SECTION 1: Fundamental Units – MCQs

1. Which of the following is a fundamental unit of length in the CGS system?
A) Meter
B) Foot
C) Centimeter
D) Inch
Answer: C) Centimeter

2. In the FPS system, the unit of mass is:
A) Kilogram
B) Pound
C) Gram
D) Slug
Answer: B) Pound

3. What is the SI unit of temperature?
A) Celsius
B) Fahrenheit
C) Kelvin
D) Rankine
Answer: C) Kelvin

4. 1 meter is equal to how many centimeters?
A) 10
B) 100
C) 1000
D) 0.01
Answer: B) 100

5. Convert 1 kg into grams.
A) 100 g
B) 1000 g
C) 10,000 g
D) 1 g
Answer: B) 1000 g

6. Which of the following is NOT a fundamental quantity?
A) Length
B) Time
C) Force
D) Temperature
Answer: C) Force

SECTION 2: Derived Units – MCQs

7. What is the SI unit of Force?

A) Dyne

B) Newton

C) Pound-force

D) Erg

Answer: B) Newton

8. Which formula is used to calculate force?

A) $F = mv$

B) $F = ma$

C) $F = m/g$

D) $F = m \times v^2$

Answer: B) $F = ma$

9. 1 Newton is equal to how many dynes?

A) 10

B) 100

C) 1000

D) 100000

Answer: D) 100000 dynes

10. What is the unit of energy in the SI system?

A) Calorie

B) Erg

C) Joule

D) Watt

Answer: C) Joule

11. What is the derived unit of power in the SI system?

A) Joule

B) Watt

C) Erg

D) Newton

Answer: B) Watt

12. Velocity is a derived quantity. What is its SI unit?

A) m/s

B) km/h

C) cm/s

D) ft/s

Answer: A) m/s

13. Which is the correct formula for density?
A) Mass × Volume
B) Volume / Mass
C) Mass / Volume
D) Force / Acceleration
Answer: C) Mass / Volume

14. The unit of volume in the CGS system is:
A) m^3
B) cm^3
C) liter
D) cc
Answer: B) cm^3

15. 1 Joule = ? erg
A) 10^5
B) 10^6
C) 10^7
D) 10^8
Answer: C) 10^7 erg

16. Acceleration is measured in which unit in the MKS system?
A) m/s
B) m/s^2
C) cm/s^2
D) ft/s^2
Answer: B) m/s^2

SECTION 3: Simple Numerical-Based MCQs
17. A car accelerates from rest at 2 m/s^2. What is its velocity after 5 seconds?
A) 2 m/s
B) 5 m/s
C) 10 m/s
D) 20 m/s
Answer: C) 10 m/s
Explanation: ($v = u + at = 0 + 2\times5 = 10$, m/s)

18. Calculate the force required to accelerate a 10 kg object at 3 m/s^2.
A) 3 N
B) 30 N
C) 13 N
D) 300 N

Answer: B) 30 N
Explanation: (F = ma = 10 × 3 = 30 , N)

19. Find the work done if a force of 5 N moves an object 3 meters.
A) 8 J
B) 15 J
C) 10 J
D) 5 J
Answer: B) 15 J
Explanation: (W = F × d = 5 × 3 = 15 , J)

20. A machine does 200 J of work in 10 seconds. What is its power output?
A) 10 W
B) 20 W
C) 2000 W
D) 100 W
Answer: B) 20 W
Explanation: (P = W/t = 200/10 = 20 , W)

Mechanical Properties

1. Which of the following describes the ability of a material to return to its original shape after the removal of an applied load?
A) Plasticity
B) Elasticity
C) Malleability
D) Toughness
Answer: B) Elasticity

2. Which property is defined as the ability of a material to be permanently deformed without breaking?
A) Ductility
B) Malleability
C) Plasticity
D) Brittleness
Answer: C) Plasticity

3. Which of the following is a material that is easily deformed under compression?
A) Ductile material
B) Malleable material
C) Brittle material
D) Stiff material

Answer: B) Malleable material

4. A material that can be stretched into a wire without breaking is called:
   A) Brittle
   B) Ductile
   C) Malleable
   D) Tough
   Answer: B) Ductile

5. Which property describes a material's ability to absorb energy without fracturing?
   A) Toughness
   B) Brittleness
   C) Hardness
   D) Stiffness
   Answer: A) Toughness

6. Which of the following refers to the resistance of a material to deformation under load?
   A) Strength
   B) Stiffness
   C) Resilience
   D) Elasticity
   Answer: B) Stiffness

7. Which property is a measure of a material's resistance to indentation?
   A) Hardness
   B) Toughness
   C) Plasticity
   D) Brittleness
   Answer: A) Hardness

8. Which material property is defined as the capacity to absorb energy when elastically deformed and to recover that energy upon unloading?
   A) Resilience
   B) Fatigue
   C) Endurance
   D) Creep
   Answer: A) Resilience

9. Which phenomenon describes the gradual deformation of a material under constant stress over time?
   A) Fatigue
   B) Endurance

C) Creep
D) Elasticity
Answer: C) Creep

10. Which of the following terms describes the weakening of a material caused by repeated cyclic loading?
A) Fatigue
B) Endurance
C) Malleability
D) Resilience
Answer: A) Fatigue

Thermal Properties

11. Which of the following is the ability of a material to conduct heat?
A) Thermal conductivity
B) Specific heat
C) Thermal diffusivity
D) Melting point
Answer: A) Thermal conductivity

12. The ability of a material to store heat energy is known as:
A) Thermal conductivity
B) Thermal expansion
C) Specific heat
D) Thermal diffusivity
Answer: C) Specific heat

13. Which property describes the change in volume of a material with change in temperature?
A) Thermal conductivity
B) Thermal expansion
C) Thermal shock
D) Melting point
Answer: B) Thermal expansion

14. Which of the following is a measure of the rate at which heat spreads through a material?
A) Thermal conductivity
B) Thermal diffusivity
C) Specific heat
D) Thermal shock
Answer: B) Thermal diffusivity

15. Thermal fatigue refers to the failure of materials caused by:
A) Thermal shock
B) Repeated heating and cooling cycles
C) High-temperature stress
D) Increased specific heat
Answer: B) Repeated heating and cooling cycles

16. Which of the following occurs when a material cracks or breaks due to rapid temperature changes?
A) Thermal shock
B) Thermal expansion
C) Thermal diffusivity
D) Melting point
Answer: A) Thermal shock

17. The temperature at which a material transitions from a solid to a liquid is called:
A) Melting point
B) Boiling point
C) Specific heat
D) Thermal expansion
Answer: A) Melting point

Electrical Properties

18. The resistance of a material to the flow of electric current is known as:
A) Conductivity
B) Resistivity
C) Dielectric strength
D) Temperature coefficient of resistance
Answer: B) Resistivity

19. Which property measures a material's ability to conduct electric current?
A) Resistivity
B) Conductivity
C) Dielectric strength
D) Temperature coefficient of resistance
Answer: B) Conductivity

20. Which of the following refers to the maximum electric field a material can withstand without breaking down?
A) Dielectric strength
B) Resistivity

C) Conductivity
D) Temperature coefficient of resistance
Answer: A) Dielectric strength

21. The change in resistivity of a material with temperature is known as:
A) Conductivity
B) Dielectric strength
C) Temperature coefficient of resistance
D) Resistivity
Answer: C) Temperature coefficient of resistance

Chemical Properties

22. Which of the following describes a material's reaction with oxygen?
A) Oxidation
B) Corrosion
C) Rusting
D) All of the above
Answer: D) All of the above

23. Which property refers to the reaction of a material with water, often leading to the formation of rust or other compounds?
A) Oxidation
B) Hydration
C) Corrosion
D) Rusting
Answer: C) Corrosion

24. Which reaction occurs when a material interacts with an acid?
A) Neutralization
B) Oxidation
C) Acid-base reaction
D) None of the above
Answer: C) Acid-base reaction

25. When a material reacts with a base, the process is generally referred to as:
A) Corrosion
B) Alkaline attack
C) Oxidation
D) Rusting
Answer: B) Alkaline attack

Here are some multiple-choice questions (MCQs) related to the topics of Magnetic Flux Density, Magnetic Field Strength, Magnetic Moment, Magnetization, and Magnetic Susceptibility:

Magnetic Properties

1. What is the term for the amount of magnetic field in a given area?
   A) Magnetic Moment
   B) Magnetic Susceptibility
   C) Magnetic Flux Density
   D) Magnetic Field Strength
   Answer: C) Magnetic Flux Density

2. Which of the following is a measure of the strength of a magnetic field in a material?
   A) Magnetic Susceptibility
   B) Magnetic Field Strength
   C) Magnetization
   D) Magnetic Flux Density
   Answer: B) Magnetic Field Strength

3. Which of the following defines the tendency of a material to become magnetized when placed in a magnetic field?
   A) Magnetic Flux Density
   B) Magnetization
   C) Magnetic Susceptibility
   D) Magnetic Moment
   Answer: C) Magnetic Susceptibility

4. What is the term for the magnetic moment per unit volume of a material?
   A) Magnetic Susceptibility
   B) Magnetization
   C) Magnetic Field Strength
   D) Magnetic Flux Density
   Answer: B) Magnetization

5. Which quantity is the vector product of the magnetic moment and the magnetic field strength?
   A) Magnetic Flux Density
   B) Magnetic Force
   C) Magnetic Field Strength
   D) Magnetic Moment
   Answer: B) Magnetic Force

6. What is the unit of magnetic flux density (B)?
   A) Tesla (T)
   B) Ampere-turns (At)
   C) Weber (Wb)
   D) Gauss (G)
   Answer: A) Tesla (T)

7. What is the relationship between magnetic field strength (H) and magnetic flux density (B) in a vacuum?
   A) $B = \mu_0 H$
   B) $B = H / \mu_0$
   C) $B = \mu_0 H \rho$
   D) $B = H \mu_0 \varepsilon_0$
   Answer: A) $B = \mu_0 H$

8. Magnetic susceptibility (χ) is defined as:
   A) The ratio of magnetic flux density to the magnetic field strength
   B) The ratio of magnetization to the magnetic field strength
   C) The ratio of magnetization to the external magnetic field
   D) The ratio of magnetic field strength to the magnetic flux density
   Answer: C) The ratio of magnetization to the external magnetic field

9. What is the magnetic moment of a current loop given by?
   A) $M = I A$
   B) $M = I r$
   C) $M = B A$
   D) $M = H A$
   Answer: A) $M = I A$

10. Which of the following materials has a negative magnetic susceptibility?
   A) Diamagnetic materials
   B) Paramagnetic materials
   C) Ferromagnetic materials
   D) None of the above
   Answer: A) Diamagnetic materials

11. A material with high magnetic susceptibility will likely exhibit which type of magnetic behavior?
   A) Diamagnetic
   B) Paramagnetic
   C) Ferromagnetic
   D) Non-magnetic

Answer: C) Ferromagnetic

12. What is the term used for the intrinsic magnetic property of a material due to its atomic structure or electron alignment?

A) Magnetization
B) Magnetic Flux Density
C) Magnetic Moment
D) Magnetic Susceptibility
Answer: A) Magnetization

13. The magnetic field strength (H) in a material is directly proportional to which of the following properties?

A) Magnetization
B) Magnetic Flux Density
C) Magnetic Susceptibility
D) All of the above
Answer: D) All of the above

14. What is the relationship between the magnetic moment and the external magnetic field in the case of a magnetic material?

A) The magnetic moment is inversely proportional to the field strength
B) The magnetic moment is directly proportional to the field strength
C) The magnetic moment is unrelated to the field strength
D) The magnetic moment is directly proportional to the temperature
Answer: B) The magnetic moment is directly proportional to the field strength

15. Which material typically has high magnetic susceptibility and is strongly magnetized in the presence of a magnetic field?

A) Ferromagnetic material
B) Paramagnetic material
C) Diamagnetic material
D) Non-magnetic material
Answer: A) Ferromagnetic material

16. Which of the following statements about diamagnetic materials is true?

A) They have a positive magnetic susceptibility
B) They are attracted to magnetic fields
C) They have a negative magnetic susceptibility
D) They exhibit permanent magnetization
Answer: C) They have a negative magnetic susceptibility

17. Which of the following is true about the relationship between magnetic flux density (B) and magnetic field strength (H) in ferromagnetic materials?

A) B and H are always equal
B) B is proportional to H, but not always linearly
C) B is independent of H
D) B decreases as H increases

Answer: B) B is proportional to H, but not always linearly

18. The phenomenon where the magnetic moment of an atom or a material aligns with an applied magnetic field is called:

A) Magnetization
B) Magnetic Susceptibility
C) Magnetic Hysteresis
D) Magnetic Moment

Answer: A) Magnetization

CAST IRON

1. Which element is primarily responsible for the formation of graphite in grey cast iron?

A) Sulfur
B) Phosphorus
C) Silicon
D) Manganese

Answer: C) Silicon

2. Which type of cast iron has a white fractured surface due to the presence of cementite?

A) Grey cast iron
B) White cast iron
C) Malleable cast iron
D) Nodular cast iron

Answer: B) White cast iron

3. Which of the following types of cast iron is obtained by heat treating white cast iron?

A) Grey cast iron
B) Malleable cast iron
C) Ductile cast iron
D) Nodular cast iron

Answer: B) Malleable cast iron

4. Which of the following is a typical application of grey cast iron?

A) Ball bearings
B) Railway wheels
C) Engine blocks

D) Drill bits
Answer: C) Engine blocks

5. Grey cast iron is known for its:
A) High ductility
B) High tensile strength
C) Excellent machinability and vibration damping
D) High corrosion resistance
Answer: C) Excellent machinability and vibration damping

STEEL – PLAIN CARBON STEEL

6. Which of the following carbon steel types has the highest carbon content?
A) Low carbon steel
B) Mild steel
C) Medium carbon steel
D) High carbon steel
Answer: D) High carbon steel

7. Steel with carbon content between 0.25% to 0.65% is classified as:
A) Low carbon steel
B) Medium carbon steel
C) High carbon steel
D) Mild steel
Answer: B) Medium carbon steel

8. Mild steel typically contains about how much carbon?
A) 0.15%
B) 0.25%
C) 0.45%
D) 0.65%
Answer: B) 0.25%

9. Which type of carbon steel is best suited for making structural components like beams and channels?
A) High carbon steel
B) Medium carbon steel
C) Mild steel
D) Tool steel
Answer: C) Mild steel

10. What is the primary alloying element in plain carbon steel apart from iron?
A) Manganese

B) Carbon
C) Silicon
D) Chromium
Answer: B) Carbon

ALLOY STEELS

11. Which of the following is a property of tool steel?
A) Low hardness
B) Low wear resistance
C) High toughness and wear resistance
D) Poor machinability
Answer: C) High toughness and wear resistance

12. Which element is primarily added to steel to make stainless steel corrosion-resistant?
A) Nickel
B) Manganese
C) Chromium
D) Tungsten
Answer: C) Chromium

13. Which alloy steel is commonly used in cutting tools due to its ability to retain hardness at high temperatures?
A) Mild steel
B) High-speed steel
C) Malleable cast iron
D) Grey cast iron
Answer: B) High-speed steel

14. High-speed steel (HSS) typically contains which major alloying elements?
A) Chromium and Manganese
B) Tungsten, Molybdenum, and Chromium
C) Nickel and Copper
D) Carbon and Lead
Answer: B) Tungsten, Molybdenum, and Chromium

15. Which type of steel is preferred for surgical instruments due to its high corrosion resistance and shine?
A) Mild steel
B) High carbon steel
C) Stainless steel
D) Tool steel
Answer: C) Stainless steel

16. Tool steels are typically used for:
A) Railway tracks
B) Pipes and fittings
C) Cutting and forming tools
D) Building structures
Answer: C) Cutting and forming tools

17. Which alloying element in steel increases wear resistance and hardness, especially in tool steels?
A) Nickel
B) Lead
C) Tungsten
D) Phosphorus
Answer: C) Tungsten

18. Which of the following steels is suitable for making springs and wires?
A) High carbon steel
B) Low carbon steel
C) Malleable cast iron
D) Stainless steel
Answer: A) High carbon steel

GENERAL

19. Which of the following is a ferrous material?
A) Brass
B) Bronze
C) Cast Iron
D) Aluminum
Answer: C) Cast Iron

20. What distinguishes alloy steel from plain carbon steel?
A) Alloy steel contains only carbon and iron
B) Alloy steel contains additional alloying elements like Cr, Ni, W
C) Alloy steel has less strength
D) Alloy steel is cheaper
Answer: B) Alloy steel contains additional alloying elements like Cr, Ni, W

Here are Multiple-Choice Questions (MCQs) with answers based on Non-Ferrous Materials, their properties, composition, and applications including Aluminum Alloys, Copper Alloys, Zinc Alloys, and Nickel Alloys.

Aluminum and Aluminum Alloys

1. Which of the following is a major property of aluminum?
A) High density
B) Magnetic
C) Lightweight and corrosion-resistant
D) Brittle
Answer: C) Lightweight and corrosion-resistant

2. Which aluminum alloy contains copper as the primary alloying element and is used in aircraft structures?
A) Y-Alloy
B) Duralumin
C) Hindalium
D) Monel
Answer: B) Duralumin

3. Y-Alloy is mainly an aluminum alloy containing:
A) Copper, Nickel, Magnesium
B) Copper, Zinc
C) Tin, Lead
D) Nickel, Zinc
Answer: A) Copper, Nickel, Magnesium

4. Hindalium is an alloy of aluminum with which element(s)?
A) Zinc and Lead
B) Magnesium and Manganese
C) Copper and Nickel
D) Magnesium, Manganese, and Silicon
Answer: D) Magnesium, Manganese, and Silicon

5. Which of the following is commonly used in the manufacture of kitchen utensils and pressure cookers?
A) Duralumin
B) Hindalium
C) Bronze
D) Gunmetal
Answer: B) Hindalium

6. Which non-ferrous metal is known for its use in lightweight structural applications like aerospace and automotive parts?

A) Copper
B) Aluminum
C) Tin
D) Zinc
Answer: B) Aluminum

Copper and Copper Alloys

7. Which property makes copper suitable for electrical wiring?
A) High hardness
B) Low density
C) High electrical conductivity
D) High magnetic permeability
Answer: C) High electrical conductivity

8. Brass is an alloy of:
A) Copper and tin
B) Copper and zinc
C) Copper and aluminum
D) Copper and lead
Answer: B) Copper and zinc

9. Bronze is an alloy of:
A) Copper and zinc
B) Copper and tin
C) Copper and aluminum
D) Copper and lead
Answer: B) Copper and tin

10. Gun metal is primarily composed of:
A) Copper, Zinc, and Lead
B) Copper, Tin, and Zinc
C) Copper and Tin
D) Copper, Nickel, and Chromium
Answer: B) Copper, Tin, and Zinc

11. Which of the following copper alloy is best suited for making bearings?
A) Bronze
B) Gun metal
C) Leaded bronze
D) Brass
Answer: C) Leaded bronze

12. Which non-ferrous metal is commonly used for making solders and bearings due to its low melting point?
A) Lead
B) Tin
C) Zinc
D) Aluminum
Answer: B) Tin

Zinc-Based Alloys

13. Solder is typically a combination of:
A) Zinc and Copper
B) Tin and Lead
C) Aluminum and Zinc
D) Copper and Nickel
Answer: B) Tin and Lead

14. German silver is an alloy of:
A) Silver and Nickel
B) Copper, Nickel, and Zinc
C) Copper and Silver
D) Zinc and Silver
Answer: B) Copper, Nickel, and Zinc

15. Which of the following is NOT a property of zinc-based alloys?
A) High melting point
B) Good corrosion resistance
C) Easy to cast
D) Non-magnetic
Answer: A) High melting point

Nickel-Based Alloys

16. Which nickel-based alloy is known for its high-temperature strength and corrosion resistance in jet engines?
A) Inconel
B) Monel
C) Bronze
D) Duralumin
Answer: A) Inconel

17. Monel is a nickel-based alloy primarily composed of:
A) Nickel and Aluminum
B) Nickel and Chromium

C) Nickel and Copper
D) Nickel and Tin
Answer: C) Nickel and Copper

18. Which of the following nickel alloy is commonly used in chemical processing equipment due to its corrosion resistance?
A) German Silver
B) Inconel
C) Gunmetal
D) Brass
Answer: B) Inconel

19. Monel is used in which of the following applications?
A) Aircraft engines
B) Marine engineering and chemical plants
C) Electrical wiring
D) Construction frames
Answer: B) Marine engineering and chemical plants

20. Which property is common to both Inconel and Monel?
A) Poor corrosion resistance
B) High thermal conductivity
C) High corrosion resistance
D) Low strength at high temperature
Answer: C) High corrosion resistance

Here are Multiple Choice Questions (MCQs) with answers based on the topics of:

Non-Metals (Polymers, Ceramics, Composites)
Carpentry & Fitting Practice
Kinematics of Machines (Links, Pairs, Constrained Motions, Chains, Inversions)

POLYMERS

1. Which of the following is a thermoplastic?
A) Bakelite
B) Epoxy
C) Polyethylene (PE)
D) Melamine
Answer: C) Polyethylene (PE)

2. Which polymer is widely used in 3D printing and is biodegradable?
A) PVC
B) PLA
C) Nylon
D) ABS
Answer: B) PLA

3. Which of the following is a thermosetting polymer?
A) PVC
B) ABS
C) Epoxy
D) Nylon
Answer: C) Epoxy

4. Which property is common in thermosetting plastics?
A) They soften on heating
B) They can be reshaped
C) They cannot be remelted once set
D) They are flexible
Answer: C) They cannot be remelted once set

5. Bakelite is commonly used for:
A) Pipes
B) 3D printing
C) Electrical insulators
D) Packaging
Answer: C) Electrical insulators

CERAMICS

6. Which of the following is a characteristic of ceramics?
A) High ductility
B) High thermal conductivity
C) High hardness and brittleness
D) High plasticity
Answer: C) High hardness and brittleness

7. Silicon carbide is an example of which type of ceramic?
A) Oxide
B) Carbide
C) Nitride
D) Composite
Answer: B) Carbide

8. Alumina (Al_2O_3) is an example of:
A) Carbide ceramic
B) Oxide ceramic
C) Polymer
D) Composite
Answer: B) Oxide ceramic

9. Which of the following applications commonly use ceramic materials?
A) Electrical wiring
B) Structural beams
C) Cutting tools and abrasives
D) Bearings in turbines
Answer: C) Cutting tools and abrasives

COMPOSITES

10. GFRP stands for:
A) Glass Fiber Reinforced Polymer
B) Graphite Fiber Reinforced Plastic
C) Graphene Filled Resin Polymer
D) General Fiber Reinforced Plastic
Answer: A) Glass Fiber Reinforced Polymer

11. CFRP is a composite material made of:
A) Carbon and resin
B) Carbon and copper
C) Carbon and glass
D) Copper and fiberglass
Answer: A) Carbon and resin

12. Which of the following is a typical application of CFRP?
A) Furniture
B) Building bricks
C) Aircraft structures
D) Pipe fittings
Answer: C) Aircraft structures

13. Composites are generally used because of:
A) High weight
B) Low cost
C) High strength-to-weight ratio
D) Poor fatigue resistance

Answer: C) High strength-to-weight ratio

CARPENTRY & FITTING PRACTICE

14. In carpentry, the tool used to check right angles is:
A) Saw
B) Bevel gauge
C) Try square
D) Mallet
Answer: C) Try square

15. Which tool is used in fitting for measuring dimensions?
A) Hacksaw
B) Vernier caliper
C) Chisel
D) File
Answer: B) Vernier caliper

16. The process of removing excess material in fitting practice is known as:
A) Drilling
B) Filing
C) Turning
D) Casting
Answer: B) Filing

KINEMATICS OF MACHINES

17. Which of the following is a kinematic link?
A) Nut and bolt together
B) Crank in an engine
C) Connecting rod
D) All of the above
Answer: D) All of the above

18. In a turning pair, the motion is:
A) Sliding only
B) Rolling only
C) Rotational
D) Translational
Answer: C) Rotational

19. A kinematic pair with completely constrained motion is:

A) Shaft in a bearing
B) Screw and nut
C) Key and slot
D) All of the above
Answer: D) All of the above

20. A combination of links forming a closed chain with motion is called:
A) Structure
B) Mechanism
C) Machine
D) Frame
Answer: B) Mechanism

21. A machine is defined as:
A) A set of rigid bodies with no relative motion
B) A structure with fixed motion
C) A mechanism that performs useful work
D) An assembly of parts used for support
Answer: C) A mechanism that performs useful work

22. In a kinematic chain, if no relative motion occurs, it is called a:
A) Mechanism
B) Machine
C) Structure
D) Frame
Answer: C) Structure

23. Inversions of kinematic chains are obtained by:
A) Adding more links
B) Fixing different links
C) Changing material
D) Breaking a link
Answer: B) Fixing different links

24. Which of the following is an inversion of a four-bar chain?
A) Beam engine
B) Watt’s mechanism
C) Crank-rocker mechanism
D) All of the above
Answer: D) All of the above

25. The beam engine mechanism is an inversion of:

A) Slider-crank chain
B) Four-bar chain
C) Double slider chain
D) Scotch yoke mechanism
Answer: B) Four-bar chain

Here are MCQs with answers based on the topics you mentioned under:

Inversions & Kinematic Chains

1. Which of the following is an inversion of the single slider crank chain?
A) Beam Engine
B) Whitworth Quick Return Mechanism
C) Double Crank Mechanism
D) Scotch Yoke Mechanism
Answer: B) Whitworth Quick Return Mechanism

2. The quick return motion mechanism is used in:
A) Engines
B) Lathes
C) Shaping machines
D) Automobiles
Answer: C) Shaping machines

3. In a Scotch yoke mechanism, the slider moves in:
A) Circular path
B) Vertical path
C) Rectilinear path
D) Zigzag path
Answer: C) Rectilinear path

4. Pantograph is used for:
A) Lifting heavy loads
B) Copying paths geometrically
C) Rotating crankshaft
D) Changing speed
Answer: B) Copying paths geometrically

5. Double slider crank chain has how many turning pairs and sliding pairs?
A) 2 turning, 2 sliding
B) 3 turning, 1 sliding
C) 4 turning
D) 2 sliding, 1 turning
Answer: A) 2 turning, 2 sliding

Transmission Systems

6. Which of the following is NOT a type of transmission system?
A) Belt drive
B) Gear drive
C) Steam engine
D) Chain drive
Answer: C) Steam engine

1. The main purpose of a transmission system is to:
A) Convert mechanical energy into electrical energy
B) Increase friction
C) Transmit power from one shaft to another
D) Store energy for future use
Answer: C) Transmit power from one shaft to another

2. Which of the following is a flexible type of transmission system?
A) Gear drive
B) Chain drive
C) Rope drive
D) Shaft drive
Answer: C) Rope drive

3. Which of the following is not a mechanical transmission system?
A) Belt drive
B) Hydraulic transmission
C) Rope drive
D) Chain drive
Answer: B) Hydraulic transmission

4. Which of the following transmission systems works on friction principle?
A) Chain drive
B) Gear drive
C) Belt drive
D) Screw drive
Answer: C) Belt drive

5. The most suitable transmission system for long distance and high power is:
A) Belt drive
B) Chain drive
C) Gear drive
D) Rope drive

Answer: D) Rope drive

6. Which of the following drives is positive (i.e., without slip)?
A) Flat belt drive
B) V-belt drive
C) Chain drive
D) Rope drive
Answer: C) Chain drive

7. Which one of the following transmission systems is used in bicycles and motorcycles?
A) Belt drive
B) Chain drive
C) Gear drive
D) Rope drive
Answer: B) Chain drive

8. In a belt drive system, the driver pulley is the one that:
A) Follows the driven pulley
B) Receives motion
C) Transfers motion to the belt
D) Stretches the belt
Answer: C) Transfers motion to the belt

9. Which drive system is most suitable for smooth and silent operation?
A) Chain drive
B) Gear drive
C) Belt drive
D) Worm gear
Answer: C) Belt drive

10. Which of the following is a disadvantage of chain drives?
A) Cannot be used for high load
B) Prone to slipping
C) Requires lubrication and tensioning
D) Noisy and less efficient than belts
Answer: C) Requires lubrication and tensioning

11. The velocity ratio of a belt drive is affected by:
A) Pulley diameters
B) Distance between pulleys
C) Slip and creep
D) All of the above

Answer: D) All of the above

12. In a cross belt drive, the direction of the driven pulley is:
A) Same as driver pulley
B) Opposite to driver pulley
C) Perpendicular to driver pulley
D) Constant
Answer: B) Opposite to driver pulley

13. Which drive requires grooved pulleys for better grip?
A) Flat belt drive
B) V-belt drive
C) Chain drive
D) Rope drive
Answer: B) V-belt drive

14. The belt material should have:
A) High density
B) Low flexibility
C) High tensile strength and flexibility
D) High hardness
Answer: C) High tensile strength and flexibility

15. Which of the following transmission systems is used in cranes and elevators?
A) Belt drive
B) Chain drive
C) Rope drive
D) Gear drive
Answer: C) Rope drive

16. Which factor differentiates between open and cross belt drive?
A) Direction of motion
B) Number of pulleys
C) Tension ratio
D) Shaft size
Answer: A) Direction of motion

17. Which transmission system is generally used in flour mills and lathe machines?
A) Chain drive
B) Rope drive
C) Belt drive
D) Hydraulic drive

Answer: C) Belt drive

18. Which transmission system has a higher initial cost but no slip?
A) Flat belt
B) V-belt
C) Chain drive
D) Rope drive
Answer: C) Chain drive

19. Which one is NOT a common belt material?
A) Leather
B) Rubber
C) Steel
D) Fabric
Answer: C) Steel

20. Which transmission system is used in vehicle engines for camshaft operation?
A) Chain drive
B) Gear drive
C) Belt drive
D) Rope drive
Answer: A) Chain drive

Belt Drives

7. Open belt drive is used when:
A) Shafts rotate in opposite direction
B) Shafts rotate in same direction
C) Shafts are at 90°
D) Speed is to be reduced
Answer: B) Shafts rotate in same direction

8. In a cross belt drive, the direction of rotation of shafts is:
A) Same
B) Opposite
C) Parallel
D) Undefined
Answer: B) Opposite

9. The velocity ratio of a belt drive is given by:
A) N_2/N_1
B) D_1/D_2
C) D_2/D_1

D) $1 + (N_1/N_2)$
Answer: C) D_2/D_1
(Where D_1 = Driver pulley diameter, D_2 = Driven pulley diameter)

10. Slip in a belt drive leads to:
A) Increase in speed
B) Reduction in velocity ratio
C) Better grip
D) Increase in power transmission
Answer: B) Reduction in velocity ratio

11. Creep in belts occurs due to:
A) Excessive load
B) Uneven tension in belt
C) Belt misalignment
D) Pulley wear
Answer: B) Uneven tension in belt

12. Which of the following materials is commonly used for flat belts?
A) Rubber
B) Steel
C) Nylon
D) All of the above
Answer: D) All of the above

13. Length of an open belt drive is given by:
A) $L = \pi(R_1 + R_2) + (R_1 - R_2)^2 / 4C$
B) $L = \pi(R_1 - R_2) + 2C$
C) $L = 2C + \pi(R_1 + R_2) + (R_1 - R_2)^2 / C$
D) None of the above
Answer: C) $L = 2C + \pi(R_1 + R_2) + (R_1 - R_2)^2 / C$

Rope Drives

14. Rope drives are preferred for:
A) Low power, short distance
B) High power, long distance
C) Low speed applications
D) Electric motors only
Answer: B) High power, long distance

15. Which application commonly uses rope drives?
A) Watch gears

B) Bicycle chains
C) Cranes and elevators
D) Fans
Answer: C) Cranes and elevators

Chain Drives

16. Chain drives are used in:
A) Elevators
B) Gearboxes
C) Bicycles and motorcycles
D) Blowers
Answer: C) Bicycles and motorcycles

17. A main advantage of chain drives over belt drives is:
A) Less noisy
B) No slip
C) Lower cost
D) Better heat resistance
Answer: B) No slip

Applications (Practical Awareness)

18. In a lathe machine, which drive system is commonly used to transmit motion to the spindle?
A) Rope drive
B) Chain drive
C) Belt drive
D) Worm gear
Answer: C) Belt drive

19. Which drive system is used in flour mills to transfer power from the motor to the grinder?
A) Gear
B) Chain
C) Belt
D) Shaft
Answer: C) Belt
20. Belt drive in a washing machine is used to:
A) Adjust temperature
B) Rotate drum
C) Heat water
D) Control spin cycle
Answer: B) Rotate drum

Simple Problems – Conceptual MCQs

21. If the driver pulley rotates at 500 RPM and the velocity ratio is 2, the driven pulley rotates at:

A) 250 RPM
B) 500 RPM
C) 1000 RPM
D) 750 RPM
Answer: A) 250 RPM

22. If a belt transmits 10 kW at 80% efficiency, the power input is:

A) 8 kW
B) 12.5 kW
C) 10 kW
D) 9.5 kW
Answer: B) 12.5 kW
(Power input = Output / Efficiency = 10 / 0.8)

23. If one rope can transmit 5 kW, how many ropes are needed to transmit 30 kW?

A) 3
B) 5
C) 6
D) 10
Answer: C) 6

Here are MCQs with answers based on the topic Gears and Gear Trains, including gear classification, terminology, types of gear trains, their applications, and velocity ratios.

Gears & Gear Drives

1. Which of the following is the primary function of a gear?

A) Convert electrical energy to mechanical energy
B) Transmit power between shafts
C) Store energy
D) Reduce temperature
Answer: B) Transmit power between shafts

2. Which type of gear connects two parallel shafts?

A) Bevel gear
B) Worm gear
C) Spur gear
D) Spiral gear
Answer: C) Spur gear

3. Bevel gears are used to transmit motion between:

A) Non-parallel and non-intersecting shafts
B) Parallel shafts
C) Intersecting shafts
D) Same shaft
Answer: C) Intersecting shafts

4. Which gear is used to connect two non-parallel and non-intersecting shafts?
A) Spur gear
B) Helical gear
C) Worm gear
D) Bevel gear
Answer: C) Worm gear

5. Which gear has teeth cut parallel to the gear axis?
A) Helical gear
B) Spur gear
C) Bevel gear
D) Worm gear
Answer: B) Spur gear

6. In gear terminology, the distance between two corresponding points on adjacent teeth is called:
A) Pitch circle diameter
B) Circular pitch
C) Module
D) Addendum
Answer: B) Circular pitch

7. The imaginary circle which passes through the point of contact of mating gears is called:
A) Addendum circle
B) Dedendum circle
C) Pitch circle
D) Base circle
Answer: C) Pitch circle

8. The gear mounted on the input shaft in a gear system is called the:
A) Idler
B) Driver
C) Driven
D) Pinion
Answer: B) Driver

Gear Trains

9. A gear train with only one gear between driver and driven gear is called:
A) Compound gear train
B) Reverted gear train
C) Simple gear train
D) Epicyclic gear train
Answer: C) Simple gear train

10. In a compound gear train:
A) All gears are on separate shafts
B) Two or more gears are mounted on the same shaft
C) Motion is not transferred
D) Only worm gears are used
Answer: B) Two or more gears are mounted on the same shaft

11. Reverted gear train is used when:
A) Input and output shafts are in line
B) Output speed must be increased
C) Shafts are at 90°
D) There is no load
Answer: A) Input and output shafts are in line

12. Which gear train has one or more gears revolving around a central gear?
A) Simple gear train
B) Compound gear train
C) Reverted gear train
D) Epicyclic gear train
Answer: D) Epicyclic gear train

13. Epicyclic gear trains are used in:
A) Shapers
B) Lathes
C) Automatic gearboxes
D) Drilling machines
Answer: C) Automatic gearboxes

14. Which of the following gear train types is commonly used in lathe machines?
A) Compound gear train
B) Epicyclic gear train
C) Reverted gear train
D) Simple gear train
Answer: A) Compound gear train

Applications of Gear Trains

15. Gear trains are used in lathe machines to:
A) Adjust power supply
B) Change cutting speed and feed rate
C) Control coolant flow
D) Sharpen cutting tools
Answer: B) Change cutting speed and feed rate

16. Which machine tool commonly uses gear trains for spindle speed variation?
A) Grinding machine
B) Lathe machine
C) Planer
D) Power hacksaw
Answer: B) Lathe machine

17. In which of the following is a quick return mechanism using gears commonly found?
A) Milling machine
B) Shaper
C) Lathe
D) Drilling machine
Answer: B) Shaper

Velocity Ratio in Gear Drives

18. The velocity ratio (VR) of a gear drive is:
A) Driven speed / Driver speed
B) Driver speed / Driven speed
C) Driver torque / Driven torque
D) None of these
Answer: B) Driver speed / Driven speed

19. In a simple gear train with three gears, the idler gear:
A) Increases speed
B) Reverses direction
C) Transmits motion without changing speed
D) Does not rotate
Answer: C) Transmits motion without changing speed

20. In a gear train, if the driver has 20 teeth and the driven has 60 teeth, the velocity ratio is:
A) 1:3
B) 3:1
C) 60:20

D) 2:1
Answer: A) 1:3
(VR = T_driven / T_driver = 60 / 20 = 3)

Simple Problem-Based MCQs

21. If gear A (driver) rotates at 1000 rpm and has 20 teeth, gear B (driven) has 40 teeth. What is the speed of gear B?
A) 500 rpm
B) 2000 rpm
C) 400 rpm
D) 800 rpm
Answer: A) 500 rpm
(N_B = N_A × T_A / T_B = 1000 × 20 / 40 = 500)

22. In an epicyclic gear train, which gear rotates about its own axis and around another gear?
A) Sun gear
B) Ring gear
C) Planet gear
D) Internal gear
Answer: C) Planet gear

23. If three gears in a compound gear train have teeth 20, 30, and 40 respectively, what is the total velocity ratio?
A) Multiply the individual ratios
B) Add all the teeth
C) Take average
D) None of the above
Answer: A) Multiply the individual ratios
(Total VR = Product of driver teeth / Product of driven teeth)

24. Which gear drive provides highest torque multiplication in limited space?
A) Worm gear
B) Spur gear
C) Helical gear
D) Bevel gear
Answer: A) Worm gear

25. Which machine tool does not commonly use gear trains?
A) Lathe
B) Drilling machine
C) CNC machine
D) Washing machine

Answer: D) Washing machine

Metal Joining Processes – Classification

1. Which of the following is a temporary joining method?
A) Welding
B) Riveting
C) Bolting
D) Brazing
Answer:C) Bolting

2. Permanent joining methods include:
A) Threading
B) Bolting
C) Welding
D) Clamping
Answer:C) Welding

3. Which of the following is not a permanent joining method?
A) Welding
B) Soldering
C) Nut and Bolt
D) Riveting
Answer:C) Nut and Bolt

Fasteners (Rivets, Bolts, Nuts)

4. Riveted joints are classified as:
A) Temporary
B) Semi-permanent
C) Permanent
D) Reusable
Answer:C) Permanent

5. Which of the following is used for making a temporary joint in mechanical structures?
A) Rivets
B) Bolts and Nuts
C) Welding
D) Brazing
Answer:B) Bolts and Nuts

6. Which type of bolt has a rounded head and is used in wooden work?
A) Eye bolt
B) Hex bolt

C) Carriage bolt
D) Stud bolt
Answer:C) Carriage bolt

7. Which type of nut prevents loosening due to vibration?
A) Hex nut
B) Cap nut
C) Castle nut
D) Wing nut
Answer:C) Castle nut

8. A rivet is generally made from:
A) Cast iron
B) Low carbon steel
C) Tool steel
D) Brass
Answer:B) Low carbon steel

Welding – Basics & Classification

9. Welding is a process of joining two metal parts by:
A) Bolting
B) Using adhesive
C) Applying heat or pressure or both
D) Screwing
Answer:C) Applying heat or pressure or both

10. Which of the following is not a welding process?
A) MIG
B) TIG
C) SMAW
D) Tapping
Answer:D) Tapping

11. Which welding process uses an electric arc as a heat source?
A) Brazing
B) Arc welding
C) Resistance welding
D) Friction welding
Answer:B) Arc welding

12. Welding processes are classified into:
A) Solid state and liquid state

B) Permanent and temporary
C) Internal and external
D) Hot and cold
Answer:A) Solid state and liquid state

Arc Welding

13. In arc welding, the heat is produced due to:
A) Resistance to current
B) Arc formed between electrode and base metal
C) Chemical reaction
D) Compressed gas
Answer:B) Arc formed between electrode and base metal

14. Which of the following is used to strike an arc in arc welding?
A) Welding transformer
B) Electrode
C) Welding cable
D) Chipping hammer
Answer:B) Electrode

15. Arc welding equipment includes:
A) Welding cables
B) Electrode holder
C) Ground clamp
D) All of the above
Answer:D) All of the above

16. Arc welding is most suitable for:
A) Wood
B) Metals
C) Plastic
D) Ceramic
Answer:B) Metals

Welding Electrodes

17. In arc welding, the electrode acts as:
A) Heating element only
B) Filler material only
C) Both heating and filler material
D) None of the above
Answer:C) Both heating and filler material

18. The coating on arc welding electrodes provides:
A) Electrical insulation
B) Flux to prevent oxidation
C) Cooling
D) Magnetic shielding
Answer:B) Flux to prevent oxidation

19. Which of the following is a consumable electrode?
A) Tungsten electrode
B) Carbon electrode
C) Coated mild steel electrode
D) Copper electrode
Answer:C) Coated mild steel electrode

TIG & MIG Welding

20. In TIG (Tungsten Inert Gas) welding, the electrode is:
A) Consumable
B) Non-consumable
C) Both
D) Does not matter
Answer:B) Non-consumable

21. In TIG welding, the shielding gas is usually:
A) Oxygen
B) Carbon dioxide
C) Argon
D) Nitrogen
Answer:C) Argon

22. MIG stands for:
A) Manual Inert Gas
B) Metal Inert Gas
C) Metal Integrated Gas
D) Metal Ignition Gas
Answer:B) Metal Inert Gas

23. MIG welding uses which type of electrode?
A) Non-consumable tungsten
B) Filler rod
C) Consumable wire electrode
D) Carbon rod
Answer:C) Consumable wire electrode

24. Compared to TIG, MIG welding is generally:
A) Slower and more precise
B) Faster and less precise
C) Cheaper and weaker
D) Only used for non-metals
Answer:B) Faster and less precise

Defects in Arc Welding

25. A common welding defect caused by improper fusion between metal and weld is:
A) Cracks
B) Porosity
C) Lack of fusion
D) Spatter
Answer:C) Lack of fusion

26. Porosity in welding is caused by:
A) High voltage
B) Moisture or gas trapped in the weld
C) Overheating
D) Wrong filler metal
Answer:B) Moisture or gas trapped in the weld

27. Which of the following is NOT a common welding defect?
A) Undercut
B) Blowholes
C) Lack of root penetration
D) Work hardening
Answer:D) Work hardening

28. Excess spatter in arc welding indicates:
A) Low arc temperature
B) Excessive arc length or current
C) Use of inert gas
D) Stronger weld
Answer:B) Excessive arc length or current

Soldering and Brazing – Principles & Basics

1. Which of the following processes is performed at the lowest temperature?
A) Welding
B) Brazing
C) Soldering

D) Forging
Answer:C) Soldering

2. Brazing is defined as joining two metals using a filler metal that melts:
A) Below 200°C
B) Above 450°C but below melting point of base metals
C) At the melting point of base metal
D) Only under pressure
Answer:B) Above 450°C but below melting point of base metals

3. Soldering and brazing are both:
A) Fusion welding processes
B) Solid-state welding processes
C) Non-fusion, low-temperature joining processes
D) Temporary joining methods
Answer:C) Non-fusion, low-temperature joining processes

4. The main difference between soldering and brazing is:
A) Type of gas used
B) Filler material melting point
C) Base metal used
D) Use of flux
Answer:B) Filler material melting point

Fillers and Heating Methods

5. Which metal is commonly used as a filler in soldering?
A) Copper
B) Tin-Lead alloy
C) Aluminum
D) Brass
Answer:B) Tin-Lead alloy

6. Which heating method is commonly used in brazing?
A) Induction heating
B) Furnace heating
C) Torch heating
D) All of the above
Answer:D) All of the above

7. Flux is used in soldering and brazing to:
A) Increase strength
B) Prevent oxidation and clean the metal surface

C) Decrease melting point
D) Add toughness
Answer:B) Prevent oxidation and clean the metal surface

8. In brazing, the filler metal is usually in the form of:
A) Wire
B) Rod
C) Paste
D) All of the above
Answer:D) All of the above

Gas Welding – CO_2 and Oxy-Acetylene

9. Gas welding uses a flame produced by burning a fuel gas with:
A) Hydrogen
B) Carbon dioxide
C) Oxygen
D) Nitrogen
Answer:C) Oxygen

10. Which of the following is a fuel gas used in gas welding?
A) Oxygen
B) Acetylene
C) Nitrogen
D) Argon
Answer:B) Acetylene

11. In oxy-acetylene welding, acetylene is stored:
A) As a liquid under high pressure
B) Dissolved in acetone under pressure
C) In solid form
D) In powder form
Answer:B) Dissolved in acetone under pressure

12. CO_2 welding is commonly referred to as:
A) TIG welding
B) MIG welding
C) SAW welding
D) Plasma arc welding
Answer:B) MIG welding (using CO_2 as shielding gas)

13. The main difference between CO_2 welding and oxy-acetylene welding is:
A) Use of filler

B) Type of shielding gas and power source
C) Manual vs automatic process
D) Base metal used
Answer:B) Type of shielding gas and power source

Types of Gas Welding Flames

14. Which of the following flames has excess oxygen?
A) Neutral flame
B) Carburizing flame
C) Oxidizing flame
D) Inert flame
Answer:C) Oxidizing flame

15. A neutral flame in oxy-acetylene welding is ideal for:
A) Oxidizing the metal
B) Heating glass
C) General-purpose welding
D) Flame cutting
Answer:C) General-purpose welding

16. Which flame is used for welding aluminum and lead?
A) Carburizing flame
B) Oxidizing flame
C) Neutral flame
D) Reducing flame
Answer:A) Carburizing flame (reducing flame)

17. An oxidizing flame can be identified by:
A) Long inner cone and bright outer flame
B) Shorter, sharp inner cone with hissing sound
C) Flame with bluish tip
D) Red flame
Answer:B) Shorter, sharp inner cone with hissing sound

18. Carburizing flame is rich in:
A) Oxygen
B) Nitrogen
C) Acetylene
D) Air
Answer:C) Acetylene

Applications

19. Soldering is commonly used in:
A) Pipe welding
B) Aerospace assembly
C) Electrical and electronic circuits
D) Automobile body welding
Answer:C) Electrical and electronic circuits

20. Brazing is preferred over soldering when:
A) Lower strength joint is acceptable
B) High strength joint is needed
C) No filler is available
D) Quick joint is needed without heating
Answer:B) High strength joint is needed