

PART 1: MULTIPLE CHOICE

1. B $I = V/R$
2. C Current is the same in series
3. C Resistor heats up $\rightarrow$ thermal
4. B $F = qvB \sin \theta$; $\sin 90^\circ = 1$
5. B $R + R$
6. B Parallel currents attract
7. B $P = V^2/R$
8. C straight line $\rightarrow E = vB$, cancel

PART II : PROBLEMS

9. a) $R_{eq} = R_1 + R_2 = 4 + 8 = 12 \Omega$

b) $I = \frac{V}{R_{eq}} = \frac{12V}{12\Omega} = 1A$

c) $V_1 = IR_1 = 1A(4\Omega) = 4V$

$V_2 = IR_2 = 1A(8\Omega) = 8V$

c) $P = I^2 R_2 = (1A)^2 8\Omega = 8W$

10. a) $R_{eq} = \left(\frac{1}{240} + \frac{1}{160}\right)^{-1} = 96\Omega$

b) $I_{240} = \frac{V}{R} = \frac{120V}{240\Omega} = 0.5A$

$I_{160} = \frac{V}{R} = \frac{120V}{160\Omega} = 0.75A$

c) $I = I_{240} + I_{160} = 1.25A$

d) $P_{240} = I_{240} V = (0.5A) 120V = 60W$

$P_{160} = I_{160} V = (0.75A) 120V = 90W$

$\Rightarrow$ The lower resistance device

11. a) $F = qvB \sin \theta$

$$= (1.6 \times 10^{-19} \text{ C}) (3 \times 10^6 \frac{\text{m}}{\text{s}}) (0.2 \text{ T}) \sin 90^\circ$$

$$= 9.6 \times 10^{-14} \text{ N}$$

b) $F = qvB \sin \theta$ $v \rightarrow 2v$; $F \rightarrow 2F$

c) $F = 0$ since $\sin 0^\circ = 0$

d) $F \perp v$, so only direction changes

12. a) $B = \frac{\mu_0 I}{2\pi r} = \frac{(4\pi \times 10^{-7}) 8}{2\pi (0.03)} = 5.33 \times 10^{-5} \text{ T}$

b) $B = \frac{\mu_0 I}{2\pi r} = \frac{(4\pi \times 10^{-7}) 8}{2\pi (0.06)} = 2.67 \times 10^{-5} \text{ T}$

c) $r \rightarrow 2r \Rightarrow B \rightarrow B/2$

d) like currents attract

$$13. a) R_{11} = \left(\frac{1}{3} + \frac{1}{6}\right)^{-1} = 2 \Omega$$

$$b) R_{eq} = 6 \Omega + 2 \Omega = 8 \Omega$$

$$c) I = \frac{V}{R_{eq}} = \frac{12V}{8 \Omega} = 1.5 A$$

$$d) V_{11} = I R_{11} = 1.5 A (2 \Omega) = 3 V, \text{ so}$$

$$I_{3\Omega} = \frac{V_{11}}{R} = \frac{3V}{3 \Omega} = 1 A$$

$$14. a) F = qvB \sin \theta = (1.6 \times 10^{-19} C) \left(2 \times 10^6 \frac{m}{s}\right) (0.5 T) \sin 90^\circ$$

$$F = 1.6 \times 10^{-13} N$$

b) F is $\perp$ to $v \Rightarrow$ centripetal acceleration

$$c) r = \frac{mv}{qB} = \frac{(1.67 \times 10^{-27})(2.0 \times 10^6)}{(1.6 \times 10^{-19})(0.5)}$$

$$r = 4.17 \times 10^{-2} m$$

d) r is proportional to v , so if v increases so does r .