

# Thermal Physics

## Fermions and Bosons

**Problem 1.-** The quantum statistical behavior of particles depends on being fermions or bosons. Indicate the kind of each of the particles below

- (A) Neutral sodium  ${}_{11}^{23}\text{Na}$     B \_\_\_ F \_\_\_  
(B) Neutral lithium  ${}_{3}^{6}\text{Li}$     B \_\_\_ F \_\_\_  
(C) Neutral lithium  ${}_{3}^{7}\text{Li}$     B \_\_\_ F \_\_\_  
(D) Photon    B \_\_\_ F \_\_\_  
(E) Deuteron  ${}_{1}^{2}\text{H}^{+}$     B \_\_\_ F \_\_\_

**Solution:**

- (A) Neutral sodium  ${}_{11}^{23}\text{Na}$      B \_\_\_ F \_\_\_  
(B) Neutral lithium  ${}_{3}^{6}\text{Li}$     B \_\_\_  F \_\_\_  
(C) Neutral lithium  ${}_{3}^{7}\text{Li}$      B \_\_\_ F \_\_\_  
(D) Photon     B \_\_\_ F \_\_\_  
(E) Deuteron  ${}_{1}^{2}\text{H}^{+}$      B \_\_\_ F \_\_\_

**Problem 2.-** What is the approximate (order of magnitude) Fermi temperature of electrons in a sample of sodium at room temperature  $T=300\text{K}$ ?

- (A) 300 K    (B) 3,000 K    (C) 30,000 K    (D) 300,000 K    (E) 0K

**Solution: C**