

# 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>	Nano Technology 14th Aug 2021 Shift 2
<b>Subject Name :</b>	Nano Technology
<b>Creation Date :</b>	2021-08-14 16:27:26
<b>Duration :</b>	120
<b>Total Marks :</b>	120
<b>Display Marks:</b>	Yes
<b>Calculator :</b>	None
<b>Magnifying Glass Required? :</b>	No
<b>Ruler Required? :</b>	No
<b>Eraser Required? :</b>	No
<b>Scratch Pad Required? :</b>	No
<b>Rough Sketch/Notepad Required? :</b>	No
<b>Protractor Required? :</b>	No
<b>Show Watermark on Console? :</b>	Yes
<b>Highlighter :</b>	No
<b>Auto Save on Console? :</b>	Yes

## Nano Technology

<b>Group Number :</b>	1
<b>Group Id :</b>	12984028
<b>Group Maximum Duration :</b>	0
<b>Group Minimum Duration :</b>	120
<b>Show Attended Group? :</b>	No

<b>Edit Attended Group? :</b>	No
<b>Break time :</b>	0
<b>Group Marks :</b>	120
<b>Is this Group for Examiner? :</b>	No

## Nano Technology

<b>Section Id :</b>	12984049
<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>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	12984049
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 1 Question Id : 1298403241 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

When a dielectric material is subjected to an alternating field of frequency in the infra-red region,

**Options :**

1. ✘ The atomic or ionic polarization ceases but the orientation polarization remains
2. ✘ The electronic polarization ceases but the atomic or ionic polarization remains

The atomic or ionic polarization and the orientation polarization cease but electronic polarization remains

3. ✓
4. ✘ All types of polarizations cease

**Question Number : 2 Question Id : 1298403242 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In the elastic regime, torque on a shaft causes

**Options :**

1. ✓ at the outer edge of the shaft
2. ✘ Uniform shear stress across the cross-section of the shaft
3. ✘ Distribution of shear stress along the radius of the shaft with maximum stress at the center of the shaft
4. ✘ Uniform bi-axial stress across the cross-section of the shaft

**Question Number : 3 Question Id : 1298403243 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

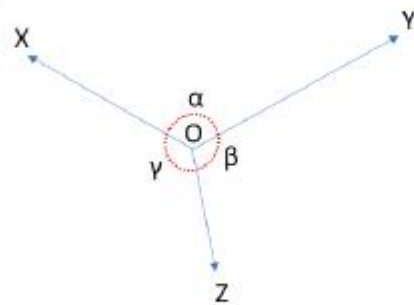
Which of the following can be designed to exceed the Stefan–Boltzmann law?

Options :

1. ✓ Nanostructures, metamaterials and sub-wavelength particles
2. ✘ Only nanostructures but not metamaterials and sub-wavelength particles
3. ✘ Only sub-wavelength particles but not nanostructures and metamaterials
4. ✘ Only metamaterials but not nanostructures and sub-wavelength particles

Question Number : 4 Question Id : 1298403244 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical  
Correct Marks : 1 Wrong Marks : 0

Three coplanar, concurrent, and non-collinear forces X, Y, and Z, respectively, are acting at a point O.



If the forces X, Y and Z are in equilibrium, then which of the following relations is correct?

Options :

1. ✘ 
$$\frac{X}{\sin\gamma} = \frac{Y}{\sin\beta} = \frac{Z}{\sin\alpha}$$

2. ✘ 
$$\frac{X}{\sin\alpha} = \frac{Y}{\sin\beta} = \frac{Z}{\sin\alpha}$$

3. ✘ 
$$\frac{X}{\sin\beta} = \frac{Y}{\sin\alpha} = \frac{Z}{\sin\gamma}$$

4. ✔ 
$$\frac{X}{\sin\beta} = \frac{Y}{\sin\gamma} = \frac{Z}{\sin\alpha}$$

Question Number : 5 Question Id : 1298403245 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical  
Correct Marks : 1 Wrong Marks : 0

A perpetual motion machine

Options :

1. ✘ Obeys the first and second law of thermodynamics

2. ✘ Violates the zeroth law of thermodynamics

3. ✔ Violates the first or second law of thermodynamics

4. ✘ Obeys all laws of thermodynamics

Question Number : 6 Question Id : 1298403246 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The ductility of free-cutting steels is

Options :

1. ✘ Slightly higher than those for the ordinary carbon steels due to the presence of lead
2. ✔ Lower than those for the ordinary carbon steels
3. ✘ Equal to that of ordinary carbon steels
4. ✘ Much higher than those for the ordinary carbon steels due to the presence of lead

Question Number : 7 Question Id : 1298403247 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

What is the entropic contribution to the free energy at absolute zero of temperature?

Options :

1. ✔ 0
2. ✘  $\infty$

3. ✘ 1

4. ✘ 0.5

**Question Number : 8 Question Id : 1298403248 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

A large volume of gas above the water implies

**Options :**

1. ✘ Higher pressure on water and therefore lower boiling point for water
2. ✔ Higher pressure on water and therefore higher boiling point for water
3. ✘ Lower pressure on water and therefore lower boiling point for water
4. ✘ Lower pressure on water and therefore higher boiling point for water

**Question Number : 9 Question Id : 1298403249 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The static moment around a considered axis for the composite area is equivalent to

**Options :**

1. ✘ The multiplication of the static moments of its sub areas of the composite area

- The multiplication of the squares of static moments of its sub areas of the composite area
2. ✘
3. ✘ The sum of the squares of static moments of its sub areas of the composite area
4. ✔ The sum of the static moments of its sub areas of the composite area

**Question Number : 10 Question Id : 1298403250 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

If  $D$  is the longest dimension in a vacuum chamber and  $\lambda$  is the mean free path of the residual air molecules in the chamber. The molecular flow occurs in the chamber when

**Options :**

1. ✘  $\lambda < D/100$
2. ✘  $\lambda < D$
3. ✘  $D/100 < \lambda < D$
4. ✔  $D < \lambda$

**Question Number : 11 Question Id : 1298403251 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**



Correct Marks : 1 Wrong Marks : 0

The conductance of a simple pipe with uniform cross-section can be increased by

Options :

1. ✓ Considering short and wide pipe
2. ✗ Considering short and narrow pipe
3. ✗ Considering long and wide pipe
4. ✗ Considering long and narrow pipe

Question Number : 12 Question Id : 1298403252 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Which of the following is correct as per Maxwell-Boltzmann equation?

Options :

1. ✗ RMS velocity of Al gas at 1200 °C is greater than that of H<sub>2</sub> gas at 1200 °C
2. ✓ RMS velocity of Al gas at 1200 °C is lesser than that of H<sub>2</sub> gas at 1200 °C
3. ✗ RMS velocity of Al gas at 1200 °C is greater than that of H<sub>2</sub> gas at 25 °C
4. ✗ Al gas flows with the same velocity as that of H<sub>2</sub> gas at 1200 °C

**Question Number : 13 Question Id : 1298403253 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Monoclinic crystal lattices can be

**Options :**

1. ✘ Strictly face-centered
2. ✘ Simple or face-centered
3. ✘ Simple or body-centered
4. ✔ Simple or base-centered

**Question Number : 14 Question Id : 1298403254 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

A cantilever beam of circular cross section is subjected to a load at its free end. If the depth of the beam and load is doubled, the deflection of the free end compared with original deflection will become

**Options :**

1. ✘ Remains same
2. ✘ Halved
3. ✘ Doubled

4. ✓ One fourth

Question Number : 15 Question Id : 1298403255 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

In  $\text{CaF}_2$  crystal

Options :

1. ✗ The coordination number of Ca is two while that of F is one
2. ✗ The coordination number of Ca is four while that of F is two
3. ✓ The coordination number of Ca is eight while that of F is four
4. ✗ The coordination number of Ca is eight while that of F is eight

Question Number : 16 Question Id : 1298403256 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

If the element of a fluid at each point has no net angular velocity about that point, the fluid flow is called as

Options :

1. ✗ A nonsteady flow
2. ✓ An irrotational flow

3. ✘ An incompressible flow

4. ✘ A nonviscous flow

**Question Number : 17 Question Id : 1298403257 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

When two streamlines in a steady fluid flow cross one another, the fluid flow

Options :

1. ✔ Become Unsteady

2. ✘ Continues to be steady with the same velocity

3. ✘ Continues to be steady with the reduced velocity

4. ✘ Stops abruptly

**Question Number : 18 Question Id : 1298403258 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In dielectric liquids, the electric field acting on a given molecule in the liquid

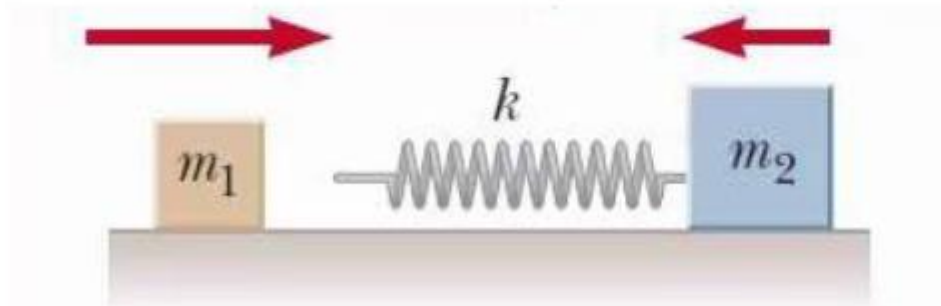
Options :

1. ✔ Consists of the external applied field and the local molecular field (due to mutual interaction of the surrounding polarized molecules)

2. ✘ Is only the local molecular field due to mutual interaction of the surrounding molecules
3. ✘ Is only the local molecular field due to mutual interaction of the surrounding polarized molecules
4. ✘ Is only the external applied field

Question Number : 19 Question Id : 1298403259 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

A block of mass  $m_1 = 2.0\text{kg}$  initially moving to right with a speed of  $4\text{ m/s}$  on a frictionless, horizontal track, collides (perfect elastic collision) with a light spring attached to second block of mass  $m_2 = 1.0\text{ kg}$  initially moving to left with a speed of  $2.0\text{ m/sec}$  as shown in Fig, find the velocities of the blocks when spring again come to original length.



Options :

1. ✔  $V_1 = 0$  and  $V_2 = 6.0\text{ m/sec}$

2. ✘  $V_1 = 6 \text{ m/sec}$  and  $V_2 = 0$
3. ✘  $V_1 = 8 \text{ m/sec}$  and  $V_2 = 6.0 \text{ m/sec}$
4. ✘  $V_1 = 0$  and  $V_2 = 8.0 \text{ m/sec}$

**Question Number : 20 Question Id : 1298403260 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

A particle travels through diffusion to a certain distance called diffusion length in a certain time called the diffusion time. The relation between diffusion time and diffusion length is given by

**Options :**

1. ✘ Diffusion time scales as diffusion length
2. ✔ Diffusion time scales as square of diffusion length
3. ✘ Diffusion time scales as cube of diffusion length
4. ✘ Diffusion time is inversely proportional to diffusion length

**Question Number : 21 Question Id : 1298403261 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The unit for plane-strain fracture toughness

Options :

1. ✘  $\text{MN/m}^2$
2. ✘  $\text{MN/m}^{1/2}$
3. ✔  $\text{MN/m}^{3/2}$
4. ✘  $\text{MN/m}$

Question Number : 22 Question Id : 1298403262 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

The type of bonding in diamond and SiC is

Options :

1. ✘ Covalent and metallic, respectively
2. ✘ Covalent and ionic, respectively
3. ✔ Covalent and covalent, respectively
4. ✘ Ionic and covalent, respectively

Question Number : 23 Question Id : 1298403263 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is

**Question Mandatory : No Option Orientation : Vertical**

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

If the lowest limit of grain size is considered in designing a material, then the designed material will be

**Options :**

1. ✓ An amorphous material
2. ✗ A nanocrystalline material
3. ✗ A microcrystalline material
4. ✗ A macrocrystalline material

**Question Number : 24 Question Id : 1298403264 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is**

**Question Mandatory : No Option Orientation : Vertical**

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

Which one of the following methods introduces grain refinement in the material?

**Options :**

1. ✗ Chemical vapor deposition
2. ✗ Plasma spray processing
3. ✓ Equal-channel angular pressing
4. ✗ Welding



Question Number : 25 Question Id : 1298403265 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Type II superconductor has

Options :

1. ✘ Two critical magnetic fields and only below the lower critical field, the superconductivity is observed
2. ✘ Two critical magnetic fields and only above the higher critical field, the superconductivity is observed
3. ✘ Two critical magnetic fields between which it doesn't allow even the partial penetration of the magnetic flux
4. ✔ Two critical magnetic fields between which it allows partial penetration of the magnetic flux through some isolated points

Question Number : 26 Question Id : 1298403266 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Dry ice is

Options :

1. ✘ Solid N<sub>2</sub>

2. ✓ Solid CO<sub>2</sub>
3. ✗ Solid NO<sub>2</sub>
4. ✗ Solid H<sub>2</sub>O + N<sub>2</sub>

**Question Number : 27 Question Id : 1298403267 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following discoveries won the Nobel prize

Options :

1. ✗ Carbon nanotubes (CNTs) and buckyballs
2. ✗ Graphene and CNTs
3. ✗ Buckyballs and diamond
4. ✓ Graphene and buckyballs

**Question Number : 28 Question Id : 1298403268 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Frank-Read mechanism is through which

Options :

1. ✘ Vacancies multiple in a crystal under stress
2. ✘ Frenkel defects multiple in a crystal under stress
3. ✘ Schottky defects multiple in a crystal under stress
4. ✔ Multiple dislocations in a crystal under stress

Question Number : 29 Question Id : 1298403269 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which of the following represents the typical thumb rules with respect to the constituents of bulk composite materials

Options :

1. ✔ The contents of the constituents should be  $\geq 10\%$  by volume and the property (to be enhanced by making a composite) of one of the constituents should be  $\geq 5$  times than the other constituents
2. ✘ The contents of the constituents should be  $\geq 5\%$  by volume and the property (to be enhanced by making a composite) of one of the constituents should be  $\geq 10$  times than the other constituents

3. ✘ The contents of the constituents should be  $\geq 5\%$  by volume and the property (to be enhanced by making a composite) of one of the constituents should be  $\geq 5$  times than the other constituents

4. ✘ The contents of the constituents should be  $\geq 10\%$  by volume and the property (to be enhanced by making a composite) of one of the constituents should be  $\geq 10$  times than the other constituents

**Question Number : 30 Question Id : 1298403270 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which law of thermodynamics is applicable when a doctor measures the body temperature of a patient

Options :

1. ✔ Zeroth law
2. ✘ First law
3. ✘ Second law
4. ✘ Third law

**Question Number : 31 Question Id : 1298403271 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which law of thermodynamics is applicable when a piece of iron rusts

Options :

1. ✘ Zeroth law
2. ✘ First law
3. ✔ Second law
4. ✘ Third law

Question Number : 32 Question Id : 1298403272 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which law of thermodynamics is applicable in the case of radioactive decay

Options :

1. ✘ Zeroth law
2. ✘ First law
3. ✔ Second law
4. ✘ Third law

Question Number : 33 Question Id : 1298403273 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If  $C(T)$  is the thermal capacity of a solid at temperature  $T$ , and when an amount of heat is absorbed by the body, then the entropy of the body at temperature  $T$  is given by

Options :

1. ✘  $\int_0^T \frac{C(T)}{T^3} dT$

2. ✘  $\int_0^T \frac{C(T)}{T^2} dT$

3. ✘  $\int_0^{T/2} \frac{C(T)}{T} dT$

4. ✔  $\int_0^T \frac{C(T)}{T} dT$

Question Number : 34 Question Id : 1298403274 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

What are Volmer–Weber, Frank–van der Merwe and Stranski–Krastanov modes

Options :

1. ✘ Additive manufacturing modes

2. ✓ Thin film growth modes
3. ✘ Line defect formation modes
4. ✘ Ultrasonic testing modes

Question Number : 35 Question Id : 1298403275 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Alloy is an example of a material

Options :

1. ✓ That has constituents that are mixed at the atomic/molecular level
2. ✘ That is constituted by impurities as secondary constituents in addition to a primary constituent
3. ✘ That is constituted by defects as secondary constituents in addition to a primary constituent
4. ✘ That is constituted by at least 2 macroscopically identifiable/distinguishable materials, which have distinct chemical and physical (including mechanical) properties

Question Number : 36 Question Id : 1298403276 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is

**Question Mandatory : No Option Orientation : Vertical**

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

Which of the following is true with respect to phase diagrams?

**Options :**

1. ✘ Only metals and alloys can have phase diagrams but not polymers and ceramics
2. ✘ Only ceramics can have phase diagrams but no other class of materials
3. ✘ Only metals, alloys and ceramics can have phase diagrams but not polymers
4. ✔ Metals, alloys, ceramics and polymers can have phase diagrams

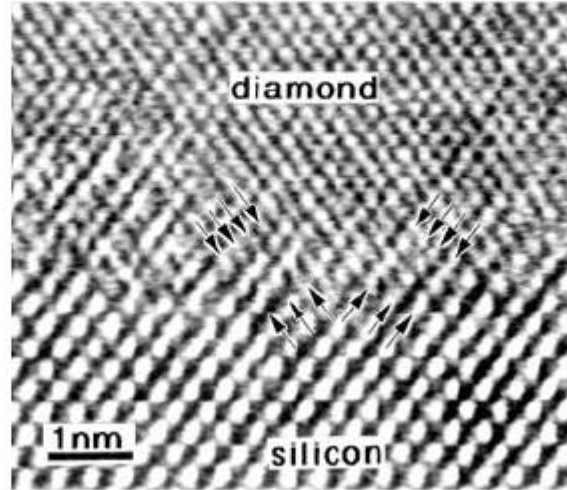
**Question Number : 37 Question Id : 1298403277 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is**

**Question Mandatory : No Option Orientation : Vertical**

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



What is the resolution in the micrograph given below?



Options :

1. ✘ Micron-scale resolution
2. ✘ Nanometer-scale resolution
3. ✔ Atomic-scale resolution
4. ✘ Sub-atomic scale resolution

Question Number : 38 Question Id : 1298403278 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which of the following can be applied to design Nozzle for a rocket produced to escape of its exhaust gases?

Options :

1. ✘ Maxwell's equation and equation of continuity
2. ✔ Bernoulli's equation and equation of continuity
3. ✘ Buoyancy
4. ✘ Buoyancy and Newton's laws of motion

Question Number : 39 Question Id : 1298403279 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Bernoulli's equation  $\frac{P}{\rho} + \frac{v^2}{2} + gh = \text{constant}$ , is applicable for

Options :

1. ✔ Steady, frictionless and incompressible flow along a streamline
2. ✘ Uniform and frictionless flow along a streamline when  $\rho$  is a function P
3. ✘ Steady and frictionless flow along a streamline when  $\rho$  is a function P
4. ✘ Steady, uniform and incompressible flow along a streamline

**Question Number : 40 Question Id : 1298403280 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

A body attains equilibrium only when the net external force and net external torque acting on the body

**Options :**

1. ✘ Attain the maximum value possible
2. ✔ Tend to be equal to zero
3. ✘ Attain the minimum possible value but not zero
4. ✘ Attain values close to that of the maximum value possible

**Question Number : 41 Question Id : 1298403281 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following methods is used to estimate the dislocation densities in semiconductors?

**Options :**

1. ✘ Infrared spectroscopy
2. ✘ Raman scattering

3. ✓ Etch pitting

4. ✘ X-ray diffraction

**Question Number : 42 Question Id : 1298403282 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following statements is correct with regards to redundant supports?

Options :

1. ✘ Redundant supports allow the structure to attain the equilibrium but make the equilibrium calculation complicated

2. ✘ Redundant supports allow the structure to attain the equilibrium and make the equilibrium calculation easier

3. ✘ Redundant supports do not allow the structure to attain the equilibrium but they make the equilibrium calculation easier

4. ✓ Redundant supports do not allow the structure to attain the equilibrium and also make the equilibrium calculation complicated

**Question Number : 43 Question Id : 1298403283 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In a typical 'Engineering Stress' versus 'Engineering Strain' plot, the amount of mechanical energy converted to heat in a volume of material resulting in damping is obtained by

Options :

1. ✓ Calculating the area covered by any instant of a loading and unloading cycle
2. ✗ Calculating the area covered by any instant of a loading and unloading cycle and dividing it with the slope of the elastic line
3. ✗ Multiplying the slope of the elastic line and strain at the yield point
4. ✗ Dividing the strain at the yield point with the slope of the elastic line

Question Number : 44 Question Id : 1298403284 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

X and Y  $\text{Jmol}^{-1}\text{K}^{-1}$  are the entropies per mole of the two equilibrium forms white Tin and grey Tin, respectively. If T K is the transition temperature below which white Tin transforms to grey Tin, then calculate the heat of transformation.

Options :

1. ✓  $T(X-Y)$
2. ✗  $T(Y-X)$

3. ✘ X-Y

4. ✘ X+Y

Question Number : 45 Question Id : 1298403285 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Single crystal Si ingots are produced by

Options :

1. ✔ Floating zone method

2. ✘ BS Murthy's method

3. ✘ Thornton's method

4. ✘ Hummers method

Question Number : 46 Question Id : 1298403286 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In the case of nanostructures, the ratio of surface energy to total energy

Options :

1. ✘ Is always 0.5

2. ✓ Usually in the order of unity
3. ✗ Is exactly zero because the total energy tends to infinity
4. ✗ Tends to infinity because the surface energy tends to infinity

**Question Number : 47 Question Id : 1298403287 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Giant Magnetoresistance (GMR) effect (which is one of the modern nanoscience revelations and which won the Nobel Prize) is based on a phenomenon called

**Options :**

1. ✗ Tunneling of magnetic domains
2. ✗ Tunnelling of atoms
3. ✗ Tunneling of resistance
4. ✓ Tunneling of magnetization

**Question Number : 48 Question Id : 1298403288 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Madelung energy is the main contribution to the binding energy of

**Options :**

1. ✓ Ionic crystals
2. ✗ Covalent crystals
3. ✗ Metals
4. ✗ Both metals and covalent crystals

Question Number : 49 Question Id : 1298403289 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Crystals of inert gas atoms are bound by Van der Waals interaction, which varies with distance (R) as

Options :

1. ✗  $R^{-8}$
2. ✓  $R^{-6}$
3. ✗  $R^{-4}$
4. ✗  $R^{-2}$

Question Number : 50 Question Id : 1298403290 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0



The ratio of the distances of two particles from their center of mass is the

Options :

1. ✘ Ratio of the square of their masses
2. ✘ Inverse ratio of the square of their masses
3. ✘ Ratio of their masses
4. ✔ Inverse ratio of their masses

Question Number : 51 Question Id : 1298403291 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is

Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Torsional vibrations in a typical internal combustion engine could break the crankshaft when

Options :

1. ✘ The frequency of the torsional vibration is  $2/3^{\text{rd}}$  of the torsional resonant frequency of the crankshaft
2. ✘ The frequency of the torsional vibration is  $3/4^{\text{th}}$  of the torsional resonant frequency of the crankshaft
3. ✔ The frequency of the torsional vibration equals the torsional resonant frequency of the crankshaft

4. ✘ The frequency of the torsional vibration is half of the torsional resonant frequency of the crankshaft

**Question Number : 52 Question Id : 1298403292 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The dimensions of angular momentum are same as that of

Options :

1. ✔ Planck's constant
2. ✘ Acceleration due to gravity
3. ✘ Energy
4. ✘ Boltzmann constant

**Question Number : 53 Question Id : 1298403293 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Phonon contribution to the thermal conductivity may be comparable with the electronic contribution in

Options :

1. ✘ Only pure metals

2. ✘ Both pure metals and impure metals
3. ✘ Both disordered alloys and pure metals
4. ✔ Both impure metals and disordered alloys

Question Number : 54 Question Id : 1298403294 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

If  $K$  and  $\sigma$  represent thermal and electrical conductivity, respectively of metals, then the ratio  $K/\sigma$  is

Options :

1. ✔ Directly proportional to temperature, with the value of proportionality constant independent of the metal
2. ✘ Inversely proportional to temperature, with the value of proportionality constant independent of the metal
3. ✘ Directly proportional to temperature, with the value of proportionality constant strongly dependent of the metal
4. ✘ Inversely proportional to temperature, with the value of proportionality constant strongly dependent of the metal

**Question Number : 55 Question Id : 1298403295 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The color centers in crystals absorb

Options :

1. ✘ Infrared light
2. ✔ Visible light
3. ✘ Ultraviolet light
4. ✘ X-rays

**Question Number : 56 Question Id : 1298403296 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Transmission shafts transmit torque due to

Options :

1. ✔ Torsional load
2. ✘ Tensile load
3. ✘ Shear forces
4. ✘ Compressive plus shear forces

Question Number : 57 Question Id : 1298403297 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A light spring balance hangs from the hook of another but same type of a light spring balance and a mass  $S$  kg hangs from the hook of the bottom spring. Then the tension in the upper spring in Newtons is?

Options :

1. ✘  $S/2$

2. ✔  $S$

3. ✘  $2S$

4. ✘  $2S^{1/2}$

Question Number : 58 Question Id : 1298403298 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For good ductility, a material must have

Options :

1. ✘ Small number of different slip planes and also have the highest possible number of slip directions

2. ✘ Large number of different slip planes and also have the smallest possible number of slip directions

3. ✓ Large number of different slip planes and also have the highest possible number of slip directions

4. ✘ Small number of different slip planes and also have the smallest possible number of slip directions

**Question Number : 59 Question Id : 1298403299 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Catalytic activity of nano-sized Pt particles will be

Options :

1. ✘ Infinitesimally lesser than the micron-sized Pt particles

2. ✘ Far lesser than the micron-sized Pt particles

3. ✘ Same as that of the micron-sized Pt particles

4. ✓ Greater than the micron-sized Pt particles

**Question Number : 60 Question Id : 1298403300 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The average oxidation number of Fe in  $\text{Fe}_3\text{O}_4$  is

Options :

1. ✘  $1/3$

2. ✘  $7/3$

3. ✔  $8/3$

4. ✘  $7/4$

**Question Number : 61 Question Id : 1298403301 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Ionic charge on Zn in forming a bond with Cl.

**Options :**

1. ✘ 0

2. ✔  $2+$

3. ✘  $4+$

4. ✘  $1+$

**Question Number : 62 Question Id : 1298403302 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Kr and O are two non-metals. They form a

**Options :**

1. ✓ Covalent compound
2. ✗ Ionic compound
3. ✗ Compound with hydrogen bonding
4. ✗ Compound with a mixture of ionic and hydrogen bonding

**Question Number : 63 Question Id : 1298403303 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following can undergo combustion reactions with oxygen?

**Options :**

1. ✗ Only organic compounds
2. ✗ Only metals
3. ✗ Only non-metals
4. ✓ All metals, Non-metals and organic compounds

**Question Number : 64 Question Id : 1298403304 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The color displayed by a fire-cracker is a consequence of



**Options :**

1. ✓ Formation of a metal oxide during the combustion reaction of a metal with oxygen in air
2. ✘ Formation of carbon dioxide as the cracker material burns
3. ✘ Formation of sulphur dioxide as the cracker material burns
4. ✘ Formation of magnesium dioxide as the cracker material burns

**Question Number : 65 Question Id : 1298403305 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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

Radiography is used to detect

**Options :**

1. ✘ Surface defects
2. ✓ Volume defects
3. ✘ Surface and subsurface defects
4. ✘ Cracks and unfused defects only

**Question Number : 66 Question Id : 1298403306 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is**

**Question Mandatory : No Option Orientation : Vertical**

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

Electrons and holes in a semi-conductor can be identified using

**Options :**

1. ✓ Hall measurements
2. ✗ A Joule-Thomson set-up
3. ✗ Raman scattering experiment
4. ✗ Rayleigh scattering experiment

**Question Number : 67 Question Id : 1298403307 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is**

**Question Mandatory : No Option Orientation : Vertical**

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

Tridymite and cristobalite are the crystalline forms of

**Options :**

1. ✗ Manganese
2. ✗ Alumina
3. ✓ Silica
4. ✗ Lithium oxide

Question Number : 68 Question Id : 1298403308 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which of the following has the lowest temperature?

Options :

1. ✓ Liquid He
2. ✗ Liquid N<sub>2</sub>
3. ✗ Liquid CO<sub>2</sub>
4. ✗ Liquid H<sub>2</sub>

Question Number : 69 Question Id : 1298403309 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which of the following statements is correct when quantum mechanics is applied to understand the motion of an electron in 1 nm wide box and the motion of a big solid spherical ball of mass 100 g in 100 cm wide box?

Options :

1. ✓ Energy quantization can be observed in both electron and solid spherical ball cases but the energy quantization will be clear in the case of electron
2. ✗ Energy quantization can be observed in only in the case of electron but not in the case of solid spherical ball

3. ✘ Energy quantization cannot be observed in both electron and solid spherical ball cases because the box sizes of 1 nm and 100 cm are not sufficiently small to observe energy quantization

4. ✘ Quantum mechanics cannot be applied in the two given cases because both are single body cases and therefore energy quantization cannot be observed

**Question Number : 70 Question Id : 1298403310 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Superalloys are used primarily in making

Options :

- 1. ✘ Bicycle bodies
- 2. ✔ Blades of steam and gas turbines
- 3. ✘ Utensils for household purposes
- 4. ✘ Vehicle bodies

**Question Number : 71 Question Id : 1298403311 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What is the maximum energy of the ejected photoelectrons when a light with a quantum energy 3.2 eV is incident on a metal surface having a work function of 1.8 eV?

Options :

1. ✓ 1.4 eV
2. ✗ 1.8 eV
3. ✗ 2.8 eV
4. ✗ 0.7 eV

Question Number : 72 Question Id : 1298403312 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Conventional Si solar cells are classified as

Options :

1. ✗ Photoconductive cells
2. ✗ Photoresistive cells
3. ✗ Photoemissive cells
4. ✓ Photovoltaic cells

**Question Number : 73 Question Id : 1298403313 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following traditional manufacturing processes is used to make crankshafts?

**Options :**

1. ✘ Welding
2. ✘ Hot isostatic pressing
3. ✔ Forging and machining
4. ✘ Rolling

**Question Number : 74 Question Id : 1298403314 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following material properties is needed for an operating crankshaft to retain its original dimensions at varying temperatures?

**Options :**

1. ✘ High thermal conductivity
2. ✘ Good fatigue resistance
3. ✔ Low thermal coefficient of expansion

4. ✘ High thermal coefficient of expansion

**Question Number : 75 Question Id : 1298403315 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

For a given amount of gas, the product of pressure and volume is constant at a constant temperature. What is the shape of the curve, if logarithmic pressure versus logarithmic volume graph is plotted?

**Options :**

1. ✘ Rectangular hyperbola
2. ✔ Straight line
3. ✘ Parabola
4. ✘ Circle

**Question Number : 76 Question Id : 1298403316 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What is the volume fraction of atoms in the grain boundaries in comparison to the volume fraction of atoms in grains of a material with average grain size of  $>1 \mu\text{m}$ ?

**Options :**

1. ✓ Negligibly small

2. ✘ 50%

3. ✘ 30%

4. ✘ 10%

**Question Number : 77 Question Id : 1298403317 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What sort of driving force is expected for grain growth in 3D nanocrystalline materials in comparison to the driving force for grain growth in regular 3D polycrystalline materials?

**Options :**

1. ✘ Negligibly small

2. ✘ Equal

3. ✘ Lower

4. ✓ Higher

**Question Number : 78 Question Id : 1298403318 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**



Which of the following standard complimentary techniques are used to determine the grain size in a nanocrystalline material?

Options :

1. ✓ Transmission electron microscopy and X-ray diffraction
2. ✗ Scanning kelvin probe microscopy and X-ray diffraction
3. ✗ Raman scattering and neutron diffraction
4. ✗ Scanning kelvin probe microscopy and neutron diffraction

Question Number : 79 Question Id : 1298403319 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which of the following wavelengths of a radiation can be used to determine the crystal structure using diffraction technique?

Options :

1. ✗ 0.01 nm
2. ✓ 0.1 nm
3. ✗ 1 nm
4. ✗ 10 nm

Question Number : 80 Question Id : 1298403320 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which of the following is also known as cold flow of a material?

Options :

1. ✘ Fatigue
2. ✔ Creep
3. ✘ Brittle Fracture
4. ✘ Endurance

Question Number : 81 Question Id : 1298403321 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

What is the reciprocal lattice of a simple hexagonal Bravais lattice?

Options :

1. ✘ Same hexagonal lattice with the same lattice constants
2. ✘ Same hexagonal lattice but with different lattice constants
3. ✔ Hexagonal lattice rotated with respect to the direct lattice and with different lattice constants

Hexagonal lattice rotated with respect to the direct lattice and with the same lattice constants

4. ✘

**Question Number : 82 Question Id : 1298403322 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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

What is the de Broglie wavelength in meters of a 1 kg mass moving with a velocity of 1 m/sec?

**Options :**

1. ✔ Magnitude of Planck's constant
2. ✘ Magnitude of Boltzmann constant
3. ✘ Magnitude of Newtonian constant of gravitation
4. ✘ Magnitude of Josephson constant

**Question Number : 83 Question Id : 1298403323 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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

One dimensional unsteady state heat transfer equation for a sphere with heat generation at the rate of 'q' can be written as

**Options :**

$$\frac{1}{r} \frac{\partial}{\partial r} \left( r \frac{\partial T}{\partial r} \right) + \frac{q}{k} = \frac{1}{\alpha} \frac{\partial T}{\partial t}$$

1. ✘

$$\frac{1}{r^2} \frac{\partial}{\partial r} \left( r^2 \frac{\partial T}{\partial r} \right) + \frac{q}{k} = \frac{1}{\alpha} \frac{\partial T}{\partial t}$$

2. ✔

$$\frac{\partial^2 T}{\partial^2 r} + \frac{q}{k} = \frac{1}{\alpha} \frac{\partial T}{\partial t}$$

3. ✘

$$\frac{\partial^2}{\partial^2 r} (rT) + \frac{q}{k} = \frac{1}{\alpha} \frac{\partial T}{\partial t}$$

4. ✘

Question Number : 84 Question Id : 1298403324 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The bulk modulus of an ideal fluid is infinity because it

Options :

1. ✘ Has infinite compressibility

2. ✘ Doesn't form free surfaces

3. ✔ Is incompressible

4. ✘ Has finite compressibility

Question Number : 85 Question Id : 1298403325 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is

Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In which of the following energy transfer between a hot fluid and a cold fluid takes place due to their complete physical mixing?

Options :

1. ✘ Counter-flow energy recovery heat exchanger

2. ✔ Direct contact heat exchanger

3. ✘ Regenerative heat exchanger

4. ✘ Microchannel heat exchanger

Question Number : 86 Question Id : 1298403326 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is

Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In which of the following transmission of molecular heat is the least?

Options :

1. ✔ Gas

2. ✘ Liquid

3. ✘ Pure metal

4. ✘ Alloy

**Question Number : 87 Question Id : 1298403327 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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

What is the process during which the entropy remains constant?

Options :

1. ✘ Isothermal process

2. ✘ Irreversible process

3. ✔ Isentropic process

4. ✘ Polytropic process

**Question Number : 88 Question Id : 1298403328 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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

What is the slope of the straight-line portion of inverse of paramagnetic susceptibility versus temperature curve?

Options :

1. ✘ Loss tangent

2. ✘ Effective magnetic moment
3. ✔ Curie constant
4. ✘ Externally applied magnetic field

**Question Number : 89 Question Id : 1298403329 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following describes the existence of a material with two or more crystalline structures?

**Options :**

1. ✔ Polymorphism
2. ✘ Isomerism
3. ✘ Isomorphism
4. ✘ Pseudomorphism

**Question Number : 90 Question Id : 1298403330 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The work function of a metal can be best expressed in terms of

**Options :**

1. ✘ Gibbs free energy of the electrons in the metal
2. ✔ Oscillations in density of electrons in the metal
3. ✘ Helmholtz free energy of the electrons in the metal
4. ✘ Volume of the electron gas in the metal

**Question Number : 91 Question Id : 1298403331 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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

Nitriding is carried out for

**Options :**

1. ✘ Annealing
2. ✘ Spheroidizing
3. ✘ Normalizing
4. ✔ Case hardening

**Question Number : 92 Question Id : 1298403332 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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



What is the type of magnetism exhibited by ferrites?

Options :

1. ✘ Ferromagnetism
2. ✘ Antiferromagnetism
3. ✔ Ferrimagnetism
4. ✘ Antiferrimagnetism

Question Number : 93 Question Id : 1298403333 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

How does the resilience of a material useful?

Options :

1. ✘ In doing work on the application of the straining force in the elastic regime
2. ✔ In doing work on the removal of the straining force within the elastic limit
3. ✘ In doing work on the application of the straining force in the plastic regime
4. ✘ In doing work on the removal of the straining force in the plastic regime

Question Number : 94 Question Id : 1298403334 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

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

Thermal stress in a rod made up of a metallic material is dependent on

**Options :**

1. ✓ Rise in temperature of the metallic material only
2. ✗ Coefficient of linear thermal expansion of the metallic material only
3. ✗ Young's modulus of the metallic material
4. ✗ Both young's modulus and coefficient of linear thermal expansion of the metallic material

**Question Number : 95 Question Id : 1298403335 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical**

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

Which of the following curves best explains distribution of temperature in the case of radial heat conduction in a solid sphere?

**Options :**

1. ✓ Hyperbola
2. ✗ Straight line
3. ✗ Parabola
4. ✗ Circle

Question Number : 96 Question Id : 1298403336 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

What will happen to the enthalpy and molar heat capacity at constant volume of a system if its temperature increases?

Options :

1. ✓ Both enthalpy and molar heat capacity at constant volume also increase
2. ✗ Molar heat capacity at constant volume decreases but enthalpy increases
3. ✗ Molar heat capacity at constant volume increases but enthalpy decreases
4. ✗ Molar heat capacity at constant volume remains the same but enthalpy decreases

Question Number : 97 Question Id : 1298403337 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

A composite slab has two layers of different materials with thermal conductivities  $K_1$  and  $K_2$ . If each layer had the same thickness, the equivalent thermal conductivity of the slab would be

Options :

1. ✗  $K_1 + K_2$
2. ✓  $(K_1 + K_2) / (K_1 K_2)$

3. ✘  $(2K_1 K_2) / (K_1 + K_2)$

4. ✘  $K_1 K_2$

**Question Number : 98 Question Id : 1298403338 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following is correct in the case of a uniform circular motion?

**Options :**

1. ✘ Velocity remains constant but acceleration continuously changes

2. ✘ Both velocity and acceleration continuously change

3. ✔ Direction of velocity changes at a constant acceleration

4. ✘ Both velocity and acceleration are constant

**Question Number : 99 Question Id : 1298403339 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

A block of mass is pulled along a smooth horizontal surface by a horizontal force? What is the force exerted on the body by the surface?

**Options :**

1. ✘ Upward normal force perpendicular to the surface

2. ✓ Downward normal force perpendicular to the surface
3. ✘ Additional horizontal force in the opposite direction of the original horizontal force
4. ✘ Additional horizontal force in the same direction of the original horizontal force

**Question Number : 100 Question Id : 1298403340 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What is the work done by a winning team in a tug of war?

Options :

1. ✘ Zero
2. ✘ Equal work as that of losing work
3. ✘ Negative work on the losing team
4. ✓ Positive work on the losing team

**Question Number : 101 Question Id : 1298403341 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What type of equilibrium is exhibited by a marble on a flat horizontal surface?

Options :

1. ✘ Unstable equilibrium
2. ✘ Stable equilibrium
3. ✘ Biased equilibrium
4. ✔ Neutral equilibrium

**Question Number : 102 Question Id : 1298403342 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following is correct with respect to center of mass of a body?

**Options :**

1. ✔ It is not necessary for any mass to be there at the center of mass of a body and it not necessary for the center of mass to lie within the body
2. ✘ It is not necessary for any mass to be there at the center of mass of a body but it is necessary for the center of mass to lie within the body
3. ✘ It is necessary for any mass to be there at the center of mass of a body but it not necessary for the center of mass to lie within the body
4. ✘ It is necessary for any mass to be there at the center of mass of a body and it is also necessary for the center of mass to lie within the body

**Question Number : 103 Question Id : 1298403343 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In the case of typical cantilever beam, the bending moment is maximum

Options :

1. ✓ At the fixed end
2. ✗ At the point of loading
3. ✗ Through out the beam
4. ✗ At its free end

**Question Number : 104 Question Id : 1298403344 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following is used to measure the endurance limit of a ductile material?

Options :

1. ✗ Impact testing
2. ✗ Hardness testing
3. ✓ Fatigue testing

#### 4. ✘ Creep testing

**Question Number : 105 Question Id : 1298403345 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

If a structure has a factor of safety of 1 then the structure will

**Options :**

1. ✘ Be able to sustain 10% more load than the design load
2. ✔ Be able to sustain not more than the design load
3. ✘ Be able to sustain 50% more load than the design load
4. ✘ Be able to sustain only 1% more load than the design load

**Question Number : 106 Question Id : 1298403346 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Wood is

**Options :**

1. ✘ An isotropic material
2. ✔ An anisotropic as well as an orthotropic material
3. ✘ An orthotropic material but not an anisotropic material



4. ✘ An isotropic material but not an orthotropic material

**Question Number : 107 Question Id : 1298403347 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Equilibrium concentration of vacancies in a metal

Options :

1. ✘ Is independent of the temperature
2. ✘ Decreases with increase in temperature
3. ✔ Increases with increase in temperature
4. ✘ Increases with increase in  $(\text{temperature})^{-1}$

**Question Number : 108 Question Id : 1298403348 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Nitinol is a

Options :

1. ✔ Shape memory alloy
2. ✘ High entropy alloy

3. ✘ Super alloy

4. ✘ Simple alloy

**Question Number : 109 Question Id : 1298403349 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Indentation hardness of a material is closely related to its

**Options :**

1. ✔ Bulk modulus

2. ✘ Young's modulus

3. ✘ Shear modulus

4. ✘ Shear and young's modulus

**Question Number : 110 Question Id : 1298403350 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

What should be the size a nanoparticle in order for it to exhibit unique electronic transport?

**Options :**

1. ✘ Greater than the electron scattering length in its bulk counterpart

2. ✓ Less than or equal to the electron scattering length in its bulk counterpart
3. ✘ Less than or equal to the phonon mean path in its bulk counterpart
4. ✘ Equal to the length of exchange interactions in its bulk counterpart

**Question Number : 111 Question Id : 1298403351 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Which of the following statements is correct?

**Options :**

1. ✘ Semiconductors are not transparent to infrared light
2. ✘ Semiconductors are not opaque to visible light
3. ✓ All metals are opaque to light of all wavelengths
4. ✘ Most insulators are not transparent to visible light

**Question Number : 112 Question Id : 1298403352 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

When a real gas undergoes Joule- Thomson expansion, the temperature

**Options :**

1. ✘ Remains Constant
2. ✘ Always increases
3. ✔ May increase or decreases
4. ✘ Always decreases

**Question Number : 113 Question Id : 1298403353 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

The position of a particle could be very accurately measured at a time  $t$ . Then, what is the uncertainty in measuring the momentum of the particle at  $t$

**Options :**

1. ✔  $\infty$
2. ✘ 0
3. ✘ 1
4. ✘  $h/4\pi$ ,  $h$  being the Planck's constant

**Question Number : 114 Question Id : 1298403354 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

An application was realized by depositing a 20 nm thick film of a crystalline material on a typical 1 m long glass window in a building. The deposited material is classified as a

Options :

1. ✘ 3D nanomaterial
2. ✔ 2D nanomaterial
3. ✘ 1D nanomaterial
4. ✘ 0D nanomaterial

Question Number : 115 Question Id : 1298403355 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0

Which of the following is incorrect with respect to nanoparticles in comparison to their bulk counterparts?

Options :

1. ✘ Reduced lattice constants and bandgap broadening
2. ✘ Reduced lattice constants and lower melting temperature
3. ✘ Lower melting temperature and bandgap broadening
4. ✔ Higher melting temperature and bandgap narrowing

Question Number : 116 Question Id : 1298403356 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If you are shrunk uniformly by 10000 times, what will be the approximate order of dimensions of the diameter of your eye ball?

Options :

1. ✘ Few mm (milli meter)
2. ✘ Few nm (nano meter)
3. ✔ Few  $\mu\text{m}$  (micro meter) or few hundreds of nm (nano meter)
4. ✘ Few  $\text{\AA}$  (angstrom)

Question Number : 117 Question Id : 1298403357 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The aspect ratio of a tube of diameter (d) and length (l) is

Options :

1. ✔  $l/d$
2. ✘  $l.d$
3. ✘  $l/d^{1/2}$

4. ✘  $l.d^{1/2}$

**Question Number : 118 Question Id : 1298403358 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

In everyday life quantum effects

**Options :**

1. ✔ Are taking place but they are not perceptible to the naked eye
2. ✘ Are taking place and are perceptible to the naked eye
3. ✘ Do not take place but we seem to perceive them
4. ✘ Do not take place and therefore they are not perceptible to the naked eye

**Question Number : 119 Question Id : 1298403359 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Statistical mechanics is a theory

**Options :**

1. ✘ That relates macroscopic properties of the particles constituting the system to the macroscopic properties of the system

2. ✘ That relates macroscopic properties of the particles constituting a system to the microscopic properties of the system
3. ✔ That relates microscopic properties of the particles constituting a system to the macroscopic properties of the system
4. ✘ That relates microscopic properties of the particles constituting a system to the microscopic properties of the system

**Question Number : 120 Question Id : 1298403360 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Option Orientation : Vertical Correct Marks : 1 Wrong Marks : 0**

Who coined the word “Nano-Technology”

**Options :**

1. ✘ Eric Drexler
2. ✘ Rohrer and Binnig
3. ✘ Richard Feynman
4. ✔ Norio Taniguchi