

Some questions and answers for Ch 7- (Alloy Steels and Cast Irons)

1- What is the difference between 4140 and 4340 steel?

Ans: The alloy content of 4340 steel is different from that of 4140 steel and their hardening characteristics vary significantly; the 4340 steel has much better hardenability.

2- How do alloy steels differ from carbon steels?

Ans: Alloy steels have designated and significant amounts of one or more intentionally added elements other than carbon and iron.

3- What is a high-strength low-alloy steel (HSLA) and where might you use it?

Ans: HSLA steels can have high strength and toughness yet still be welded. They are used for submarines and vessels likely to see high stress in service.

4- Which of the following are alloy steels?

- a. C1020 c. 1040
- b. B1112 d. 4620

Ans: (d) 4620

5- What is the amount of carbon content in Low-Carbon Steels?

Ans: They generally have less than 0.25% carbon.

6- Between HSLA steels and the plain carbon steels, which one is more resistant to corrosion in normal atmosphere?

Ans: HSLA

7- Why ferrous alloys are produced in larger quantities than any other metal types especially in engineering construction?

Ans:

Their widespread use is accounted for by three factors:

- (1) iron- containing compounds exist in abundant quantities within the Earth's crust,
- (2) metallic iron and steel alloys may be produced using relatively economical extraction, refining, alloying, and fabrication techniques; and
- (3) ferrous alloys are extremely versatile (multipurpose), in that they may be tailored to have a wide range of mechanical and physical properties.

8- What is cast iron and how many types are there?

Ans: Cast irons are a class of ferrous alloys with carbon contents above 2.14 wt%; in practice, however, most cast irons contain between 3.0 and 4.5 wt% C and. In addition, they have other alloying elements such as silicon or manganese.

The principle types of cast irons are: gray, white, ductile or nodular iron, malleable, and compacted graphite iron.

9- Which of the following is not a requirement of cast iron?

- a. Fe
- b. Si
- c. Cu
- d. Mn
- e. C

Ans: (c) Cu

10- How is ductile iron made?

Ans: Ductile iron is made by adding small amount of magnesium or cerium to the gray iron before casting.

11- What is malleable iron and how is it made?

Ans: Malleable iron has relatively high strength and appreciable ductility or malleability. It has the graphite in the form of clusters or rosettes surrounded by a ferrite or pearlite matrix and it is being made from white iron.

Malleable iron is made by heating white iron at temperatures between 800°C and 900°C for a prolonged time period and in a neutral atmosphere (to prevent oxidation).

12- How is ductile iron different from malleable iron?

Ans: Ductile iron gets its ductility from the ladle treatment and not from a long-term heat treatment. Malleable iron is easier to machine and more stable because of the lengthy heat treatment.

13- What is white iron and where is it used?

Ans: For low-silicon cast irons (containing less than 1.0 wt% Si) and rapid cooling rates, most of the carbon exists as cementite instead of graphite. The fracture surface of this alloy has a white appearance, and thus it is termed white cast iron. White iron is extremely hard but also very brittle, they are almost unmachinable.

White irons are used when we need very hard and wear-resistant surface, without a high degree of ductility, for example, as rollers in rolling mills.