

WELDING SECTION

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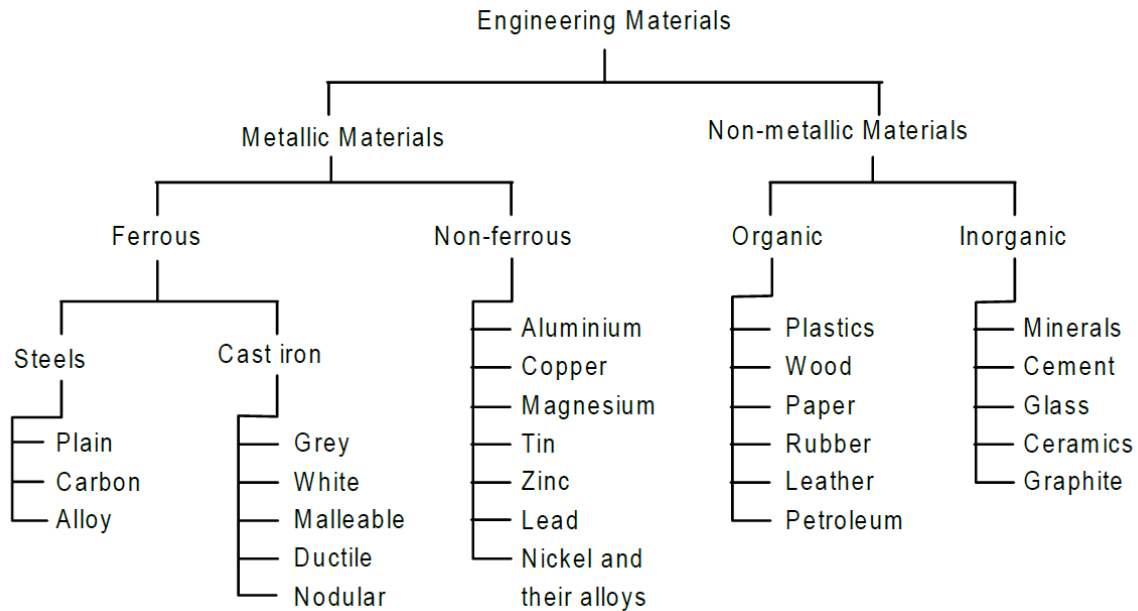
- ✓ **Materials:** A material is a substance or mixture of substances that constitutes an object. Materials can be pure or impure, living or non-living matter. Materials can be classified based on their physical and chemical properties, or on their geological origin or biological function.
- ✓ **Ferrous:** Ferrous metals are those which have the iron as their main constituent, such as pig iron, cast iron, wrought iron and steels.
- ✓ **Non-Ferrous:** Non-ferrous metals are those which have a metal other than iron as their main constituent, such as copper, aluminum, brass, bronze, tin, silver zinc, invar etc.
- ✓ **Polymers:** is a large molecule, or macromolecule, composed of many repeated subunits. Due to their broad range of properties, both synthetic and natural polymers play essential and ubiquitous roles in everyday life.
- ✓ **Ceramics:** A ceramic material is an inorganic, non-metallic, often crystalline oxide, nitride or carbide material. Some elements, such as carbon or silicon, may be considered ceramics. Ceramic materials are brittle, hard, strong in compression, and weak in shearing and tension.
- ✓ **Composite Materials:** is a material made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure, differentiating composites from mixtures and solid solutions.
- ✓ **Weldability:** The weldability, also known as joinability, of a material refers to its ability to be welded. Many metals and thermoplastics can be welded, but some are easier to weld than others. A material's weldability is used to determine the welding process and to compare the final weld quality to other materials.
- ✓ **What is laser beam welding?**

A welding technique used to join pieces of metal or thermoplastics through the use of a laser is called laser beam welding.
- ✓ **What is electron beam welding?**

Electron beam welding is a fusion welding process in which a beam of high-velocity electrons is applied to the material and thus welding is done.

Electron beam welding and laser beam welding are two very popular methods used for welding. Let us have a deep insight into the difference between both of welding process.

- ✓ **Cast Iron:** Cast iron is basically an alloy of iron and carbon and is obtained by re-melting pig iron with coke, limestone and steel scrap in a furnace known as cupola. The carbon content in cast iron varies from 1.7% to 6.67%. It also contains small amounts of silicon, manganese, phosphorus and Sulphur in form of impurities elements.



| S.No | Grey Cast Iron | White Cast Iron | Spherodidal Cast Iron |
|------|---|---|---|
| 1. | It is an alloy of carbon and silicon with iron having grey color when fractured. It is marked by the presence of flakes of matrix of ferrite, pearlite or austenite. Carbon in iron exists in free form as graphite | White cast iron has almost all its carbon as iron carbide. Its broken surface shows a bright white fracture. | Graphite appears as around Particles or spheroids. |
| 2 | It has good machinability, high resistance to wear, high vibration damping capacity and high compressive strength. | It has poor machinability, excellent abrasive wear resistance. | It has good machinability, good damping, excellent castability and sufficient wear resistance |
| 3 | It is used in machine tool structure, Main-hole covers, cylinder blocks, heads for I.C. engines, gas or water pipes for underground purposes, frames for electric motors, piston rings and sanitary wares. | It is used for producing malleable iron castings and manufacturing those structural component parts which require a hard and abrasion resistant material. | It is used in I.C. engines, paper Industry machinery, machinery for farming and tractor, application, earth moving machinery, valve and fittings, pipes, pumps, compressors and construction machinery. |

✓ **Difference between laser and electron beam welding:**

1. EBW is performed in a high vacuum environment, which is most suitable for titanium, refractory metals and flammable metals. while LBW is not performed under a vacuum environment it usually performed with shielding gas such as argon or nitrogen.
2. EBW is usually narrower than the laser weld. The LBW weld is particularly suited for high volume application.
3. EBW cost is higher than the LBW.
4. In EBW X-rays is generated while not generated in LBW.
5. Size of the workpiece is limited because of vacuum size in EBW while LBW can weld any size of workpieces.
6. The power efficiency of EBW is 80 to 90 % and 7 to 10 % is for LBW.
7. Penetration is deep in case of EBW while lack penetration in LBW.

✓ **Difference between MIG and TIG welding:**

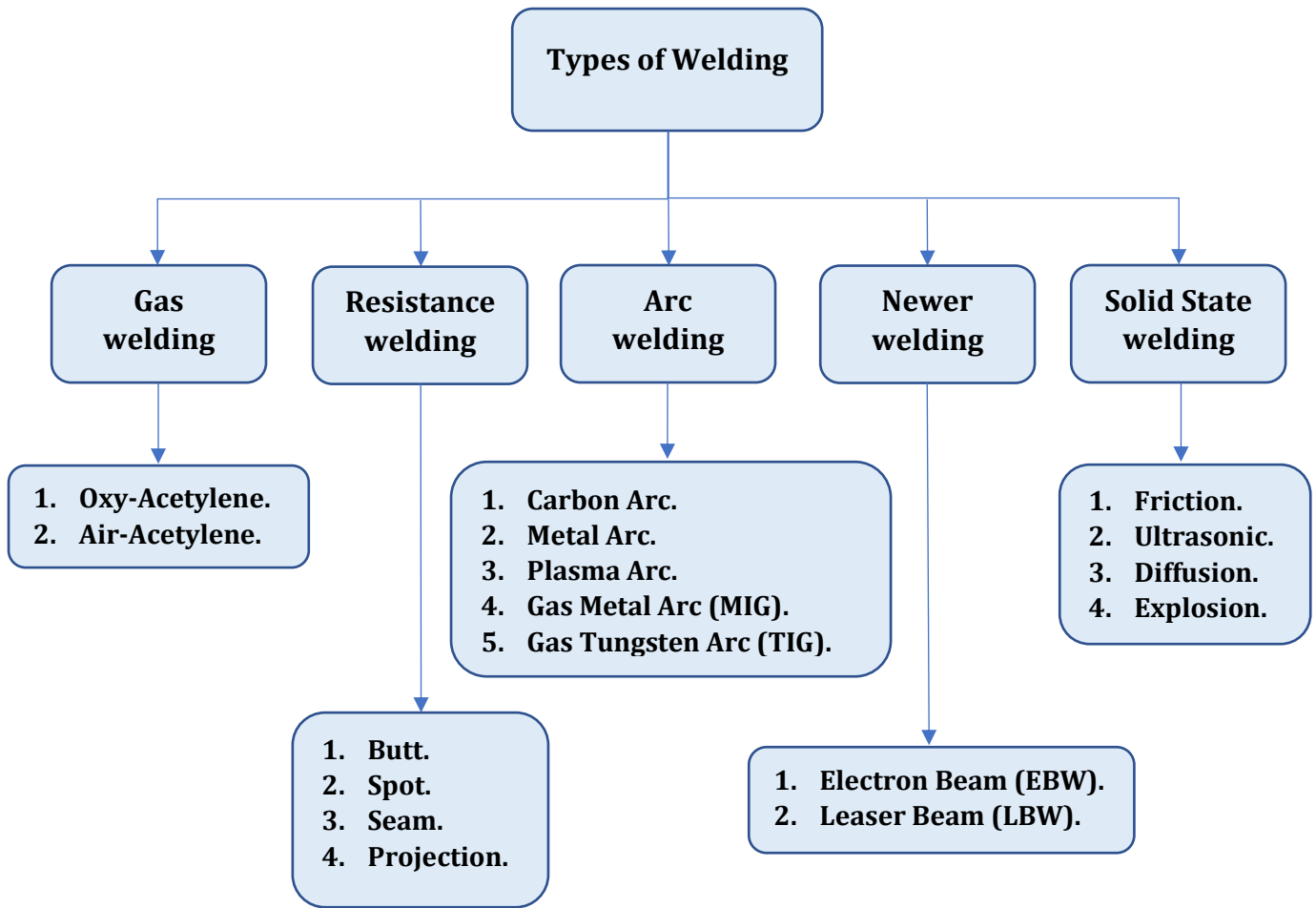
| No. | MIG | TIG |
|-----|--|--|
| 1. | The welding is known as Metal Inert Gas welding. | This is known as Tungsten Inert Gas welding. |
| 2. | Metal rod is used as electrode and workpiece used as another electrode. | Tungsten rod is used as electrode. |
| 3. | It is Gas Shielded Metal Arc Welding. | It is Gas Shielded Tungsten Arc Welding. |
| 4. | Continuous feed electrode wire is used which are fast feeding. | Welding rods are used which are slow feeding. |
| 5. | The welding area is flooded with a gas which will not combine with the metal. | Gas is used to protect the welded area from the atmosphere. |
| 6. | MIG can weld material such as mild steel, stainless steel and aluminum. A range of material thicknesses can be welded from thin gauge sheet metal right up to heavier structural plates. | TIG weld things like kitchen sinks and tool boxes. Pipe welding and other heavier tasks can also be performed, you just need have a unit that is capable of putting out the amount of power that you need. |
| 7. | MIG required consumable metallic electrode. | It is used non consumable tungsten electrode. |
| 8. | Electrode feeding is continuously from a wire reel. | It does not require electrode feed. |
| 9. | DC with reverse polarity is used. | It can use both AC and DC. |
| 10. | Filler metal is compulsory used. | Filler metal may or may not be used. |
| 11. | It can up to 40 mm thick metal sheet. | Metal thickness is limited about 5 mm. |
| 12. | MIG comparatively faster than TIG. | TIG is slow welding process. |

✓ **Difference between Fusion welding and Solid-State welding:**

| No. | Fusion Welding | Solid State Welding |
|-----|---|--|
| 1. | Surface of the base metals are fused to form coalescence during welding. Filler metal, if used, is also fused. | No melting takes place in solid state welding. However base metal may be heated to an elevated temperature without melting. |
| 2. | Application of heat during welding is necessary. Heat can be applied by various means such as electric arc, fuel gas flame, resistance heating, laser beam etc. | No such heat source usually required, but pressure may be applied externally for welding. |
| 3. | Filler material can be applied easily. | Usually no filler is applied. |
| 4. | Noticeable heat affected zone HAZ exist surround weld bed. | HAZ is usually not noticeable. A narrow HAZ may exist in certain cases. |
| 5. | Mechanical properties of the parent materials are severely affected because of intense of heating. | Mechanical properties usually remain unaltered in solid state welding. Sometimes minor changes may occur. |
| 6. | Level of distortion is very high owing to excessive heat input per unit area. | Solid state welding produce minimal distortion. |
| 7. | Examples: Arc welding, Gas welding, resistance welding, intense energy beam welding process. | Examples: roll welding, pressure welding, friction welding, diffusion welding, etc. |

✓ **Difference between Brazing & Soldering:**

| No. | Brazing | Soldering |
|-----|--|---|
| 1. | Filler material is an alloy of Cu & Zn. | Filler material is an alloy of lead & Tin. |
| 2. | Filler metal has the melting point above 400°C. | Filler metal has the melting point below 400°C. |
| 3. | High pressure & temperature do not affect the joint. | Joints are affected by high temperature & pressure. |
| 4. | Equipment costs is more. | Equipment costs is very low. |
| 5. | Used for mechanical joints due to high temperature involved. | Used for electrical connection or mechanical. |
| 6. | Flux used is Borax & NH ₄ CL. | Flux used is Zinc Chloride & HCL. |
| 7. | Dissimilar metals can be joined easily. | Only similar metal can be joined. |
| 8. | Stronger joints. | Less stronger joints. |



➤ **Testing & inspection Methods:**

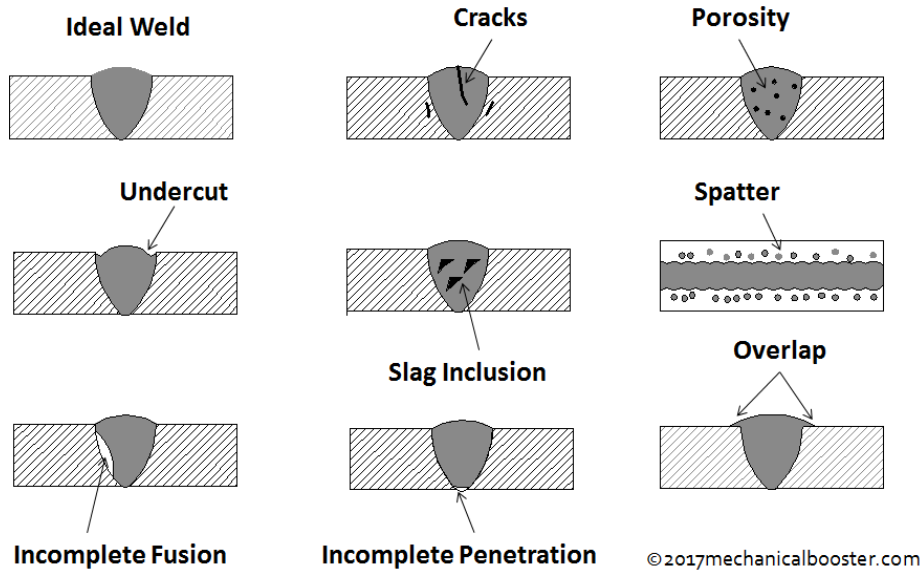
- ✓ **Destructive Test (DT):**
 - Tension Test.
 - Nick-Break Test.
 - Bend Test.
 - Hardness Test.
 - Fatigue Test.
 - Impact Test.

- ✓ **Non-Destructive Test (NDT):**
 - Visual Examination.
 - Radiography Testing:
 1. Gamma-Ray.
 2. X-Ray.
 - Magnetic Testing.
 - Ultrasonic Testing.
 - Penetrant Examination.
 - Stethoscope Test.
 - Eddy-Current Inspection.

✓ **Metallurgical Problem in Welding:**

1. Heat Affected Zone.
2. Burning.
3. Segregation.
4. Gas Pockets.

Different Welding Defects



WELDING SECTION

MULTIPLE CHOICE QUESTIONS

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MCQ for Welding

1. Which of the following joint have high corrosion resistance?

- a. Welding joint
- b. Riveted joint
- c. Bolted joint
- d. None of the above

(Ans: a)

2. Which of the following ray is not produced during welding?

- a. Gamma rays
- b. Visible light rays
- c. Infrared ray
- d. Ultra violet rays

(Ans: a).

3. Single-V and single-U butt welds are used for sheets of thickness

- a. Up to 10mm
- b. 5-15mm
- c. 10-20mm
- d. 15-25mm

(Ans: b)

4. Double-V and double-U butt welds are used for plates of thickness

- a. 1-5mm
- b. 5-10mm
- c. 10-15mm
- d. Over 15mm

(Ans: d)

5. Which of the following types is not fillet weld?

- a. butt joint
- b. lap joint
- c. T-joint
- d. Corner joint

(Ans: a)

6. The metals having good weldability, in descending order are

- a. cast steel, iron, carbon steel, cast iron
- b. carbon steel, iron, cast steel, cast iron
- c. iron, carbon steel, cast steel, cast iron
- d. cast iron, iron, carbon steel, cast steel

(Ans: a)

7. In fusion welding, penetration is the ratio of

- a. width of the weld to its depth
- b. length of the weld to its depth
- c. depth of the weld to its width
- d. depth of the weld to its length

(Ans: a)

8. Which of the following is an example of plastic welding?

- a. Gas welding
- b. Arc welding
- c. Forge welding
- d. Thermit welding

(Ans: c)

9. Which of the following is an example of fusion welding?

- a. Arc welding
- b. Forge welding
- c. Resistance welding
- d. Thermit welding with pressure

(Ans: a)

10. Which of the following welding process is used for welding of sheet metals in automobile and air craft industries?

- a. Shield metal arc welding
- b. Gas tungsten arc welding
- c. Thermit welding
- d. Resistance welding

(Ans: d)

11. In which of the following process, heat is created by blacksmith fire

- a. Forge welding
- b. Spot welding
- c. Projection welding
- d. Seam welding

(Ans: a)

12. Heat is created by chemical reaction in

- a. Resistance welding
- b. Oxy-acetylene welding
- c. Tungsten arc welding
- d. Thermit welding

(Ans: d)

13. The voltage used in resistance welding is generally kept between

- a. 4-12 volts
- b. 12-20 volts
- c. 20-28 volts
- d. 28-36 volts

(Ans: a)

14. The heat generated (H) in resistance welding is expressed by

- a. I^2Rt
- b. IR^2t
- c. IRt^2
- d. $2IRT$

(Ans: a)

15. The voltage needed in resistance welding does not depend upon

- a. Composition
- b. Area
- c. Thickness of weld
- d. Length of weld

(Ans: d)

16. Which of the following statement(s) is/are true for resistance welding?

- i. The time for which current flows is very important
 - ii. After switching off the current, the pressure is maintained until the weld cools
 - iii. Water is circulated through hollow electrodes to cool the electrodes
-
- a. i & ii
 - b. i & iii
 - c. ii & iii
 - d. i, ii & iii

(Ans: d)

17. In resistance welding, two electrodes are made of

- a. Aluminum
- b. Copper
- c. Iron
- d. Bronze

(Ans: b)

18. Which of the following is not a resistance welding?

- a. Spot welding
- b. Butt welding
- c. Pressure welding
- d. Percussion welding

(Ans: c)

19. The resistance welding process suitable for welding ferrous and non-ferrous metals up to 8mm thickness is

- a. Spot welding
- b. Projection welding
- c. Butt welding
- d. Pressure welding

(Ans: a)

20. In spot welding, for lap joint, the diameter of welded zone (weld nugget) should be

- a. $4t+2.5\text{mm}$
- b. $8t+2.5\text{mm}$
- c. $12t+2.5\text{mm}$
- d. $2t+2.5\text{mm}$

Where 't' is thickness of sheet

(Ans: d)

21. In spot welding, the spacing between two spot welds is

- a. $4t$
- b. $8t$
- c. $12t$
- d. $16t$

(Ans: c)

22. In spot welding, the tip diameter of electrode is about

- a. \sqrt{t}
- b. $\sqrt{2t}$
- c. $2\sqrt{t}$
- d. $\sqrt{3t}$

(Ans: a)

23. In projection welding, the depth of projection is about

- a. 20% of sheet thickness
- b. 40% of sheet thickness
- c. 60% of sheet thickness
- d. 80% of sheet thickness

(Ans: c)

24. In which of the following resistance welding, a large number of welds can be carried out simultaneously

- a. spot welding
- b. Projection welding
- c. Seam welding
- d. Percussion welding

(Ans: b)

25. Which resistance welding process is used for making continuous welds between two overlapping pieces of sheet metals?

- a. Projection welding
- b. Seam welding
- c. Flash welding
- d. Percussion welding

(Ans: a)

26. The current is not passed continuously in

- a. Projection welding
- b. Seam welding
- c. Flash welding
- d. Percussion welding

(Ans: b)

27. In which of the following resistance welding process, electrodes of two copper wheels are used

- a. Projection welding
- b. Seam welding
- c. Flash welding
- d. Percussion welding

(Ans: b)

28. Electric resistance welded (ERP) pipes are manufactures by

- a. Projection welding
- b. Seam welding
- c. Percussion welding
- d. Flash welding

(Ans: b)

29. Match the following

1. Seam welding
2. Butt welding
3. Percussion welding

1. rods and pipes of uniform cross section
2. Welding satellite tips to tools
3. ERW pipes welding

Which of the following is true?

- a. 1-3, 2-2, 3-1
- b. 1-3, 2-1, 3-2
- c. 1-2, 2-3, 3-1
- d. 1-2, 2-1, 3-3

(Ans: b)

30. In oxy-acetylene welding the flame temperature is

- a. 1600-1700°C
- b. 2000-2100°C
- c. 2500-2600°C
- d. 3200-3300°C

(Ans: d)

31. In oxy-acetylene welding colour of oxygen cylinder is

- a. Red
- b. Maroon
- c. Black
- d. Brown

(Ans: c)

32. In oxy-acetylene welding colour of acetylene cylinder is

- a. Red
- b. Maroon
- c. Black
- d. Brown

(Ans: b)

33. Acetylene can be prepared by the chemical reaction between

- a. Water and Calcium carbide
- b. Water and Calcium carbonate
- c. Hydrogen and Calcium carbide
- d. Hydrogen and Calcium carbonate

(Ans: a)

34. Which flame is suitable for welding of ferrous metals, Cu and Al alloys?

- a. Oxidizing flame
- b. Carburizing flame
- c. Neutral flame
- d. None of the above

(Ans: c)

35. Which flame is suitable for cutting operations?

- a. Oxidizing flame
- b. Carburizing flame
- c. Neutral flame
- d. None of the above

(Ans: a)

36. Which flame is suitable for welding of non-ferrous metals (brasses and bronzes)?

- a. Oxidizing flame
- b. Carburizing flame
- c. Neutral flame
- d. None of the above

(Ans: a)

37. Which flame is suitable for welding steel?

- a. Oxidizing flame
- b. Carburizing flame
- c. Neutral flame
- d. None of the above

(Ans: b)

38. Which of the following is not true for gas welding?

- a. Heat effected zone and distortion are less as compare to arc welding
- b. It is suitable for thin sheets
- c. It is slower than arc welding
- d. There are safety problems in storing and handling the gases

(Ans: a)

39. The temperature of arc in case of arc welding is

- a. 2000°C
- b. 2600°C
- c. 3000°C
- d. 3600°C

(Ans: d)

40. In arc welding, arc initiation voltage is of the order

- a. 20-60V
- b. 60-100V
- c. 100-140V
- d. 140-180V

(Ans: b)

41. A gap of _____ is maintained for producing sound weld

- a. 1mm
- b. 3mm
- c. 5mm
- d. 7mm

(Ans: b)

42. Which of the following welding process uses non-consumable electrode?

- a. Gas tungsten arc welding (TIG)
- b. Shielded metal arc welding
- c. CO₂ shielded welding
- d. Gas metal arc welding (MIG)

(Ans: a)

43. In arc welding, the three elements to be controlled to obtain satisfactory welding operation are

- a. Current, voltage and speed of travel
- b. Current, voltage and arc length
- c. Current, arc length and speed of travel
- d. Voltage, arc length and speed of travel

(Ans: a)

44. In Gas tungsten arc welding (TIG) the following polarity is used

- a. Direct current straight polarity (DCSP)
- b. Direct current reverse polarity (DCRP)
- c. Alternating Current high frequency (ACHF)
- d. All of the above

(Ans: d)

45. Which of the following gas mixtures is not used in Gas tungsten arc welding (TIG)?

- a. Argon-Helium
- b. Argon-Nitrogen
- c. Argon-Hydrogen
- d. Argon-Carbon dioxide

(Ans: b)

46. In Gas metal arc welding (MIG) which of the following polarity is generally used

- a. Direct current straight polarity (DCSP)
- b. Direct current reverse polarity (DCRP)
- c. Alternating Current high frequency (ACHF)
- d. All of the above

(Ans: a)

47. Which welding process is used to join two thick plates in one single pass?

- a. Oxy-acetylene welding
- b. Gas tungsten arc welding (TIG)
- c. Gas metal arc welding (MIG)
- d. Electroslag welding

(Ans: d)

48. The following welding process is used to weld fastener to plates without drilling or punching holes?

- a. Electroslag welding
- b. Oxy-acetylene welding
- c. Butt welding
- d. Stud welding

(Ans: d)

49. For underwater welding which of the following process is not used?

- a. Electroslag welding
- b. Shielded metal arc welding (SMAW)
- c. Gas tungsten arc welding (GTAW)
- d. Gas metal arc welding (MIG)

(Ans: a)

50. The following welding process has greater directional stability due to passage of arc through copper orifice

- a. Oxy-acetylene welding
- b. Gas metal arc welding (MIG)
- c. Gas tungsten arc welding (TIG)
- d. Plasma arc welding

(Ans: d)

51. The process which employ an exothermal chemical reaction to develop high temperature

- a. Electroslag welding
- b. Plasma arc welding
- c. Thermit welding
- d. Stud welding

(Ans: c)

52. During exothermal chemical reaction in Thermal welding, the temperature is of the order of

- a. 2100°C
- b. 2700°C
- c. 3100°C
- d. 3500°C

(Ans: b)

53. Which process is used for repairing of tracks and spokes of driving wheels?

- a. Electroslag welding
- b. Plasma arc welding
- c. Thermit welding
- d. Electron beam welding

(Ans: c)

54. Which process allows fusion welds of great depth with minimum width?

- a. Electron beam welding
- b. Ultrasonic welding
- c. Plasma arc welding
- d. Friction welding

(Ans: a)

Ques.1. In arc welding, the temperature of the arc is of the order of

1. 100° C
2. 1000° C
3. 3500° C
4. 35000° C

Answer.3. **3500°C**

Ques.2. The arc has

1. Linear resistance characteristics
2. Positive resistance characteristics
3. Negative resistance characteristics
4. Highly inductive characteristics

Answer.3. **Negative resistance characteristics**

Ques.3. Arc can be produced by

1. AC current only
2. DC current only
3. Either AC or DC current
4. All of the above

Answer.3. **Either AC or DC current**

Ques.4. The resistance of the arc

1. Decrease with an increase of the current
2. Increases with increases of the current
3. Does not depends on current
4. None of the above

Answer.1. **Decrease with an increase of the current**

Ques.5. In arc welding, the voltage on A.C supply system is in the range

1. 1000-1200 V
2. 400-500 V
3. 200-250 V
4. 70-100V

Answer.4. **70-100V**

Ques.6. In arc welding by dc supply, the voltage required is

1. 10 to 20 V
2. 50 to 60 V
3. 100 to 120 V
4. 200 to 250 V

Answer.2. **50-60V**

Ques.7. In arc welding, once the arc is struck, the voltage required to maintain the arc will be

1. 20-30 V
2. 100-120 V
3. 200-220 V
4. 500-1000 V

Answer.1. **20-30V**

Ques.8. A DC generator used for A.C welding should have

1. Rising characteristics
2. Dropping Characteristics
3. Straight characteristics
4. All of the above

Answer.2. **Dropping Characteristics**

Ques.9. The Polarity of A.C welding sets is

1. Positive
2. Negative
3. No polarity
4. Infinite

Answer.3. **No polarity**

Ques.10. As the thickness of the part to be welded increases, which of the following parameter for ac welding should also increase?

1. Voltage
2. Current
3. Frequency
4. All of the above

Answer.2. **Current**

Ques.11. In “argon arc welding” the electrode is made of

1. Carbon
2. Steel
3. Tungsten
4. No electrode is needed

Answer.3. **Tungsten**

Ques.12. In argon arc welding the purpose of using argon is

1. To prevent oxidation of metal by coming in contact with the oxygen of the air
2. To create an inert atmosphere around the job to be welded
3. To obviate the necessity for using flux
4. All of the above

Answer.4. **All of the above**

Ques.13. Steel rails are welded by

1. Resistance welding
2. Thermit Welding
3. Argon arc welding
4. Gas welding

Answer.2. **Thermit Welding**

Ques.14. In gas welding the gases used are

1. Oxygen and nitrogen
2. Argon and Helium
3. Helium and carbon dioxide
4. Acetylene and oxygen

Answer.4. **Acetylene and oxygen**

Ques.15. Steel pipes are manufactured by

1. Arc welding
2. Thermit welding
3. Resistance welding
4. Argon arc welding

Answer.3. **Resistance welding**

Ques.16. Which of the following is different from the remaining?

1. Spot welding
2. Seam welding
3. Butt welding
4. Argon arc welding

Answer.4. **Argon arc welding**

Ques.17. Two 3 mm thick mild steel sheets are to be welded. The electrode of 18, 16, 3 and 10 Nos are available which one would you select?

1. No: 10
2. No: 3
3. No: 16
4. No: 18

Answer.2. **3**

Ques.18. What is an example of plastic welding?

1. Gas Welding
2. Resistance welding
3. Thermit welding without pressure
4. None of these

Answer.2. **Resistance welding**

Ques.19. Gray iron is usually welded by

1. Arc welding
2. Gas welding
3. TIG welding
4. MIG welding

Answer.1. **Arc welding**

Ques.20. In ultrasonic welding, the frequency range is generally

1. 100 – 4000 cps
2. 4000-20000 cps
3. 20,000-40,000 cps
4. 80,000-200,000 cps

Answer.3. **20,000-40,000 cps**

Ques.21. Arc blow is a welding defect which is encountered in

1. Arc welding using D.C current
2. Arc welding using A.C current
3. Gas welding
4. Thermit welding

Answer.1. **Arc welding using D.C current**

Ques.22. A rectifier for welding has voltage/current characteristic as

1. Drooping
2. Rising
3. Static
4. Variable

Answer.1. **Drooping**

Ques.23. The advantages of welding motor generator is usually in the range of

1. Easily Portable
2. Used for ferrous and Non-ferrous material
3. Can be used for all welding position
4. Less maintenance

Answer.4. **Less maintenance**

Ques.24. For welding duty rectifier commonly used are

1. Mercury arc rectifier
2. Selenium metal rectifier
3. Any of the above
4. None of the above

Answer.2. **Selenium metal rectifier**

Ques.25. In resistance welding, aluminum, as compared to steel, requires

1. Larger welding time
2. Smaller welding time
3. Equal welding time
4. Welding time depends upon the value of weld current

Answer.2. **Smaller welding time**

Ques.26. Which of the following is not a welding accessory?

1. Electrode holder
2. Work Clamp
3. Cable
4. Gloves

Answer.4. **Gloves**

Ques.27. Chipping hammers are used

1. To remove slag from welding
2. To align the pieces to be welded
3. For targe welding
4. For marking spots to be welded

Answer.1. **To remove slag from welding**

Ques.28. The welding electric circuit is

1. Always earthed
2. Never earthed
3. Through cables only
4. None of the above

Answer.1. **Always earthed**

Ques.29. The eyes of the welding operator must be protected against

1. Ultraviolet radiation
2. Infrared radiations
3. Both (A) and (B)
4. Solar radiation

Answer.3. **Both (A) and (B)**

Ques30. The danger of electric shock is maximum

1. During arcing
2. After arcing
3. Before welding
4. While inserting an electrode into the holder

Answer.4. **While inserting an electrode into the holder**

Resistance Welding methods

1. Which kind of resistance is experienced in upset butt welding?

- a) Electric resistance
- b) Magnetic resistance
- c) Thermal resistance
- d) Air resistance

Answer: a

Explanation: In the making of an upset butt welding, there are jaws made of copper, into which the part to be welded is put, and hence a solid contact is made. At this point of contact, while the current flows, it gets transformed into heat because of electric resistance.

2. Which of the following can be easily be welded from flash butt welding process?

- a) Tin
- b) Lead
- c) Cast irons
- d) Carbon steel

Answer: d

Explanation: In flash butt welding process, the welding of materials like steels and other iron alloys are easy to weld, except for cast iron. The welding of materials like tin, lead, zinc and antimony cannot be welded using flash butt method.

3. Electrodes used in spot welding are made up of which material?

- a) Only Copper
- b) Copper and tungsten
- c) Copper and chromium
- d) Copper and aluminium

Answer: d

Explanation: The electrodes that are employed in the spot welding are required to possess a high amount of electrical and thermal conductivity. Hence, they are primarily made up of copper or copper and tungsten or copper and chromium.

4. How are the metals to be welded connected to each other in spot welding?

- a) Electric contact
- b) Magnetic field

- c) Mechanical pressure
- d) Direct contact

Answer: c

Explanation: In spot welding process, the metal or the alloy parts which are to be welded, are heated in their in their zones. To bring these parts in contact with one another, mechanical pressure is applied, causing them to connect.

5. Which of the following method is not used in applying pressure in spot welding process?
- a) Hand lever
 - b) Foot lever
 - c) Air pressure
 - d) Hydraulic cylinder

Answer: a

6. Up to what thickness, can steel be welded using spot welding process?
- a) 10 mm
 - b) 11 mm
 - c) 12 mm
 - d) 13 mm

Answer: c

Explanation: In spot welding process, to bring the heated parts in contact with one another, mechanical pressure is applied. This pressure can be of three types, by using foot lever, by providing air pressure or by using a hydraulic cylinder. The use of these methods allows steel or other metal parts to be welded up to a thickness of 12 mm.

7. What is the maximum power supply needed for the working of spot-welding process?
- a) 135 kVA
 - b) 140 kVA
 - c) 145 kVA
 - d) 150 kVA

Answer: d

Explanation: Spot welding can be used for all types of ductile metals. It can also be employed for structures of sheet metals, and can be applied for making of boxes and cans. For its applications, the maximum power that can be needed for this process is 150 kVA.

8. What is the minimum power supply needed for the working of spot-welding process?

- a) 10 kVA
- b) 14 kVA
- c) 6 kVA
- d) 22 kVA

Answer: a

9. Upset butt welding is majorly used in the making of automobile parts.

- a) True
- b) False

Answer: b

Explanation: Upset butt welding is mainly used for the manufacture of welding bars, rods, wires or tubing. For the manufacture of automobile parts, such as axles, wheels or frames, flash butt welding is extensively used.

10. In flash butt welding, the forced out metal is called flash.

- a) True
- b) False

Answer: a

Explanation: In flash butt welding process, there is a light contact between the edges. A high voltage is supplied when the flashing action takes place. In this process, the metal that is forced out, is called as flash.

Thermit Welding

1. In an iron thermit, how many moles of aluminium reacts with three moles of iron oxide to give nine moles of iron?
- a) 6
 - b) 7
 - c) 8
 - d) 9

Answer: c

Explanation: The thermit process, which is used for welding depends on the chemical reaction between oxide of iron and aluminium metal. According to this reaction, when 8 moles of aluminium reacts with 3 moles of iron oxide, then, 4 moles of aluminium oxide and 9 moles of iron is formed.

2. What is the magnitude of temperature produced in a thermit reaction?
- a) 2500°C
 - b) 3000°C
 - c) 3500°C
 - d) 4000°C

Answer: b

Explanation: Thermit welding is called as fusion welding. A superheated melt operates in this type of melt. The heat that is produced has the temperature approximately twice than that of the melting point of steel, which is about 3000°C.

3. Thermit welding is used for making rail tracks.
- a) True
 - b) False

Answer: a

Explanation: A superheated melt operates in this type of melt. The production of pipes, rail tracks, shafts or big gears can be done using thermit pressure welding. Thermit welding is called as fusion welding.

Solid State Welding

1. At what temperature, does fusion welding takes place?

- a) 850°C
- b) 900°C
- c) 950°C
- d) 1000°C

Answer: b

Explanation: The process of fusion welding can be used for joining metal to a metal or a metal can be joined to a ceramic. For the joining of this process, a temperature of 900°C is provided for the approach.

2. Which of the following is not a type of diffusion welding?

- a) Gas-pressure welding
- b) Vacuum fusion welding
- c) Eutectic fusion bonding
- d) Eutectoid fusion welding

Answer: d

Explanation: Diffusion welding is having three basic techniques which are incorporated by it. These three basic techniques are, gas – pressure welding, vacuum fusion welding and eutectic fusion welding.

3. What is the minimum frequency used in ultrasonic welding?

- a) 10,000 Hz
- b) 20,000 Hz
- c) 30,000 Hz
- d) 40,000 Hz

Answer: b

Explanation: The process of ultrasonic welding is mainly used for the joining of similar metals or dissimilar metals using vibration energy, by way of high frequency. The minimum frequency needed for this purpose is 20,000 Hz.

4. What is the maximum frequency used in ultrasonic welding?

- a) 30,000 Hz
- b) 40,000 Hz
- c) 50,000 Hz
- d) 60,000 Hz

Answer: d

5. In what conditions are the parts kept before welding in ultrasonic welding method?

- a) Low static pressure
- b) High static pressure
- c) Low moving pressure
- d) High moving pressure

Answer: a

Explanation: In ultrasonic welding method, the parts which are to be joined, are kept clamping to one another in between of supporting member and the welding tip. This clamping is done at a low static pressure.

6. What is the maximum thickness that can be welded in ultrasonic welding?

- a) 1.8 mm
- b) 2.1 mm
- c) 2.3 mm
- d) 2.5 mm

Answer: d

Explanation: Welding such as spot welding or continuous seam welding can be done through ultrasonic welding. The maximum thickness that can be achieved varies depending on the metal. The maximum thickness that can be welded is 2.5mm.

7. Electric currents are passed in ultrasonic welding.

- a) True
- b) False

Answer: b

Explanation: In ultrasonic welding method, the parts which are to be joined, are kept clamping to one another in between of supporting member and the welding tip. In doing this, no current is required to be passed through the metal, and usually, no heat is needed for this too.

8. What is the minimum thickness that can be welded in ultrasonic welding?

- a) 0.58 mm
- b) 0.21 mm
- c) 0.38 mm
- d) 0.92 mm

Answer: c

9. Which of the following is not a factor for explosive welding?

- a) High relative velocity
- b) Less amount of plastics
- c) Proper orientation
- d) High pressure

Answer: b

Explanation: While considering for explosive welding, the factors that one needs to understand is that, there has to be high relative velocity. There should be proper orientation and it needs to be kept under high amount of pressure.

10. ' α ' is the angle between target plate and flyer plate.

- a) True
- b) False

Answer: a

Explanation: The workpiece which has its position fixed is called as the target plate and the other plate is called as flyer plate. The distance between the two plates is denoted by 'd' and the angle between them is denoted by ' α '.

Welding of Various Metals

1. Which of the following methods cannot be used for welding carbon steel?

- a) Arc welding
- b) Gas welding
- c) Ultrasonic welding
- d) Forge welding

Answer: c

Explanation: For the welding of carbon steel material, one may use the arc welding method. To gas weld carbon steel is also a feasible option and carbon steels can be treated using forge welding also, but it cannot be welded using ultrasonic welding.

2. High alloys steels are preheated up to what temperature?

- a) 350°C
- b) 400°C
- c) 450°C
- d) 500°C

Answer: b

Explanation: High alloy steels are those steels which contain high amount of carbon in them. These alloys need to be preheated before welding in order to avoid cracking. The temperature up to which these alloys are preheated is 400°C.

3. Up to what percent of carbon content in steel, it is not required to preheat it?

- a) 0.25% – 0.3%
- b) 0.3% – 0.35%
- c) 0.35% – 0.4%
- d) 0.4% – 0.45%

Answer: a

Explanation: Low carbon steels are the ones containing low amount of carbon in them, which does not require preheating. The amount of carbon content needed in low carbon steels, is 0.25% to 0.3%, if preheating is to be avoided.

4. Which of the following material is not used in alloy steels?

- a) Molybdenum
- b) Nickel

- c) Chromium
- d) Sodium

Answer: d

Explanation: In alloy steels, there is a big composition used up by iron. Along with iron, there vitally has to be carbon in alloy steels. Along with carbon, there is a presence of other elements such as, molybdenum, nickel and chromium in small amounts.

5. Which among the following methods is best suited for stainless steels?

- a) Electric butt welding
- b) Seam welding
- c) Flux coated arc welding
- d) Oxy-hydrogen welding

Answer: a

Explanation: There are a few methods of treating stainless steels for welding, such as, any of the metal arc welding methods or the oxy-acetylene welding method, but the one best suited for this alloy is electric butt welding.

6. Stainless steels are annealed at what temperature?

- a) 650°C – 700°C
- b) 700°C – 750°C
- c) 750°C – 800°C
- d) 800°C – 850°C

Answer: c

Explanation: Stainless steels are hardened by constant heating and cooling and the best method suited for this alloy is electric butt welding. As soon as the stainless-steel alloy is electric butt welded, it needs to be annealed at a temperature in between 750°C to 800°C.

7. Which of the following is not a material used for making an electrode in metal arc welding, for treating stainless steels?

- a) Niobium
- b) Columbium
- c) Titanium
- d) Potassium

Answer: d

Explanation: Stainless steels are best welded using the electric butt welding method and then followed by annealing at around 750°C to 800°C. Stainless steels can also be welded using the metal arc welding methods. For this the electrode which is needed is made up of niobium, titanium and columbium. These materials avoid the occurrence of the defect called weld decay.

8. What is the temperature needed for preheating in cast irons?

- a) 550°C
- b) 600°C
- c) 650°C
- d) 700°C

Answer: b

Explanation: Cast irons, upon the removal of welding heat, get solidified very quickly. This solidification takes place due to the surrounding cold mass and the air around. Because of such quick cooling, the carbon gets retained and hard metal stays in the weld. To overcome this, cast irons have to be preheated to 600°C.

9. Low carbon steels need not be preheated before welding.

- a) True
- b) False

Answer: a

Explanation: Carbon steels which contain carbon in a very low amount are not compulsorily required to be preheated before undergoing welding if the large runs are made. This is because, in low carbon steels, unlike high carbon steels, there is no cracking seen on welding.

10. Carbon steels can be fusion welded.

- a) True
- b) False

Answer: b

Explanation: Carbon steels are best treated using forge welding, resistance welding, arc welding or by gas welding. Carbon steels essentially cannot be fusion welded, because, of the occurrence of cracks which may cause due to carbon pick up.