1. The process by which steel is heated to a suitable temperature depending upon its carbon content and is held at that temperature for sufficient time and then slowly cooled to room temperature in the furnace itself is known as

   (1) Annealing (2) Hardening (3)Normalising (4) Tempering
   Ans: 1

Tempering, in metallurgy, process of improving the characteristics of a metal, especially steel, by heating it to a high temperature, though below the melting point, then cooling it, usually in air. The process has the effect of toughening by lessening brittleness and reducing internal stresses. Suitable temperatures for tempering vary considerably, depending on the type of steel and designed application; for tool steels, the hardness of which must be retained, the range is usually from 200° to 250° C (400° to 500° F).

Britannica, The Editors of Encyclopaedia. "tempering". ***Encyclopedia Britannica***, 12 Apr. 2019, https://www.britannica.com/technology/tempering-metallurgy. Accessed 25 November 2021.

Thermal Engineering of Steel Alloy Systems
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12.02.7

Tempering

Tempering is a term historically associated with the heat treatment of martensite in steels to change the microstructure and mechanical properties by holding the steel component isothermally at a temperature below which austenite cannot form. When steel is hardened the as-quenched martensite not only is very hard but also has low toughness. Tempering, also known as ‘drawing,’ is the thermal treatment of hardened and normalized steels to obtain improved toughness and ductility, lower hardness, and improved dimensional stability.

During tempering, solid-state reactions occur and the as-quenched martensite is transformed into tempered martensite, which, at higher tempering temperatures, is composed of highly dispersed spheroids of cementite (carbides) dispersed in a soft matrix of ferrite, resulting in reduced hardness and increased toughness. The objective is to allow hardness to decrease to the desired level and then to stop the solid-state reactions as the sequence of carbide precipitation by cooling. The extent of the tempering effect is determined by the temperature and time of the process (*56*).

The tempering process may be conducted at any temperature up to the lower critical temperature (Ac1). When steel is tempered in air, the heated oxide film on the surface of the steel exhibits a color, known as ‘tempering color,’ which is characteristic of the surface temperature. Table 4 provides a summary of characteristic surface temperatures for tempering and their colors (*57*).

https://www.sciencedirect.com/topics/engineering/tempering-temperature

The four basic types of heat treatment that steel undergoes are annealing, normalizing, hardening, and tempering.

The **three stages of heat treatment** that include heating the metal to a set temperature (the heating stage), keeping it at that temperature for a specific length of time (the soaking stage), and cooling it down to room temperature with a method that depends on the type of metal and the desired properties (the cooling stage).

ANNEALING STEEL

To anneal steels and other ferrous metals to produce the highest level of ductility, heat the metal slowly to the appropriate temperature, soak it, and then allow it to cool slowly by either burying it in some sort of insulating material or by simply turning off the furnace and letting both the furnace and the part cool slowly together.

NORMALIZING

The purpose of normalizing is to remove any internal stresses from heat treatment, machining, forging, forming, welding, or casting. Metal failure can result from uncontrolled stress, so normalizing steel before any hardening can help ensure the success of projects.

WHAT'S THE DIFFERENCE BETWEEN ANNEALING & NORMALIZING?

Normalizing only applies to ferrous metals like steel. But there's another key difference in the heat treatment process: when normalizing, after the metal is heated to a higher temperature, it is air-cooled after removal from the furnace.

Normalized steel is stronger than annealed steel. With both high strength and high ductility, it is tougher than annealed steel. If the metal part needs to withstand impact or have maximum toughness to resist external stresses, it is usually recommended that it is normalized rather than annealed.

Since normalized metals are air-cooled, the mass of the metal is a key determinant of the cooling rate and resulting part's level of hardness. During normalizing, thinner pieces will cool faster in the air and become harder than thicker pieces. But, with annealing and its furnace cooling, the hardness of both thick and thin parts will be comparable.

https://www.kloecknermetals.com/blog/the-4-types-of-heat-treatment-steel-undergoes/

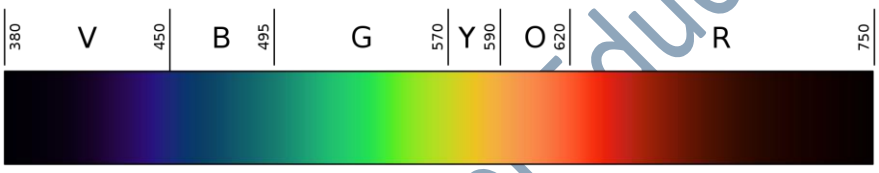
1.1 The current range for a M.S. electrode 4 mm is

(1) 60 to 90 amps
(2) 130 to 170 amps
(3) 70 to 110 amps
(4) 150 to 250 amps

Ans: 1

The most common stick welding rod sizes are **3/32″ (2.4mm), 1/8″ (3.2mm), and 5/32″ (4mm)**. These sizes are enough to weld the most common projects with stick welding. Typically the 1/8” is comparatively a more common welding rod size than others. And here, 5/32” as well as 3/16” are also some common sizes.
Length 350, 450 mm

2. Visible light region lies
(1) beyond infrared region
(2)before ultraviolet region
(3) between infrared and ultraviolet regions (VIBGYOR)
(4)nowhere near infrared or ultraviolet regions
Ans: 3.



By Gringer - Own work, Public Domain, https://commons.wikimedia.org/w/index.php?curid=4639774
https://en.wikipedia.org/wiki/Visible_spectrum#/media/File:Linear_visible_spectrum.svg

3. Pearlite combines the good properties of both ferrite and cementite, and due to this, certain property of steel increases with the carbon content until 0.83% carbon is reached. What is that property?
(1) Hardness (2) Strength (3) Ductility (4) Malleability
Ans: 2

4. If he main electric supply is not available, we can do arc welding with
(1) motor generator set (2) transformer set
(3) engine generator set (4) rectifier set
Ans: 3

5. Variable equivalent weights are possible it an element exhibits
(1) variable valency (2) variable atomic weights
(3) variable molecular weights (4) variable atomic number
Ans: 1

6. In electroplating the metal to e coated is taken as the
(1) electrolyte (2) cathode (3) anode (4) vessel
Ans: 2

7. The part of the universal surface gauge which helps to draw a parallel line along a datum edge is the
(1) rocker arm (2) snug
(3) fine adjustment (4) guide pins
Ans: 2

8. The external threads on G.I pipes are cut easily by
(1) tap sets (2) dies and die stocks
(3) centre lathes (4) thread rollers
Ans: 2

9. In batch processing, the control an be transferred from one place to another using
(1) LOOP command (2) GO TO command
(3) SHIFT command (4)IF Command
Ans: 2

10. By using coolant on work pieces we can choose
(1) higher cutting speeds
(2)lower cutting feeds
(3) lower cutting speeds
(4)heavy depth of cuts with low feed
Ans: 1

11. Aluminium is a powerful _____ agent
(1) oxidising (2) reducing (3) transition (4) none of these
Ans: 1

12. The most important quality of any cutting fluid is
(1) emulsification (2) specific heat
(3) specific gravity (4)viscosity
Ans: 4

13. In complete transfer of electrons from one atom to another _____ bond is formed.
(1) electrovalent (2) covalent (3) ionic (4) co-ordinate
Ans: 3

14. Tab washers re used for
(1) preventing vibration (2) locking the nuts
(3) self locking (4) fastening structural lubrication work
Ans: 2

TAB WASHERS

Tab washers are **a mechanical locking solution that secure bolted joints using a physical barrier**. The washer itself is a thin piece of metal usually rectangular or circular. The tab washer is installed between the bolt head/nut and the mating surface, and the bolted joint is tightened like a regular bolt. Once the bolt has been tightened, the tab section of the washer is knocked up around the bolt

head/nut to lock it in place and prevent any rotation.

Tab washers are a type of lock washer, round in shape and often manufactured with a single tab or multiple tabs and notches that can be formed to shape around bolts and nuts. These washers are ideal for use in harsh environments, effectively locking a part into place in applications requiring extreme heat conditions or heavy vibrations.

LOCKING TAB WASHERS

Locking washers are often bent after assembly to stop rotation and have replaced the use of locking pins and castle or slotted nuts.

15. Surface plates are used for marking because
(1) They can withstand the weight of heavy components
(2) They have large surface area
(3) Marking tools can slide over easily
(4) They provide the datum surface
Ans: 4

16. In a plain bush bearing, to prevent the rotation of bush in the housing, it should be fitted by means of
(1) soldering (2) key or screw (3) brazing (4) welding
Ans: 2

17. The purpose of a feeler gauge is to
(1) Maintain the required type of fit
(2) Ensure contact between surfaces without any obstruction
(3) Make for lubrication
(4) Adjust the components for play
Ans: 2

18. A drilling machine used by a carpenter for cabinet making is a
(1) ratchet drilling machine (2) radial drilling machine
(3)breast drilling machine (4) sensitive drilling machine
Ans: 3

19. The datum from which the measurements of a vernier height gauge are taken is
(1) beam (2) the verniar slide
(3) base (4) above the scriber point
Ans: 3

20. Cast-iron is normally turned by applying
(1) soluable oil as coolant
(2)no cutting fluid is used
(3) straight cutting oil as a coolant

(4)water as coolant
Ans: 2

21. Broaching is the process in which
(1) a tool is pushed or pulled through a hole or surface
(2)the work piece is pushed or pulled through the tool
(3)both the work piece and tool are rotated through a hole or surface
(4)only the tool is rotated through a hole or surface
Ans: 1

22. When threading , the carriage is moved along the bed-ways by
(1) a pinion and rack (2) the feed-rod spline or key-way
(3)the lead screw thread (4) the hand wheel
Ans: 3

23. The process of beveling the end of a hole is called
(1) counter boring (2) counter sinking
(3) spot facing (4) reaming
Ans: 2

24. Solder is a special mixture of
(1) copper and lead (2) tin and lead
(3) copper and tin (4) tin and flux
Ans: 2

25. The standard pipe fittings are provided with threads conforming with
(1) BA (2)BSW (3)BSP (4) Metric
Ans: 3

26. For mounting a lathe chuck
(1) start it by hand and then switch on to power and assemble to the spindle nose
(2) mount it by power only
(3) mount it by hand only
(4) mount it with the help of a hammer
Ans: 1

27. The necessity of tack welding in a joint is to
(1) joint two pieces (2) join two pieces of pipes
(3) control distortion during welding (4) eliminate spatters
Ans: 3

28. To true a job precisely in a 4 jaw chuk the instrument used is a
(1) micrometer
(2)vernier bevel protractor
(3) dial test indicator with a magnetic base
(4)try square
Ans: 3

29. To avoid rubbing of the boring tool in a hole of a work, it is necessary to grind a
(1) top rake angle

(2)side clearance angle
(3) side rake angle
(4)secondary front clearance angle
Ans: 2

30. The process of enlarging the end of a hole for accommodating the socket screw head is
(1) reaming (2) spot facing (3) counter boring (4) counter sinking
Ans: 3

31. Drill chucks are fitted on the drilling machine spindle by means of a
(1) knurled ring (2) arbor (3) drift (4) pinion and key
Ans: 3

32. The rake angle is the angle between the
(1) working face and the bottom face of the cutting edge
(2) top face of the cutting edge and the line perpendicular to the working surface
(3) angle between the working surface an the axis of the chisel when chipping
(4) bottom face of the cutting edge an the working surface
Ans: 2

33. Which among the following indicates the roughness value
(1) A (2) B (3)C (4) D
Ans: 2

34. Which of the following is used to cut small diameter wires, pins, nails and to remove nails from wood ?
(1) Side cutting pliers (2) Combination pliers
(3) End-cutting pliers (4) Flat nose pliers
Ans: 3

35. Which type of chip formation would be the best for turning mil steel?
(1) long curly chips (2) segmental chips
(3) I-shaped chips (4) spiral chips
Ans: 3

36. The author of the Classic Tamil Drama "Manonmaniyam" was
(1) Jayakanthan (2)SambandaMudaliyar
(3) Sundaram Pillai (4)BharathiDasan
Ans: 3

37. The volume of 1 gram molecule of a gas at S.T.P is 22.4 litre. This is given by
(1) Gay Lussac's law (2) Dalton's law
(3) Avogadro's law (4) Graham's law
Ans: 1

38. A minor load of 10 kg is applied initially in Rockwell hardness testing to;
(1) eliminate getting wrong reading due to the hardness of the inner surface of the work piece

(2) eliminate the effect of backlash in the machine
(3) eliminate any movement of the work piece
(4) eliminate sudden jerk while applying a major load
Ans: 2

39. Excessive tool over hang;
(1) causes excessive tool wear
(2) will result in chatter
(3) causes overheating of the tool
(4) will alter the top rake and the front clearance angle of the tool
Ans: 2

40. In one complete revolution of the bull gear wheel the ram gets
(1) one reverse stroke (2) one forward and reverse stroke
(3) one forward stroke (4) none of the three are correct
Ans: 2

41. For turning lengthy tapers with a small taper angle , the method of taper turning employed is
(1) Off= setting the tail stock
(2) form tool plunging
(3) swiveling the compound-slide
(4) combination of the lathe cross slide and the compound slide movement
Ans: 1

42. Shaft ends are centre drilled for
(1) supporting jobs between centres (2) lubricating the dead centre
(3) reducing the weight (4) assisting counter boring
Ans: 1

43. Computer software includes
(1) application programs (2) operating system programs
(3) packaged programs (4) all the above
Ans: 4

44. For a body to float in a liquid
(1) density of the body should be equal to the density of the liquid
(2) weight of the body should be equal to the weight of the liquid displaced
(3) weight of the body should be equal to the weight of an equal volume of liquid
(4) volume of the body should be equal to the density of the liquid
Ans: 2

45. The purpose of the rake angle is
(1) to prevent the flank of the tool rubbing with the work piece
(2) to guide the chips away and avoid clogging
(3) to obtain a good surface finish
(4) to increase the life of the tool
Ans: 1

46. The heat required to convert unit mass of solid into a liquid at the same temperature is known as
(1) latent heat of fusion
(2) latent heat of steam
(3) latent heat of vaporization
(4) latent heat of vapourisation
Ans: 1

47. A centre gauge is used to
(1) check the pitch of the thread
(2) set the tool at the correct centre height
(3) check the fit of the thread
(4)check the angle of the threading tool
Ans: 2

48. The vice clamps re used to
(1) protect hard jaws
(2) clamp the work pieces rigidly
(3) protect the finished surfaces
(4) prevent the movable jaw being filled
Ans: 3

49. A rough turning tool is used when
(1) good surface finish is required
(2) more stock is to be removed
(3) the spindle speed is very high
(4) machining soft materials
Ans: 2