

# Telangana State Council Higher Education

## Notations :

- 1.Options shown in green color and with ✓ icon are correct.
- 2.Options shown in red color and with ✗ icon are incorrect.

<b>Question Paper Name :</b>	Nanotechnology 13th June 2024 Shift 2
<b>Subject Name :</b>	Nanotechnology
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<b>Share Answer Key With Delivery Engine :</b>	Yes
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## Nanotechnology

<b>Group Number :</b>	1
<b>Group Id :</b>	38382347
<b>Group Maximum Duration :</b>	0
<b>Group Minimum Duration :</b>	120
<b>Show Attended Group? :</b>	No
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<b>Group Marks :</b>	120

## Nanotechnology

<b>Section Id :</b>	383823124
<b>Section Number :</b>	1
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	120

<b>Number of Questions to be attempted :</b>	120
<b>Section Marks :</b>	120
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	383823124
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 1 Question Id : 3838236481 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The primary focus of material science is

**Options :**

1. ✘ Studying biological systems
2. ✔ Investigating the properties and applications of materials
3. ✘ Developing software algorithms
4. ✘ Exploring outer space

**Question Number : 2 Question Id : 3838236482 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which of the following is not a category of engineering materials?

**Options :**

1. ✘ Metals
2. ✘ Ceramics
3. ✘ Polymers
4. ✔ Liquids

**Question Number : 3 Question Id : 3838236483 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In crystallography, what is the significance of Miller indices?

**Options :**

1. ✘ They denote the temperature at which a material melt
2. ✔ They describe the directions and planes in a crystal lattice
3. ✘ They indicate the molecular weight of the crystal
4. ✘ They determine the electrical conductivity of the material

**Question Number : 4 Question Id : 3838236484 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

What class of materials is characterized by high electrical conductivity?

**Options :**

1. ✔ Metals
2. ✘ Polymers
3. ✘ Ceramics
4. ✘ Composites

**Question Number : 5 Question Id : 3838236485 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

What is a Burgers vector?

**Options :**

1. ✘ A measure of the electrical conductivity of a material
2. ✔ A vector that represents the magnitude and direction of a dislocation
3. ✘ The force required to fracture a crystal
4. ✘ A unit cell dimension in a crystal lattice

**Question Number : 6 Question Id : 3838236486 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Plastic deformation in metals at room temperature is primarily due to

**Options :**

1. ✓ Slip
2. ✗ Twisting
3. ✗ Cracking
4. ✗ Vaporization

**Question Number : 7 Question Id : 3838236487 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The type of material is primarily used for insulation purposes is

**Options :**

1. ✗ Metals
2. ✓ Polymers
3. ✗ Ceramics
4. ✗ Composites

**Question Number : 8 Question Id : 3838236488 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which of the following material is typically brittle?

**Options :**

1. ✗ Metals
2. ✗ Polymers
3. ✓ Ceramics
4. ✗ Composites

**Question Number : 9 Question Id : 3838236489 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The Hall-Petch equation relates grain size to

**Options :**

1. ✘ Electrical conductivity

2. ✘ Thermal expansion

3. ✔ Yield strength

4. ✘ Magnetic susceptibility

**Question Number : 10 Question Id : 3838236490 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which unit cell has two sides of equal length, a third side of different length, and all angles equal to 90 degrees?

**Options :**

1. ✔ Tetragonal

2. ✘ Orthorhombic

3. ✘ Hexagonal

4. ✘ Cubic

**Question Number : 11 Question Id : 3838236491 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

What property is measured by the slope of the initial, linear portion of a stress-strain diagram?

**Options :**

1. ✘ Toughness

2. ✘ Ductility

3. ✓ Modulus of elasticity

4. ✘ Malleability

**Question Number : 12 Question Id : 3838236492 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The coordination number of atoms in a body-centered cubic (BCC) unit cell is

**Options :**

1. ✘ 4

2. ✘ 6

3. ✓ 8

4. ✘ 12

**Question Number : 13 Question Id : 3838236493 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The minimum resolved shear stress required to initiate slip is known as

**Options :**

1. ✘ Yield strength

2. ✘ Ultimate tensile strength

3. ✓ Critical resolved shear stress (CRSS)

4. ✘ Fracture toughness

**Question Number : 14 Question Id : 3838236494 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The phenomenon where a superconductor expels an external magnetic field is known as

**Options :**

1. ✘ BCS effect

2. ✓ Meissner effect
3. ✗ Josephson effect
4. ✗ Hall effect

**Question Number : 15 Question Id : 3838236495 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The crystal system characterized by three unequal axes which intersect at  $90^\circ$  is

**Options :**

1. ✗ Cubic
2. ✗ Tetragonal
3. ✓ Orthorhombic
4. ✗ Monoclinic

**Question Number : 16 Question Id : 3838236496 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The trigonal crystal system can also be referred to as

**Options :**

1. ✗ Hexagonal
2. ✓ Rhombohedral
3. ✗ Cubic
4. ✗ Tetragonal

**Question Number : 17 Question Id : 3838236497 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Type-II superconductors exhibit a 'mixed state'  $H_{c1}$  (lower critical magnetic field) and  $H_{c2}$  (upper critical magnetic field) which means

**Options :**

1. ✘ The material alternates between superconducting and normal conducting regions
2. ✘ Cooper pairs break down entirely
3. ✔ Magnetic flux partially penetrates the material in the form of quantized vortices
4. ✘ The material's critical temperature ( $T_c$ ) fluctuates

**Question Number : 18 Question Id : 3838236498 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Polymers are classified based on their

**Options :**

1. ✘ Melting points
2. ✘ Ability to conduct electricity
3. ✔ Molecular structure and synthesis process
4. ✘ Color and texture

**Question Number : 19 Question Id : 3838236499 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The energy levels available to electrons in a quantum well are

**Options :**

1. ✘ Continuous
2. ✔ Quantized due to confinement
3. ✘ Defined by the Fermi level
4. ✘ Independent of the well's dimensions

**Question Number : 20 Question Id : 3838236500 Question Type : MCQ Option Shuffling : Yes**



**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The Clausius-Mossotti equation relates the dielectric constant of a material to its

**Options :**

1. ✓ Molecular polarization
2. ✗ Crystal structure
3. ✗ Atomic mass
4. ✗ Conductivity

**Question Number : 21 Question Id : 3838236501 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The crucial component of a semiconductor laser that provides optical feedback and helps to build up the stimulated emission process is

**Options :**

1. ✓ Optical cavity
2. ✗ Heat sink
3. ✗ Doping gradient
4. ✗ Quantum well

**Question Number : 22 Question Id : 3838236502 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In a laser, the population inversion is achieved between which two energy levels?

**Options :**

1. ✗ Ground state and the first excited state
2. ✗ Two vibrational levels of the ground state
3. ✓ Two closely spaced excited states

4. ✘ The first and second excited states

**Question Number : 23 Question Id : 3838236503 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The characteristic property of liquid crystal materials that makes them suitable for display technologies is

**Options :**

1. ✘ High thermal conductivity
2. ✔ Ability to polarize light
3. ✘ Electrical conductivity
4. ✘ Magnetic responsiveness

**Question Number : 24 Question Id : 3838236504 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Organic conductors are known for their

**Options :**

1. ✘ High melting points
2. ✔ Ability to conduct electricity through  $\pi$ -conjugated systems
3. ✘ Magnetic properties
4. ✘ Transparency in the visible light spectrum

**Question Number : 25 Question Id : 3838236505 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In a typical stress-strain diagram for mild steel, the yield point is characterized by

**Options :**

1. ✘ A sudden drop in stress

2. ✘ A linear relationship between stress and strain
3. ✔ A plateau after the elastic limit is reached
4. ✘ An immediate fracture following elastic deformation

**Question Number : 26 Question Id : 3838236506 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Comparing the stress-strain diagrams of cast iron and aluminum alloy, which statement is true regarding their elastic moduli?

**Options :**

1. ✘ Cast iron and aluminum alloy have approximately the same elastic modulus
2. ✔ Cast iron has a higher elastic modulus than aluminum alloy
3. ✘ Aluminum alloy has a significantly higher elastic modulus than cast iron
4. ✘ The elastic modulus is irrelevant in comparing these two materials

**Question Number : 27 Question Id : 3838236507 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The factor most critical in determining the area under the stress-strain curve for a given material is

**Options :**

1. ✘ The material's density
2. ✔ The material's toughness
3. ✘ The material's conductivity
4. ✘ The material's transparency

**Question Number : 28 Question Id : 3838236508 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The slope of the stress-strain curve in the elastic region is indicative of the material's

**Options :**

1. ✘ Ductility
2. ✘ Brittleness
3. ✘ Hardness
4. ✔ Modulus of elasticity

**Question Number : 29 Question Id : 3838236509 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

For a material with a pronounced yield point in its stress-strain diagram, such as mild steel, the yield point phenomenon is attributed to

**Options :**

1. ✘ Sudden orientation of dislocations in the direction of the applied stress
2. ✘ The release and redistribution of internal stresses
3. ✔ The abrupt movement of dislocations after overcoming the Peierls-Nabarro barrier
4. ✘ An increase in the rate of strain hardening due to temperature rise

**Question Number : 30 Question Id : 3838236510 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Considering the stress-strain diagram, the material would be best suited for an application requiring high toughness is

**Options :**

1. ✔ Mild steel, due to its extensive plastic deformation and toughness
2. ✘ Cast iron, because of its high brittleness
3. ✘ Aluminum alloy, as it has the highest modulus of elasticity

4. ✘ Cast iron, due to its high strength

**Question Number : 31 Question Id : 3838236511 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Analyze the impact of temperature on the electronic conductivity of metals and semiconductors. Choose the correct statement

**Options :**

1. ✔ Increasing temperature decreases the conductivity of metals but increases for semiconductors
2. ✘ Increasing temperature increases the conductivity of both metals and semiconductors
3. ✘ Increasing temperature decreases the conductivity of both metals and semiconductors
4. ✘ Increasing temperature increases the conductivity of metals but decreases for semiconductors

**Question Number : 32 Question Id : 3838236512 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Differentiate between ferromagnetism and ferrimagnetism based on their magnetic domain alignment. The following statement accurately describes ferrimagnetism

**Options :**

1. ✘ Magnetic domains align in opposite directions, cancelling each other out
2. ✘ Magnetic domains align in the same direction, enhancing the magnetic effect
3. ✔ Magnetic domains align in opposite directions, but unequal in number, creating a net magnetic moment
4. ✘ Magnetic domains do not align in any specific direction, leading to a weak magnetic effect

**Question Number : 33 Question Id : 3838236513 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Apply the concept of superconductivity to explain the disappearance of electrical resistance. The application best demonstrates this principle is

**Options :**

1. ✓ High-power transmission lines
2. ✗ Portable electronic devices
3. ✗ Solar panels
4. ✗ Incandescent light bulbs

**Question Number : 34 Question Id : 3838236514 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The principle that explains the variation of electrical conductivity in metals and semiconductors with temperature is

**Options :**

1. ✗ Ohm's law
2. ✗ Coulomb's law
3. ✗ Free electron theory
4. ✓ Band theory of solids

**Question Number : 35 Question Id : 3838236515 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The phenomenon observed when a material exhibits zero electrical resistance below a critical temperature is

**Options :**

1. ✗ Ferromagnetism
2. ✓ Superconductivity
3. ✗ Photovoltaic effect
4. ✗ Thermionic emission

**Question Number : 36 Question Id : 3838236516 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The type of magnetism utilized in permanent magnets is

**Options :**

1. ✘ Diamagnetism
2. ✘ Paramagnetism
3. ✔ Ferromagnetism
4. ✘ Ferrimagnetism

**Question Number : 37 Question Id : 3838236517 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In optical fibers, the principle enables light transmission along the fiber's length is

**Options :**

1. ✘ Refraction
2. ✔ Total internal reflection
3. ✘ Diffraction
4. ✘ Polarization

**Question Number : 38 Question Id : 3838236518 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which statement accurately differentiates crystalline ceramics from non-crystalline ceramics?

**Options :**

1. ✘ Crystalline ceramics have disordered atomic structures
2. ✘ Non-crystalline ceramics exhibit higher thermal conductivity
3. ✔ Crystalline ceramics have long-range periodic atomic arrangements
4. ✘ Non-crystalline ceramics are more ductile

**Question Number : 39 Question Id : 3838236519 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The bottom-up approach in nanotechnology involves

**Options :**

1. ✘ Breaking down larger materials into nano-sized particles
2. ✔ Assembling materials atom by atom or molecule by molecule
3. ✘ Fusion of micro-sized materials
4. ✘ Application of external forces to create nanomaterials

**Question Number : 40 Question Id : 3838236520 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which theory best explains the phenomenon of superconductivity?

**Options :**

1. ✘ Drude model
2. ✔ BCS theory
3. ✘ Band theory
4. ✘ Free electron model

**Question Number : 41 Question Id : 3838236521 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The type of semiconductor bandgap is essential for materials used in light-emitting diodes is

**Options :**

1. ✘ Insulator
2. ✘ Indirect bandgap



3. ✓ Direct bandgap

4. ✗ Zero bandgap

**Question Number : 42 Question Id : 3838236522 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The process describes the transition of a polymer from a hard and glassy state to a rubbery state is

**Options :**

1. ✗ Vulcanization

2. ✗ Polymerization

3. ✓ Glass transition

4. ✗ Crystallization

**Question Number : 43 Question Id : 3838236523 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In composite material science, what role does the matrix play?

**Options :**

1. ✗ Reinforcement

2. ✗ Structural framework

3. ✓ Acts as a binder for reinforcement

4. ✗ Provides electrical conductivity

**Question Number : 44 Question Id : 3838236524 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which of the following is a challenge associated with nanotechnology?

**Options :**

1. ✗ Increasing the size of nanoparticles

2. ✓ Maintaining the stability of nanostructures
3. ✘ Simplifying the production of bulk materials
4. ✘ Reducing the electrical conductivity of nanomaterials

**Question Number : 45 Question Id : 3838236525 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

What is a key challenge in the top-down approach to nanotechnology?

**Options :**

1. ✓ Achieving atomic precision
2. ✘ Generating larger quantities of materials
3. ✘ Reducing the cost of production
4. ✘ Ensuring stability of the nanostructures

**Question Number : 46 Question Id : 3838236526 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In composite materials, the role of the matrix is to

**Options :**

1. ✘ Provide strength and rigidity
2. ✘ Act as the primary load-bearing component
3. ✓ Disperse the reinforcement evenly and transfer stress
4. ✘ Increase the electrical conductivity

**Question Number : 47 Question Id : 3838236527 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which type of optical fiber is best suited for long-distance communication because of its low attenuation?

**Options :**

1. ✘ Multimode step-index fiber
2. ✘ Multimode graded-index fiber
3. ✔ Single-mode fiber
4. ✘ Plastic optical fiber

**Question Number : 48 Question Id : 3838236528 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In designing a composite material for aerospace applications, the most crucial factor to consider for the matrix material is

**Options :**

1. ✘ Electrical conductivity
2. ✔ Thermal expansion coefficient
3. ✘ Optical properties
4. ✘ Magnetic properties

**Question Number : 49 Question Id : 3838236529 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The process of cross-linking in polymerization affects the mechanical properties of the resulting polymer by

**Options :**

1. ✘ Decreasing its tensile strength
2. ✘ Making it more flexible
3. ✔ Increasing its thermal stability

4. ✘ Reducing its electrical conductivity

**Question Number : 50 Question Id : 3838236530 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The effectiveness of a material for use in superconductivity applications depends on its

**Options :**

1. ✘ Optical properties
2. ✘ Magnetic properties
3. ✔ Critical temperature
4. ✘ Electrical resistivity

**Question Number : 51 Question Id : 3838236531 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Given that the electronic conductivity of a material increases with temperature, this material is most likely

**Options :**

1. ✘ A metal
2. ✔ An intrinsic semiconductor
3. ✘ A superconductor
4. ✘ A polymer

**Question Number : 52 Question Id : 3838236532 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Identify the technique not typically associated with the top-down approach in creating nanoscale structures

**Options :**

1. ✘ Lithography

2. ✘ Etching
3. ✔ Self-assembly
4. ✘ Milling

**Question Number : 53 Question Id : 3838236533 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Evaluating the historical development of nanotechnology, its emergence was most significantly influenced by the ability to

**Options :**

1. ✘ Synthesize large polymers
2. ✔ Observe and manipulate individual atoms and molecules
3. ✘ Generate electricity from renewable sources
4. ✘ Increase the computational power of microprocessors

**Question Number : 54 Question Id : 3838236534 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Considering the unique properties of nanomaterials, the development of a new drug delivery system utilizing nanotechnology would likely focus on

**Options :**

1. ✘ Increasing the size of the drug molecules for easier detection
2. ✔ Enhancing the solubility and bioavailability of poorly soluble drugs
3. ✘ Reducing the effectiveness of drugs to minimize side effects
4. ✘ Focusing solely on external applications to the skin

**Question Number : 55 Question Id : 3838236535 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which scientist delivered the influential lecture "There's Plenty of Room at the Bottom," laying a foundation for the concept of nanotechnology?

**Options :**

1. ✘ Albert Einstein
2. ✘ Norio Taniguchi
3. ✘ Eric Drexler
4. ✔ Richard Feynman

**Question Number : 56 Question Id : 3838236536 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

What does an operational amplifier (Op-Amp) do in its most basic form?

**Options :**

1. ✘ Amplifies a digital signal
2. ✘ Converts AC to DC
3. ✔ Amplifies the difference in voltage between its input terminals
4. ✘ Converts digital signals to analog signals

**Question Number : 57 Question Id : 3838236537 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The statement that best describes the function of a non-inverting amplifier is

**Options :**

1. ✘ It reverses the phase of the input signal while amplifying it
2. ✔ It amplifies the input signal without altering its phase
3. ✘ It adds multiple input signals into a single output

4. ✘ It generates a fixed waveform output regardless of the input

**Question Number : 58 Question Id : 3838236538 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which of the following is a characteristic that distinguishes a JFET from a MOSFET?

**Options :**

1. ✘ JFETs are voltage-controlled, while MOSFETs are current-controlled devices
2. ✘ MOSFETs can only operate in depletion mode, whereas JFETs can operate in both depletion and enhancement modes
3. ✘ JFETs have a higher input impedance compared to MOSFETs
4. ✔ MOSFETs are controlled by voltage applied to their gate, whereas JFETs are controlled by the current

**Question Number : 59 Question Id : 3838236539 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

What is the primary function of an operational amplifier?

**Options :**

1. ✘ To decrease signal power
2. ✔ To increase signal power
3. ✘ To convert AC to DC
4. ✘ To generate digital signals

**Question Number : 60 Question Id : 3838236540 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which of the following components is most suitable in designing a simple circuit using digital integrated circuits that could serve as a basic memory element?

**Options :**

1. ✘ XOR gate

2. ✓ Flip-flop

3. ✗ NAND gate

4. ✗ Adder

**Question Number : 61 Question Id : 3838236541 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The purpose of a field oxide (FOX) in CMOS fabrication is to

**Options :**

1. ✗ Create conductive channels

2. ✗ Act as a mask for doping

3. ✓ Provide electrical isolation

4. ✗ Improve gate switching speed

**Question Number : 62 Question Id : 3838236542 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Latch-up in CMOS is a condition caused by

**Options :**

1. ✗ High power supply voltage

2. ✓ Parasitic bipolar transistors

3. ✗ Excessive gate oxide thickness

4. ✗ Narrow channel widths

**Question Number : 63 Question Id : 3838236543 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**



What is the relationship between quantization error and the number of bits in an A/D converter?

**Options :**

1. ✘ Quantization error is directly proportional to the number of bits
2. ✔ Quantization error is inversely proportional to the number of bits
3. ✘ Quantization error is independent of the number of bits
4. ✘ The relationship is more complex and depends on other factors

**Question Number : 64 Question Id : 3838236544 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Designing a high-gain op-amp circuit with tight output voltage tolerance. Which of the following factor become critically important in component selection?

**Options :**

1. ✘ Slew rate of the op-amp
2. ✔ Input offset voltage of the op-amp
3. ✘ Power supply rejection ratio (PSRR) of the op-amp
4. ✘ Common-mode rejection ratio (CMRR) of the op-amp

**Question Number : 65 Question Id : 3838236545 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

To create a square wave generator using an operational amplifier, the configuration should be used is

**Options :**

1. ✘ Integrator
2. ✔ Comparator
3. ✘ Adder

#### 4. ✖ Differentiator

**Question Number : 66 Question Id : 3838236546 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Evaluate the impact of the setup and hold time violations in a D flip-flop's operation. Choose the correct statement that accurately reflects the consequences.

**Options :**

1. ✖ It leads to a lower power consumption due to reduced switching activity
2. ✖ It causes the output to toggle continuously, increasing the error rate
3. ✔ It may result in metastable states, potentially causing unpredictable behavior
4. ✖ It enhances the flip-flop's speed by allowing faster data processing

**Question Number : 67 Question Id : 3838236547 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The primary application of the Discrete Fourier Transform in signal processing is

**Options :**

1. ✔ To convert time-domain signals into their frequency-domain representation
2. ✖ To amplify the signal strength
3. ✖ To reduce noise in the time-domain signal
4. ✖ To convert analog signals to digital form

**Question Number : 68 Question Id : 3838236548 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In analyzing the role of BJTs in the design of an analog signal amplifier, which of the following factors is critical for maximizing linear amplification?

**Options :**

1. ✖ Ensuring the BJT is always in saturation

2. ✓ Operating the BJT in the active region
3. ✗ Selecting a BJT with the highest possible current gain
4. ✗ Using a BJT with minimal base-emitter voltage

**Question Number : 69 Question Id : 3838236549 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Common application of flip-flops in digital circuits is

**Options :**

1. ✗ Amplification
2. ✗ Signal generation
3. ✓ Data storage
4. ✗ Signal modulation

**Question Number : 70 Question Id : 3838236550 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The most critical factor to consider when selecting an Analog-to-Digital Converter (A/D) for a high-precision measurement system is

**Options :**

1. ✗ Conversion speed
2. ✗ Power consumption
3. ✓ Resolution
4. ✗ Size

**Question Number : 71 Question Id : 3838236551 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

CMOS technology is widely used in fabricating

**Options :**

1. ✘ Magnetic storage devices
2. ✘ Optical fibers
3. ✔ Integrated circuits
4. ✘ Electromechanical systems

**Question Number : 72 Question Id : 3838236552 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Analyze the effect of temperature on the operation of a 555 timer. Which aspect of the 555 timer's performance is most sensitive to temperature variations?

**Options :**

1. ✘ Duty cycle of the output waveform
2. ✘ Threshold voltage levels
3. ✘ Output pulse amplitude
4. ✔ Timing accuracy and stability

**Question Number : 73 Question Id : 3838236553 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Synthesize a strategy for minimizing leakage effect in the DFT analysis of signals with finite duration. The most effective approach is

**Options :**

1. ✘ Applying a rectangular window to the signal before computing the DFT
2. ✘ Increasing the length of the DFT to include more zero-padding
3. ✔ Utilizing a window function that tapers the beginning and end of the signal

4. ✘ Reducing the sample rate to decrease the resolution of the DFT

Question Number : 74 Question Id : 3838236554 Question Type : MCQ Option Shuffling : Yes  
Display Question Number : Yes

Correct Marks : 1 Wrong Marks : 0

In a half adder circuit, what happens if both inputs are 1?

Options :

1. ✘ The sum is 1 and the carry is 0
2. ✔ The sum is 0 and the carry is 1
3. ✘ Both sum and carry are 1
4. ✘ Both sum and carry are 0

Question Number : 75 Question Id : 3838236555 Question Type : MCQ Option Shuffling : Yes  
Display Question Number : Yes

Correct Marks : 1 Wrong Marks : 0

Which of the following characteristic is most crucial for the accuracy of an A/D converter?

Options :

1. ✘ Conversion speed
2. ✔ Resolution
3. ✘ Power consumption
4. ✘ Size

Question Number : 76 Question Id : 3838236556 Question Type : MCQ Option Shuffling : Yes  
Display Question Number : Yes

Correct Marks : 1 Wrong Marks : 0

How does a MOSFET differ from a JFET?

Options :

1. ✘ The type of charge carriers
2. ✔ The presence of a gate oxide

3. ✘ The use of bipolar junctions
4. ✘ The reliance on majority carriers only

**Question Number : 77 Question Id : 3838236557 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Which of the following statement is correct in analyzing the effect of increasing the gate voltage beyond the threshold on an n-channel MOSFET's drain current?

**Options :**

1. ✘ It decreases the drain current due to enhanced depletion
2. ✘ It has no significant effect on the drain current
3. ✔ It increases the drain current by enhancing the channel conductivity
4. ✘ It reverses the direction of the drain current

**Question Number : 78 Question Id : 3838236558 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

To determine the impact of scaling on CMOS device performance, scaling down CMOS technology typically results in

**Options :**

1. ✔ Lowered power consumption and increased speed
2. ✘ Increased static power consumption
3. ✘ Decreased integration density
4. ✘ Reduced reliability of the devices

**Question Number : 79 Question Id : 3838236559 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Analyze the principle of operation for CCDs in digital imaging. The core function relies on

**Options :**

1. ✘ Conversion of acoustic waves into electrical signals
2. ✘ Direct photon detection without charge transfer
3. ✔ Sequential transfer of charge packets between capacitive bins
4. ✘ Amplification of radio frequency signals

**Question Number : 80 Question Id : 3838236560 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Assess the significance of zero-padding in the application of DFT to signal analysis. Zero-padding is crucial for

**Options :**

1. ✘ Decreasing the resolution of the DFT
2. ✔ Increasing the frequency resolution of the DFT
3. ✘ Reducing the computational time needed for DFT calculations
4. ✘ Directly enhancing the amplitude of the signal components

**Question Number : 81 Question Id : 3838236561 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

According to wave-particle duality, electrons exhibit

**Options :**

1. ✘ Only particle-like behavior
2. ✘ Only wave-like behavior
3. ✘ Neither wave nor particle behavior
4. ✔ Both wave-like and particle-like behavior

**Question Number : 82 Question Id : 3838236562 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Heisenberg's uncertainty principle makes it impossible to simultaneously determine with perfect accuracy

**Options :**

1. ✘ The position and color of a particle
2. ✘ The momentum and velocity of a particle
3. ✔ The position and momentum of a particle
4. ✘ The energy and mass of a particle

**Question Number : 83 Question Id : 3838236563 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The Schrodinger equation is fundamental to quantum mechanics because it describes

**Options :**

1. ✘ The trajectory of a particle in a field
2. ✔ The probability distribution of a particle's position and momentum
3. ✘ The behavior of a classical wave
4. ✘ The energy levels in a crystal lattice

**Question Number : 84 Question Id : 3838236564 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Fermi's Golden rule is particularly useful for calculating the

**Options :**

1. ✘ Probability of particle decay
2. ✔ Rate of transitions between quantum states due to a perturbation



3. ✖ Speed of light in a vacuum
4. ✖ Strength of the strong nuclear force

**Question Number : 85 Question Id : 3838236565 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In the context of scattering in a central potential, phase shifts indicate

**Options :**

1. ✖ The change in the direction of a wavefront upon reflection
2. ✖ Variations in the central potential's strength
3. ✔ The alteration of a wave's phase after passing through a potential
4. ✖ The number of particles scattered per second

**Question Number : 86 Question Id : 3838236566 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The Born approximation is applied in quantum mechanics to

**Options :**

1. ✔ Estimate the scattering amplitude for weak potentials
2. ✖ Calculate exact wave functions for bound states
3. ✖ Determine the non-relativistic limit of particle interactions
4. ✖ Solve the Schrödinger equation for any potential

**Question Number : 87 Question Id : 3838236567 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

For identical particles in quantum mechanics, the Pauli exclusion principle states that

**Options :**

1. ✔ No two particles can occupy the same quantum state

- ✘ Particles can share quantum states if they have different spins
- ✘ Identical particles do not interact
- ✘ All particles must occupy distinct energy levels

**Question Number : 88 Question Id : 3838236568 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

For an electron moving in a hydrogen atom, the central potential it experiences is primarily due to

**Options :**

- ✘ The nuclear strong force
- ✔ Electromagnetic attraction to the proton
- ✘ Gravitational attraction to the proton
- ✘ Quantum tunneling effects

**Question Number : 89 Question Id : 3838236569 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The transition rate for a particle moving between states in Fermi's Golden rule is directly proportional to

**Options :**

- ✔ The square of the matrix element of the perturbation
- ✘ The initial state wave function only
- ✘ The difference in energy between the final and initial states
- ✘ The potential energy of the system

**Question Number : 90 Question Id : 3838236570 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In scattering theory, the differential cross-section determines

**Options :**

1. ✓ The probability of a particle being deflected by a specific angle
2. ✗ The total energy of the scattering particles
3. ✗ The phase shift of the wave function
4. ✗ The conservation of angular momentum

**Question Number : 91 Question Id : 3838236571 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The condition for the equilibrium of a particle in a plane subjected to concurrent forces requires that

**Options :**

1. ✗ The sum of the forces in any one direction is zero
2. ✗ The sum of the vertical forces equals the sum of the horizontal forces
3. ✗ The algebraic sum of the moments about any point is zero
4. ✓ The vector sum of all forces acting on the particle is zero

**Question Number : 92 Question Id : 3838236572 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The centroid of a composite plane figure can be found by

**Options :**

1. ✗ Dividing the sum of the areas of individual shapes by the total number of shapes
2. ✗ Adding the centroids of individual shapes and dividing by the area of the composite figure
3. ✓ Multiplying the area of each shape by its centroid's coordinates, summing these products and dividing by the total area

4. ✘ Taking the average of the centroids of all individual shapes

**Question Number : 93 Question Id : 3838236573 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In analyzing the general case of forces in a plane, one must ensure

**Options :**

1. ✘ Only horizontal forces are considered for equilibrium
2. ✘ Forces are resolved into their scalar components
3. ✔ Forces are represented as vectors and resolved into vertical and horizontal components
4. ✘ Only vertical forces are analyzed for system stability

**Question Number : 94 Question Id : 3838236574 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The moment of inertia of a plane figure about an axis in its plane is

**Options :**

1. ✘ Directly proportional to the mass of the figure
2. ✔ The resistance of the figure to rotation about the axis
3. ✘ Equal to the product of mass and radius of gyration squared
4. ✘ Inversely proportional to the square of its dimensions

**Question Number : 95 Question Id : 3838236575 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The parallel axis theorem states that the moment of inertia of a body about any axis is equal to

**Options :**

- Its moment of inertia about a parallel axis through its center of mass plus the product of its mass
1. ✔ and the distance between the axes squared

2. ✘ The sum of the moment of inertia of individual components
3. ✘ Its moment of inertia about the centroidal axis minus the square of the distance between the axes
4. ✘ The product of its area and the square of the distance between the two axes

**Question Number : 96 Question Id : 3838236576 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The polar moment of inertia of a plane figure about a point is indicative of

**Options :**

1. ✘ The figure's resistance to bending
2. ✘ The figure's resistance to axial loads
3. ✔ The figure's resistance to torsional deformation
4. ✘ The total area of the plane figure

**Question Number : 97 Question Id : 3838236577 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The mass moment of inertia of an object is a measure of

**Options :**

1. ✔ Its resistance to changes in rotational motion about an axis
2. ✘ The total mass distributed in the object
3. ✘ Its ability to conduct heat
4. ✘ The gravitational force acting on it

**Question Number : 98 Question Id : 3838236578 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The study of the motion of bodies without considering the forces that cause the motion is known as

**Options :**

1. ✘ Kinetics
2. ✔ Kinematics
3. ✘ Statics
4. ✘ Thermodynamics

**Question Number : 99 Question Id : 3838236579 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

D'Alembert's Principle is used to

**Options :**

1. ✔ Convert a dynamic problem into an equivalent static problem
2. ✘ Determine the acceleration in dynamic systems
3. ✘ Calculate the work done by a variable force
4. ✘ Analyze the stability of rigid bodies

**Question Number : 100 Question Id : 3838236580 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In simple harmonic motion (SHM), the force acting on the particle is

**Options :**

1. ✘ Proportional to the square of displacement
2. ✘ Inversely proportional to displacement
3. ✘ Proportional to the cube of displacement
4. ✔ Proportional to the displacement and in the opposite direction

**Question Number : 101 Question Id : 3838236581 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In steady state conduction, the temperature gradient within a solid material does not

**Options :**

1. ✘ Increase over time
2. ✘ Decrease over time
3. ✔ Change over time
4. ✘ Vary spatially within the material

**Question Number : 102 Question Id : 3838236582 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The mode of heat transfer that requires no medium is

**Options :**

1. ✘ Conduction
2. ✘ Convection
3. ✔ Radiation
4. ✘ Advection

**Question Number : 103 Question Id : 3838236583 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The primary mechanism of heat transfer in furnaces is

**Options :**

1. ✘ Conduction
2. ✘ Convection
3. ✘ Radiation

4. ✓ Convection and Radiation

**Question Number : 104 Question Id : 3838236584 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Factors affecting furnace efficiency do not include

**Options :**

1. ✘ Type of fuel used
2. ✘ Design of the furnace
3. ✘ Ambient temperature
4. ✓ Color of the furnace exterior

**Question Number : 105 Question Id : 3838236585 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

A tool used to visualize energy flow and efficiency in a system is

**Options :**

1. ✘ Pie chart
2. ✘ Bar graph
3. ✓ Sankey diagram
4. ✘ Line graph

**Question Number : 106 Question Id : 3838236586 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The principle of waste heat recovery that involves transferring heat from exhaust gases to the incoming air is

**Options :**

1. ✘ Combustion
2. ✓ Recuperation



3. ✘ Regeneration

4. ✘ Condensation

**Question Number : 107 Question Id : 3838236587 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The difference between recuperators and regenerators is primarily in their

**Options :**

1. ✘ Operating temperatures

2. ✘ Heat transfer mechanisms

3. ✔ Continuous versus intermittent operation

4. ✘ Application industries

**Question Number : 108 Question Id : 3838236588 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In recuperators, AMTD refers to

**Options :**

1. ✘ Average Molecular Thermal Drive

2. ✔ Arithmetic Mean Temperature Difference

3. ✘ Analytical Method of Thermal Distribution

4. ✘ Asymmetrical Mean Temperature Dynamics

**Question Number : 109 Question Id : 3838236589 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Salt bath furnaces are used for

**Options :**

1. ✘ Melting metals
2. ✔ Heat treating small parts
3. ✘ Generating steam
4. ✘ Incinerating waste

**Question Number : 110 Question Id : 3838236590 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Protective atmospheres in furnaces are used to

**Options :**

1. ✘ Increase fuel consumption
2. ✘ Enhance heat transfer
3. ✔ Prevent oxidation and other chemical reactions
4. ✘ Decrease the thermal efficiency

**Question Number : 111 Question Id : 3838236591 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The efficiency of a Carnot cycle is determined by

**Options :**

1. ✔ The difference in temperature between the hot and cold reservoirs
2. ✘ The total work done during the cycle
3. ✘ The amount of heat absorbed in the process
4. ✘ The specific heat capacities of the substances involved

**Question Number : 112 Question Id : 3838236592 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The Gibbs-Helmholtz equation is used to determine

**Options :**

1. ✘ The change in internal energy at constant volume
2. ✘ The change in enthalpy at constant pressure
3. ✔ The relationship between the Gibbs free energy change and temperature
4. ✘ The efficiency of an engine cycle

**Question Number : 113 Question Id : 3838236593 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Chemical potential in a thermodynamic system is a measure of

**Options :**

1. ✘ The change in pressure with volume at constant temperature
2. ✘ The change in entropy with temperature at constant volume
3. ✘ The potential energy per particle to do work
4. ✔ The energy change when a particle is added to a system at constant temperature and pressure

**Question Number : 114 Question Id : 3838236594 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The third law of thermodynamics states that

**Options :**

1. ✘ Energy in the universe is constant
2. ✔ Entropy of a perfect crystal at absolute zero is zero
3. ✘ The efficiency of any engine cannot be 100%
4. ✘ Temperature can be measured in a relative scale

**Question Number : 115 Question Id : 3838236595 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

The efficiency of a cyclic process is limited by

**Options :**

1. ✘ The first law of thermodynamics
2. ✘ The zeroth law of thermodynamics
3. ✔ The second law of thermodynamics
4. ✘ The conservation of momentum

**Question Number : 116 Question Id : 3838236596 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Entropy can be conceptually understood as a measure of

**Options :**

1. ✘ Pressure within a system
2. ✔ Disorder or randomness in a system
3. ✘ The energy unavailable to do work
4. ✘ Temperature changes in a system

**Question Number : 117 Question Id : 3838236597 Question Type : MCQ Option Shuffling : Yes**

**Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In Joule's experiments, the equivalence of heat and mechanical work was demonstrated, establishing the mechanical

**Options :**

1. ✘ Advantage of heat engines
2. ✔ Equivalent of heat

3. ✘ Energy conservation principle
4. ✘ Work principle in thermodynamics

**Question Number : 118 Question Id : 3838236598 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

During an isothermal expansion of an ideal gas

**Options :**

1. ✘ The temperature of the gas increases
2. ✔ The internal energy of the gas remains constant
3. ✘ The gas absorbs heat without doing work
4. ✘ The pressure of the gas remains constant

**Question Number : 119 Question Id : 3838236599 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

In a reversible adiabatic expansion of an ideal gas

**Options :**

1. ✘ The temperature of the gas remains constant
2. ✔ The gas does work without heat exchange with the surroundings
3. ✘ Heat is absorbed by the gas to perform work
4. ✘ The process occurs at constant pressure

**Question Number : 120 Question Id : 3838236600 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

**Correct Marks : 1 Wrong Marks : 0**

Statistical entropy in thermodynamics is a measure that

**Options :**

1. ✘ Is independent of the microscopic states of a system

2. ✘ Decreases with the number of accessible microscopic states
3. ✔ Increases as the number of accessible microscopic states increases
4. ✘ Is constant for all ideal gases