

SAMPLE EXAM 3

1. The intensity at a distance of 4.0 m from a source that is radiating equally in all directions is $9.85 \times 10^{-7} \text{ W/m}^2$. What is the intensity level in dB at a distance of 6 m?

ans 56.4 dB

2. The intensity of a certain sound wave is $2 \times 10^{-7} \text{ W/m}^2$. If its intensity is raised by 30 decibels, what is the new intensity in W/m^2 ?

Ans. $2 \times 10^{-4} \text{ W/m}^2$

3. A factory siren indicating the end of the shift has a frequency of 80 Hz. What frequency is perceived by the occupant of a car traveling away from the factory at 30 m/s? The speed of the sound is 343 m/s.

ans 73 Hz

4. A factory siren indicating the end of the shift has a frequency of 82 Hz. If the occupant of a car traveling away from the factory perceives frequency of 76 Hz, what is the speed of the car? The speed of the sound is 343 m/s.

ans 25.1 m/s

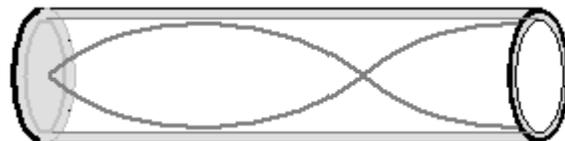
5. A 500-Hz whistle is moved toward a listener at a speed of 10.0 m/s. At the same time, the listener moves at a speed of 20.0 m/s in a direction away from the whistle. What is the apparent frequency heard by the listener? (The speed of sound is 340 m/s.)

ans 485 Hz

6. A violin string 20.0 cm long with mass 4.8 g and tension 48 N, fixed at both ends, oscillates in its $n=2$ mode. What is the wavelength in air of the sound emitted by this vibrating string? (The speed of the sound in air is 343 m/s.)

ans 1.534 m

7. If an organ pipe shown is to resonate at 370 Hz, what is its required length?



ans. 70 cm

8. An organ pipe, open at both ends, is 2.2 m long. If the velocity of sound in air is 343 m/s, the frequency of third harmonic of this pipe is:

ans 234 Hz

9. The attractive electrostatic force between the two point charges 4×10^{-6} C and Q has a magnitude of 1.77 N when the separation between charges is 25 cm. The sign and magnitude of the charge Q is closest to

Ans. -3×10^{-6} C

10. A 2 mg particle carrying a charge of 4nC is placed in an uniform electric field of magnitude of 100 N/C. Find the particle's acceleration.

ans 0.2 m/s²

11. How many electrons are removed from a metal ball if the ball is to carry a positive charge of 3.2 nC?

ans 2×10^{10}

12. Find the magnitude of the electric field in a distance of 2 m from the 6 nC charge.

ans 13.5 N/C

13. Determine the magnitude and direction of the electric field midway between a -8nC and a -6 nC charge 60 cm apart.

ans 200 N/C to the left

14. What is the speed of a proton that has been accelerated from rest through a potential difference of 4.0 kV? ($m_p=1.67 \times 10^{-27}$ kg, $e=1.6 \times 10^{-19}$ C)

Ans. 8.8×10^5 m/s

15. How strong is the electric field between two parallel plates 8 cm apart if the potential difference between them is 50 V

Ans. 625 V/m

16. The wiring in a house must be thick enough so it doesn't become so hot to start a fire. What diameter must a copper wire ($\rho = 1.68 \times 10^{-8}$ Ω m) be if it is to carry a maximum current of 30 A and produce no more than 1.6 W of heat per meter of length?

ans 3.5 mm

17. What is the resistance of a light bulb that uses an average power of 125 W when connected to ac power source with maximum voltage of 250 V?

ans 250 Ω

18. How many electrons are flowing past any point in the wire of resistance of 7.5- Ω during a two-minutes time interval if a 200-V potential difference is applied across its leads?

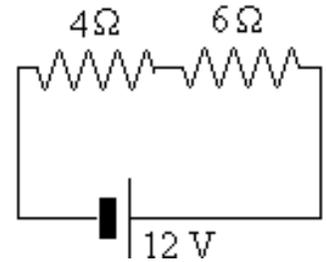
ans. 2×10^{22}

19. An electrical heating coil of resistance of 28 Ω is used to heat up a 3.0 kg of water at 20⁰C. What is the current in the heating coil if the water warms up to 60⁰C in 5 min? (specific heat of water is 4186 J/kg⁰C)

ans 7.7 A

20. The power dissipated in the $6\ \Omega$ resistor is:

Ans. 8.64W



21. A 200-W driveway light bulb is on 10 hours per day. Assuming the power company charges 10 cents for each kilowatt-hour of electricity used, estimate the annual cost to operate the bulb. (1 year = 365 days)

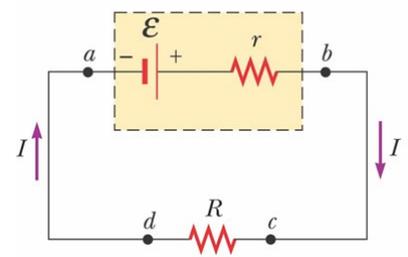
ans \$73.00

22. An ac voltage of $80V \cdot \sin(377\text{rad/s} \cdot t)$ is applied across a resistor of $35\ \Omega$. What is the rms value of the current in this resistor?

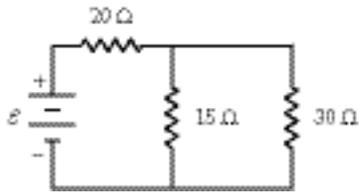
Ans. 1.62 A

23. If the terminal voltage of the 9- V battery connected across 10- Ω resistor R is 8.4 V, what is the internal resistance of the battery?

Ans. 0.70 Ω

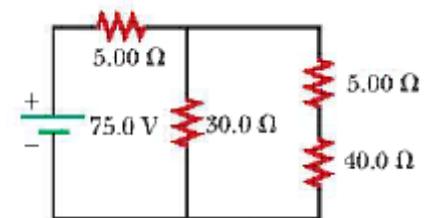


24. If the current in the 15- Ω resistor is 0.2 A, what is emf of the battery V?



Ans 9 V

25. For the circuit shown calculate the current through the 30- Ω resistor.



ans 1.96A

