

# By OnlineInterviewQuestions.com

## Metallurgical Engineering Interview Questions

### Q1. What is carbide?

Carbide is a chemical compound in which carbon is combined with a metallic or semi-metallic element.

### Q2. What is the microstructure of metals?

Materials can be broadly classified into metallic, polymeric, ceramic, and composite. The microstructure of the material is influenced by its physical properties which in turn govern the application of these materials in industrial practice. The microstructure defined as the structure of a material's surface as manifested by a microscope above 25× magnification.

### Q3. What are the effects of alloying elements on steel?

Steel is made of iron, carbon, and some other alloy, and non-alloyed. Different alloy elements have different effects on steel Mechanical and Physical properties.

The effects of alloying elements on steel are as follows:

**C(Carbon)** is the most important constituent of steel. It can raise hardness, tensile strength, and resistance to wear and abrasion but can reduce the ductility, toughness, and machinability of steel.

**Si(Silicon)** is a deoxidizer and detoxifier. It increases ductility, tensile and yield strength, hardness, enforceability, and magnetic permeability.

**Mn(Manganese)** is a detoxifier and can react with sulfur to improve enforceability. It increases tensile strength, hardness, hardenability, resistance to wear, and the rate of carbon-penetration in carburizing but decreases the tendency toward scaling and distortion.

**P(Phosphorus)** increases strength and hardness and improves machinability.

**S(Sulfur)** improves machinability in free-cutting steels, but without sufficient manganese, it produces brittleness at red heat. It decreases weldability, impacts toughness, and ductility.

**Cr(Chromium)** is very important in steel. It can increase steel's hardness, tensile strength, hardenability, toughness, resistance to wear and abrasion, resistance to corrosion, and scaling at elevated temperatures.

**Co(Cobalt)** increases strength and hardness and permits higher quenching temperatures and increases the red

hardness of high-speed steel.

**CB(Columbium)** used as stabilizing elements in stainless steel. Thus, localized precipitation of carbides at grain boundaries is prevented. Cu (Copper) negatively affects forge welding but does not seriously affect arc or oxyacetylene welding.

**Nickel(Ni)** increases strength and hardness without sacrificing ductility, toughness, resistance to corrosion, and scaling at elevated temperatures when introduced in suitable quantities in high-chromium (stainless) steels.

**Ta(Tantalum)** used as stabilizing elements in stainless steel. Thus, localized precipitation of carbides at grain boundaries is prevented.

**Ti(Titanium)** used as stabilizing elements in stainless steel. Thus, localized precipitation of carbides at grain boundaries is prevented.

#### **Q4. What type of corrosion occurs in sea water and in a steam boiler.**

Corrosion of the sea water and steam boiler may occur in three ways, by oxidation, by electrolytic dissolution, and by acid attack.

#### **Q5. What do you understand by metastable structure in metallurgy?**

Metastable structures are no novelty in metallurgy. The traditional practice of metallurgy has centered on the formation, characterization, and understanding. This upsurge reflects developments in the techniques of melt quenching, condensation, and irradiation of materials, as well as in the kinetic understanding of structural evolution.

#### **Q6. At what temperature oxidation corrosion occur?**

Oxidation corrosion occurs at high temperatures that is defined as the degradation of the metallic material at temperatures higher than 400 °C (750 °F) and at atmospheric pressures.

#### **Q7. What is the difference between CCT and TTT curve?**

The difference between CCT and TTT curve are as follows:

##### **CCT**

CCT stands for Continuous cooling transformation which is a continuous cooling curve.

CCT curves are useful to obtain different metastable products by controlling the rate of cooling.

##### **TTT**

TTT stands for time-temperature transformation which is basically a time-temperature transformation curve.

TTT is only for experimental purposes.

## **CCT**

In the CCT, the temperature is changing continuously, we get phase transformation at continuous cooling.

## **TTT**

In the TTT, the temperature is constant, and only by changing time, we get the phase formation.

### **Q8. What does Annealing temperature means?**

Annealing is a heat treatment that alters the physical and sometimes chemical properties of a material to increase its ductility and reduce its hardness for making it more workable In metallurgy and materials science. It involves heating a material that increases its recrystallization temperature, maintaining a suitable temperature for an appropriate amount of time.

### **Q9. What is the formula to calculate the firing order of an engine?**

There is no fixed formula to calculate the firing order of an engine because it has no fixed firing order. Even for engines with the same cylinder count. For instance, the 4 cylinders Yamaha R1 has had a wave-like firing order, since 2007 or so cutting down on vibrations but making it sound like a parallel twin.

If you want to know about the firing order, look into maintenance manuals or try sending an email to the manufacturer and ask him nicely

### **Q10. What are Ceramics?**

Ceramics are an inorganic non-metallic solid made up of either metal or non-metal compounds that have been shaped and then hardened by heating to high temperatures(known as a kiln). Ceramics are generally made by taking mixtures of clay, earthen elements, powders, water that makes them hard, corrosion-resistant, and brittle as the desired shape. Ceramics are covered by decorative, waterproof, paint-like substances known as glazes.

### **Q11. What are allotropes? What are the allotropes of Iron and Carbon?**

Allotropy is defined as the existence of a chemical element in more than one crystalline form, which is different in the arrangement of atoms and the occurrence of molecules in crystalline solids that contain different numbers of atoms.

The 4 allotropes of iron are Alpha, Gamma, Delta, and Epsilon.

The 2 allotropes of carbon are diamond and graphite.

### **Q12. What is the major difference between quenching and annealing?**

Annealing is a heat treatment that alters the microstructure of a material causing changes in properties such as strength, hardness, and ductility whereas Quenching is the cooling process of the material from the higher room temperature generally, faster cooling like dipping in water, brine solution, oil, etc

**Q13. What is vacuum induction melting?**

Vacuum Induction Melting is a Process that involves the melting of metal under vacuum conditions.

**Q14. What is power metallurgy?**

Powder metallurgy is a metal-forming process. It is performed by heating compacted metal powders to just below their melting points.

**Q15. What is the melting point of brass?**

Melting point of Brass is 930°C (1710°F).

**Q16. Which plaster is used in gold investment casting?**

Gypsum-bonded investment plaster is generally used in gold investment casting.

**Q17. Which liquid can dissolve gold?**

The most useful and important liquid for dissolving gold is aqua regia, (royal water), composed of two parts of hydrochloric (muriatic) acid, and one part of nitric (aqua fortis).

**Q18. What is a SPCC material?**

The full form of SPCC is Spill Prevention, Control, and Countermeasure. SPCC Plan has the SPCC rule that requires facilities to develop, maintain, and implement an oil spill prevention plan, called an SPCC Plan. The main purpose of the SPCC rule is to help facilities prevent a discharge of oil into navigable waters or adjoining shorelines.

**Q19. What is the atomic density of ceramics?**

The atomic density of ceramics is generally  $2.35 \text{ g/cm}^3$ . It depends on the intermediate density between polymers and metals.

**Q20. Why in liquid carburizing mixture of salts is preferred than single salt?**

In the **liquid carburizing** mixture of salts is preferred over single salt because in the salt bath the carbon to be diffused in the workpiece comes from a molten salt that is a mixture of sodium cyanide (NaCN) and barium chloride ( $\text{BaCl}_2$ ) to provide better hardness to the metal surface.

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