

1. Which of the following is the hardest constituent of steel?

- a) Ledeburite
- b) Austenite
- c) Bainite
- d) Martensite

2. Iron possesses BCC crystal structure up to (in degree centigrade)?

- a) 1539
- b) 768
- c) 910
- d) 1410

3. Iron possesses BCC crystal structure above (in degree centigrade)?

- a) 1539
- b) 768
- c) 910
- d) 1410

4. Iron possesses FCC crystal structure above (in degree centigrade)?

- a) 1539
- b) 768
- c) 910
- d) 1410

5. Which of the following form of iron is magnetic in nature?

- a) α
- b) δ
- c) γ
- d) λ

6. For steel, which one of the following properties can be enhanced upon annealing?

- a) Hardness
- b) Toughness
- c) Ductility
- d) Resilience

7. In Annealing, cooling is done in which of the following medium?

- a) Air
- b) Water
- c) Oil
- d) Furnace

8. In normalizing, cooling is done in which of the following medium?

- a) Air
- b) Water
- c) Oil
- d) Furnace

9. Mild steel can be converted into high carbons steel by which of the following heat treatment process?

- a) Annealing
- b) Normalizing
- c) Case hardening
- d) Nitriding

10. Upon annealing, eutectoid steel converts to which of the following?

- a) Pearlite
- b) Cementite
- c) Austenite
- d) Martensite

1) The purpose of normalizing steel is to

- A) Remove induced stresses
- B) Improve machinability
- C) Soften the steel
- D) Increase the toughness and reduce brittleness

2) A carbon steel piece is heated just above 730 Degree Centigrade, maintained at that temperature for a few hours and then slowly cooled. What heat treatment process is carried out ?

- A) Normalizing
- B) Casehardening
- C) Hardening
- D) Annealing

3) A given component cracked after heat treatment. What can be the possible reason ?

- A) It was heated for long time
- B) It was not properly cleaned before heating
- C) It was suddenly cooled in brine
- D) It was slowly cooled in air

5) To reduce internal stresses of a hardened tool, the method of heat treatment generally applied is

- A) Stabilising
- B) Annealing
- C) Normalizing
- D) Tempering

9) After heating up to required hardening temperature, why must tool steels be quenched ?

- A) To induce internal stresses
- B) To build up hardening structure
- C) To fall off the scale
- D) To retain it to its original structure

11) Heat treatment of metals is necessary

- A) To produce certain desired properties**
- B) To make good appearance on the component**
- C) To increase strength of the metal**
- D) To make the metal rust-proof**

15) The instrument used to measure high temperature in the furnace is

- A) Thermometer**
- B) Barometer**
- C) Colorimeter**
- D) Pyrometer**

19) The purpose of heat treatment is

- A) To change the mechanical properties of steel**
- B) To change the internal structure of steel**
- C) To change the appearance of the component**
- D) To change the chemical properties of steel**

20) One component of C50 steel is heated to 830 Degree Centigrade, soaked it for some time and then quenched in oil. Again it is heated to 600 Degree Centigrade and quenched in oil. Name this process of heat treatment.

- A) Annealing**
- B) Normalizing**
- C) Hardening and tempering**
- D) Case hardening**

21) Which one of the following groups of quenching media is in order of their severity of the cooling rate, i.e. from slow to rapid cooling ?

- A) Oil, forced air, brine solution
- B) forced air, oil, brine solution
- C) Brine solution, oil, forced air
- D) Forced air, brine solution, oil

23) Which one of the following structures of steel is obtained due to the drastic cooling from the austenite structure ?

- A) Pearlite
- B) Cementite
- C) Martensite
- D) Troostite

24) Which one of the following processes by which steel is heated to the required temperature and then cooled slowly in the furnace itself ?

- A) Tempering
- B) Hardening
- C) Nitriding
- D) Annealing

25) What is the main purpose of annealing ?

- A) To improve machinability
- B) To improve magnetism
- C) To increase hardness
- D) To increase toughness

26) During heat treatment when carbon is dissolved to form solid solution, it is known as

- A)** Ferrite
- B)** Pearlite
- C)** Austenite
- D)** Cementite

38) After hardening process, the metal becomes more hardened and also will become more

- A)** Brittle
- B)** Ductile
- C)** Malleable
- D)** Tough

5. Cast iron has carbon

- i. <2.0%
- ii. > 7%
- iii. > 2.0%
- iv. None

6. Low alloy steels has carbon

- i. $\leq 1\%$
- ii. $\leq 2\%$
- iii. $\geq 2\%$
- iv. None

8. Lower critical temperature (A_1) in iron carbon diagram is

- i. 527°C
- ii. 727°C
- iii. 911°C
- iv. None

12. Fastest cooling will be obtained by cooling in

- i. Air
- ii. Water
- iii. Brine
- iv. None

14. Hypo-eutectoid steel contains carbon

- i. $< 0.022\%$
- ii. $< 0.770\%$
- iii. $< 6.77\%$
- iv. None

15. Hypereutectoid steel contains carbon

- i. $< 0.22\%$
- ii. $< 0.770\%$
- iii. $> 0.770\%$
- iv. None

16. The micro-structure of α ferrite iron is

- i. FCC
- ii. BCC
- iii. HCP
- iv. None

17. Which micro-structure γ -Austenite has

- i. BCC
- ii. FCC
- iii. HCP
- iv. None

18. δ -Ferrite has which micro-structure

- i. HCP
- ii. FCC
- iii. BCC
- iv. None

19. Referring to transformations in iron carbon diagrams, super-cooling takes place when

- i. Transformations take place at temperatures below the predicted by the phase diagram
- ii. Transformations take place at temperatures equal to the predicted by the phase diagram
- iii. Transformations take place at temperatures above the predicted by the phase diagram
- iv. None

20. Super-heating applies to transformations in iron carbon diagrams when

- i. Transformations take place at temperatures below the predicted by the phase diagram
- ii. Transformations take place at temperatures equal to the predicted by the phase diagram
- iii. Transformations take place at temperatures above the predicted by the phase diagram
- iv. None

21. TTT diagrams stand for

- i. Time, temperature and transformation
- ii. Temperature, transformation and time
- iii. Temperature, time and transformation
- iv. None

22. TTT diagrams are drawn as a family of

- i. V-shaped curves
- ii. Z-shaped curves
- iii. S-shaped curves
- iv. None

23. At low temperatures, transformations are

- i. Slow
- ii. Fast
- iii. Neither fast nor slow
- iv. None

24. The growth of grain at low temperatures is

- i. Neither fast nor slow
- ii. Fast
- iii. Slow
- iv. None

25. Martensite is formed from Austenite on

- i. Fast cooling
- ii. Slow cooling
- iii. Medium cooling
- iv. None

- دمای استنیتته کردن کدام عملیات حرارتی به درصد کربن قطعه وابسته نیست؟
- عملیات آنیل همدمما عکس کدام عملیات حرارتی است؟
- نام دیگر عملیات حرارتی آنیل نفوذی چیست؟
- چرا مارتنزیت یک فاز ناپایدار است؟
- فریت ویدمن اشتیتن چطور حاصل می شود؟
- کدامیک از فولادهای آلیاژی زیر به استنیتته کردن بیشتری نیاز دارد؟ (فولاد آلیاژی با کاربید $Cr_{23}C_6$) و (فولاد آلیاژی با کاربید TiC)
- هدف از عملیات آنیل همدمما چیست؟
- آنیل بین بحرانی برای چه نوع فولادهای بیشتر مورد استفاده قرار می گیرد؟
- مکانیزم آنیل نیمه بحرانی برای کاهش تنش پسماند چیست؟
- منشا تنش پسماند در قطعه چه می تواند باشد؟
- مکانیزم تشکیل بینیت پایینی چیست؟
- میزان سختی کدامیک فولاد سخت شده بیشتر است؟ (فولاد کربنی با ۰/۳ درصد کربن یا فولاد کربنی با ۰/۶ درصد کربن)
- فاز کدام فولاد سخت شده زیر میکروسکوپ قابل تشخیص است؟ (فولاد کربنی با ۰/۳ درصد کربن یا فولاد کربنی با ۰/۹ درصد کربن)
- میزان استنیت باقی مانده در فولاد ۱/۲ درصد کربن چقدر است؟ بیشتر از ۴۰ درصد یا بیشتر از ۳۰ درصد
- چه عملیات حرارتی نیاز به استنیتته کردن ندارد؟
- محدوده کدام عملیات حرارتی در حدود ۱۲۰۰ درجه سانتی گراد است؟
- در صورتی که فولادی آنیل شده با ۰/۴ درصد کربن دارای سختی ۲۰۰ مگاپاسکال باشد و با عملیات حرارتی آنیل همدمما میزان پرلایت آن حدود ۷۵ درصد و با سختی به ۳۰۰ مگاپاسکال باشد. این میزان سختی معادل کدام فولاد آنیل شده است؟