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**Notations :**

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

| | |
|---|---|
| **Question Paper Name :** | Nano Technology 08th June 2025 Shift 2 |
| **Subject Name :** | Nano Technology |
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## Nano Technology

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|---|---|
| **Group Number :** | 1 |
| **Group Id :** | 83189663 |
| **Group Maximum Duration :** | 0 |
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| **Show Attended Group? :** | No |
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|---|---|
| **Break time :** | 0 |
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# Nano Technology

| | |
|---|---|
| **Section Id :** | 83189663 |
| **Section Number :** | 1 |
| **Section type :** | Online |
| **Mandatory or Optional :** | Mandatory |
| **Number of Questions :** | 120 |
| **Number of Questions to be attempted :** | 120 |
| **Section Marks :** | 120 |
| **Maximum Instruction Time :** | 0 |
| **Sub-Section Number :** | 1 |
| **Sub-Section Id :** | 83189663 |
| **Question Shuffling Allowed :** | Yes |

**Question Number : 1 Question Id : 8318967441 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The shape of first Brillouin zone of an FCC lattice is?

**Options :**

1. ✖ Tetrahedral

2. ✖ Triagonal

3. ✖ Truncated hexagon

4. ✔ Truncated octahedron

**Question Number : 2 Question Id : 8318967442 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

For a body to be in equilibrium under concurrent coplanar forces, the sum of:

**Options :**

1. ✖ Moments must be zero

2. ✖ Forces in vertical direction must be zero

3. ✖ All forces must be zero

4. ✔ Horizontal and vertical components of forces must each be zero

**Question Number : 3 Question Id : 8318967443 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

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

A metal nanopowder is produced by four different process as given below. Spherical morphology of the powder is more likely in?

**Options :**

1. ✖ Electrolytic reduction process

2. ✖ Water atomization process

3. ✖ Machining process

4. ✔ Air atomization process

**Question Number : 4 Question Id : 8318967444 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**
**Correct Marks : 1 Wrong Marks : 0**

In a simply supported beam, where does maximum bending moment occur under a point load?

**Options :**

1. ✖ At the support

2. ✔ At the point load

3. ✖ Mid-span

4. ✖ Uniform throughout

**Question Number : 5 Question Id : 8318967445 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which mathematical method is used in X-ray crystallography?

**Options :**

1. ✔ Fourier Transformation

2. ✖ Partial Differentiation

3. ✖ Geiger Method

4. ✖ Permutation

**Question Number : 6 Question Id : 8318967446 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In 2D viscous incompressible flow, the continuity equation is:

**Options :**

1. ✔ $\partial u/\partial x + \partial v/\partial y = 0$

2. ✖ $\partial u/\partial x + \partial v/\partial x = 0$

3. ✖ $\partial u/\partial y = \partial v/\partial x$

4. ✖ $\partial^2 u/\partial x^2 = \partial^2 v/\partial y^2$

**Question Number : 7 Question Id : 8318967447 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Grain size distribution in nano material is close to?

**Options :**

1. ✖ Bimodal

2. ✖ Parabolic

3. ✔ Log normal

4. ✖ Exponential

**Question Number : 8 Question Id : 8318967448 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The number of dimensionless groups formed using Buckingham's π-theorem is:

**Options :**

1. ✖ Equal to number of variables

2. ✖ Equal to number of fundamental dimensions

3. ✔ Variables minus fundamental dimensions

4. ✖ Always 3

**Question Number : 9 Question Id : 8318967449 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

On a Mohr's circle, any point on the circle represents:

**Options :**

1. ✖ Axial stress only

2. ✖ Pure shear

3. ✔ Stress on some inclined plane

4. ✖ Principle stress

**Question Number : 10 Question Id : 8318967450 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The equation which describes the relationship between grain size and

the yield of poly crystalline metals is called as?

**Options :**

1. ✖ Burgers' equation

2. ✔ Hall – Petch equation

3. ✖ Boltzmann equation

4. ✖ Braags' equation

**Question Number : 11 Question Id : 8318967451 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A method used to produce high quality semiconductor grade material?

**Options :**

1. ✔ Floating zone refining

2. ✖ Laser ablation

3. ✖ Vacuum arc melting

Vacuum induction melting

4. ✖

**Question Number : 12 Question Id : 8318967452 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Laminar flow is characterized by:

**Options :**

High Reynolds number

1. ✖

Random particle motion

2. ✖

Smooth, orderly layers

3. ✔

Sudden pressure drops

4. ✖

**Question Number : 13 Question Id : 8318967453 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Differential scanning calorimetry is used for the determination of?

**Options :**

1. ✖ Surface topography

2. ✖ Co-efficient of thermal expansion

3. ✔ Phase transformations

4. ✖ Grain boundary chemical analysis

**Question Number : 14 Question Id : 8318967454 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In Joule's experiment, heat is converted into:

**Options :**

1. ✖ Light

2. ✖ Work

3. ✖ Entropy

4. ✔ Internal energy

**Question Number : 15 Question Id : 8318967455 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Inert gas used in Brunauer – Emmet – Teller (BET) surface area analysis for measuring low surface area values is:

**Options :**

1. ✖ $N_2$

2. ✖ Ar

3. ✔ Kr

4. ✖ Xe

**Question Number : 16 Question Id : 8318967456 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

An Ellingham diagram is used to:

**Options :**

1. ✖ Calculate melting points

2. ✖ Determine gas fugacity

3. ✔ Predict reduction feasibility of metal oxides

4. ✖ Evaluate activity coefficients

**Question Number : 17 Question Id : 8318967457 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In the case of nanostructures, the ratio of number of atoms on the surface to the number of atoms in the interior is _____

**Options :**

1. ✖ exactly zero because the total tends to infinity

may be of the order of unity

2. ✔

always 0.5

3. ✖

tends to infinity because the surface energy tends to infinity

4. ✖

**Question Number : 18 Question Id : 8318967458 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A quantum dot emits light at 600 nm. If the particle size is reduced,

the emitted wavelength will:

**Options :**

Increase

1. ✖

Decrease

2. ✔

Remain same

3. ✖

First increase, then decrease

4. ✖

**Question Number : 19 Question Id : 8318967459 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The primary mode of heat transfer in solids is:

**Options :**

Conduction

1. ✔

Convection

2. ✖

Radiation

3. ✖

All modes equally

4. ✖

**Question Number : 20 Question Id : 8318967460 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

How many number of Bravais lattices are there in the monoclinic crystal system?

**Options :**

1. ✖ 4

2. ✖ 3

3. ✖ 1

4. ✔ 2

**Question Number : 21 Question Id : 8318967461 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Displacement thickness in boundary layer theory represents:

**Options :**

1. ✖ Thickness of wall

2. ✖ Distance where velocity is zero

3. ✔ Shift in outer inviscid flow due to boundary layer

4. ✖ Distance of maximum shear

**Question Number : 22 Question Id : 8318967462 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The Navier-Stokes equation is based on:

**Options :**

1. ✖ Conservation of mass only

2. ✔ Newton's second law for fluids

3. ✖ Bernoulli's principle

4. ✖ Pascal's law

**Question Number : 23 Question Id : 8318967463 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

For the emission of characteristic X-rays from the K-shell of an element, the incident energy should be?

**Options :**

1. ✖ Less than the corresponding ionization potential

2. ✔ Greater than the corresponding ionization potential

3. ✖ Greater than the bond energy

4. ✖ Less than the bond energy

**Question Number : 24 Question Id : 8318967464 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A material shows the following stress strain data: Stress = 400 MPa at strain = 0.002. Find modulus of elasticity.

**Options :**

1. ✔ 200 GPa

2. ✖ 100 GPa

3. ✖ 300 GPa

4. ✖ 250 GPa

**Question Number : 25 Question Id : 8318967465 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Surface area per gram of the adsorbent is called?

**Options :**

1. ✖ Molar surface area

2. ✖ Normal surface area

Specific surface area

3. ✔

Equivalent surface area

4. ✖

**Question Number : 26 Question Id : 8318967466 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Reynolds stresses arise due to:

**Options :**

Laminar sublayer

1. ✖

Density variation

2. ✖

Mean flow gradients

3. ✖

Turbulent fluctuations

4. ✔

**Question Number : 27 Question Id : 8318967467 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Optical fibers rely primarily on:

**Options :**

1. ✖ Electron tunneling

2. ✖ Magnetic hysteresis

3. ✔ Total internal reflection

4. ✖ Photoluminescence

**Question Number : 28 Question Id : 8318967468 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Electron backscattered diffraction is a technique based on?

**Options :**

1. ✖ Optical microscopy

2. ✔ Scanning electron microscopy

3. ✖ Atomic force microscopy

4. ✖ X-ray diffraction

**Question Number : 29 Question Id : 8318967469 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A polymer shows a glass transition temperature (Tg) of 100°C. If modified with nanofillers, Tg increases by 15%. What is the new Tg?

**Options :**

1. ✖ 110°C

2. ✔ 115°C

3. ✖ 120°C

4. ✖ 130°C

**Question Number : 30 Question Id : 8318967470 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Thermodynamically stable defects are?

**Options :**

1. Point defects ✔

2. Line defects ✖

3. Surface defects ✖

4. Volume defects ✖

**Question Number : 31 Question Id : 8318967471 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Enthalpy and temperature are?

**Options :**

1. Both extensive properties ✖

2. ✖ Both intensive properties

3. ✔ Extensive and intensive properties, respectively

4. ✖ Intensive and extensive properties, respectively

**Question Number : 32 Question Id : 8318967472 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In laminar boundary layer flow over a flat plate, wall shear stress:

**Options :**

1. ✖ Constant

2. ✔ Decreases with distance

3. ✖ Increases with distance

4. ✖ Zero

**Question Number : 33 Question Id : 8318967473 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The third law of thermodynamic states that in the limit $T \rightarrow 0$?

**Options :**

1. ✖ $U = 0$

2. ✔ $S = 0$

3. ✖ $H = 0$

4. ✖ $G = 0$

**Question Number : 34 Question Id : 8318967474 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Turbulent flow is generally observed when Reynolds number is:

**Options :**

1. ✖ $< 2000$

2. ✔ $> 4000$

3. ✖ $< 500$

4. ✖ Between 500–1000

**Question Number : 35 Question Id : 8318967475 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The product of electron and hole concentration in an extrinsic semiconductor is?

**Options :**

1. ✖ Infinity

2. ✖ Dependent of impurity concentration

3. ✔ Independent of impurity concentration

4. ✖ Zero

**Question Number : 36 Question Id : 8318967476 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The susceptibility of a diamagnetic material is essentially independent of temperature.

**Options :**

1. ✖ At very high temperatures

2. ✔ As long as the electronic structure is independent of temperature

3. ✖ At very low temperature of the order 10 K

4. ✖ Under all circumstances

**Question Number : 37 Question Id : 8318967477 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A flat plate is placed in an air stream at 20 °C. The free stream velocity is 2 m/s. If the kinematic viscosity of air is $1.5 \times 10^{-5}$ $m^2/s$, what is the Reynolds number at a distance of 1 m from the leading edge?

**Options :**

1. $1.33 \times 10^5$ ✔

2. $1.00 \times 10^5$ ✖

3. $2.00 \times 10^5$ ✖

4. $2.67 \times 10^5$ ✖

**Question Number : 38 Question Id : 8318967478 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

An elemental superconductor is a perfect?

**Options :**

1. ✖ Ferromagnetic

2. ✔ Diamagnetic

3. ✖ Paramagnetic

4. ✖ Dielectric

**Question Number : 39 Question Id : 8318967479 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Maximum shear stress in a circular shaft under torque is at:

**Options :**

1. ✖ Center

2. ✔ Surface

3. ✖ At radius/2

At neutral axis

4. ✖

**Question Number : 40 Question Id : 8318967480 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

High elastic modulus in material arises from?

**Options :**

High strength of bonds

1. ✔

Combination of bonds

2. ✖

Weak bonds

3. ✖

No bond

4. ✖

**Question Number : 41 Question Id : 8318967481 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Nusselt number is a function of:

**Options :**

1. ✖ Heat capacity

2. ✖ Conductivity only

3. ✔ Grashof and Prandtl numbers

4. ✖ Reynolds number only

**Question Number : 42 Question Id : 8318967482 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In bending, the stress is maximum at:

**Options :**

1. ✖ Neutral axis

2. ✔ Outer fibers

3. ✖ Midpoint

At centroid

4. ✖

**Question Number : 43 Question Id : 8318967483 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A Salt Bath Furnace provides heat transfer primarily by:

**Options :**

Conduction

1. ✖

Radiation

2. ✖

Immersion (convection + conduction)

3. ✔

Direct flame contact

4. ✖

**Question Number : 44 Question Id : 8318967484 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In plane Couette flow, the flow is generated by:

**Options :**

1. ✖ Pressure gradient

2. ✖ Gravity

3. ✔ Relative motion between two plates

4. ✖ Viscous heating

**Question Number : 45 Question Id : 8318967485 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The ceramic that can be used as a cutting tool?

**Options :**

1. ✖ Magnesia

2. ✖ Titania

3. ✔ Alumina

4. ✖ Yittria

**Question Number : 46 Question Id : 8318967486 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the following is a dimensionless number related to heat conduction?

**Options :**

1. ✔ Fourier Number

2. ✖ Nusselt Number

3. ✖ Prandtl Number

4. ✖ Stanton Number

**Question Number : 47 Question Id : 8318967487 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The efficiency of a furnace is generally defined as:

**Options :**

1. ✖ Energy lost / energy input

2. ✖ Energy input / energy loss

3. ✔ Useful heat / heat supplied

4. ✖ Mass of fuel / heat output

**Question Number : 48 Question Id : 8318967488 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In materials characterization, electron microscopy uses which property of electron?

**Options :**

1. ✖ Negative charge

2. ✖ Spin nature

3. ✔ Wave nature

4. ✖ Zero

**Question Number : 49 Question Id : 8318967489 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A particle moves along a straight line with uniformly increasing acceleration. In the first 2 seconds, it covers 10 meters, and in the next 2 seconds it covers 30 meters. Which of the following statements is correct?

**Options :**

1. ✖ The particle has a constant velocity.

2. ✖ The particle's acceleration is increasing linearly with time.

The particle has a constant non-zero acceleration, and the initial velocity is non-zero.

3. ✖

The particle starts from rest and has constant acceleration.

4. ✔

**Question Number : 50 Question Id : 8318967490 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 deformation region is

**Options :**

Elastic modulus

1. ✔

Plastic modulus

2. ✖

Poisson's ratio

3. ✖

Bulk modulus

4. ✖

**Question Number : 51 Question Id : 8318967491 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Boltzmann's equation is:

**Options :**

1. $S = kT \ln P$ ✖

2. $S = k \ln W$ ✔

3. $S = PV / T$ ✖

4. $S = Q / T$ ✖

**Question Number : 52 Question Id : 8318967492 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Requirement of cross-slip movement of distortion?

**Options :**

1. Preferred slip plane ✖

2. ✖ Preferred slip direction

3. ✔ No preferred slip plane

4. ✖ No preferred slip direction

**Question Number : 53 Question Id : 8318967493 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Recuperators are more suitable than regenerators when:

**Options :**

1. ✖ Fuel is solid

2. ✔ Operation is continuous

3. ✖ Fuel cost is negligible

4. ✖ Space is not an issue

**Question Number : 54 Question Id : 8318967494 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The first law of thermodynamics is conservation of?

**Options :**

1. ✖ Momentum

2. ✔ Energy

3. ✖ Pressure

4. ✖ Velocity

**Question Number : 55 Question Id : 8318967495 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The role of a reducing agent in metallic nanomaterials synthesis is to?

**Options :**

1. ✖ Act as a solvent for the reaction

2. ✔ Donate electrons to the metal ions

3. ✖ Accept electrons from the metal ions

4. ✖ Increase the temperature of the reaction mixture

**Question Number : 56 Question Id : 8318967496 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Carnot engine consists of?

**Options :**

1. ✖ Two constant volume and two reversible adiabatic process

2. ✔ Two isothermal and two reversible adiabatic process

3. ✖ Two constant pressure and two reversible adiabatic process

One constant volume, one constant pressure and two reversible adiabatic process

4. ✖

**Question Number : 57 Question Id : 8318967497 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A furnace uses preheated air at 300°C instead of ambient air at 30°C. If fuel consumption reduces by 20%, the impact is:

**Options :**

Higher stack temperature

1. ✖

Lower available heat

2. ✖

Increased efficiency

3. ✔

More fuel required

4. ✖

**Question Number : 58 Question Id : 8318967498 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Quantum dots are used in display technologies because they

**Options :**

1. ✖ Are very large in size

2. ✖ Emit fixed wavelengths regardless of size

3. ✔ Emit light with size-tunable wavelengths

4. ✖ Absorb only UV light

**Question Number : 59 Question Id : 8318967499 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the following techniques is used to determine particle sizes

in the sub-nanometer range?

**Options :**

1. ✖ Sedimentation

2. ✔ Dynamic light scattering

3. ✖ X-ray radiography

4. ✖ Sieving

**Question Number : 60 Question Id : 8318967500 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the information is true regarding scanning electron microscopy?

**Options :**

1. ✖ As working distance increases resolution increases

2. ✔ As working distance decreases resolution increases

3. ✖ As working distance decreases depth of field increases

4. ✖ As working distance changes depth of field remains unaltered

**Question Number : 61 Question Id : 8318967501 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Fugacity is a corrected pressure that:

**Options :**

1. ✔ Replaces pressure in ideal gas equations

2. ✖ Applies to solids only

3. ✖ Equals actual pressure

4. ✖ Increases with ideality

**Question Number : 62 Question Id : 8318967502 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

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

The throttling process is _____ process.

**Options :**

1. ✖ Reversible

2. ✔ Irreversible

3. ✖ Closed

4. ✖ Open

**Question Number : 63 Question Id : 8318967503 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**
**Correct Marks : 1 Wrong Marks : 0**

The fraction of heat which changes into work?

**Options :**

1. ✖ Helm – Holtz frequency

2. ✔ Gibbs's free energy

3. ✖ H + G

4. ✖ F + G

**Question Number : 64 Question Id : 8318967504 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Magnetic flux is expressed by?

**Options :**

1. ✖ Ampere

2. ✖ Volts

3. ✔ Weber

4. ✖ Weber/$m^2$

**Question Number : 65 Question Id : 8318967505 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the following technique is used to measure the chemical composition of the nanomaterials?

**Options :**

1. ✖ Raman spectroscopy

2. ✖ X-ray diffraction

3. ✔ Energy Dispersive Spectroscopy

4. ✖ UV – VIS spectroscopy

**Question Number : 66 Question Id : 8318967506 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In simple harmonic motion, the velocity is zero when:

**Options :**

1. ✖ Displacement is zero

2. ✖ Only displacement is maximum

3. ✖ Only acceleration is maximum

4. ✔ Both displacement and acceleration is maximum

**Question Number : 67 Question Id : 8318967507 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Miller indices for a plane cutting $x = a$, $y = \infty$, $z = c$ is:

**Options :**

1. ✔ (1 0 1)

2. ✖ (1 0 0)

3. ✖ (1 1 1)

4. ✖ (0 1 1)

**Question Number : 68 Question Id : 8318967508 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

For a certain gas, $C_p = 29$ J/mol·K and $C_v = 21$ J/mol·K. What is the gas constant R?

**Options :**

1. ✔ 8 J/mol·K

2. ✖ 6 J/mol·K

3. ✖ 10 J/mol·K

4. ✖ 12 J/mol·K

**Question Number : 69 Question Id : 8318967509 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**

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

The total area under stress – strain curve represents?

**Options :**

1. ✖ Malleability

2. ✔ Toughness

3. ✖ Resilience

4. ✖ Fracture strength

**Question Number : 70 Question Id : 8318967510 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes**
**Correct Marks : 1 Wrong Marks : 0**

The free energy of a nano-sized system compared to its bulk counterpart?

**Options :**

1. ✖ Is no longer intensive

2. ✖ Continues to be intensive

3. ✔ Is no longer extensive

4. ✖ Continuous to be extensive

**Question Number : 71 Question Id : 8318967511 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Total internal reflection in optical fibers occurs when:

**Options :**

1. ✖ Light goes from low to high refractive index

2. ✖ Angle of incidence < critical angle

3. ✖ Light is absorbed by the cladding

4. ✔ Angle of incidence > critical angle and $n_1 > n_2$

**Question Number : 72 Question Id : 8318967512 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Burgers vector is used to describe:

**Options :**

1. Twinning ✖

2. Dislocation ✔

3. Plastic flow ✖

4. Vacancy migration ✖

**Question Number : 73 Question Id : 8318967513 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

One of the optical properties of nanomaterials that changes with size is:

**Options :**

1. ✖ Luster

2. ✔ Absorption spectrum

3. ✖ Transparency

4. ✖ Density

**Question Number : 74 Question Id : 8318967514 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Vant Hoff's isotherm is used to relate:

**Options :**

1. ✖ Enthalpy and entropy

2. ✖ Heat of reaction and pressure

3. ✔ Equilibrium constant and temperature

4. ✖ Fugacity and activity

**Question Number : 75 Question Id : 8318967515 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Carbon nanotubes are the typical example of?

**Options :**

1. ✖ Zero-dimensional materials

2. ✖ Two-dimensional materials

3. ✖ Three-dimensional materials

4. ✔ One-dimensional materials

**Question Number : 76 Question Id : 8318967516 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

For an ideal gas, enthalpy is a function of:

**Options :**

1. ✖ Pressure

2. ✔ Temperature only

3. ✖ Volume

4. ✖ Entropy

**Question Number : 77 Question Id : 8318967517 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The critical resolved shear stress (CRSS) determines:

**Options :**

1. ✔ When slip initiates

2. ✖ Dislocation density

3. ✖ Fracture toughness

Twinning behavior

4. ✖

**Question Number : 78 Question Id : 8318967518 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the following property makes carbon nanotubes an excellent material for nanoelectronics?

**Options :**

High aspect ratio

1. ✖

High melting point

2. ✖

High specific heat capacity

3. ✖

Ballistic electron transport

4. ✔

**Question Number : 79 Question Id : 8318967519 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which is not a feature of cold working?

**Options :**

1. ✖ Increase in dislocation density

2. ✖ Grain refinement

3. ✔ High ductility

4. ✖ Strain hardening

**Question Number : 80 Question Id : 8318967520 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

X-rays are?

**Options :**

1. ✖ Stream of electrons

2. ✖ Stream of positively charged particles

3. ✔ Electromagnetic radiations of high frequency

4. ✖ Stream of uncharged particles

**Question Number : 81 Question Id : 8318967521 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

When temperature increases, the energy bandgap of a semiconductor?

**Options :**

1. ✔ Decreases

2. ✖ Does not change

3. ✖ Increases

4. ✖ Almost zero

**Question Number : 82 Question Id : 8318967522 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Hall–Petch equation relates yield strength (σ<sub>y<sub>) to:

**Options :**

1. ✖ Strain rate

2. ✔ Grain size

3. ✖ Stacking fault energy

4. ✖ Poisson's ratio

**Question Number : 83 Question Id : 8318967523 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the following polymers are widely used in organic light emitting diodes (OLEDs)?

**Options :**

1. ✖ Polypropylene

2. ✔ Electroluminescent polymers

3. ✖ Polyaniline

4. ✖ Kevlar

**Question Number : 84 Question Id : 8318967524 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The Gibbs-Helmholtz equation relates:

**Options :**

1. ✖ Enthalpy and entropy

2. ✔ Gibbs free energy and enthalpy

3. ✖ Internal energy and volume

4. ✖ Work and entropy

**Question Number : 85 Question Id : 8318967525 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In an impurity semiconductor, donor impurity atoms?

**Options :**

1. ✖ Add holes to the valence band

2. ✖ Remove electrons from the valence band

3. ✔ Add electrons to the conduction band

4. ✖ Add electrons to the valence band

**Question Number : 86 Question Id : 8318967526 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In the sol – gel process, the transition from sol to gel is mainly due to?

**Options :**

1. ✖ High temperature annealing

2. ✔ Hydrolysis and poly-condensation reactions

3. ✖ Application of external magnetic field

4. ✖ Application of an electric field

**Question Number : 87 Question Id : 8318967527 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which material typically shows no yield point in its stress-strain diagram?

**Options :**

1. ✖ Mild steel

2. ✔ Cast iron

3. ✖ Annealed copper

4. ✖ High carbon steel

**Question Number : 88 Question Id : 8318967528 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

When hydrogen peroxide is added to an acidified solution of KI, iodine ($I_2$) is liberated. In this case, hydrogen peroxide acts as?

**Options :**

1. ✖ A weak acid

2. ✖ A strong acid

3. ✔ Oxidizing agent

4. ✖ Reducing agent

**Question Number : 89 Question Id : 8318967529 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The laws of thermodynamic apply only to

**Options :**

1. ✔ Matter in bulk

2. ✖ Individual atom

3. ✖ Individual molecule

4. ✖ Individual proton

**Question Number : 90 Question Id : 8318967530 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A furnace uses 1000 kJ of fuel energy.

Useful heat output = 700 kJ.

What is the furnace efficiency?

**Options :**

1. ✖ 50%

2. ✔ 70%

3. ✖ 80%

4. ✖ 30%

**Question Number : 91 Question Id : 8318967531 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The $\Delta H$ for a reaction is independent of?

**Options :**

1. ✔ The path followed

2. ✖ $\Delta V$

3. ✖ The initial and final states

4. ✖ T

**Question Number : 92 Question Id : 8318967532 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A metal specimen elongates 0.2 mm under a tensile load. Original gauge length = 50 mm. Find engineering strain.

**Options :**

1. ✔ 0.004

2. ✖ 0.02

3. ✖ 0.002

4. ✖ 0.04

**Question Number : 93 Question Id : 8318967533 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which is a bottom-up approach in nanotechnology?

**Options :**

1. ✖ Ball milling

2. ✖ Lithography

3. ✔ Chemical vapour deposition

4. ✖ Cutting bulk materials

**Question Number : 94 Question Id : 8318967534 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A cantilever beam carrying a point load at free end, BM at fixed end is:

**Options :**

1. ✖ Zero

2. ✔ PL

3. ✖ PL/2

4. ✖ Maximum at mid-span

**Question Number : 95 Question Id : 8318967535 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the following material deposition techniques involves plasma for the deposition of the material?

**Options :**

1. ✖ Co-precipitation

2. ✖ Thermal evaporation

3. ✔ Sputtering

4. ✖ Sol – gel

**Question Number : 96 Question Id : 8318967536 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A stacking fault is an example of:

**Options :**

1. ✖ Volume defect

Line defect

2. ✖

Point defect

3. ✖

Planar defect

4. ✔

**Question Number : 97 Question Id : 8318967537 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In a nanomaterial, quantum confinement occurs when the particle size becomes comparable to the?

**Options :**

Thermal wavelength of electrons

1. ✖

Gravitational wavelength of electrons

2. ✖

De Broglie wavelength of electrons

3. ✔

Electron magnetic moment

4. ✖

**Question Number : 98 Question Id : 8318967538 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

During a constant pressure process, the heat added equals:

**Options :**

Change in internal energy

1. ✖

Work done

2. ✖

Change in enthalpy

3. ✔

Zero

4. ✖

**Question Number : 99 Question Id : 8318967539 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The Carnot cycle is:

**Options :**

1. ✔ Reversible and ideal

2. ✖ Irreversible

3. ✖ Isobaric

4. ✖ Isochoric

**Question Number : 100 Question Id : 8318967540 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Which of the following is the correct relationship between fugacity (f) and chemical potential (μ)?

**Options :**

1. ✔ $\mu = \mu_0 + RT \ln(f)$

2. ✖ $f = \mu_0 + RT \ln(\mu)$

3. ✖ $\mu_0 = f + RT \ln(\mu)$

4. ✖ $f = \mu + RT \ln(\mu_0)$

**Question Number : 101 Question Id : 8318967541 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Adiabatic flame temperature is highest when:

**Options :**

1. ✖ Air-fuel ratio is lean

2. ✔ Combustion is complete and adiabatic

3. ✖ Heat loss occurs

4. ✖ Fuel is incomplete

**Question Number : 102 Question Id : 8318967542 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The Zeroth Law of Thermodynamics is used to define:

**Options :**

1. ✖ Entropy

2. ✖ Enthalpy

3. ✔ Temperature

4. ✖ Internal energy

**Question Number : 103 Question Id : 8318967543 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Glass transition temperature (Tg) in polymers marks:

**Options :**

1. ✖ Melting point

Onset of cross-linking

2. ✖

Transition from brittle to rubbery state

3. ✔

Start of crystallization

4. ✖

**Question Number : 104 Question Id : 8318967544 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

According to free electron theory, electrical conductivity increases with:

**Options :**

Increasing temperature

1. ✖

Decreasing temperature

2. ✔

Increasing atomic number

3. ✖

4. ✖ Decreasing electron mobility

**Question Number : 105 Question Id : 8318967545 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A quantum dot is a nanomaterial of dimension?

**Options :**

1. ✖ One

2. ✖ Four

3. ✖ Two

4. ✔ Zero

**Question Number : 106 Question Id : 8318967546 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A ductile material exhibits:

**Options :**

1. ✖ Brittle fracture without warning

2. ✔ Large plastic deformation before breaking

3. ✖ High thermal conductivity

4. ✖ High hardness

**Question Number : 107 Question Id : 8318967547 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The work done during isothermal expansion of an ideal gas is:

**Options :**

1. ✖ Zero

2. ✖ $P\Delta V$

3. ✔ $nRT \ln(V_2/V_1)$

4. ✖ $nC_v\Delta T$

**Question Number : 108 Question Id : 8318967548 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

What is the primary reason for the unique properties of nanomaterials?

**Options :**

1. ✖ High density

2. ✖ Large grain size

3. ✔ High surface area to volume ratio

4. ✖ High porosity

**Question Number : 109 Question Id : 8318967549 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In semiconductors, light is emitted when:

**Options :**

1. ✖ Holes move from valence to conduction band

2. ✔ Electrons recombine with holes

3. ✖ Photons collide with atoms

4. ✖ Energy band gap increases

**Question Number : 110 Question Id : 8318967550 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The monomer of poly vinyl chloride (PVC) is?

**Options :**

1. ✖ Ethylene dichloride

2. ✖ Ethylene chloride

3. ✖ Chloroform

4. ✔ Chloro ethene

**Question Number : 111 Question Id : 8318967551 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

If $A$ is a $3 \times 3$ matrix with eigenvalues $1, 2$ *and* $3$, what is the trace of $A^2 - 3A + I$?

**Options :**

1. ✖ $-2$

2. ✖ $1$

3. ✖ $2$

4. ✔ $-1$

**Question Number : 112 Question Id : 8318967552 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Consider the system of equations:

$$x + 2y - z = 3$$
$$2x + 4y - 2z = 7$$
$$3x + 6y - 3z = 9$$

Which of the following statements is true about the system?

**Options :**

1. ✖ The system has a unique solution.

2. ✖ The system has infinitely many solutions

3. ✔ The system has no solution

4. ✖ The system has finitely many solutions but not unique.

**Question Number : 113 Question Id : 8318967553 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

A direction in which the function $f(x) = 2x + y$ remain constant at the point $(1,1)$ is _____

**Options :**

1. $\frac{\hat{i}}{\sqrt{5}} - \frac{2\hat{j}}{\sqrt{5}}$ ✔

2. $-\frac{2\hat{i}}{\sqrt{5}} + \frac{\hat{j}}{\sqrt{5}}$ ✖

3. $-\frac{\hat{i}}{\sqrt{5}} - \frac{\hat{j}}{\sqrt{5}}$ ✖

4. $\frac{\hat{i}}{\sqrt{5}} + \frac{2\hat{j}}{\sqrt{5}}$ ✖

**Question Number : 114 Question Id : 8318967554 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The surface integral $\int_S x^2\, dS$ over the upper hemisphere

$z = \sqrt{1 - x^2 - y^2}$ with radius 1 is_____

**Options :**

1. ✔ $\frac{\pi}{4}$

2. ✖ $\frac{\pi}{3}$

3. ✖ $\pi$

4. ✖ $2\pi$

**Question Number : 115 Question Id : 8318967555 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The set of all critical points of the function $f(x) = |x^2 - 1|$ on $[-2,2]$ is _____

**Options :**

1. ✖ $\{-1, 1\}$

2. ✔ $\{-1, 0, 1\}$

3. ✖ $\{1, 0\}$

4. ✖ $\{0\}$

**Question Number : 116 Question Id : 8318967556 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Suppose $\sum_{n=1}^{\infty} a_n(x-2)^n$ is convergent at $x = -5$, then it need not be convergent on which interval?

**Options :**

1. ✖ $|x-2| \leq 5$

2. ✖ $|x-2| < 5$

3. ✔ $|x-2| \leq 7$

4. ✖ $|x-2| < 7$

**Question Number : 117 Question Id : 8318967557 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

The general solution of the ordinary differential equation

$\frac{dy}{dx} = log(x\frac{dy}{dx} - y)$ is

**Options :**

1. ✖ $y = cx + e^c$, where $c$ is an arbitrary constant

2. ✖ $y = cx^2 + e^c$, where $c$ is an arbitrary constant

3. ✔ $y = cx - e^c$, where $c$ is an arbitrary constant

4. ✖ $y = cx^2 - e^c$, where $c$ is an arbitrary constant

**Question Number : 118 Question Id : 8318967558 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

If $X$ is a normal distribution with mean $\mu$ and variation $\sigma^2$, then the standard deviation and the mean of $Z = \frac{X-\mu}{2\sigma}$ are_____ , _____ respectively.

**Options :**

1. ✖ $\sigma, \mu$

2. ✖ $1, 0$

3. ✖ $0, \frac{1}{2}$

4. ✔ $\frac{1}{2}, 0$

**Question Number : 119 Question Id : 8318967559 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

In a binomial distribution $B(n = 10, p)$ the probability of getting exactly 4 successes equals the probability of getting exactly 6 successes. What is the mean of the distribution?

**Options :**

1. ✖ 0.5

2. ✖ 3.5

3. ✖ 2.5

4. ✔ 5

**Question Number : 120 Question Id : 8318967560 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Correct Marks : 1 Wrong Marks : 0**

Given $x_0 \neq 0$, the iteration $x_{n+1} = \frac{1}{2}\left(-\frac{9}{x_n} + x_n\right), n \geq 0$ is a

_____

**Options :**

1. ✖ Newton's method for $f(x) = -9 + x^2$

2. ✖ Fixed point iteration for $f(x) = \frac{9+x^2}{2x}$

3. ✔ Newton's method for $f(x) = 9 + x^2$

4. ✖ Fixed point iteration for $f(x) = 9 + x^2$