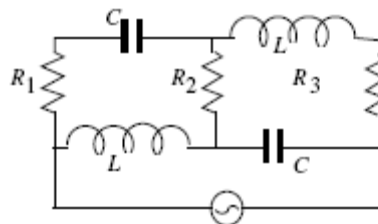


Practice Exam: Final

1. The circuit shown in the sketch is connected to an ac generator with an rms voltage of 120 V. What value must R_1 have if the rms current in this circuit is to approach 1 A at high frequency? ($R_2 = R_3 = 100 \Omega$)

- a) 10Ω
- b) 20Ω
- c) 0Ω
- d) 100Ω
- e) There is not enough information to find R_1 .



2. If the work required to move a $+0.35 \text{ C}$ charge from point **A** to point **B** is $+125 \text{ J}$, what is the potential difference between the two points?

- a) zero volts
- b) 88 V
- c) 360 V
- d) 44 V
- e) 180 V

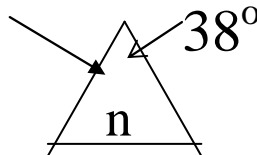
3. A 5-A current is maintained in a simple circuit that consists of a resistor between the terminals of an ideal battery. If the battery supplies energy at a rate of 20 W , how large is the resistance?

- a) 0.4Ω
- b) 2Ω
- c) 8Ω
- d) 0.8Ω
- e) 1Ω

4. A proton is traveling south as it enters a region that contains a magnetic field. The proton is deflected downward toward the earth. What is the direction of the magnetic field?

- a) downward, toward the earth
- b) north
- c) south
- d) west
- e) east

5. An overhead electric power line carries a maximum current of 125 A. What is the magnitude of the maximum magnetic field at a point 4.50 m directly below the power line?
- 5.56×10^{-6} T
 - 3.49×10^{-5} T
 - 7.95×10^{-3} T
 - 1.75×10^{-5} T
 - 4.69×10^{-4} T
6. What is the inductance of the inductor in a series RCL circuit with a resonant frequency of 640Hz if the only other element in the circuit is a 1.2- μ F capacitor?
- 52 mH
 - 0.12 H
 - 13 H
 - 74 mH
 - 2.1 H
7. What is the magnitude and direction of the electric force on a $-1.2 \mu\text{C}$ charge at a point where the electric field is 2500 N/C and is directed along the +y axis.
- 0.15 N, $-y$ direction
 - 0.0030 N, $-y$ direction
 - 4.3 N, $+x$ direction
 - 0.15 N, $+y$ direction
 - 0.0030 N, $+y$ direction
8. When the incidence of a ray on a prism is normal there is total internal reflection on the second face. Which of the following could the index of refraction n be? (The angle of the prism is 38°)
- 1.0
 - 1.2
 - 1.3
 - 1.5
 - 1.7



9. When a single slit of width 0.1 mm is illuminated with red light ($\lambda = 750\text{nm}$), the position in the screen of the first minimum of the diffraction pattern is $y=4\text{mm}$. What would be the position of the first minimum if the slit were illuminated with yellow light ($\lambda = 550\text{nm}$)?

- 2.4 mm
- 2.9 mm
- 4.0 mm
- 4.2 mm
- 4.7 mm

10. Suppose a thin piece of glass is placed in front of one of the slits of a double-slit interferometer, so the waves enter the slits with a phase shift of $3\lambda/2$. How would the interference pattern be

- a) The same as the usual double-slit pattern
- b) Reversed of the usual double-slit pattern.
- c) The lines would be more separated than the usual
- d) The lines would be less separated than the usual
- e) There would not be interference

11. A near point of an eye is 50 cm. What focal length must a corrective lens have to enable the eye to see clearly an object 25 cm away?

- a) 25 cm
- b) 50 cm
- c) 60 cm
- d) 65 cm
- e) 17 cm

12. The properties of the transmission of light in a fiber optics are based on

- a) Diffraction
- b) Interference
- c) Total internal reflection
- d) Dispersion
- e) None of the above

13. An object is placed in front of a concave mirror, at the center of curvature. What is the magnification of the image?

- a) 1, upright
- b) 1, inverted
- c) 2, upright
- d) 2, inverted
- e) 0.5, upright

14. Which of the following is true about any electromagnetic wave?

- a) Both E and B fields are perpendicular to the direction of travel for the wave.
- b) E and B fields are parallel to each other and to the direction of travel of the wave.
- c) E is parallel to the direction of travel but perpendicular to B.
- d) E oscillates with twice the frequency of B
- e) Can not propagate through empty space.

15. What is the binding energy of the Deuteron (${}^2_1\text{H}$)

- a) 1.2 MeV
- b) 2.2 MeV
- c) 22 MeV
- d) 22 KeV
- e) 2.2 eV

16. The activity of a newly discovered radioactive isotope reduces to 96% of its original value in an interval of 2 hours. What is the half-life?

- a) 10.2 h
- b) 34.0 h
- c) 44.0 h
- d) 56.1 h
- e) 68.6 h

17. A proton and an electron have the same De Broglie wavelength. Which of the following magnitudes is also the same for the two particles?

- a) speed
- b) momentum
- c) energy
- d) frequency
- e) mass

18. The threshold wavelength for emission of electrons from a given surface is 320 nm. What will be the maximum kinetic energy of the ejected electrons if the wavelength is changed to 250 nm?

- a) 0 eV
- b) 4.1 eV
- c) 5.0 eV
- d) 1.1 eV
- e) 3.9 eV

19. The work function of copper is 4.7 eV. How many photons of frequency 1×10^{15} Hz are necessary to eject an electron?

- a) It is impossible, because the photon energy is too low.
- b) 1
- c) 2
- d) 3
- e) 4

20. Which of the following electron transitions in a Hydrogen atom results in the emission of the highest energy photon?

- a) $n = 6$ to $n = 2$
- b) $n = 2$ to $n = 6$
- c) $n = 5$ to $n = 1$
- d) $n = 1$ to $n = 5$
- e) $n = 3$ to $n = 6$