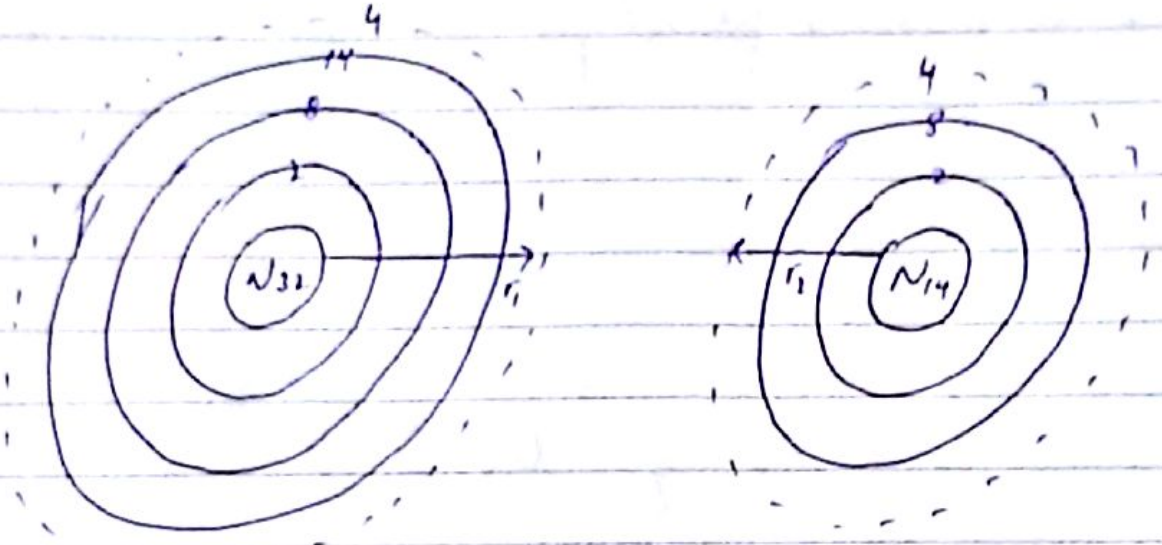
Date 25/11/14

(Lecture 4) Semi Conductors

- Elements of group - 4 in periodic table are generally Semi-Conductors

i.e Germanium Ge^{32}, Silicon Si^{14}

Core Attraction:



(Structure of Germanium) (Structure of Silicon)

$r_1 > r_2$

Core Attraction in Germanium is

$$f_{Ge} = \frac{k(-4e)(+4e)}{r_1^2} = \frac{-16Ke^2}{r_1^2}$$

Core Attraction in Silicon:

$$F_{Si} = \frac{K(-4e)(14e)}{r_2^2} = \frac{-16Ke^2}{r_2^2}$$

As $r_1 >> r_2$

$$\frac{F_{Ge}}{F_{Si}} = \frac{-16Ke^2/r_1^2}{-16Ke^2/r_2^2} = \frac{r_2^2}{r_1^2} = 4/5 < 1$$

$$\frac{F_{Ge}}{F_{Si}} < 1 \quad \text{So,} \quad \boxed{F_{Ge} < F_{Si}}$$

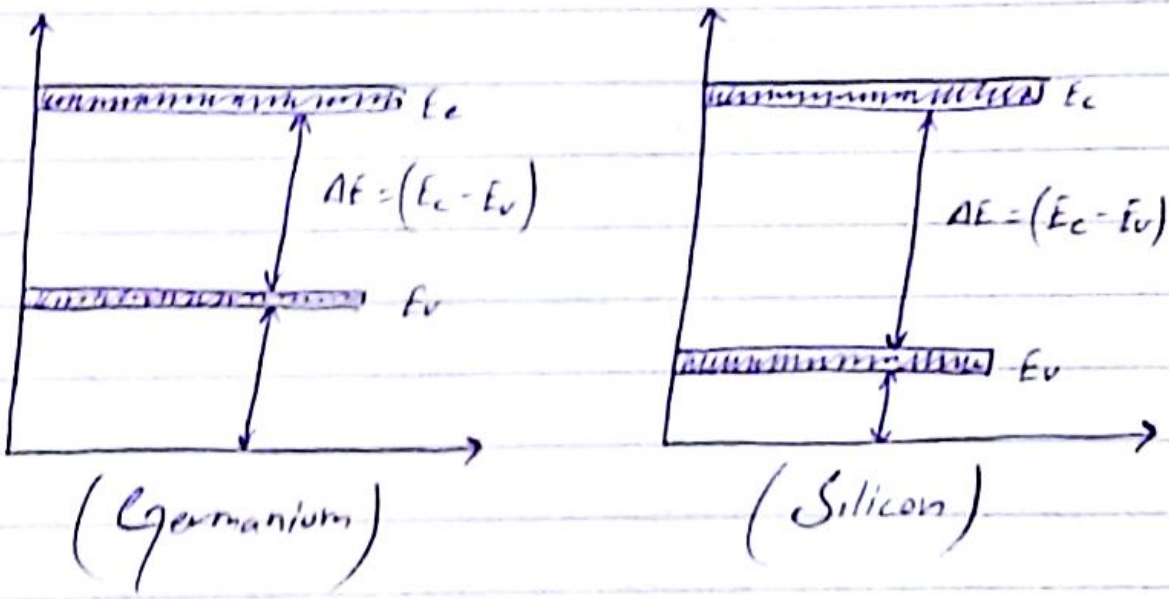
Important Question:
Why silicon is prefered over Germanium?

Answer:
The statement $F_{Ge} < F_{Si}$ shows that Germanium is less stable to heat than Silicon, so Silicon is more stable and preferable to Germanium.

Question:-

Compare Germanium and Silicon on the basis of Energy Level Diagram?

Answer:-



(Germanium) (Silicon)

Structure of Semi-Conductors

- It has Crystalline Structure
- It has Covalent-bond Structure.

Semi-Conductors in pure form are Insulators (0°K) and called Intrinsic Semi-Conductors.