

159

179

183

24


106

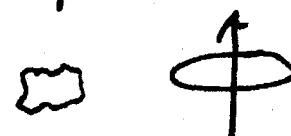
# Magnetic Flux

$$\Phi = \int \vec{B} \cdot d\vec{A} \quad (\text{Webers})$$

Very important quantity in E+M. Proportional to total number of field lines passing through a surface.

1) Current loop always acts to maximize the flux through the surface defined by current loop

a)  Align B with A

b)  maximize A

2) Current loop always acts to oppose changes in flux by generating an induced emf

a) changing A

b) varying  $\vec{B}$



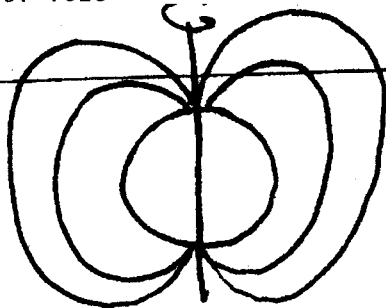
$$\mathcal{E} = vBl$$

$$\mathcal{E} = - \frac{d\Phi}{dt}$$

FARADAY'S LAW

3) In most cases flux is conserved

Sun



$$B \approx 1 \text{ Gauss} \\ = 10^{-4} \text{ T} = 10^{-4} \text{ Wb/m}^2$$

$$\langle \Phi \rangle = B A \\ = B \cdot 4\pi r^2$$

$$\langle \Phi \rangle = 10^{-4} \text{ Wb/m}^2 \cdot 4 \cdot \pi \cdot (7 \times 10^8 \text{ m})^2 \\ = 6 \times 10^{14} \text{ Wb}$$

Some stars shed small outer parts of envelope during final phases of their lives, rest collapses under gravity to form compact ball a few km in size.  $\langle \Phi \rangle$  stays the same

$$B = \frac{\Phi}{A} = \frac{6 \times 10^{14} \text{ Wb}}{4 \cdot \pi \cdot (10^4 \text{ m})^2} \\ = 5 \times 10^5 \text{ Wb m}^{-2} = \underline{5 \times 10^9 \text{ Gauss}}$$

"neutron star" New believe peculiar pulsating radio sources known as "pulsars" are rapidly rotating neutron stars



w/ B field not aligned w/ rot'n axis. Particles ( $e^-$ ,  $p^+$ ) constrained to move along mag. field lines are accelerated to v high velocity, radiate