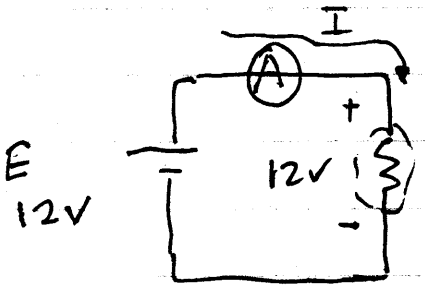
2012/2/8



Resistive Load

Light Bulb

12V 55W

$P = E \cdot I$ Watt.

$P = E \cdot I$

$55W = 12V \cdot I$

$I = \frac{55}{12} = 4.6$ Amp

Energy Conversion

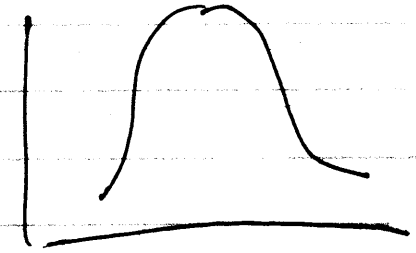
Loss

$55W = P_{Light} + P_{Heat}$

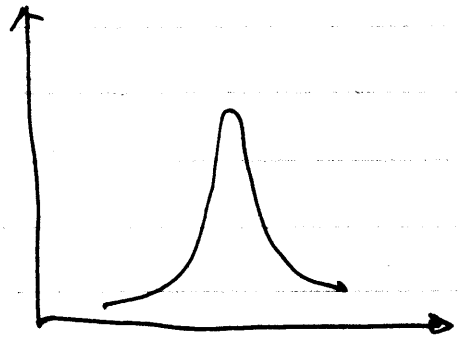
$\eta = \frac{P_{out}}{P_{in}} * 100\%$

η = efficiency

LED Lighting.



Spectrum



nm

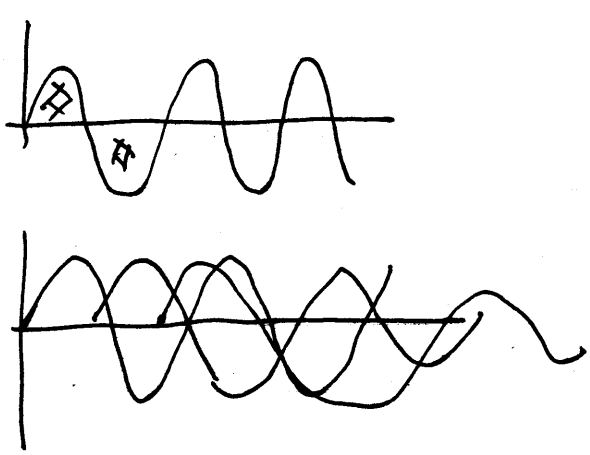
nanometer

10^{-9} m

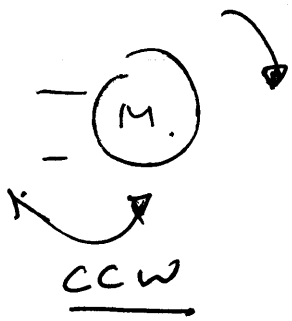
Electric Motor

AC single phase 1 ϕ 120V/240V

three phase 3 ϕ



clock wise



Motor

1 ϕ 120V ____ HP Fractional HP.

¼, ½

1 Horse power

1HP = 746 watt. ≈ 8 x 100 watt Light bulb.

800 watt Microwave oven

Cost $

~~1 Hor~~ 1 hp, running for ∞ hours

746 w x hr

= 0.746 Kw.hr

= 0.746 KWH ~~Meter~~

$0.60¢ 424 x 24hr.

$12 day x 30 day = $360

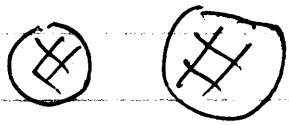
Motor → Heating, Cooling

Optimize the utilization

AEP → Motor, HVAC

~~I&M~~

Weight



400Hz 60Hz

Air Craft
480V 3φ (400 Hz)
G1 G2

KV 18.5 KV 4160V

354 KV -{{- 34.5V -}{- }{ 480

3φ Transformer

I_{small} → wire size

-}}- 240/120

2200 Amp / 230 V.

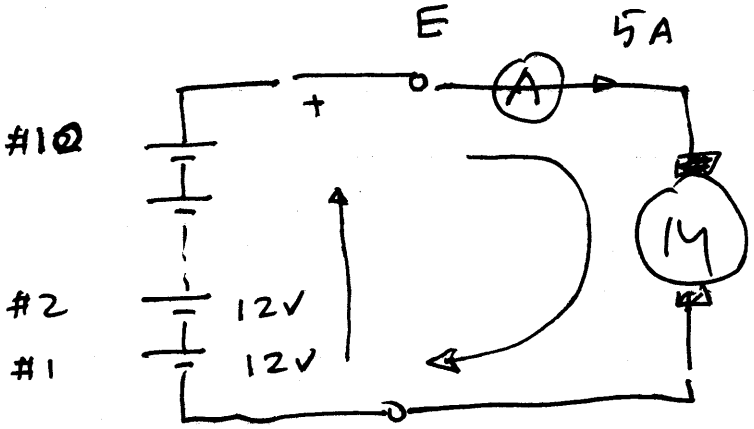
$P = V \cdot I$

$ 7 million

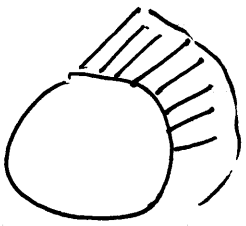
* Demand meter
overload, time limit

Golf Car

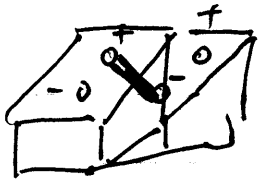
Ex. 4.6

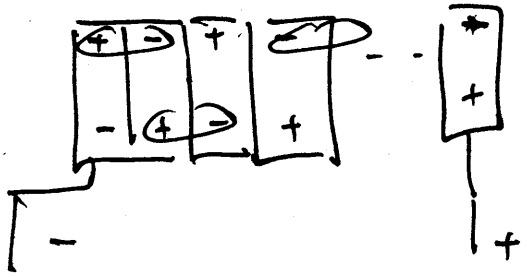


12V/Battery × 10 Battery = 120V



Spring copper





$P = V \cdot I = 120 \times 5$

$= 600\ W$

$\approx HP \quad \frac{HP}{0.8\,HP} \quad \frac{600}{746} = 0.8$

$P = I^2 \cdot R$

$I = \sqrt{\frac{P}{R}}$

$\sqrt{1} = 1$ AC

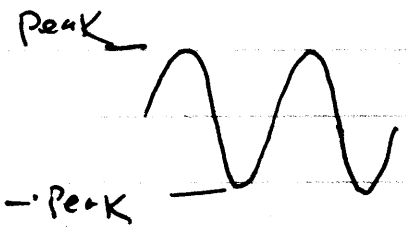
✓ $\sqrt{2} = 1.414$ ⇐ 1ϕ circuit

✓ $\sqrt{3} = 1.732$ ⇐ 3ϕ circuit

$\sqrt{4} = 2$

Light Bulb

120V 100 W



RMS

Root-Mean-Square

$\sqrt{2} \cdot I_{Rms} = I_{Peak}$

$\sqrt{2} \cdot V_{Rms} = V_{Peak}$

$\sqrt{100} = 10$

Sqrt (9)

$\sqrt{9} = 3$.