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

PAP Physics Spring Exam Review

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

____ 1. A container of gas is at a pressure of 1.3×10^5 Pa and a volume of 6.0 m^3. How much work is done by the gas if it expands at constant pressure to twice its initial volume?
a. 3.7×10^5 J
b. 2.6×10^5 J
c. 7.8×10^5 J
d. 4.6×10^5 J

____ 2. How is conservation of internal energy expressed for an adiabatic system?
a. $Q = W = 0$, so $\Delta U = 0$ and $U_i = U_f$
b. $Q = 0$, so $\Delta U = -W$
c. $\Delta T = 0$, so $\Delta U = 0$; therefore, $\Delta U = Q - W = 0$, or $Q = W$
d. $\Delta V = 0$, so $P\Delta V = 0$ and $W = 0$; therefore, $\Delta U = Q$

____ 3. How is conservation of internal energy expressed for an isovolumetric system?
a. $Q = W = 0$, so $\Delta U = 0$ and $U_i = U_f$
b. $Q = 0$, so $\Delta U = -W$
c. $\Delta T = 0$, so $\Delta U = 0$; therefore, $\Delta U = Q - W = 0$, or $Q = W$
d. $\Delta V = 0$, so $P\Delta V = 0$ and $W = 0$; therefore, $\Delta U = Q$

____ 4. How is conservation of internal energy expressed for an isothermal system?
a. $Q = W = 0$, so $\Delta U = 0$ and $U_i = U_f$
b. $Q = 0$, so $\Delta U = -W$
c. $\Delta T = 0$, so $\Delta U = 0$; therefore, $\Delta U = Q - W = 0$, or $Q = W$
d. $\Delta V = 0$, so $P\Delta V = 0$ and $W = 0$; therefore, $\Delta U = Q$

____ 5. A total of 165 J of work is done on a gaseous refrigerant as it undergoes compression. If the internal energy of the gas increases by 123 J during the process, what is the total amount of energy transferred as heat?
a. –42 J
b. 42 J
c. –288 J
d. 288 J

____ 6. A mass attached to a spring vibrates back and forth. At the equilibrium position, the
a. the acceleration reaches a maximum.
b. velocity reaches a maximum.
c. net force reaches a maximum.
d. velocity reaches zero.

____ 7. A mass attached to a spring vibrates back and forth. At maximum displacement, the spring force and the
a. velocity reach a maximum.
b. velocity reach zero.
c. acceleration reach a maximum.
d. acceleration reach zero.

____ 8. A simple pendulum swings in simple harmonic motion. At maximum displacement,
a. the acceleration reaches a maximum.
b. the velocity reaches a maximum.
c. the acceleration reaches zero.
d. the restoring forces reach zero.

____ 9. A mass on a spring that has been compressed 0.1 m has a restoring force of 20 N. What is the spring constant?
a. 10 N/m
b. 20 N/m
c. 200 N/m
d. 300 N/m

____ 10. An amusement park ride has a frequency of 0.05 Hz. What is the ride's period?
a. 5 s
b. 10 s
c. 20 s
d. 40 s

____ 11. A car with bad shock absorbers bounces up and down with a period of 1.5 s after hitting a bump. The car has a mass of 1500 kg and is supported by four springs with a spring constant of 6600 N/m. What is the period for each spring?

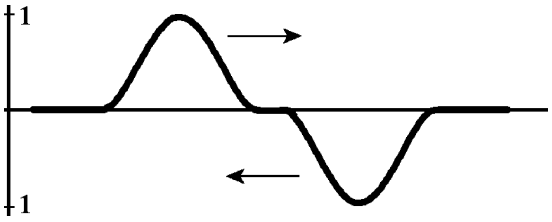
a. 1.5 s
c. 4.4 s
b. 5.8 s
d. 3.6 s

____ 12. What is the period of a 4.12 m long pendulum?

a. 2.01 s
c. 4.07 s
b. 3.11 s
d. 9.69 s

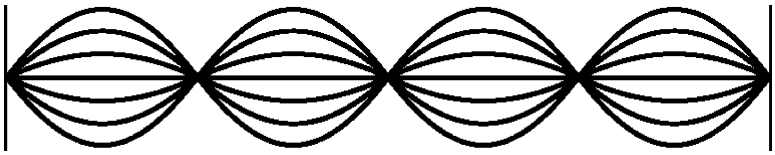
____ 13. A radio wave has a speed of 3.00×10^8 m/s and a frequency of 107 MHz. What is the wavelength?

a. 3.21 m
c. 0.100 m
b. 45.0 m
d. 2.79 m



____ 14. Which of the following types of interference will occur in the figure above?

a. partial constructive
c. complete constructive
b. partial destructive
d. complete destructive



____ 15. How many nodes and antinodes are shown in the standing wave above?

a. four nodes and four antinodes
c. four nodes and five antinodes
b. four nodes and three antinodes
d. five nodes and four antinodes

____ 16. Sound waves

a. are a part of the electromagnetic spectrum.
b. do not require a medium for transmission.
c. are longitudinal waves.
d. are transverse waves.

____ 17. 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
c. 170 Hz
b. 85 Hz
d. 680 Hz

____ 18. Two notes have a beat frequency of 8 Hz. The frequency of one note is 612 Hz. What is the frequency of the other note?

a. 325 Hz or 318 Hz
c. 604 Hz or 620 Hz
b. 5 Hz
d. 680 Hz

____ 19. The Tarantula train is moving away from the station at 30.0 m/s and blows his horn that has a frequency of 305 Hz. What frequency is detected by a stationary passenger waiting at the station?
a. 340 Hz
b. 360 Hz
c. 280 Hz
d. 260 Hz

____ 20. What is the frequency of infrared light of 1.0×10^{-4} wavelength?
a. 3.0×10^{-2} Hz
b. 3.0×10^{4} Hz
c. 3.0×10^{12} Hz
d. 3.0×10^{2} Hz

____ 21. If you know the wavelength of any form of electromagnetic radiation, you can determine its frequency because
a. all wavelengths travel at the same speed.
b. the speed of light varies for each form.
c. wavelength and frequency are equal.
d. the speed of light increases as wavelength increases.

____ 22. If you are reading a book and you move twice as far away from the light source, how does the brightness at the new distance compare with that at the old distance? It is
a. one-eighth
b. one-fourth
c. one-half
d. twice

____ 23. If a light ray strikes a flat mirror at an angle of 14° from the normal, the reflected ray will be
a. 13° from the mirror's surface.
b. 27° from the normal.
c. 90° from the mirror's surface.
d. 14° from the normal.

____ 24. 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

____ 25. If a virtual image is formed 10.0 cm along the principal axis from a convex mirror with a focal length of –15.0 cm, what is the object's distance from the mirror?
a. 30.0 cm
b. 12 cm
c. 6.0 cm
d. 3.0 cm

____ 26. When red light and green light shine on the same place on a piece of white paper, the spot appears to be
a. yellow.
b. brown.
c. white.
d. black.

____ 27. When a light ray moves from air into glass at an angle of 45°, its path is
a. bent toward the normal.
b. bent away from the normal.
c. parallel to the normal.
d. not bent.

____ 28. Carbon tetrachloride ($n = 1.46$) is poured into a container made of crown glass ($n = 1.52$). If a light ray in the glass is incident on the glass-to-liquid boundary and makes an angle of 30.0° with the normal, what is the angle of the corresponding refracted ray with respect to the normal?
a. 55.5°
b. 28.7°
c. 31.4°
d. 19.2°

____ 29. An object is placed 6.0 cm from a thin converging lens along the axis of the lens. The lens has a focal length of 9.0 cm. What is the distance from the image to the lens?
a. 3.0 cm
b. –3.0 cm
c. 18 cm
d. –18 cm

____ 30. An object is placed 14.0 cm from a diverging lens. If a virtual image appears 10.0 cm from the lens on the same side as the object, what is the focal length of the lens?
a. –50.0 cm
b. –35 cm
c. –10.0 cm
d. –8.0 cm

____ 31. A film projector produces a 1.51 m image of a horse on a screen. If the projector lens is 4.00 m from the screen and the size of the horse on the film is 1.07 cm, what is the magnification of the image?
a. 141
b. –14.1
c. 7.08×10^{-3}
d. -7.08×10^{-3}

____ 32. Which of the following describes what will happen to a light ray incident on a glass-to-air boundary at greater than the critical angle?
a. total reflection
b. total transmission
c. partial reflection, partial transmission
d. partial reflection, total transmission

____ 33. The process of charging a conductor by bringing it near another charged object and then grounding the conductor is called
a. charging by contact.
b. induction.
c. charging by polarization
d. neutralization.

____ 34. 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. $\frac{1}{25}$

____ 35. Two point charges have a value of 30 μC each and are 4 cm apart. What is the electric field at the midpoint between the two charges? ($k_c = 8.99 \times 10^9$ N•m^2/C^2)
a. 4.5×10^7 N/C
b. 2.3×10^7 N/C
c. $.5 \times 10^7$ N/C
d. 0 N/C

____ 36. If a conductor is in electrostatic equilibrium, any excess charge
a. flows to the ground.
b. resides entirely on the conductor's outer surface.
c. resides entirely on the conductor's interior.
d. resides entirely in the center of the conductor.

____ 37. A uniform electric field with a magnitude of 5.0×10^2 N/C is directed parallel to the positive x-axis toward the origin. What is the change in electrical energy of a proton ($q = 1.60 \times 10^{-19}$ C) as it moves from $x = 5$ m to $x = 2$ m?
a. 8.0×10^{-17} J
b. 2.4×10^{-16} J
c. 2.0×10^{21} J
d. 500 J

____ 38. Two protons, each having a charge of 1.60×10^{-19} C, are 2.0×10^{-5} m apart. What is the electrical potential energy between the two charges?
a. 1.1×10^{-23} J
b. 3.2×10^{-19} J
c. 3.2×10^{-16} J
d. 1.6×10^{-14} J

____ 39. A capacitor consists of two metal plates; ____ is stored on one plate and ____ is stored on the other.
a. negative charge; positive charge
b. potential energy; kinetic energy
c. potential difference; internal resistance
d. residual charge; induced charge

____ 40. A 0.50 μF capacitor is connected to a 12 V battery. How much electrical potential energy is stored in the capacitor?

a. 2.0×10^{-12} J
b. 1.0×10^{-12} J
c. 0.04 J
d. 3.6×10^{-5} J

____ 41. The amount of charge that moves through the filament of a light bulb in 2.00 s is 2.67 C. What is the current in the light bulb?

a. 5.34 A
b. 1.33 A
c. 0.835 A
d. 0.417 A

____ 42. A flashlight bulb with a potential difference of 4.5 V across it has a resistance of 8.0 Ω. How much current is in the bulb filament?

a. 3.7 A
b. 1.8 A
c. 9.4 A
d. 0.56 A

____ 43. Tripling the current in a circuit with constant resistance has the effect of changing the power by what factor?

a. $\frac{1}{3}$
b. $\frac{1}{9}$
c. 3
d. 9

____ 44. If a 5.00×10^2 W heater has a current of 4.00 A, what is the potential difference across the ends of the heating element?

a. 2.00×10^3 V
b. 125 V
c. 2.50×10^2 V
d. 8.00×10^{-3} V

____ 45. If the potential difference across a pair of batteries used to power a flashlight is 6.0 V, what is the potential difference across the flashlight bulb?

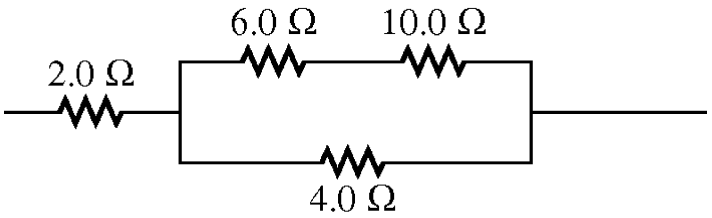
a. 3.0 V
b. 6.0 V
c. 9.0 V
d. 12 V

____ 46. Three resistors with values of 3.0 Ω, 6.0 Ω, and 12 Ω are connected in series. What is the equivalent resistance of this combination?

a. 0.58 Ω
b. 1.7 Ω
c. 7.0 Ω
d. 21 Ω

____ 47. Three resistors connected in parallel have voltages labeled ΔV_1, ΔV_2, and ΔV_3. Which of the following expresses the total voltage across the three resistors?

a. $\Delta V_t = \Delta V_1 + \Delta V_2 + \Delta V_3$
b. $\Delta V_t = (1/\Delta V_1 + 1/\Delta V_2 + 1/\Delta V_3)$
c. $\Delta V_t = \Delta V_1 = \Delta V_2 = \Delta V_3$
d. $\Delta V_t = (1/\Delta V_1 + 1/\Delta V_2 + 1/\Delta V_3)^{-1}$



____ 48. What is the equivalent resistance for the resistors in the figure above?

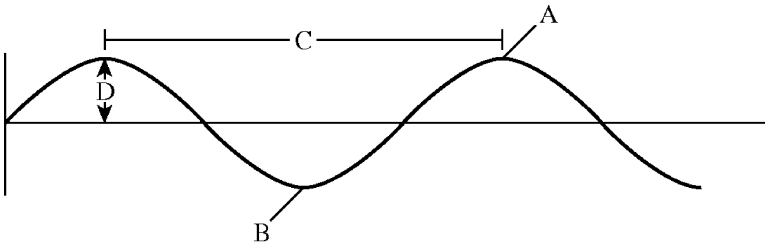
a. 2.3 Ω
b. 5.2 Ω
c. 13 Ω
d. 22 Ω

____ 49. What is the path of an electron moving parallel to a uniform magnetic field?
a. straight line
b. circle
c. ellipse
d. parabola

____ 50. The bright lines in the absorption spectrum of an element can be accounted for by the
a. absorption of photons that occurs when electrons jump from a higher-energy state to a lower-energy state.
b. emission of photons that occurs when electrons jump from a higher-energy state to a lower-energy state.
c. absorption of photons that occurs when electrons jump from a lower-energy state to a higher-energy state.
d. emission of photons that occurs when electrons jump from a lower-energy state to a higher-energy state.

____ 51. The dark lines in the absorption spectrum of an element can be accounted for by the
a. absorption of photons that occurs when electrons jump from a higher-energy state to a lower-energy state.
b. emission of photons that occurs when electrons jump from a higher-energy state to a lower-energy state.
c. absorption of photons that occurs when electrons jump from a lower-energy state to a higher-energy state.
d. emission of photons that occurs when electrons jump from a lower-energy state to a higher-energy state.

Short Answer



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

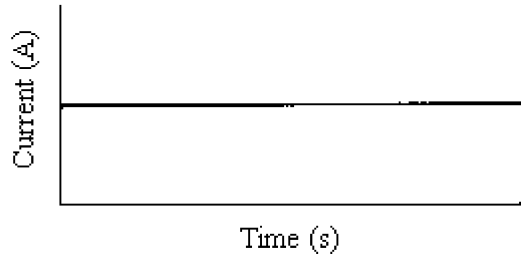
53. In the waveform shown above, which letter represents the trough of the wave?

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

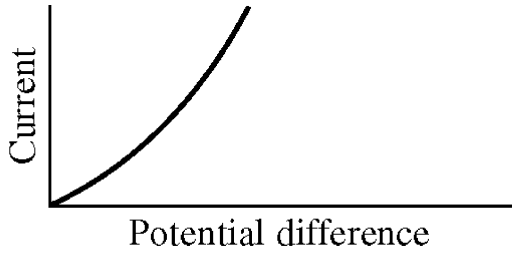
55. What happens to the energy of a wave when the amplitude is increased?

56. What determines the pitch of a musical note?

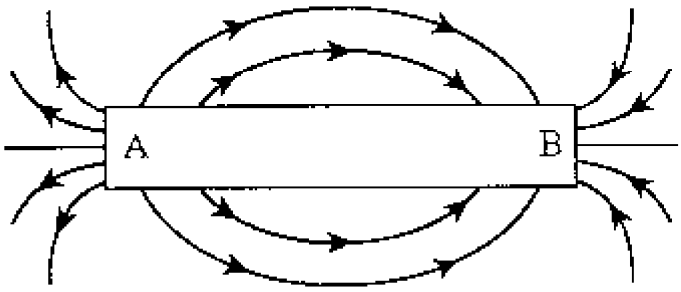
57. Which carries a sound wave more rapidly, a solid or a gas? Explain.



58. What type of electric current is shown in the figure above?

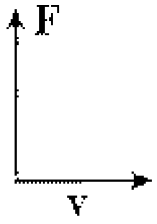


59. What type of material does the current-potential difference curve illustrate in the graph above?



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

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



62. 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.

Problem

63. What is the electric force between a proton and an alpha particle (charge $2e$) that are separated by a distance of 3.0×10^{-6} m? ($e = 1.60 \times 10^{-19}$ C, $k_c = 8.99 \times 10^{9}$ N•m^2/C^2)

PAP Physics Spring Exam Review
Answer Section

MULTIPLE CHOICE

1. ANS: C
2. ANS: B
3. ANS: D
4. ANS: C
5. ANS: A
6. ANS: B
7. ANS: C
8. ANS: A
9. ANS: C
10. ANS: C
11. ANS: A
12. ANS: C
13. ANS: D
14. ANS: D
15. ANS: D
16. ANS: C
17. ANS: A
18. ANS: C
19. ANS: D
20. ANS: C
21. ANS: A
22. ANS: B
23. ANS: D
24. ANS: B
25. ANS: A
26. ANS: A
27. ANS: A
28. ANS: C
29. ANS: D
30. ANS: B
31. ANS: A
32. ANS: A
33. ANS: B
34. ANS: D
35. ANS: D
36. ANS: B
37. ANS: B
38. ANS: A
39. ANS: A

40. ANS: D
41. ANS: B
42. ANS: D
43. ANS: D
44. ANS: B
45. ANS: B
46. ANS: D
47. ANS: C
48. ANS: B
49. ANS: A
50. ANS: B
51. ANS: C

SHORT ANSWER

52. ANS:
    D
53. ANS:
    B
54. ANS:
    wavelength
55. ANS:
    The energy increases.
56. ANS:
    frequency
57. ANS:
    A solid carries a sound wave more rapidly because its molecules are closer together than those of a gas.
58. ANS:
    Direct current
59. ANS:
    nonohmic material
60. ANS:
    A
61. ANS:
    The magnetic south pole is located at the geographic North Pole of Earth.
62. ANS:
    out of the page

PROBLEM

63. ANS:
    5.1×10^{-17} N