Name:

Physics 2140: Example Exam Chapters 17.4-20
Real Exam Date 3 March 2004

20 multiple choice questions worth 5 points each.

1. A 60-W light bulb is in a socket supplied with 120 V. What is the current in the bulb?

a. 0.50 A

b. 2.0 A

c. 60 A

d. 7 200 A

2. A nichrome wire has a radius of 0.50 mm and a resistivity of $1.5 \times 10^{-6}\Omega$-m. What is the resistance per unit length of this wire?

a. 0.001 5 Ω/m

b. 0.95 Ω/m

c. 1.6 Ω/m

d. 1.9 Ω/m

3. If a 500-W heater carries a current of 4.00 A, what is the resistance of the heating element?

a. 85.7 Ω

b. 42.8 Ω

c. 31.3 Ω

d. 11.2 Ω

4. Which process will double the power given off by a resistor?

a. doubling the current while doubling the resistance

b. doubling the current by making a resistance half as big

c. doubling the current by doubling the voltage

d. doubling the current while making the voltage half as big

5. Three 8.0 Ω resistors are connected in parallel. What is their equivalent resistance?

a. 0.054 Ω

b. 0.13 Ω

c. 0.38 Ω

d. 2.7 Ω

6. Three resistors connected in series each carry currents labeled I1, I2 and I3. Which of the following expresses the value of the total current IT in the system made up of the three resistors in series?

a. IT = I1 + I2 + I3

b. IT = (1/I1 + 1/I2 + 1/I3)

c. IT = I1 = I2 = I3

d. 1/IT = (1/I1 + 1/I2 + 1/I3)

7. Three resistors connected in parallel have the individual voltages labeled V1, V2 and V3, respectively. Which of the following expresses the total voltage VT across the three resistors when connected in this manner?

a. VT = V1 + V2 + V3

b. VT = (1/V1 + 1/V2 + 1/V3)

c. VT = V1 = V2 = V3

d. 1/VT = (1/V1 + 1/V2 + 1/V3)

8. A 1 000-V battery, a 3 000 Ω resistor and a 0.50 μF capacitor are connected in series with a switch. The time constant for such a circuit, designated by the Greek letter, τ, is defined as the time required to charge the capacitor to 63% of its capacity after the switch is closed. What is the value of τ for this circuit?

a. 6.0×10^9 s

b. 1.7×10^{10} s

c. 1.7×10^7 s

d. 1.5×10^3 s

9. A hair dryer draws 1 200 W, a curling iron draws 800 W, and an electric light fixture draws 500 W. If all three of these appliances are operating in parallel on a 120 V circuit, what is the total current drawn?

a. 19.4 A

b. 20.8 A

c. 25.4 A

d. 36.7 A

10. The two ends of a 3.0 Ω resistor are connected to a battery causing a power of 27 Watts to be disapated in the resistor. What is the current flowing in the circuit?

a. 3.0 A

b. 9.0 A

c. 0.33 A

d. 0.11 A

11. A solenoid with 500 turns, 0.10 m long, carrying a current of 4.0 A and with a radius of 10 m will have what strength magnetic field at its center? (magnetic permeability in empty space $\mu_0 = 4\pi \times 10^{-7}$ T-m/A)

a. 31×10^{-4} T

b. 62×10^{-4} T

c. 125×10^{-4} T

d. 250×10^{-4} T

12. When a magnetic field causes a charged particle to move in a circular path, the only quantity listed below which the magnetic force changes significantly as the particle goes around in a circle is the particle's:

a. energy

b. momentum

c. radius for the circle

d. time to go around the circle once

13. A current in a solenoid with N turns creates a magnetic field at the center of that loop. The field strength is directly proportional to:

a. number of turns in the loop

b. current strength

c. Both choices A and B are valid.

d. None of the above are valid.

14. A proton is released such that its initial velocity is from right to left across this page. The proton s path, however, is deflected in a direction toward the bottom edge of the page due to the presence of a uniform magnetic field. What is the direction of this field?

a. out of the page

b. into the page

c. from bottom edge to top edge of the page

d. from right to left across the page

15. An electron which moves with a speed of 3.0×10^4 m/s parallel to a uniform magnetic field of 0.40 T experiences a force of what magnitude? ($e = 1.6 \times 10^{-19}$ C)

a. 4.8×10^{-14} N

b. 1.9×10^{-15} N

c. 2.2×10^{-24} N

d. zero

16. A deuteron, with the same charge but twice the mass of a proton, moves with a speed of 3.0×10^5 m/s perpendicular to a uniform magnetic field of 0.20 T. Which of the paths described below would it follow? ($q_p = 1.6 \times 10^{-19}$ C and $m_d = 3.34 \times 10^{-27}$ kg)

a. a straight line path

b. a circular path of 1.6 cm radius

c. a circular path of 3.1 cm radius

d. a circular path of 0.78 cm radius

17. The basic function of the electric generator is which of the following conversion processes?

a. mechanical energy to electrical

b. electrical energy to mechanical

c. low voltage to high or vice versa

d. alternating current to direct

18. In a circuit made up of inductor, resistance, ammeter, battery and switch in series, at which of the following times after the switch is closed is the rate of current increase greatest?

a. zero

b. one time constant

c. reciprocal of one time constant

d. ten time constants

19. A uniform 4.5 T magnetic field passes through the plane of a wire loop 0.10 m^2 in area. What flux passes through the loop when the direction of the 4.5 T field is at a 30° angle to the normal of the loop plane?

a. 5.0 T-m^2

b. 0.52 T-m^2

c. 0.39 T-m^2

d. 0.225 T-m^2

20. A bar magnet is falling through a loop of wire with constant velocity. The south pole enters first. As the magnet leaves the wire, the induced current (as viewed from above):

a. is clockwise

b. is counterclockwise

c. is zero

d. is along the length of the magnet