

**MSE 426**  
**Heat Treatment of Materials**  
**(2024-2025 FALL)**  
Assignment 3

1- Choose the correct statement about pure iron

It is a soft and ductile material  
 Its crystal structure at room temperature is BCC and the crystal structure changes with temperature  
 Small additions of C, Mn, Mo, Cr, etc. enhance the mechanical properties  
 Melting point is 1535°C  
 all of them

2- Choose the odd one out of the followings

Heat treatment of steels includes austenitization followed by cooling at different cooling rates  
 To predict the microstructure, phase diagrams are used if the steel is cooled in equilibrium conditions (slowly)  
 To predict the microstructure, TTT are used if the steel is cooled in non-equilibrium conditions (relatively faster)  
 By heat treatment, type and amount of phases don't change  
  $\alpha$  (ferrite),  $Fe_3C$ (cementite),  $\gamma$ (austenite), martensite, bainite phases are some of the phases that can be formed as a result of heat treatment in steels

3- Which one of the followings is not true about equilibrium phase diagrams

For one component system like water, it tells us the stable phases at different temperatures and pressures  
 For two component system like iron-carbon, it tells us the stable phase at different temperatures and composition at constant pressure.  
 Type and relative amounts of phases formed under equilibrium conditions can be calculated using phase diagrams  
 Type of phases can be predicted after fast cooling from high temperatures  
 Melting point of substances or elements can be predicted from phase diagram

4- Choose the odd one out

Low carbon steels contain less than 0.3 wt.% carbon  
 High carbon steels are the hardest, but least ductile group of steel and can be used in tool and die steels  
 High carbon steels contain about 2.2 wt.% carbon  
 Carbon content of the medium carbon steel changes between 0.3 and 0.6 wt.% C.  
 For automobile body components, low carbon steel is preferred

5- Carbon can dissolve in pure iron crystal structure and can form solid solution of  $\alpha$  (ferrite) phase at room temperature ..... **T F**

6- Maximum solubility of carbon in ferrite occurs at .....  $^{\circ}C$  and its amount is ..... wt.% C, while in austenite maximum solubility of carbon is ..... wt.% and occurs at .....  $^{\circ}C$ .