Name: _____ Class: _____ Date: _____ ID: A

Physics Semester Two Review B 2006

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

X 1. At a fixed boundary, waves are
   a. neither reflected nor inverted.
   b. reflected but not inverted.
   c. reflected and inverted.
   d. inverted but not reflected.

C 2. Which statement about sound waves is correct?
   a. They generally travel faster through solids than through gases.
   b. They generally travel faster through gases than through solids.
   c. They generally travel faster through gases than liquids.
   d. They generally travel faster than light.

C 3. If you are on a train, how will the pitch of the train's whistle sound to you as the train moves?
   a. The pitch will become steadily higher.
   b. The pitch will become steadily lower.
   c. The pitch will not change.
   d. The pitch will become higher then become lower.

A 4. What is the lowest frequency that will resonate in a 2.0 m length organ pipe closed at one end? The speed of sound in air at this temperature is 340 m/s.
   a. 42 Hz
   b. 85 Hz
   c. 170 Hz
   d. 680 Hz

$f = 1\ \frac{340}{4(2)}$

C 5. If a guitar string has a fundamental frequency of 500 Hz, what is the frequency of its second harmonic?
   a. 250 Hz
   b. 750 Hz
   c. 1000 Hz
   d. 1500 Hz

A 6. If a guitar string has a fundamental frequency of 7.50×10^2 Hz, what is the frequency of its fifth harmonic?
   a. 3750 Hz
   b. 750 Hz
   c. 2000 Hz
   d. 1500 Hz

A 7. Two violin players tuning their instruments together hear 8 beats in 2 s. What is the frequency difference between the two violins?
   a. 2 Hz
   b. 4 Hz
   c. 8 Hz
   d. 16 Hz

C 8. Which portion of the electromagnetic spectrum is used in a microscope?
   a. infrared waves
   b. gamma rays
   c. visible light
   d. ultraviolet light

A 9. When a straight line is drawn perpendicular to a flat mirror at the point where an incoming ray strikes the mirror's surface, the angles of incidence and reflection are measured from the normal and
   a. the angles of incidence and reflection are equal.
   b. the angle of incidence is greater than the angle of reflection.
   c. the angle of incidence is less than the angle of reflection.
   d. the angle of incidence can be greater than or less than the angle of reflection.

A 10. When two parallel mirrors are placed so that their reflective sides face one another, ____ images form. This is because the image in one mirror becomes the ____ for the other mirror.
   a. multiple; object
   b. reduced; virtual image
   c. inverted; center of curvature
   d. enlarged; focal point

Name: _____ $\frac{1}{14cm} + \frac{1}{29cm} =$ ID: A

b 11. A concave mirror forms a real image at 14 cm from the mirror surface along the principal axis. If the corresponding object is at a 29 cm distance, what is the mirror's focal length?
a. 14 cm
b. 9.4 cm
c. 12 cm
d. 36 cm

a.X 12. A wave on a rope approaches two gratings in a row. The wave is polarized parallel to grating 1 and perpendicular to grating 2. The wave passes through
a. only grating 1.
b. only grating 2.
c. both gratings.
d. neither grating.

a 13. When light passes at an angle to the normal from one material into another material in which its speed is lower,
a. it is bent toward the normal to the surface.
b. it always lies along the normal to the surface.
c. it is unaffected.
d. it is bent away from the normal to the surface.

a 14. An attracting force occurs between two charged objects when
a. charges are of unlike signs.
b. charges are of like signs.
c. charges are of equal magnitude.
d. charges are of unequal magnitude.

d 15. Two point charges, initially 2 cm apart, are moved to a distance of 10 cm apart. By what factor do the resulting electric and gravitational forces between them change?
a. 5
b. 25
c. $\frac{1}{5}$
d. $\frac{1}{25}$

$\frac{kqq}{r^2}$ $\frac{1}{4} \rightarrow \frac{1}{100}$

X 16. Two point charges are 10.0 cm apart and have charges of 2.0 μC and –2.0 μC, respectively. What is the electric field at the midpoint between the two charges?
a. 2.9×10^7 N/C
b. 1.4×10^7 N/C
c. 7.2×10^6 N/C
d. 0 N/C

$E = \frac{kq}{r^2}$

$E = \frac{(9 \times 10^9)(2 \times 10^{-6} C)}{(.05)^2} = 7.2 \times 10^6 \times 2 = 1.44 \times 10^7 N/C$

-2 ⟵ 2

b 17. If a lamp is measured to have a resistance of 45 Ω when it operates at a power of 80 W, what is the current in the lamp?
a. 2.10 A
b. 1.3 A
c. 0.91 A
d. 0.83 A

$V = IR$
$P = IV$
$\sqrt{\frac{80}{45}}$

C 18. Two resistors with values of 6.0 Ω and 12 Ω are connected in parallel. This combination is connected in series with a 4.0 Ω resistor. What is the overall resistance of this combination?
a. 0.50 Ω
b. 2.0 Ω
c. 8.0 Ω
d. 22 Ω

$\frac{1}{6} + \frac{1}{12}$ $\frac{3}{12} = 4$

a 19. If a wire is carrying a strong, steady current, the magnetic field is
a. proportional to the current and inversely proportional to the distance from the wire.
b. proportional to the current and proportional to the distance from the wire.
c. inversely proportional to the current and inversely proportional to the distance from the wire.
d. inversely proportional to the current and proportional to the distance from the wire.

B.

c 20. In a magnetized substance, the domains
a. are randomly oriented.
b. cancel each other.
c. line up mainly in one direction.
d. can never be reoriented.

Name: _____ ID: A

a 21. An electron that moves with a speed of 3.0×10^4 m/s perpendicular to a uniform magnetic field of 0.40 T experiences a force of what magnitude? ($e = 1.60 \times 10^{-19}$ C)

F=qvB
$(1.6 \times 10^{-19})(3 \times 10^4)(.4)$

a. 4.8×10^{-14} N
b. 1.9×10^{15} N
c. 2.2×10^{24} N
d. 0

C 22. The direction of the force on a current-carrying wire in an external magnetic field is
a. perpendicular to the current only.
b. perpendicular to the magnetic field only.
c. perpendicular to the current and to the magnetic field.
d. parallel to the current and to the magnetic field.

b 23. What is the path of an electron moving perpendicular to a uniform magnetic field?
a. a straight line
b. a circle
c. an ellipse
d. a parabola

a X 24. Which conversion process is the basic function of the electric generator?
(a) mechanical energy to electrical energy
b. electrical energy to mechanical energy
c. low voltage to high voltage, or vice versa
d. alternating current to direct current

b X 25. Which conversion process is the basic function of the electric motor?
a. mechanical energy to electrical energy
(b.) electrical energy to mechanical energy
c. low voltage to high voltage, or vice versa
d. alternating current to direct current

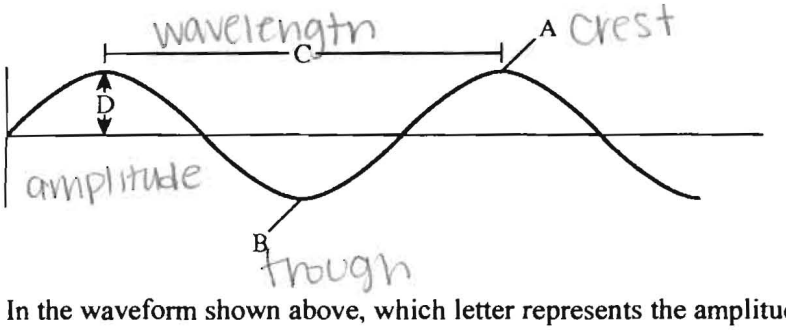
X 26. Calculate the binding energy of the carbon-12 nucleus. ($c^2 = 931.50$ MeV/u; atomic masses: ${}^{12}_{6}\text{C} = 12.000\ 000$ u; ${}^{1}_{1}\text{H} = 1.007\ 825$ u; $m_n = 1.008\ 665$ u)
a. 26.880 MeV
b. 44.554 MeV
c. 81.972 MeV
d. 92.163 MeV

Short Answer

27. How is the relationship between period and frequency represented as an equation? $f = 1/T$ they are inverses

28. A boat produces a wave as it passes an aluminum can floating in a lake. Explain why the can is not carried by the wave motion. because particles locally don't move side to side... just up & down so the can is not moved to the side → just up & down.

29. Explain the relationship between local particle vibrations and overall wave motion.

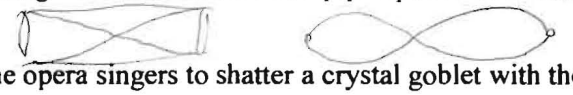


30. In the waveform shown above, which letter represents the amplitude of the wave? see above

31. In the waveform shown above, what does letter C represent?

Name: _____ ID: A

32. What happens to the energy of a wave when the amplitude is increased? higher energy
33. What determines the pitch of a musical note? frequency / wavelength
34. What happens to pitch when the frequency of a sound wave increases? higher pitch
35. Which carries a sound wave more rapidly, a solid or a gas? Explain. solids, particles close together
36. Why is the pattern of standing waves that occurs in a pipe open at both ends the same as that of a vibrating string?

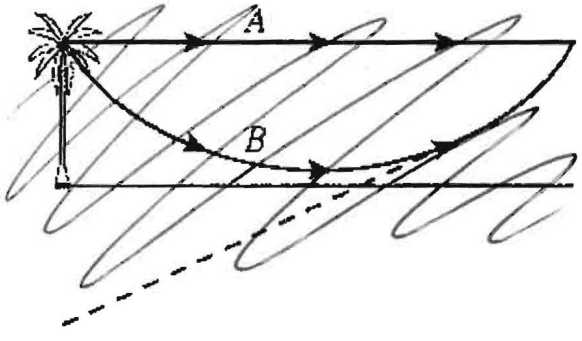


37. How is it possible for some opera singers to shatter a crystal goblet with their voices? they hit the resonant frequency.
38. Why are some primary colors called additive?
39. What occurs when beams of light of three primary colors are combined? White light
40. What occurs when light passed through a red filter is combined with light passed through a green filter? yellow light
41. The critical angle for internal reflection inside a certain transparent material is found to be 48°. If entering light has an angle of incidence of 52°, predict whether the light will be refracted or whether it will undergo total internal reflection. TIR
42. A ray of light travels from calcite (n = 1.434) into air at an angle of 35°. Predict whether the light will be refracted or whether it will undergo total internal reflection.

$\sin\theta_c = \frac{1}{1.434}$

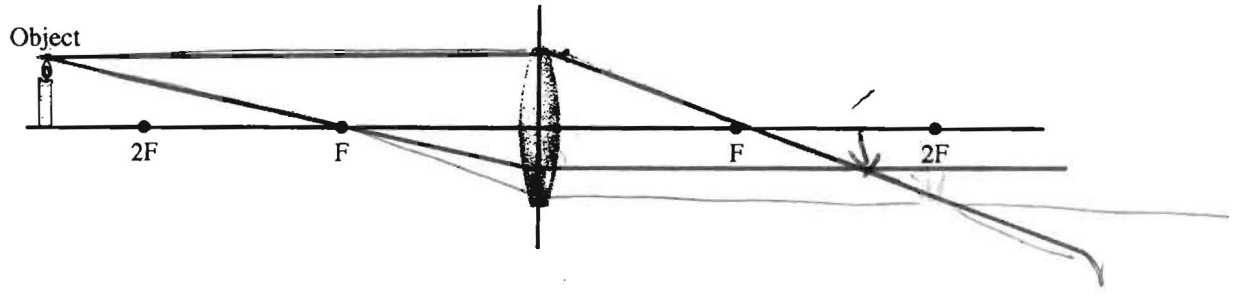
$\theta_c = 44$

it will be refracted



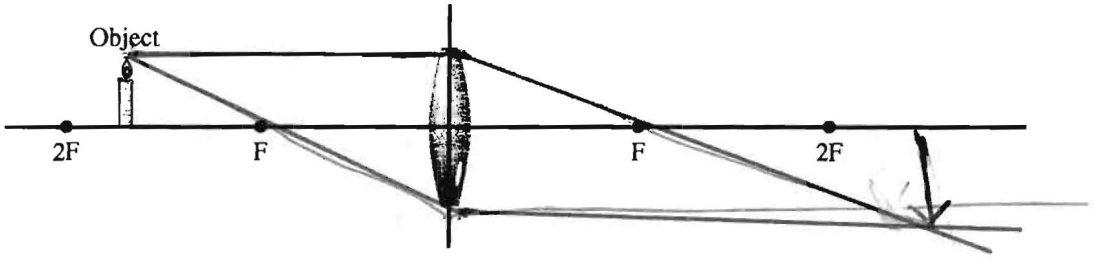
43. Use the figure above to describe how a mirage is produced.
44. How does white light passing through a prism produce a visible spectrum? because white light is all the colors & each color is going to get bent slightly differently
45. What does the perceived color of each water droplet in a rainbow depend on?

Name: _____ ID: A



46. What is the position and kind of image produced by the lens above? Draw a ray diagram to support your answer. Smaller, inverted

47. A student burns a hole in a pencil with a magnifying lens. What is the position and kind of image produced by the lens? Draw a ray diagram to support your answer.



48. What is the position and kind of image produced by the lens above? Draw a ray diagram to support your answer. inverse larger

49. What is meant by the statement that a laser produces a narrow beam of coherent light?

50. How does a laser produce coherent light?

51. When a conductor is given a negative charge, the charge will move on the conductor until the repulsive forces between the free electrons are in _____.

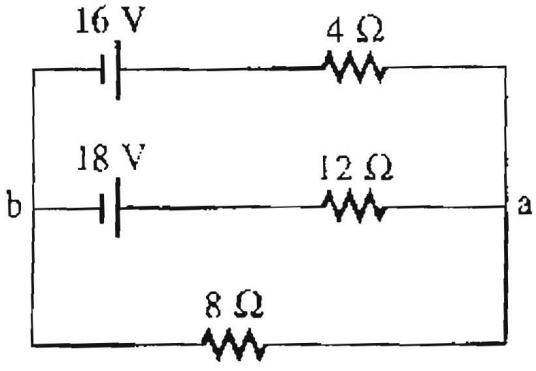
52. What is electric force? $F = kqq/r^2$

53. What is electric current? charge/time

54. What are some applications of electric current? electricity

55. What are the characteristics of direct current? all charges move in the same direction

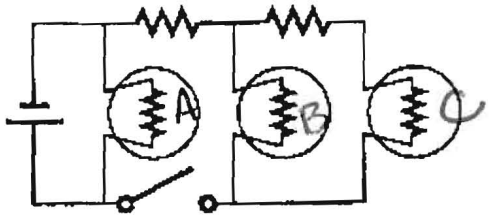
Name: _____ ID: A

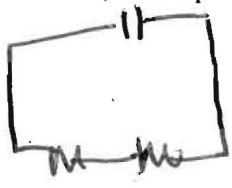


2 batteries
3 resistors

56. Identify the types of elements in the schematic diagram above and the number of each type.

57. Draw a schematic diagram that contains one battery, two resistors, ~~one capacitor~~, and one closed switch.

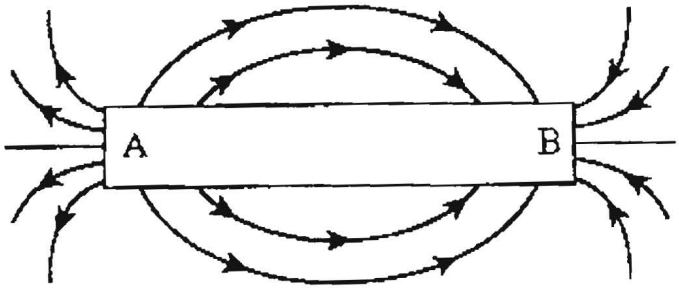




58. Which bulbs will have a current in the schematic diagram above? only Bulb A

59. A bar magnet is suspended and allowed to rotate freely. If the magnetic field of Earth is considered to be equivalent to that of a large bar magnet, which pole of the suspended magnet would point toward the magnetic north pole of Earth? [illegible]

60. If the head of an iron nail touches a magnet, the nail will become a magnet by induction. If the nail touches the north pole of the magnet, what kind of pole is at the point of the nail? Explain. North see below

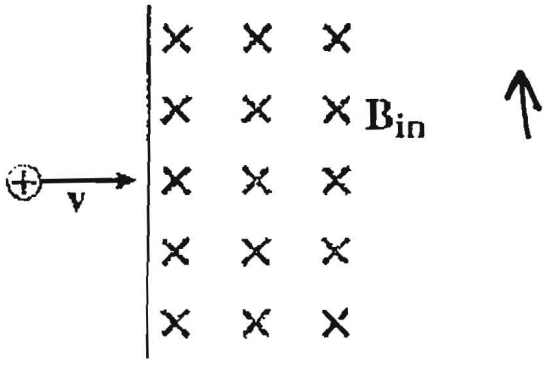


61. The magnetic field of a bar magnet is shown in the figure above. Is the magnet's north pole at A or B?

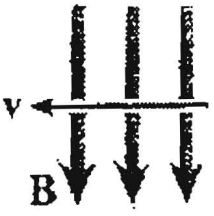
62. Which magnetic pole is at the geographic North Pole of Earth? South

63. Describe how the right-hand rule applies to the magnetic field produced by the current in a straight conductor. Thumb = Direction of current
Palm = Direction of force
Fingers = Direction of magnetic field

Name: _____ ID: A

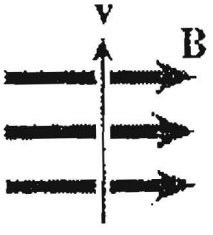


64. Find the direction of the force on an proton moving through the magnetic field shown above.



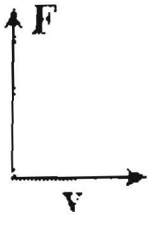
e⁻ × into

65. Find the direction of the force on an electron moving through the magnetic field shown above.



out •

66. Find the direction of the force on an electron moving through the magnetic field shown above.



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67. A negative charge is moving through a magnetic field. The direction of motion and the direction of the force acting on it at one moment are shown in the figure. Find the direction of the magnetic field.

68. Electrons move from the south to the north in a wire. What is the direction of the magnetic field at a point directly above the wire?

N
W E
S

Above the wire the mag field is →

Name: _____ ID: A

69. List three essential components of a generator. two wire, magnet

Problem

70. A ray of light passes from air into cubic zirconia ($n = 2.20$) at an angle of 56° to the normal. What is the refracted angle? 22° $n_1 \sin\theta_i = n_2 \sin\theta_2$ $\sin 56 = 2.2 \sin\theta_2$

71. A ray of light passes from air into fluorite ($n = 1.434$) at an angle of 19° to the normal. What is the refracted angle? 13.1 $n_1 \sin\theta_i = n_2 \sin\theta_2$ $1 \sin 19 = 1.434 \sin\theta_2$

72. An object is placed along the principal axis of a thin converging lens that has a focal length of 22 cm. If the distance from the object to the lens is 36 cm, what is the distance from the image to the lens? $\frac{1}{22} = \frac{1}{36\text{ cm}} + \frac{1}{x}$

73. An optical fiber is made of clear plastic ($n = 1.50$). Light travels through the fiber at angles ranging from 43° to 59°. Predict whether the light will be refracted or whether it will undergo total internal reflection when the cable is in the air. $\sin\theta_c = \frac{1}{1.5} = 41.8^\circ$

74. What is the electric force between an electron and a proton that are separated by a distance of 1.0×10^{-10} m? ($e = 1.60 \times 10^{-19}$ C, $k_c = 8.99 \times 10^9$ N•m²/C²) $F = \frac{kqq}{r^2} = \frac{(9\times10^9)(1.6\times10^{-19})(1.6\times10^{-19})}{(1\times10^{-10})^2}$ $F = 2.3 \times 10^{-8}$ N

75. The amount of charge that moves through the filament of a microwave in 10.0 s is 24.2 C. What is the current in the microwave? $I = \frac{C}{t}$ $\frac{24.2}{10} = 2.42$ A

76. A 2.0 kΩ resistor has 0.042 A of current in it. What is the potential difference across the resistor? $V = IR$ $V = (2\times10^3\,\Omega)(.042)$ $V = 84$ V

77. A toaster is connected across a 120-V outlet. If the resistance of the toaster is 25 Ω, how much power is dissipated in the form of electromagnetic radiation and heat? $P = IV$ $P = V^2/R$ $P = \frac{120^2}{25}$ $P = 576$ W

78. Three resistors with values of 11 Ω, 8 Ω, 2 Ω, respectively, are connected in parallel. What is their equivalent resistance? $\frac{1}{11} + \frac{1}{8} + \frac{1}{2} = \frac{1}{R_T}$ $R_T = 1.39\,\Omega$

79. An electron moves north at a velocity of 7.3×10^4 m/s and has a magnetic force of 1.8×10^{-18} N exerted on it. If the magnetic field points upward, what is the magnitude of the magnetic field? $F = qvB$ $1.8\times10^{-18} = 1.6\times10^{-19} \cdot 7.3\times10^4 B$ $B = 1.54 \times 10^{-4}$ T

80. A step-up transformer used on a 120-V line has 19 turns on the primary and 9691 turns on the secondary. What is the potential difference across the secondary? $\frac{V_P}{C_P} = \frac{V_S}{C_S}$ $\frac{120\text{V}}{19} = \frac{V_S}{9691}$ $V_S = 61206.3$ V