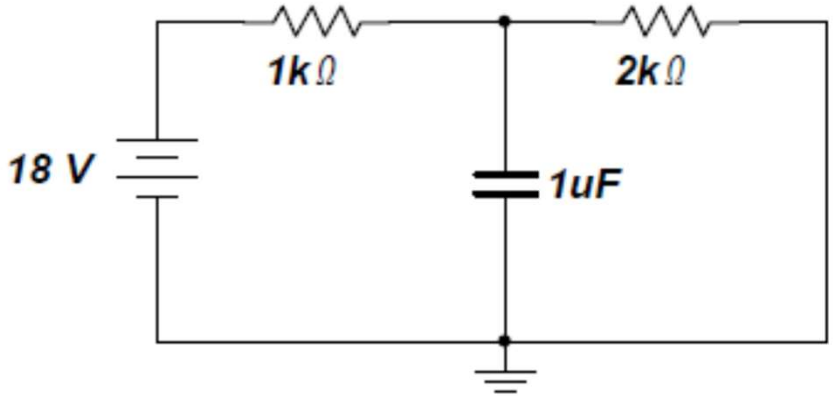
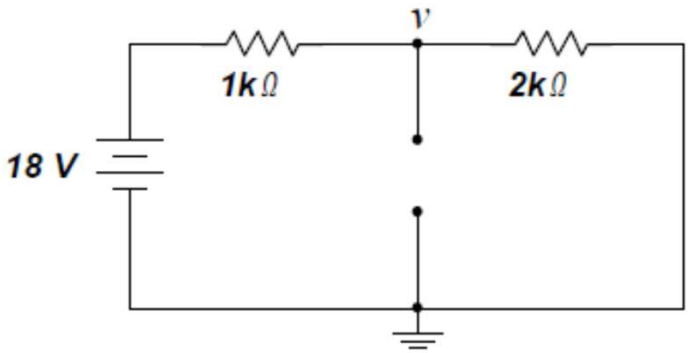
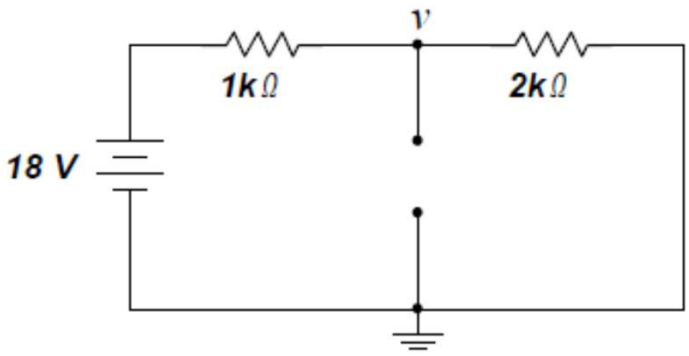
Lecture-3

Q. 1.

Calculate the energy stored in the capacitor of the circuit to the right under DC conditions.





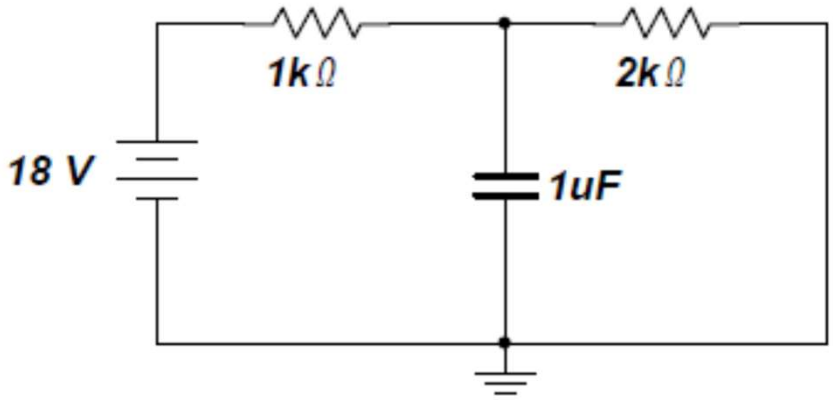


And from the voltage divider formed by the 1kΩ and the 2kΩ resistors the voltage v is 12Volts. Therefore the energy stored in the capacitor is

$$Ec = \frac{1}{2}Cv^2 = \frac{1}{2}1\times10^{-6}\times12^2 = 72\,\mu\text{Joules}$$

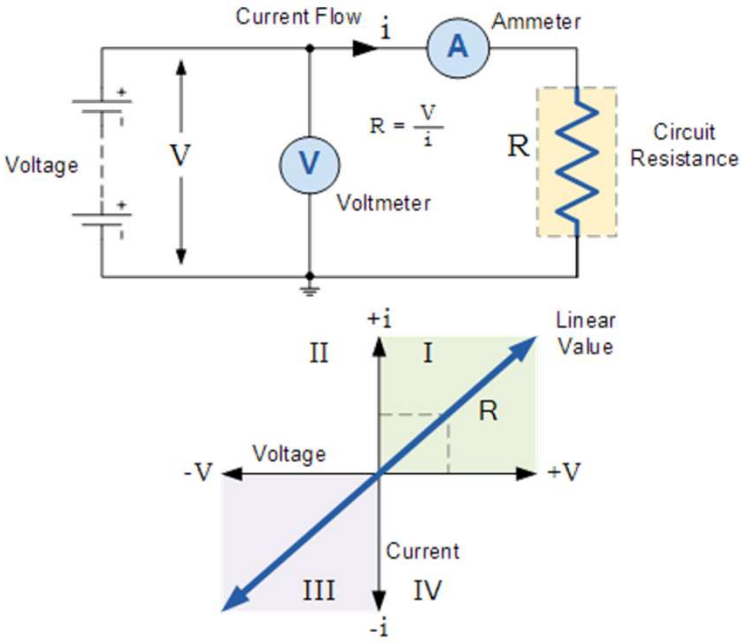
H.W.

If the capacitor is replaced by an inductor (1mH) then how much energy is stored by it.



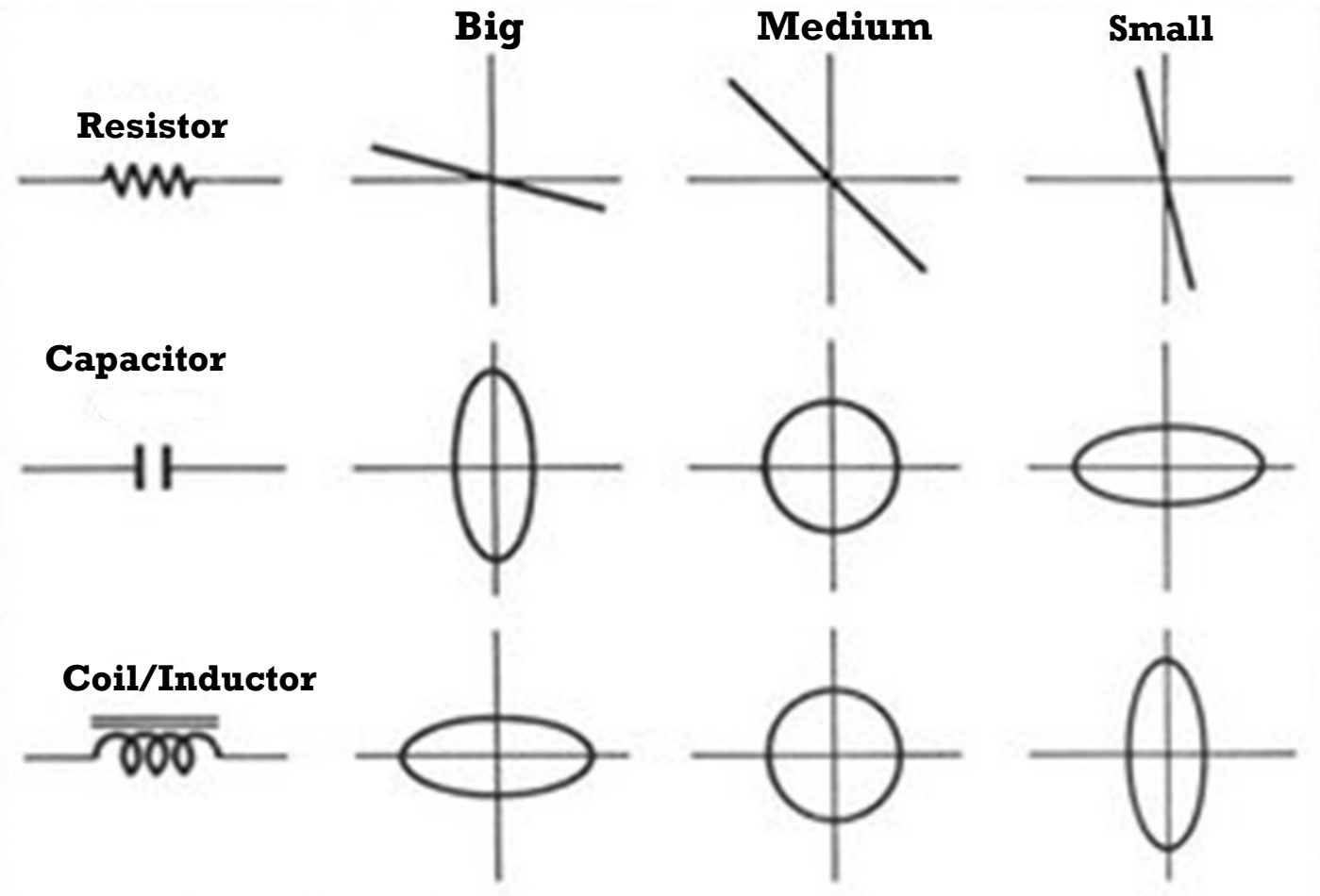
Steady State I-V Characteristics of R

With DC Sources



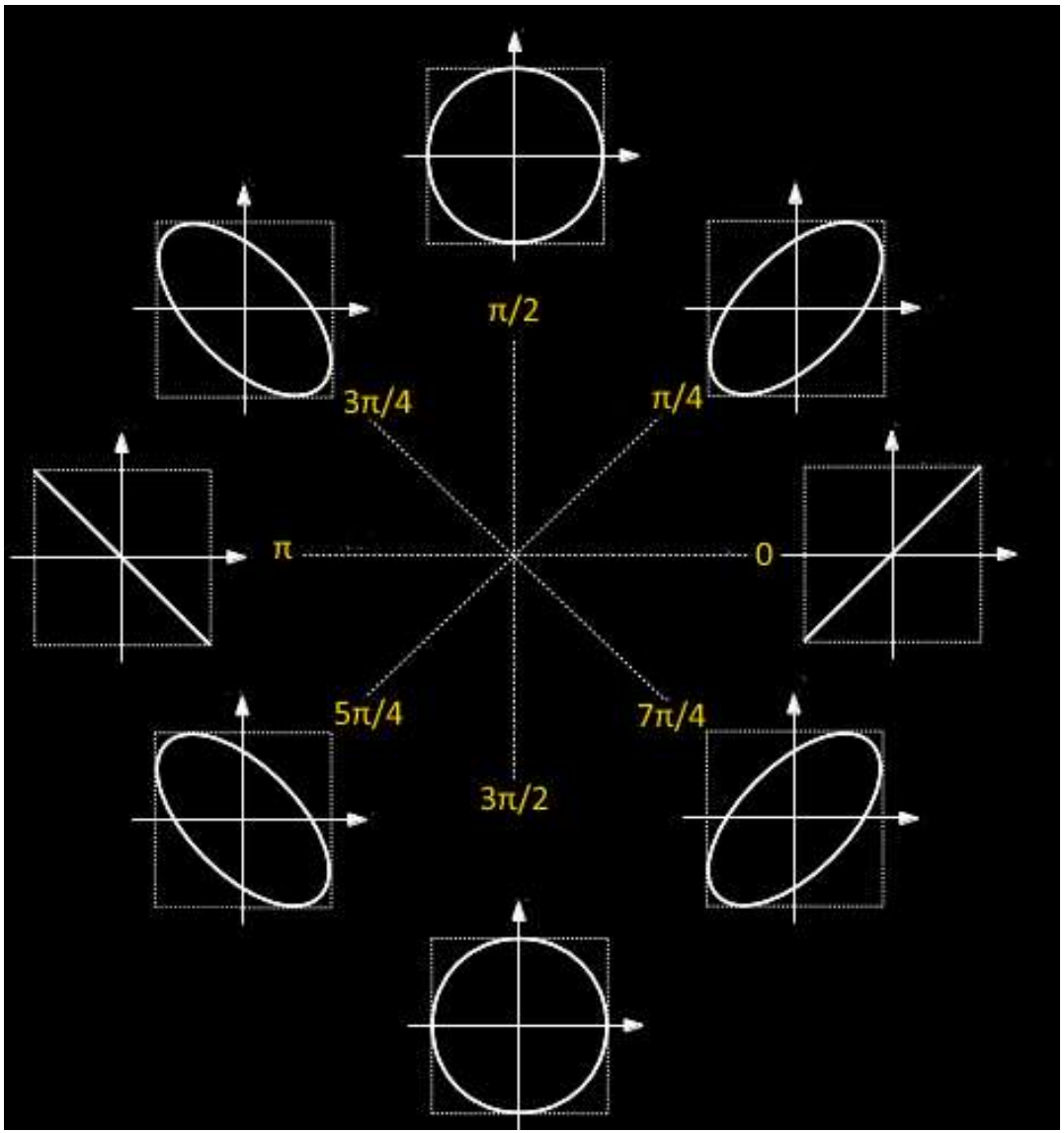
Steady State I-V Characteristics of R, C and L

With AC Source

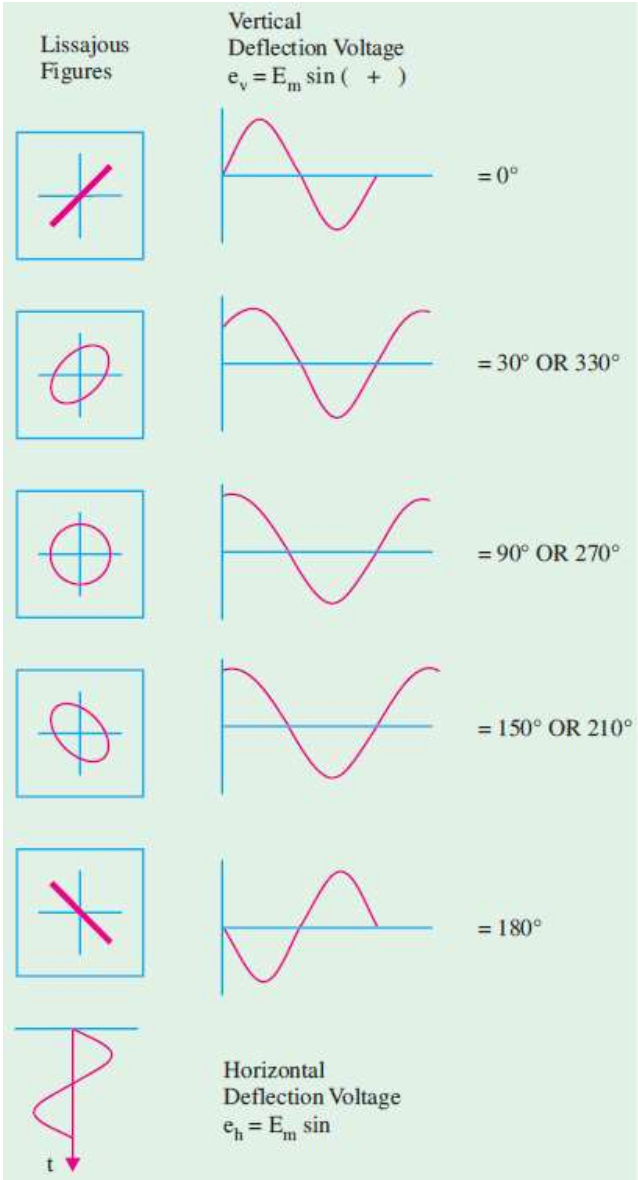


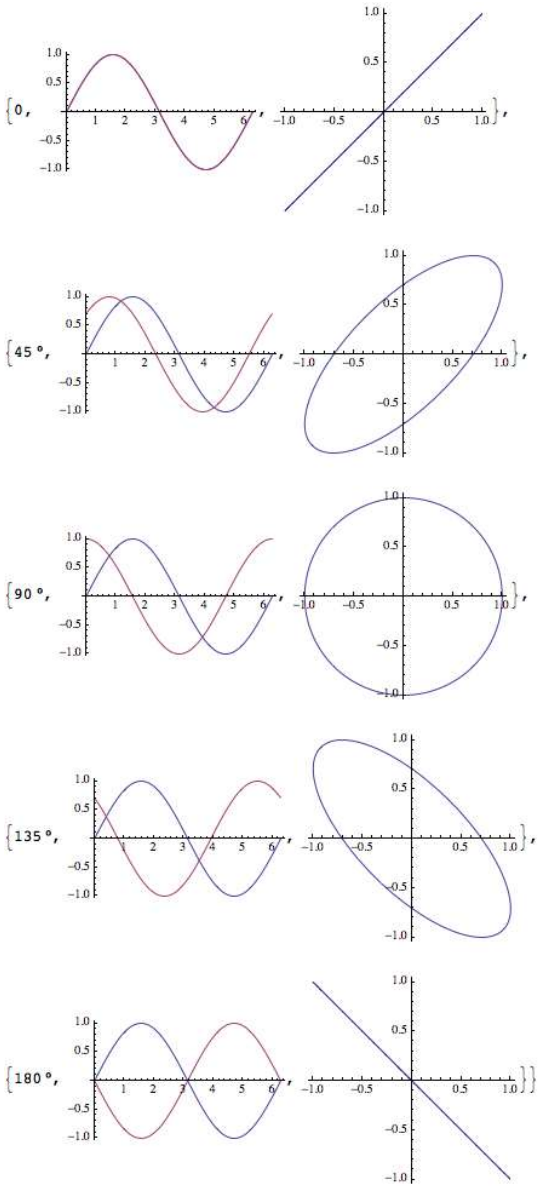
Basic Lissajous Curves

Lissajous figures are created by the combination of two sine waves



https://datagenetics.com/blog/april22015/index.html


Lissajous Figures
Vertical Deflection Voltage
$e_v = E_m \sin(\ +\ )$
= 0°
= 30° OR 330°
= 90° OR 270°
= 150° OR 210°
= 180°
t
Horizontal Deflection Voltage
$e_h = E_m \sin$


{0,
{45°,
{90°,
{135°,
{180°,

Materials

Classification:- In terms of Electrical Conductivity

- Conductor
- Insulator
- Semiconductor

Si-crystal (semiconductor)
Intrinsic (pure):
Extrinsic (doped):

- p-type (trivalent doping ions e.g. B) and
- n-Type (pentavalent doping ions e.g. P)

Electron concentration gradient

- $n = n_{n0}$ (*n*-side) > $n = np_0$ (*p*-side)

⇨Electrons *diffuse* towards the left and enter the *p*-region and recombine with the holes (majority carriers)

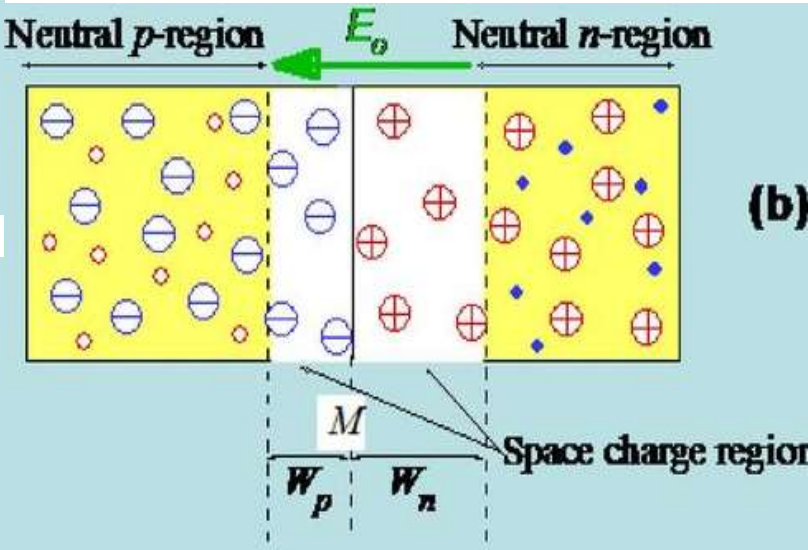
⇨The *p*-side near the junction becomes depleted of majority carriers and has exposed negative acceptors of concentration N_a.

Hole concentration gradient

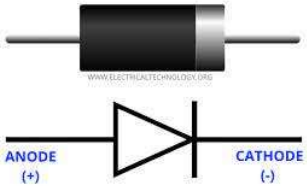
- $p = p_{p0}$ (*p*-side) > $p = p_{n0}$ (*n*-side)

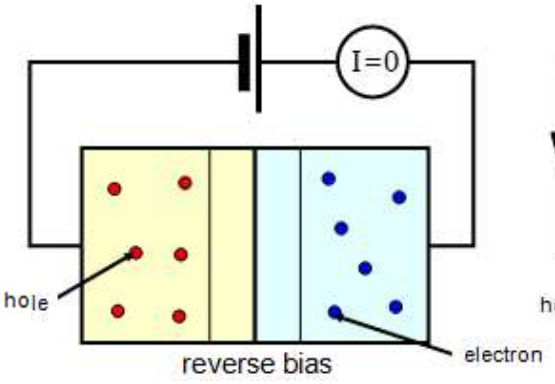
⇨Holes *diffuse* towards the right and enter the *n*-region and recombine with the electrons (majority carriers) in this region.

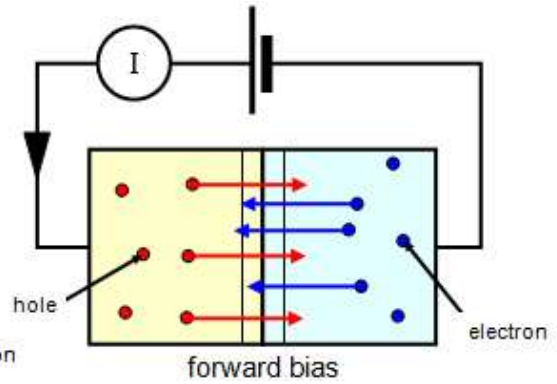
⇨The *n*-side near the junction becomes depleted of majority carriers and has exposed positive donors of concentration N_d.

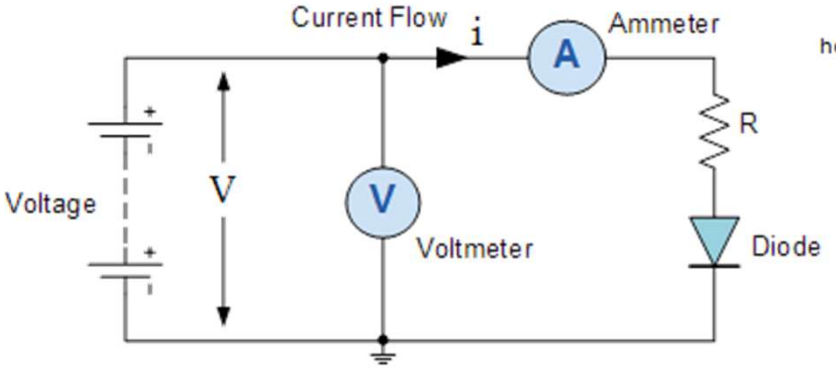


P-N Junction Diode









E.g.

- Zener Voltage (V_Z): 3.3V
- Power dissipation (P_Z): 500mW
- Zener current (I_{ZT}): 76mA