1. (d).
2. (d).
3. (d).
4. (b), because the change in magnetic flux is greater in A.
5. (d).

7. The direction is $\boxed{\text{counterclockwise (in head-on view)}}$.

9. $\boxed{\text{No}}$, it does not depend on the magnetic flux. $\boxed{\text{It depends on the rate of the flux change with time}}$.

10. The one $\boxed{\text{from the plastic tube}}$ will emerge first. When the one falls into the copper tube, a current will be induced by the changing magnetic flux in the copper tube. This current will generate a magnetic field opposite to the one of the magnet. The two fields will generate an attractive force and slow down the falling of the magnet. There is no such current in the plastic tube, because it is an insulator.

$\boxed{12}$. $\Phi = BA\cos\theta$, where θ is the angle between the field and the normal to the loop.

(a) $\Phi = BA\cos 90° = \boxed{0}$.

(b) $\Phi = (0.30\text{ T})(0.015\text{ m}^2)\cos(90° - 37°) = \boxed{2.7\times10^{-3}\text{ T·m}^2}$.

(c) $\Phi = (0.30\text{ T})(0.015\text{ m}^2)\cos 0° = \boxed{4.5\times10^{-3}\text{ T·m}^2}$.

16. (a) $\Phi = NBA\cos\theta$, ☞ $A = \dfrac{\Phi}{NB\cos\theta} = \dfrac{0.50\text{ T·m}^2}{(10)(0.25\text{ T})\cos 0°} = \boxed{0.20\text{ m}^2}$.

(b) $\theta = 90° - 60° = 30°$. $A = \dfrac{0.50\text{ T·m}^2}{(10)(0.25\text{ T})\cos 30°} = \boxed{0.23\text{ m}^2}$.

17. $\Phi = BA\cos\theta = (\mu_0 n I)A\cos 0° = (4\pi\times10^{-7}\text{ T·m/A})(250\text{ /m})(1.5\text{ A})(\pi)(0.030\text{ m})^2 = \boxed{1.3\times10^{-6}\text{ T·m}^2}$.

28. (a) The negative flux means that the final magnetic field $\boxed{\text{direction is opposite to that of the initial field}}$.

(b) $\mathcal{E} = -N\dfrac{\Delta\Phi}{\Delta t} = -(1)\times\dfrac{-20\text{ Wb} - 40\text{ Wb}}{1.5\times10^{-3}\text{ s}} = \boxed{4.0\times10^4\text{ V}}$.

(c) New time will be half as long so $\boxed{0.75\text{ ms}}$.

(d) The originally change in flux is –60 Wb, and this has to be doubled to –120 Wb, so the final flux should be $\boxed{-80\text{ Wb}}$.

29. When the area is parallel to the field, the flux is zero, because $\theta = 90°$ ($\Phi = BA\cos\theta$).

So $\mathcal{E} = -N\dfrac{\Delta\Phi}{\Delta t} = -(10)\times\dfrac{(1.8\text{ T})(0.055\text{ m}^2)\cos 0° - 0}{0.25\text{ s}} = -\boxed{4.0\text{ V}}$.

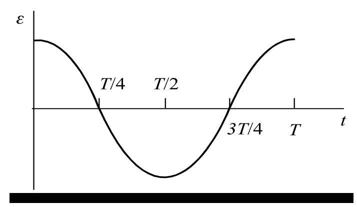
32. (c). The maximum induced emf is directly proportional to the area of the loop.
33. (c).
34. (a) When the value of emf is maximum, the plane of the loop is parallel to the field. At this position the magnetic flux is minimum; thus, when it rotates to a slightly different position, the change in flux will be the greatest (any change from zero is a big change).

(b) When the magnetic flux is a maximum, the plane of the loop is perpendicular to the field. At this position the flux is maximum; thus, when it rotates to a slightly different position, the change in flux will be small.

35. The magnet moving through the coil produces a current. As the magnet moves up and down in the coil it will induce a current in the coil that will light the bulb. However, the magnet produces the current (Faraday's law of induction) at the expense of its kinetic energy and potential energy. The magnet's motion will therefore damp out.

38. (a) After half a period the voltage will be maximum (magnitude, the voltage is actually negative) again.

$$t = \frac{T}{2} = \frac{1}{2f} = \frac{1}{2(60\text{ Hz})} = \boxed{1/120\text{ s}}.$$



(b) After one-quarter of a period the voltage will be zero.

$$t = \frac{T}{4} = \frac{1}{4(60\text{ Hz})} = \boxed{1/240\text{ s}}.$$

(c) After one period, the value returns. $t = \frac{1}{60\text{ Hz}} = \boxed{1/60\text{ s}}$.

39. (a) $\mathcal{E}_o = NBA\omega = (1)(0.015\text{ T})(0.10\text{ m})^2(2\pi)(60\text{ Hz}) = \boxed{0.057\text{ V}}$.

(b) $\mathcal{E}_o \propto N$, so $\mathcal{E}_o = \boxed{0.57\text{ V}}$.

44. $\mathcal{E}_o = NBA\omega = 2\pi NBAf = 2\pi(20)(0.800\text{ T})(\pi)(0.10\text{ m})^2(60\text{ Hz}) = \boxed{1.9 \times 10^2\text{ V}}$.

This maximum value (positive or negative) is attained every half of a period.

$$t = \frac{T}{2} = \frac{1}{2f} = \frac{1}{2(60\text{ Hz})} = \boxed{\text{every } 1/120\text{ s}}.$$

45. $\mathcal{E}_o = NBA\omega = 2\pi NBAf$, ☞ $f = \frac{\mathcal{E}_o}{2\pi NBA} = \frac{24\text{ V}}{2\pi(100)(0.250\text{ T})(0.080\text{ m})(0.12\text{ m})} = \boxed{16\text{ Hz}}$.

50. (a).
51. (b).
52. It is transmitted at [high voltage and thus low current in order to reduce joule heat]. Since power, $P = IV$, a higher voltage will result in a lower current, and joule heat is equal to I^2R, where R is the resistance of the transmission lines.

53. [Yes], a step-up transformer can be used as a step-down transformer. You just need to [reverse the roles of the primary and secondary coils], so there are more turns on the high voltage side.

58. (a) $\frac{I_p}{I_s} = \frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{10\text{ A}}{4.0\text{ A}} = 2.5.$ So $N_s = 2.5\,(120\text{ V}) = \boxed{3.0 \times 10^2\text{ V}}$.

(b) $N_p = \frac{4.0\text{ A}}{10\text{ A}} N_s = \frac{800}{2.5} = \boxed{3.2 \times 10^2\text{ turns}}$.

70. (b).
71. (d).
72. (e).

73. (d). When frequency is doubled, the wavelength is halved.

74. $\boxed{\text{No, dc current cannot generate varying magnetic fields}}$. It takes an alternating current to emit electromagnetic waves, and the current from a battery is dc.

79. $c = \lambda f,$ ☞ $\lambda_1 = \dfrac{c}{f_1} = \dfrac{3.00 \times 10^8 \text{ m/s}}{920 \times 10^3 \text{ Hz}} = \boxed{326 \text{ m}}$. $\lambda_2 = \dfrac{3.00 \times 10^8 \text{ m/s}}{1280 \times 10^3 \text{ Hz}} = \boxed{234 \text{ m}}$

85. (a) The direction of the induced current is $\boxed{\text{(1) up}}$, according to Lenz's law.

(b) $I = \dfrac{\varepsilon}{R} = \dfrac{BLv}{R} = \dfrac{(0.250 \text{ T})(0.50 \text{ m})(2.0 \text{ m/s})}{10\ \Omega} = 2.5 \times 10^{-2} = \boxed{25 \text{ mA}}$.

87. (a) $\boxed{\text{No}}$, because the $\boxed{\text{input power is greater than output power}}$.

$P_{\text{input}} = IV = (11.0 \text{ A})(120 \text{ V}) = 1320 \text{ W} > 1200 \text{ W}$.

(b) The efficiency is $\dfrac{P_{\text{output}}}{P_{\text{inout}}} = \dfrac{1200 \text{ W}}{1320 \text{ W}} = \boxed{90.9\%}$.