of 6s and a radius of 4m?

7. The moon revolves in its orbit at a distance of 3.84 x 108 meters from the center of the Earth. The mass of the Earth is 5.98 x 1024 kilograms. What is the tangential velocity of the moon in its orbit?

a. If the moon were farther from the Earth, would its tangential velocity increase, decrease, or remain constant? Why?

b. If the moon were more massive, would its tangential velocity increase, decrease, or remain constant? Why?

8. In the diagram at the right, draw vector arrows that indicate the following for an object that is moving in a clockwise circle.

B

A

C

a. the net force at point A

b. The acceleration at point B

c. The velocity at point C

9. Define:

force

torque

What are the units of force?

What are the units of torque?

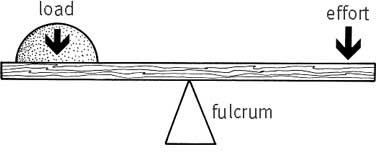
10. In terms of center of gravity, support base, and torque, why can’t you stand with your heels and

back to the wall and then bend over to touch your toes without falling over?

11. Calculate the torque produced by a 50-N perpendicular force at the end of a 0.2-m-long wrench.

a. Calculate the torque produced by the same 50-N force when a pipe extends the length of the

wrench to 0.5 m.



12. If a 200-g mass is placed 30 cm from the fulcrum, where should a 500-g mass be placed so that the system balances?

**Universal Gravitation**

13. Why did Newton think that a force must act on the moon?

14. What did Newton conclude about the force that pulls apples to the ground and the force that holds the moon in orbit?

15. If the moon falls, why doesn’t it get closer to Earth?

16. Define tangential velocity?

17. Since the planets are pulled to the sun by gravitational attraction, why don’t they simply crash into the sun?

18. What did Newton say about Universal Gravitation?

19. What is the equation to calculate the force of gravity between two objects?

20. What are the units?

21. What does the very small value of the gravitational constant G (in standard units) tell us about the strength of gravitational forces?

22. How is the force of gravity affected when distances between two objects is doubled?

a. Tripled?

b. Why does this occur? Include a formula to support your answer.

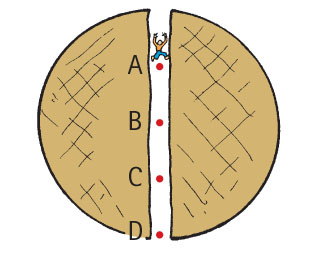
23. If the gravitational force of the sun on the planets suddenly disappeared, in what kind of paths would the planets move?

24. Two bowling balls each have a mass of 6.8 kg. They are located next to each other with their centers .218 m apart. What gravitational force do they exert on each other?

**Gravitational Interactions**

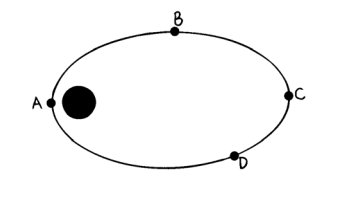
25. Upon what quantities does the acceleration of gravity on the surfaces of various planets depend?

26. How does the gravitational field surrounding Earth vary with increasing distance?

27. Where is your weight greatest- at the surface of the Earth, deep below the surface, or above the surface?

28. Why would your weight be less if you were deep beneath Earth’s surface?

29. Where in an elliptical orbit is the speed of a satellite maximum? Where is it minimum?

30. This question reviews several concepts of mechanics. A satellite travels the elliptical path as shown below. At which of the positions A through D does the satellite experience the maximum:

a gravitational force?

b. Speed?

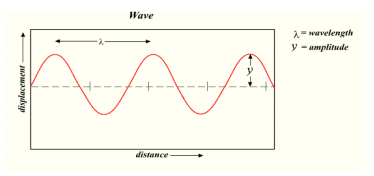
c. Kinetic energy?

d. Gravitational potential energy?

e. Acceleration?

**Waves**

31. Label and distinguish among these different parts of a wave: amplitude, crest, trough, and wavelength.



32. What is the frequency if the time in the drawing represents 2 seconds?

a. What is the period?

33. Distinguish between the period and the frequency of a vibration or a wave. How do they relate to one another?

34. Does the medium in which a wave travels move along with the wave itself? Defend your answer.

35. How does the speed of a wave relate to its wavelength and frequency?

36. As the frequency of sound is increased, does the wavelength increase or decrease? Give an example.

37. Distinguish between a transverse wave and a longitudinal wave. Indicate the interval(s) which represents one full wavelength on both types of waves.



38. New York’s 300-m high Citicorp tower oscillates in the wind with a period of 6.80 s. Calculate its frequency of vibration.

39. Calculate the speed of waves in a puddle that are 0.15 m apart and made by tapping the water surface twice each second.

40. What is the source of all sounds?

41. How does pitch relate to frequency?

42. What is the average frequency range of a young person’s hearing?

43. Define:

infrasonic

ultrasonic sound

compressions

rarefactions

Constructive interference

Destructive interference

44. How are compressions and rarefactions produced?

45. Light can travel through a vacuum, as is evidenced when you see the sun or the moon. Can sound travel through a vacuum also? Explain why or why not.

46. Why does sound travel faster in solids and liquids than in gases?

47. What is the wavelength, in meters, of the sound produced by a tuning fork that has a frequency of 320 Hz? The temperature of the air is 15 ºC.

48. Sound waves travel at approximately 340 m/s. What is the wavelength of a sound with a frequency of 20 Hz (the lowest note we can hear as a sound)?

a. What is the wavelength of a sound with a frequency of 20 kHz (the highest note we can hear)?

49. Suppose you wish to produce a sound wave that has a wavelength of 1 m in room temperature air. What would its frequency be?

**Light and Color**

50. List the types of electromagnetic waves in order from the lowest frequencies to the highest frequencies.

51. What do all of these waves have in common?

52. What are their differences?

53. What is the source of electromagnetic waves?

54. What is the speed of electromagnetic waves?

55. What is a red shift from a star, and how does it provide evidence for the big band?

56. How do the frequencies of infrared, visible, and ultraviolet light compare?

57. Different bells and tuning forks have their own natural vibrations and emit their own tones when struck. How is this analogous to light?

58. An infrared wave has a wavelength of 7.1 x 10-7 m. What is its frequency?

59. What is the wavelength of a 512 Hz sound wave traveling at 345 m/s in air?

60. What evidence can you cite to support the idea that light can travel through a vacuum?

61. List the order of the colors in the spectrum.

a. What is the low energy end?

b. What is the high energy end?

62. What colors of spots are lit on a television tube to give it full color?

63. What colors of ink are used to print full-color pictures in books and magazines?

64. Bart uses a helium-neon laser to align his telescope. The laser emits red light with a wavelength of 633 nm. What is the wavelength of the helium-neon laser in meters?

a. How much energy is given off by each photon of laser light?

65. The KRRO broadcasts at 103.7 MHz (FM). What is the frequency of the KRRO’s broadcast in Hz?

a. Calculate the wavelength of the KRRO’s broadcast.

66. Name one property that reinforces the particle nature of light.

67. Name one property that reinforces the wave nature of light.

68. A pendulum makes exactly 40 vibrations in 20.0s. What is it’s period?

69. A wave has a time period of 0.005 seconds. What would the frequency be in Hertz?

**Electrostatics**

70. Which force- gravitational or electrical-repels as well as attracts?

71. Gravitational forces depend on the property called mass. What comparable property underlines electrical forces?

72. How do protons and electrons differ in their charge?

73. How do like charges behave?

74. How do unlike charges behave?

75. How is Coulomb’s law similar to Newton’s law of gravitation?

76. In a grain elevator on Farmer Judd’s farm, kernels of grain become electrically charged while falling through the elevator. One kernel of grain is charged with +2.0 x 10-16 C, while another holds +5.0 x 10-16 C. Calculate the electrostatic force between the kernels when they are separated by .05 m.

77. Why are metals good conductors?

78. Why are materials such as rubber, glass and plastic good insulators?

**Electricity**

79. Define and give units:

electric current

ampere

voltage

resistance

work

power

energy

80. What is Ohm’s law?

81. If the resistance of a circuit remains constant while the voltage across the circuit decreases to half its former value, what change occurs in the current?

82. Which of these is a unit of power and which is a unit of electrical energy: a watt, a kilowatt, and a kilowatt-hour?

83. How many amperes flow through a 60-watt bulb when 120 volts are impressed across it?

84. A motor with an operating resistance of 32 ohms is connected to a voltage source. The current I the circuit is 3.8 A. What is the voltage of the source?

85. How much current moves through your fingers (resistance: 1200 ohms) if you touch them to the terminals of a 6-volt battery?

86. Calculate the resistance of the filament in a lightbulb that carries 0.4 A when 3.0 V is impressed across it.

87. Calculate the current in a 140-W electric blanket connected to a 120-V outlet.

88. How much voltage is required to make 2 amperes flow through a resistance of 8 ohms?

89. An 8 amp electric heater operates on a 120V outlet. What is the power of the device?

a. Calculate the energy used for 4 hours.

b. Calculate the cost to operate the electric heater if the cost per kilowatt-hour is 8 cents.

90. Distinguish between a series circuit and a parallel circuit?

a. Draw a schematic for each.

91. If three lamps are connected in a series to a 6 volt battery, how many volts are impressed across each lamp?

92. If three lamps are connected in parallel to a 6-volt battery, how many volts are impressed across each lamp?

93. In which case will there be more current in each of three lamps— if they are connected to the same battery in series or parallel?

a. In which case will there be more voltage across each lamp?

94. What happens to the total circuit resistance when more devices are added to a series circuit? To a parallel circuit?

95. What is the total resistance of a pair of 8-ohm resistors in series? In parallel? Draw a schematic diagram of each.

96. Why does the total circuit resistance decrease when more devices are added to a parallel circuit?

**Electromagnetism**

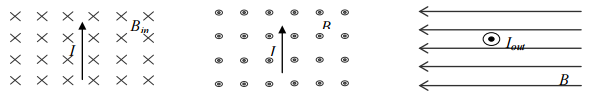
97. What is a magnetic domain?

98. Why do some pieces of iron behave as magnets, while other pieces of iron do not?

99. Why will dropping or heating a magnet weaken it?

100. What is the right hand rule used for?

101. For each situation below, a current carrying wire runs through a magnetic field. Draw and label the direction of the magnetic force exerted on the wire.



102. A 6.0 V battery is connected to a wire of length .15 m and resistance of .10 Ω. Calculate the current flowing through the wire.

a) If the magnetic field is .025 T, calculate the magnetic force exerted on the wire.

103. A magnet moved into a coil of wire will induce voltage in the coil. What is the effect of moving a magnet into a coil with more loops?

104. Define electromagnetic induction.

105. What is a generator?

106. What is a motor?

107. What would be needed to build each?

108. A motor is characterized by three main ingredients: magnetic field, moving charges, and magnetic force. What are the three main ingredients that characterize a generator?

109. How can a change in voltage in a coil of wire (the primary) be transferred to a neighboring coil of wire (the secondary) without physical contact?

110. What does a step-up transformer step up—voltage, current, or energy?

111. How does the relative number of turns on the primary and the secondary coil in a transformer affect the step-up or step-down voltage factor?

112. If the number of secondary turns is 10 times the number of primary turns, and the input voltage to the primary is 6 volts, how many volts will be induced in the secondary coil?

**Nuclear Fusion**

113. What is nuclear fusion?

114. What is the mass that is created during a nuclear fusion turned into?

115. Where does nuclear fusion occur in a star?

116. Where do stars come from?

117. What is the most common element found in a star? Second most common?

118. What does the red shift tell us about the universe?

119. What is the Big Bang Theory?

120. What causes movement within the mantle?

121. How does the Earth generate internal thermal energy?

122. Put the layers of the Earth in the correct order: mantle, inner core, crust outer core.