Honors Phys Review WS 4 KEY

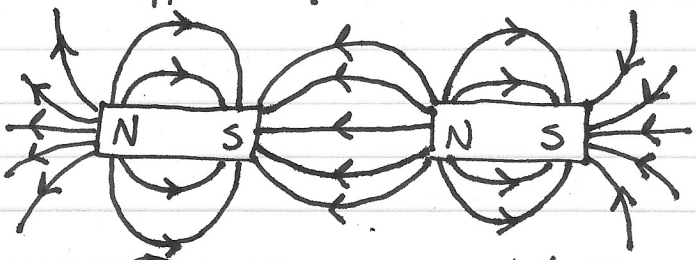
1. moving charge

2. a discrete region of magnetism in ferromagnetic material

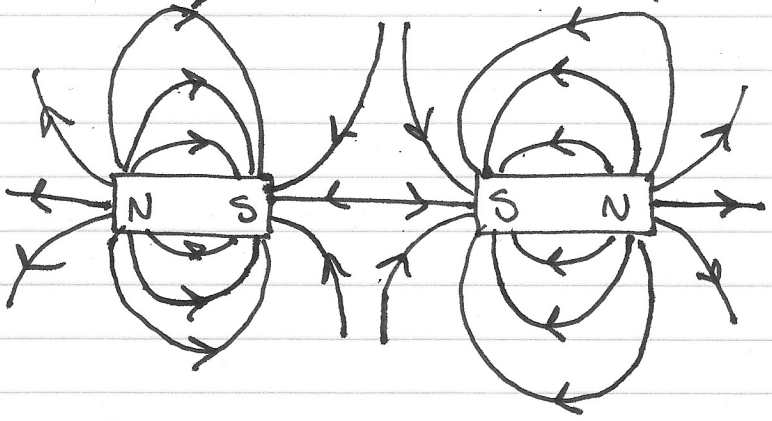
3. in magnets, the domains are aligned
   in non-magnets, the domains are oriented randomly

4. Earth's magnetic field is produced by the flow of molten iron in the outer core. The field is gradually getting weaker, and, eventually, the poles will switch.

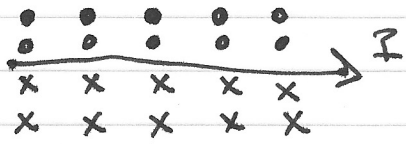
5. a)



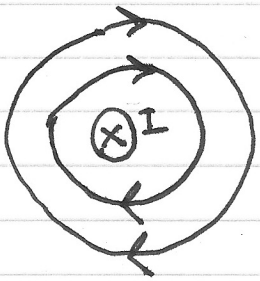
b)



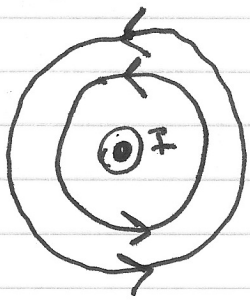
c)



d)



e)



6. $V = -N\frac{\Delta\Phi}{\Delta t}$

7. the production of an electric current in a conductor by vary the magnetic field applied to the conductor

8. Down. Out of the page

9. the total magnetic field passing through a given area

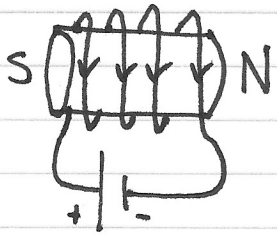
10. a magnet produced by a current-carry coil of wire adding a ferromagnetic core, increasing the number of loops in the coil, increasing the potential difference across the coil, decrease the resistance of the coil

11. induced voltage will increase

12. $B = \frac{\mu_0 I}{2\pi r}$

$= \frac{4\pi \times 10^{-7} \frac{Tm}{A} \cdot 2A}{2\pi \cdot 0.1m}$

$= \boxed{4.0 \times 10^{-6} T}$

13. 

(use right-hand rule)

14. a) $E = \Delta V / d$

$= 10{,}000 V / 0.04m$

$= \boxed{250{,}000 V/m}$

b) $F_e = Eq$

$= 250{,}000 V/m \cdot 1.6 \times 10^{-19} C$

$= \boxed{4.0 \times 10^{-14} N \text{ up}}$

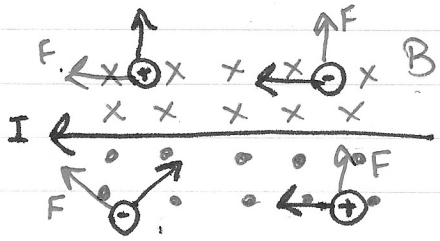
c) $F_B = qvB$

$B = F_B / qv$

$= 4.0 \times 10^{-14} N / (1.6 \times 10^{-19} C \cdot 4.5 \times 10^{6} \frac{m}{s})$

$= \boxed{55.6 \text{ mT into the page}}$

15. Voltage (& current)
an oscillating magnetic field produced by a primary coil will induce a voltage in the secondary coil. The induced voltage will be proportional to the ratio of loops between the primary & secondary coils

16. 

17. Direct Current is a current that flows in one direction
Alternating Current is a current that oscillates in magnitude & direction.
It's easier to produce a large AC current with a generator than a large DC current with a battery. Also, given the large distances between the power plant & consumer, AC will lose much less energy in the trip than DC. Finally, AC voltage can be transform but DC voltage cannot.

18. American: 120V
European: 230V
Chinese: 220V

The higher Chinese voltage supplied a power greater than the tolerance of the razor's internal resistors causing them to burn out

19. $F_B = IlB$
$I = F_B / lB$
$= 0.9N / (6.3m \cdot 0.088T)$
$= \boxed{1.6A}$

20. a) $F_e = \frac{k q_1 q_2}{r^2}$

$= \frac{9\times10^9 \, (1.6\times10^{-19} C)^2}{(5.3\times10^{-11} m)^2}$

$= \boxed{8.2\times10^{-8} N}$

b) $F_e = F_c$

$= \frac{mv^2}{r}$

$= \frac{m}{r}\left(\frac{2\pi r}{T}\right)^2$

$\rightarrow T = \sqrt{\frac{4\pi^2 m r}{F_e}}$

$= \sqrt{\frac{4\pi^2 \cdot 9.11\times10^{-31} kg \cdot 5.3\times10^{-11} m}{8.2\times10^{-8} N}}$

$= \boxed{1.5\times10^{-16} s}$

c) $I = \frac{q}{t}$

$= \frac{1.6\times10^{-19} C}{1.5\times10^{-16} s}$

$= \boxed{1.1 \, mA}$

d) $B = \frac{\mu_0 I}{2r}$

$= \frac{4\pi\times10^{-7} \frac{Tm}{A} \cdot 1.1\times10^{-3} A}{2 \cdot 5.3\times10^{-11} m}$

$= \boxed{13 \, T}$

21. a) $\Delta\Phi = \Delta B A$

$= \Delta B \pi r^2$

$= (9.66\,T - 1.92\,T)\,\pi\,(0.065\,m)^2$

$= \boxed{0.10\ Wb}$

b) $V = N\frac{\Delta\Phi}{\Delta t}$

$= 23 \cdot \frac{0.1\ Wb}{4\,s}$

$= \boxed{0.58\ V}$

c) $V = IR$

$I = V/R$

$= 0.58\,V / 10\,\Omega$

$= \boxed{58\ mA}$

22. a) $F_B = qvB$

$= 1.6\times10^{-19} \cdot 9.8\times10^{7}\,\frac{m}{s} \cdot 4.6\,T$

$= \boxed{7.2\times10^{-11}\ N\ up}$

b) $F_B = F_C$

$= mv^2/r$

$\rightarrow r = \frac{mv^2}{F_B}$

$= \frac{1.67\times10^{-27}\,kg\,(9.8\times10^{7}\,\frac{m}{s})^2}{7.2\times10^{-11}\,N}$

$= \boxed{22\ cm;\ ccw}$

c) $|F_{B,e^-}| = |F_{B,p^+}|$

$r = \frac{m_{e^-} v^2}{F_B}$

$= \frac{9.11\times10^{-31}\,kg\,(9.8\times10^{7}\,\frac{m}{s})^2}{7.2\times10^{-11}\,N}$

$= \boxed{1.2\times10^{-4}\ m;\ CW}$