Andhra Pradesh State Council of 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.

Question Paper Name :	Nano Technology 30th April 2026 Shift 2
Subject Name :	Nano Technology
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Nano Technology

Group Number :	1
Group Id :	75207664
Group Maximum Duration :	0
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Show Attended Group? :	No
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Nano Technology

Section Id :	75207664
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	120
Number of Questions to be attempted :	120
Section Marks :	120
Section Negative Marks :	0
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	75207664
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 1 Question Id : 7520767561 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Major challenge in nanotechnology is

Options :

1. ✖ Quantum effects

2. ✔ scalability and control

3. ✖ high density

4. ✖ low reactivity

Question Number : 2 Question Id : 7520767562 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The value of bulk modulus of a fluid is required to determine

Options :

1. ✖ Reynold's number

2. ✖ Froude's number

3. ✔ Mach number

4. ✖ Euler's number

Question Number : 3 Question Id : 7520767563 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A car starts from rest and accelerates uniformly at 2 m/s^2. Find its velocity after 10 sec?

Options :

1. ✔ 20 m/s

2. ✖ 25 m/s

3. ✖ 15 m/s

4. ✖ 30 m/s

Question Number : 4 Question Id : 7520767564 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

What is the primary reason why materials exhibit vastly different properties at the Nano-scale compared to the Bulk scale?

Options :

1. ✔ A significant increase in the Surface-to-Volume ratio and the emergence of Quantum Confinement effects

2. ✖ The disappearance of atoms from the lattice

3. ✖ The loss of all chemical reactivity

4. ✖ Increased gravitational forces at the small scale

Question Number : 5 Question Id : 7520767565 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The kinematic viscosity is the

Options :

1. ✔ ratio of absolute viscosity to the density of the liquid

2. ✖ ratio of density of the liquid to the absolute viscosity

3. ✖ product of absolute viscosity and density of the liquid

4. ✖ product of absolute viscosity and mass of the liquid

Question Number : 6 Question Id : 7520767566 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following supports can resist both vertical and horizontal forces but not moments?

Options :

1. ✖ Roller support

2. ✔ Pin support

3. ✖ Fixed support

4. ✖ Hinge support

Question Number : 7 Question Id : 7520767567 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

In a Fibre-reinforced composite, the "Critical Fibre Length" (l_c) is defined as the length required for

Options :

1. ✖ the fibre to break before the matrix fails

2. ✔ the maximum tensile stress to be transferred from the matrix to the centre of the fibre

3. ✖ the composite to become transparent

4. ✖ the matrix to undergo recrystallization

Question Number : 8 Question Id : 7520767568 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Coefficient of resistance is the ratio of

Options :

1. ✖ actual velocity of jet at vena contracta to the theoretical velocity

2. ✖ area of jet at vena contracta to the area of orifice

3. ✔ loss of head in the orifice to the head of water available at the exit of the orifice

4. ✖ actual discharge through an orifice to the dieoretical discharge

Question Number : 9 Question Id : 7520767569 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The efficiency of a furnace is defined as:

Options :

1. ✖ (Heat supplied / Heat utilized) × 100

2. ✔ (Heat utilized / Heat supplied) × 100

3. ✖ (Heat losses / Heat supplied) × 100

4. ✖ (Heat utilized / Total heat supplied) × 100

Question Number : 10 Question Id : 7520767570 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Why are ceramics typically much stronger in compression than in tension?

Options :

1. ✔ Because they contain inherent micro-cracks that act as stress concentrators under tensile loads

2. ✖ Because they have a high density of mobile dislocations

3. ✖ Because their ionic bonds are only stable under compressive forces

4. ✖ Because they undergo significant plastic deformation before fracture

Question Number : 11 Question Id : 7520767571 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The pressure measured above or below the atmospheric pressure is known as

Options :

1. ✖ suction pressure

2. ✖ vacuum pressure

3. ✖ negative pressure

4. ✔ gauge pressure

Question Number : 12 Question Id : 7520767572 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following has bcc crystal structure?

Options :

1. ✔ Ferrite

2. ✖ Austenite

3. ✖ Martensite

4. ✖ Cementite

Question Number : 13 Question Id : 7520767573 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The Glass Transition Temperature (Tg) of a polymer is a critical parameter. Which of the following statements correctly describes the behaviour of a polymer below Tg?

Options :

1. ✖ The polymer chains are in a liquid-like, flowable state

2. ✖ The polymer is in a "rubbery" state with high molecular mobility

3. ✔ The long-range segmental motion of polymer chains is "frozen," making the material brittle

4. ✖ The polymer undergoes a first-order phase transition from liquid to solid

Question Number : 14 Question Id : 7520767574 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The coefficient of viscosity may be determined by using an instrument is called_____

Options :

1. ✖ accelerometer

2. ✖ viscometer

3. ✖ vibrometer

4. ✔ pressure gauge

Question Number : 15 Question Id : 7520767575 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which among the following is NOT a factor in Hume-Rothery rules of formation of substitutional solid solutions

Options :

1. ✖ crystal structure

2. ✖ relative size

3. ✖ chemical affinity

4. ✔ chemical Reactivity

Question Number : 16 Question Id : 7520767576 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

In the band theory of solids, the 'Effective Mass' of an electron is determined by

Options :

1. ✖ the number of valence electrons

2. ✖ the velocity of light in the crystal

3. ✖ the atomic weight of the lattice ions

4. ✔ the curvature of the E - k diagram

Question Number : 17 Question Id : 7520767577 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following statement is wrong?

Options :

1. ✖ The heat transfer in liquid and gases takes place according to convection

2. ✖ The amount of heat flow through a body is dependent upon the material of the body

3. ✔ The thermal conductivity of solid metals increases with rise in temperature

4. ✖ Logarithmic mean temperature difference is not equal to the arithmetic mean temperature difference.

Question Number : 18 Question Id : 7520767578 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Curie temperature of ferrite is

Options :

1. ✔ 768°C

2. ✖ 910°C

3. ✖ 1147°C

4. ✖ 727°C

Question Number : 19 Question Id : 7520767579 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

If a material has a band gap (E_g) of 4.0 eV, it will most likely be

Options :

1. ✔ transparent to visible light

2. ✖ opaque and metallic

3. ✖ a p-type semiconductor at room temperature

4. ✖ highly absorbent in the infrared region.

Question Number : 20 Question Id : 7520767580 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Thermal diffusivity is a

Options :

1. ✖ function of temperature

2. ✔ physical property of a substance

3. ✖ dimensionless parameter

4. ✖ function of pressure

Question Number : 21 Question Id : 7520767581 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which one of the following elements is ferrite stabilizer?

Options :

1. ✖ Nickel

2. ✖ Copper

3. ✔ Chromium

4. ✖ Manganese

Question Number : 22 Question Id : 7520767582 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

According to the Free Electron Theory, if the temperature of a pure metal is increased, the collision frequency of electrons increases. How does this specifically affect the Fermi energy (E_F) of the metal?

Options :

1. ✖ It decreases linearly with temperature

2. ✖ It drops to zero at the melting point

3. ✖ It increases significantly due to higher thermal energy

4. ✔ It remains essentially constant

Question Number : 23 Question Id : 7520767583 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

In a loaded beam, the point of contra flexure occurs at a section where

Options :

1. ✖ bending moment is minimum

2. ✔ bending moment is zero or changes sign

3. ✖ bending moment is maximum

4. ✖ shearing force is maximum

Question Number : 24 Question Id : 7520767584 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The property that cannot be obtained from a tensile test is

Options :

1. ✖ Yield Strength

2. ✖ Ultimate Tensile Strength

3. ✖ Ductility

4. ✔ Endurance Limit

Question Number : 25 Question Id : 7520767585 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

In a combustion process, the "Theoretical Adiabatic Flame Temperature" is the maximum temperature the products can reach. This temperature is lower in practice because

Options :

1. ✖ real reactions are always endothermic

2. ✔ part of the energy is consumed by the dissociation of product molecules

3. ✖ the heat capacity of the products decreases at high temperatures

4. ✖ the nitrogen in the air acts as a catalyst, absorbing energy

Question Number : 26 Question Id : 7520767586 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

If the shear force along a section of a beam is zero, the bending moment at the section is

Options :

1. ✖ zero

2. ✔ maximum

3. ✖ minimum

4. ✖ average of maximum-minimum

Question Number : 27 Question Id : 7520767587 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Yield point phenomenon observed in mild steel is due to the presence of

Options :

1. ✖ Silicon

2. ✖ Manganese

3. ✔ Carbon

4. ✖ Chromium

Question Number : 28 Question Id : 7520767588 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Adiabatic flame temperature is maximum when

Options :

1. ✖ the reaction incomplete

2. ✔ no heat loss and complete combustion

3. ✖ the heat loss is maximum

4. ✖ excess air is high

Question Number : 29 Question Id : 7520767589 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The stress necessary to initiate yielding, is considerably

Options :

1. ✔ more than that necessary to continue it

2. ✖ less than that necessary to continue it

3. ✖ more than that necessary to stop it

4. ✖ less than that necessary to stop it.

Question Number : 30 Question Id : 7520767590 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Cold working of metal is carried out at

Options :

1. ✔ below recrystallization temperature

2. ✖ above recrystallization temperature

3. ✖ below room temperature

4. ✖ just above the grain growth temperature

Question Number : 31 Question Id : 7520767591 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Mixing identical gases results in

Options :

1. ✔ no change in entropy

2. ✖ decrease in entropy

3. ✖ increase in entropy

4. ✖ infinite entropy

Question Number : 32 Question Id : 7520767592 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Strain energy of any member may be defined as work done to

Options :

1. ✔ deformation

2. ✖ pressure

3. ✖ moment

4. ✖ Force

Question Number : 33 Question Id : 7520767593 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following metal working operation is a direct compression process?

Options :

1. ✖ Extrusion

2. ✔ Forging

3. ✖ Wire drawing

4. ✖ Stretch forming

Question Number : 34 Question Id : 7520767594 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

According to the Gibbs Phase Rule (F = C - P + 2), at the triple point of a pure metal (e.g., where solid, liquid, and vapour coexist), the degrees of freedom F is

Options :

1. ✖ 1 (P can be varied)

2. ✖ 2 (Both T and P can be varied)

3. ✔ 0 (The state is invariant)

4. ✖ 3 (Composition, T, and P can be varied)

Question Number : 35 Question Id : 7520767595 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

If ΔG is positive, the reaction is:

Options :

1. ✖ Spontaneous

2. ✔ Non-spontaneous

3. ✖ At equilibrium

4. ✖ Reversible

Question Number : 36 Question Id : 7520767596 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Seamless tubes can be produced by

Options :

1. ✖ rolling

2. ✔ extrusion

3. ✖ deep drawing

4. ✖ forging

Question Number : 37 Question Id : 7520767597 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

In statistical thermodynamics, Stirling's Approximation (ln N! approx. N ln N - N) is valid only when

Options :

1. ✖ N is a small integer

2. ✔ N is very large

3. ✖ The system is at 0 K

4. ✖ The gas behaves non-ideally

Question Number : 38 Question Id : 7520767598 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

For ideal solution, activity (a) equals:

Options :

1. ✖ Density

2. ✖ Pressure

3. ✖ Volume

4. ✔ Mole fraction

Question Number : 39 Question Id : 7520767599 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

In an adiabatic process:

Options :

1. ✖ Heat transfer occurs

2. ✔ No heat transfer occurs

3. ✖ Temperature is constant

4. ✖ Pressure is constant

Question Number : 40 Question Id : 7520767600 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The Zeroth Law of Thermodynamics provides the basis for temperature measurement. If Body A is in thermal equilibrium with Body B, and Body B is in thermal equilibrium with Body C, which property must be identical for all three?

Options :

1. ✖ Internal Energy (U)

2. ✖ Total Enthalpy (H)

3. ✔ Temperature (T)

4. ✖ The product of Pressure and Volume (PV)

Question Number : 41 Question Id : 7520767601 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Chemical potential is equal to:

Options :

1. ✖ Enthalpy

2. ✔ Gibbs free energy per mole

3. ✖ Entropy

4. ✖ Internal energy

Question Number : 42 Question Id : 7520767602 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following processes produces maximum work?

Options :

1. ✖ Rapid expansion of gas

2. ✖ Free expansion

3. ✔ Reversible expansion

4. ✖ Irreversible expansion

Question Number : 43 Question Id : 7520767603 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Two parallel edge dislocations of the same sign (same Burger's vector) are located on the same slip plane. As they approach each other, what happens?

Options :

1. ✖ Energy decreases; Force is attractive

2. ✔ Energy increases; Force is repulsive

3. ✖ Energy remains constant; Force is zero

4. ✖ Energy increases; Force is attractive

Question Number : 44 Question Id : 7520767604 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

At eutectic point, degree of freedom is:

Options :

1. ✔ 0

2. ✖ 1

3. ✖ 2

4. ✖ 3

Question Number : 45 Question Id : 7520767605 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Stirling's approximation is used to simplify:

Options :

1. ✖ Integrals

2. ✔ Factorials

3. ✖ Logarithms

4. ✖ Derivatives

Question Number : 46 Question Id : 7520767606 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following statements regarding mechanical twinning is FALSE?

Options :

1. ✖ Twinning occurs more frequently at high strain rates and low temperatures.

2. ✖ The atomic displacement in twinning is a fraction of the interatomic distance.

3. ✖ Twinning changes the orientation of the crystal lattice in the deformed region.

4. ✔ Twinning produces the same total strain as slip for the same amount of atomic movement.

Question Number : 47 Question Id : 7520767607 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Second law states:

Options :

1. ✖ Energy conserved

2. ✔ Entropy increases

3. ✖ Heat = work

4. ✖ $\Delta H = 0$

Question Number : 48 Question Id : 7520767608 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The efficiency of a Carnot engine depends on:

Options :

1. ✖ Pressure

2. ✖ Volume

3. ✔ Temperatures of reservoirs

4. ✖ Working substance

Question Number : 49 Question Id : 7520767609 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The volume $\boldsymbol{V}$of a cubic unit cell is related to the lattice parameter $\boldsymbol{a}$. Which of the following expressions is dimensionally and physically correct?

Options :

1. ✖ $V = a + a^2$

2. ✖ $V = 2a$

3. ✖ $V = a^2$

4. ✔ $V = a^3$

Question Number : 50 Question Id : 7520767610 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which material is diamagnetic?

Options :

1. ✖ Iron

2. ✔ Copper

3. ✖ Nickel

4. ✖ Cobalt

Question Number : 51 Question Id : 7520767611 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

At equilibrium, Gibbs free energy change is:

Options :

1. ✖ Positive

2. ✖ Negative

3. ✔ Zero

4. ✖ Infinite

Question Number : 52 Question Id : 7520767612 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Drag force F depends on density ρ, velocity V, and diameter D:

$$F = k\rho^a V^b D^c$$

Find exponents a, b, c.

Options :

1. ✖ $(1, 2, 1)$

2. ✖ $(2, 2, 1)$

3. ✖ $(1, 1, 2)$

4. ✔ $(1, 2, 2)$

Question Number : 53 Question Id : 7520767613 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Paramagnetic materials have:

Options :

1. ✖ Large negative susceptibility

2. ✖ Infinite susceptibility

3. ✖ Zero susceptibility

4. ✔ Small positive susceptibility

Question Number : 54 Question Id : 7520767614 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Magnetic susceptibility (χ) of paramagnetic materials follows:

Options :

1. ✔ Curie's Law ($\chi \propto 1/T$)

2. ✖ Ohm's law

3. ✖ Hooke's law

4. ✖ Wiedemann–Franz law

Question Number : 55 Question Id : 7520767615 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

For a laminar boundary layer developing over a flat plate, the displacement thickness is defined as:

$$\delta^* = \int_0^{\delta} \left(1 - \frac{u}{U_\infty}\right) dy$$

Physically, δ^*represents

Options :

1. ✖ Momentum loss in the boundary layer

2. ✔ Reduction in mass flow due to the presence of the boundary layer

3. ✖ Energy lost in the boundary layer

4. ✖ Vorticity in the flow

Question Number : 56 Question Id : 7520767616 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Curie temperature is the temperature at which:

Options :

1. ✔ Ferromagnetic → Paramagnetic

2. ✖ Paramagnetic → Diamagnetic

3. ✖ Solid → Liquid

4. ✖ Magnetic → Non-magnetic

Question Number : 57 Question Id : 7520767617 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The core of optical Fiber has refractive index:

Options :

1. ✖ Less than cladding

2. ✖ Equal to cladding

3. ✔ Greater than cladding

4. ✖ Zero

Question Number : 58 Question Id : 7520767618 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

For Inlet diameter > Outlet diameter the Velocity and pressure along the flow will be as

Options :

1. ✖ Velocity decreases, pressure increases

2. ✔ Velocity increases, pressure decreases

3. ✖ Velocity constant, pressure decreases

4. ✖ Velocity increases, pressure constant

Question Number : 59 Question Id : 7520767619 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Retentivity means:

Options :

1. ✖ Resistance to magnetization

2. ✔ Ability to retain magnetism

3. ✖ Loss of magnetism

4. ✖ Increase in magnetization

Question Number : 60 Question Id : 7520767620 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A major thermodynamic reason for nanoparticle agglomeration is:

Options :

1. ✖ Low density

2. ✖ High melting point

3. ✔ High surface energy

4. ✖ Low band gap

Question Number : 61 Question Id : 7520767621 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

In a horizontal pipe, velocity doubles. Pressure gets

Options :

1. ✖ Unchanged

2. ✔ Decreased

3. ✖ Increased

4. ✖ Doubled

Question Number : 62 Question Id : 7520767622 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which has highest magnetic susceptibility?

Options :

1. ✖ Diamagnetic

2. ✖ Paramagnetic

3. ✔ Ferromagnetic

4. ✖ Antiferromagnetic

Question Number : 63 Question Id : 7520767623 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The Third Law of thermodynamics states that entropy at absolute zero is:

Options :

1. ✖ Maximum

2. ✖ Minimum

3. ✔ Zero for perfect crystal

4. ✖ Infinite

Question Number : 64 Question Id : 7520767624 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A solid circular shaft is subjected to bending moment and torsional moment. What is the nature of maximum principal stress at the outer surface?

Options :

1. ✖ Pure bending stress

2. ✖ Pure shear stress

3. ✔ Combination of normal and shear stress

4. ✖ Zero stress

Question Number : 65 Question Id : 7520767625 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Ceramic materials are generally:

Options :

1. ✖ Ductile and soft

2. ✔ Brittle and hard

3. ✖ Flexible and elastic

4. ✖ Conductive

Question Number : 66 Question Id : 7520767626 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The packing sequence of atoms in FCC is

Options :

1. ✖ AB AB AB…

2. ✖ BC BC BC…

3. ✖ AC AC AC…

4. ✔ ABC ABC ABC….

Question Number : 67 Question Id : 7520767627 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A particle under force $\boldsymbol{F} = -\boldsymbol{kx}$. Then Motion is

Options :

1. ✖ uniform

2. ✔ simple harmonic

3. ✖ circular

4. ✖ random

Question Number : 68 Question Id : 7520767628 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Zirconia ceramics exhibit:

Options :

1. ✖ High electrical conductivity

2. ✖ Transformation toughening

3. ✖ Low hardness

4. ✔ Transformation toughening

Question Number : 69 Question Id : 7520767629 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Hall-Petch equation predicts the relation between grain size and

Options :

1. ✔ Yield Strength

2. ✖ Ductility

3. ✖ %Elongation

4. ✖ Tensile Strength

Question Number : 70 Question Id : 7520767630 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Three forces 3 N, 4 N, and 5 N act at a point. For equilibrium, angle between 3 N and 4 N is

Options :

1. ✖ 60°

2. ✔ 90°

3. ✖ 120°

4. ✖ 180°

Question Number : 71 Question Id : 7520767631 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A composite material is composed of:

Options :

1. ✖ Single phase material

2. ✖ Only metals

3. ✖ Only polymers

4. ✔ Two or more distinct phases

Question Number : 72 Question Id : 7520767632 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

Given the variables: velocity (V), density (ρ), viscosity (μ), and characteristic length (L), how many dimensionless groups can be formed?

Options :

1. ✖ 1

2. ✖ 2

3. ✔ 3

4. ✖ 4

Question Number : 73 Question Id : 7520767633 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A shaft is subjected to pure torsion. The state of stress at any point on the surface of the shaft, relative to the axis of the shaft, consists of

Options :

1. ✖ pure normal stress

2. ✔ pure shear stress

3. ✖ equal normal and shear stresses

4. ✖ zero stress

Question Number : 74 Question Id : 7520767634 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Cross slip is observing

Options :

1. ✔ screw dislocation

2. ✖ edge dislocation

3. ✖ twinning

4. ✖ bending

Question Number : 75 Question Id : 7520767635 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A particle starts from rest and moves with a constant acceleration of 2 m/s^2. What is the distance traveled by the particle in the 5^{th} second of its motion?

Options :

1. ✖ 25 m

2. ✔ 9 m

3. ✖ 10 m

4. ✖ 12.5 m

Question Number : 76 Question Id : 7520767636 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A rigid body rotates about a fixed axis under a constant moment (M). If the Mass Moment of Inertia (I) of the body is doubled while the moment remains the same, the angular acceleration (α) will

Options :

1. ✖ double

2. ✖ remain the same

3. ✔ be halved

4. ✖ quadruple

Question Number : 77 Question Id : 7520767637 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

One of the following is not a strengthening mechanism:

Options :

1. ✖ Cold working

2. ✖ Precipitation hardening

3. ✖ Strain aging

4. ✔ Annealing

Question Number : 78 Question Id : 7520767638 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Water flows from pipe diameter 200mm to 100mm. If velocity in larger pipe is 2 m/s, find velocity in smaller pipe.

Options :

1. ✖ 2 m/s

2. ✖ 4 m/s

3. ✖ 6 m/s

4. ✔ 8 m/s

Question Number : 79 Question Id : 7520767639 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Removing a hole from a plate shifts centroid:

Options :

1. ✖ Depends on material

2. ✖ Toward hole

3. ✔ Away from hole

4. ✖ No change

Question Number : 80 Question Id : 7520767640 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following crystal structure is ductile?

Options :

1. ✔ Face centered cubic (FCC)

2. ✖ Body centered cubic (BCC)

3. ✖ Hexagonal close packed (HCP)

4. ✖ Body centered tetragonal (BCT)

Question Number : 81 Question Id : 7520767641 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Ideal c/a ratio of HCP is

Options :

1. ✔ 1.633

2. ✖ 1.88

3. ✖ 1.58

4. ✖ 1.48

Question Number : 82 Question Id : 7520767642 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A surface with emissivity 0.8 and area 1 m^2 is maintained at 500 K and is surrounded by air at 300 K. Given Stefan–Boltzmann constant $\sigma = 5.67 \times 10^{-8}$ W/m^2K^4.

What is the rate of radiative heat transfer?

Options :

1. ✖ 3.5 kW

2. ✔ 2.47 kW

3. ✖ 2.0 kW

4. ✖ 1.5 kW

Question Number : 83 Question Id : 7520767643 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following is a natural polymer?

Options :

1. ✖ Polyethylene

2. ✖ Nylon

3. ✔ Cellulose

4. ✖ PVC

Question Number : 84 Question Id : 7520767644 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The forces of 60 N and 80 N are in equilibrium at a point, acting at an angle of 90^0 to each other. Find the magnitude of the third force?

Options :

1. ✔ 100 N

2. ✖ 120 N

3. ✖ 140 N

4. ✖ 160 N

Question Number : 85 Question Id : 7520767645 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Two metals, A and B, have Stacking Fault Energies of 20 mJ/m^2 and 160 mJ/m^2 respectively. Which of the following is true regarding their deformation behaviour?

Options :

1. ✖ Metal A will cross-slip more easily than Metal B.

2. ✖ Metal B will exhibit a higher rate of work hardening than Metal A.

3. ✔ Metal B will cross-slip more easily than Metal A.

4. ✖ Metal A will not exhibit any plastic deformation.

Question Number : 86 Question Id : 7520767646 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The hot working temperature of lead

Options :

1. ✖ 300 °C

2. ✖ 100 °C

3. ✖ 200 °C

4. ✔ Room temperature

Question Number : 87 Question Id : 7520767647 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

An activity represents:

Options :

1. ✔ Effective concentration

2. ✖ Pressure

3. ✖ Volume

4. ✖ Temperature

Question Number : 88 Question Id : 7520767648 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Consider an adiabatic process in which a gas is compressed. Which of the following statements is strictly CORRECT regarding the energy transfer?

Options :

1. ✖ The internal energy of the system remains constant because Q = 0.

2. ✖ Heat is converted into work during the compression.

3. ✖ Work is a mode of energy transfer that is stored as "Work Energy" in the system.

4. ✔ Work is done on the system, increasing the internal energy, but the system contains no "Heat" or "Work."

Question Number : 89 Question Id : 7520767649 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Total recoverable strain energy stored within the elastic limit in the stress-strain curve is called-

Options :

1. ✖ Ductility

2. ✖ Hardness

3. ✔ Resilience

4. ✖ Tensile strength

Question Number : 90 Question Id : 7520767650 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Efficiency of Carnot engine is always:

Options :

1. ✖ Greater than 1

2. ✔ Less than 1

3. ✖ Equal to 1

4. ✖ Infinite

Question Number : 91 Question Id : 7520767651 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following materials possesses anti-parallel spins of unequal magnitude, resulting in a spontaneous magnetic moment below a critical temperature?

Options :

1. ✖ Ferromagnetic

2. ✖ Paramagnetic

3. ✖ Antiferromagnetic

4. ✔ Ferrimagnetic

Question Number : 92 Question Id : 7520767652 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which of the following has the highest thermal diffusivity:

Options :

1. ✖ Iron

2. ✔ Lead

3. ✖ Concrete

4. ✖ Wood

Question Number : 93 Question Id : 7520767653 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

At 0K, an intrinsic semiconductor behaves like a:

Options :

1. ✖ Conductor

2. ✔ Insulator

3. ✖ Superconductor

4. ✖ Metal

Question Number : 94 Question Id : 7520767654 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Thermosetting polymers differ from Thermoplastics primarily because

Options :

1. ✖ Thermosets have a linear molecular structure and can be reshaped by heating

2. ✔ Thermosets possess a three-dimensional cross-linked network that prevents melting

3. ✖ Thermoplastics have higher thermal stability than thermosets

4. ✖ Thermosets are formed exclusively by addition polymerization

Question Number : 95 Question Id : 7520767655 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

If two forces acting at a joint are not along the straight line, then for the equilibrium of the joint

Options :

1. ✖ one of the forces must be zero

2. ✔ each force must be zero

3. ✖ forces must be equal and of the same sign

4. ✖ forces must be equal in magnitude but opposite in sign

Question Number : 96 Question Id : 7520767656 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Vacancy diffusion coefficient: $D = D_0 \exp(-Q/RT)$

Options :

1. ✔ Dimensionally correct

2. ✖ Requires D_0/L to be correct

3. ✖ Requires Q dimensionless

4. ✖ All formulas fail dimensionally

Question Number : 97 Question Id : 7520767657 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

The "Glassy" state in ceramics is characterized as

Options :

1. ✖ A perfectly ordered crystalline lattice

2. ✖ A material that lacks any atomic bonding

3. ✖ A liquid that has a very low viscosity

4. ✔ A metastable, non-crystalline solid with short-range order but no long-range order

Question Number : 98 Question Id : 7520767658 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

Centroid of triangle lies at:

Options :

1. ✖ Midpoint

2. ✔ Intersection of medians

3. ✖ Circumcenter

4. ✖ Vertex

Question Number : 99 Question Id : 7520767659 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

Which of the following statements is FALSE?

Options :

1. ✖ Entropy is a state function

2. ✔ Heat is a state function

3. ✖ Internal energy is a state function

4. ✖ Gibbs free energy is a state function

Question Number : 100 Question Id : 7520767660 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

Transparency of glass is due to

Options :

1. ✖ absence of grain boundaries

2. ✖ presence of free electrons

3. ✖ metallic bonding

4. ✔ lack of scattering centres

Question Number : 101 Question Id : 7520767661 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

If $\Delta U = 100$ J and work done = 40 J, heat supplied is:

Options :

1. ✖ 60 J

2. ✔ 140 J

3. ✖ 100 J

4. ✖ 40 J

Question Number : 102 Question Id : 7520767662 Question Type : MCQ

Correct Marks : 1 Wrong Marks : 0

According to the Boltzmann Equation $S = k_B \ln \Omega$, if a system is in a state of "Perfect Order" (a perfect crystal at 0 K), the number of microstates Ω and the entropy S are

Options :

1. ✖ $\Omega = 0, S = 0$

2. ✔ $\Omega = 1, S = 0$

3. ✖ $\Omega = 1, S = 1$

4. ✖ $\Omega \rightarrow \infty, S \rightarrow \infty$

Question Number : 103 Question Id : 7520767663 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Which combination gives highest strength-to-weight ratio?

Options :

1. ✔ Polymer + fibres

2. ✖ Metal + fibres

3. ✖ Polymer + particles

4. ✖ Ceramic + voids

Question Number : 104 Question Id : 7520767664 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Ferromagnetic materials show:

Options :

1. ✖ Weak repulsion

2. ✔ Strong attraction

3. ✖ No interaction

4. ✖ Random behaviour

Question Number : 105 Question Id : 7520767665 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A material loses its strong magnetization suddenly at a critical temperature and becomes weakly magnetic. This transition is from

Options :

1. ✖ Diamagnetic → Paramagnetic

2. ✖ Paramagnetic → Ferromagnetic

3. ✔ Ferromagnetic → Paramagnetic

4. ✖ Superconducting → Diamagnetic

Question Number : 106 Question Id : 7520767666 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The 'Fugacity Coefficient ($\phi = f/P$)' of a real gas approaches unity when

Options :

1. ✖ the pressure approaches infinity

2. ✖ the temperature approaches 0K

3. ✔ the pressure approaches zero

4. ✖ the gas is compressed into a liquid

Question Number : 107 Question Id : 7520767667 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

According to equation of continuity,

Options :

1. ✖ $w_1a_1 = w_2a_2$

2. ✖ $w_1v_1 = w_2v_2$

3. ✔ $a_1v_1 = a_2v_2$

4. ✖ $a_1/v_1 = a_2/v_2$

Question Number : 108 Question Id : 7520767668 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Assertion (A): Gibbs free energy determines spontaneity at constant T and P.

Reason (R): A process is spontaneous when Gibbs free energy is minimum.

Options :

1. ✖ Both A and R are true, and R is the correct explanation of A

2. ✔ Both are true, but R is not the correct explanation of A

3. ✖ A is true, R is false

4. ✖ A is false, R is true

Question Number : 109 Question Id : 7520767669 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

A plane wall of thickness 0.1 m and thermal conductivity 50 W/m·K has a surface area of 2 m^2. The temperature difference across the wall is 100 K.

What is the rate of heat transfer through the wall?

Options :

1. ✖ 200 kW

2. ✔ 100 kW

3. ✖ 50 kW

4. ✖ 25 kW

Question Number : 110 Question Id : 7520767670 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Diamagnetic materials are:

Options :

1. ✖ Attracted by magnetic field

2. ✔ Repelled by magnetic field

3. ✖ Neutral

4. ✖ Strongly attracted

Question Number : 111 Question Id : 7520767671 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Let A be a $n \times n$ matrix such that $A^3 = A$. Then which one of the following is true?

Options :

1. ✖ A must be an identity matrix.

2. ✖ A^2must be an identity matrix

3. ✖ A is invertible

4. ✔ A is diagonalisable

Question Number : 112 Question Id : 7520767672 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The function $f(x)=\begin{cases} x\sin\frac{1}{x}, & x\neq 0 \\ 0, & x=0 \end{cases}$ is

Options :

1. ✔ continuous everywhere

2. ✖ continuous only at $x = 0$

3. ✖ not continuous at $x = 0$

4. ✖ nowhere continuous

Question Number : 113 Question Id : 7520767673 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Let $\vec{f} = x^2yz\hat{\imath} + xy^2z\hat{\jmath} + xyz^2\hat{k}$ be a vector field. If $\vec{F}(x,y,z) = curl\,\vec{f}$, then the vector $\vec{F}(1,-2,1)$ is equal to _____

Options :

1. ✖ $-3\hat{\imath} + 4\hat{\jmath} + 3\hat{k}$

2. ✔ $-3\hat{\imath} + 3\hat{k}$

3. ✖ $3\hat{\imath} - 3\hat{k}$

4. ✖ $-3\hat{\imath} - 4\hat{\jmath} + 3\hat{k}$

Question Number : 114 Question Id : 7520767674 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The integrating factor of the differential equation $(1 + x^2)\frac{dy}{dx} + 2xy - 4x^2 = 0$ is

Options :

1. ✖ $\log(1 - x)$

2. ✖ $\log(1 + x^2)$

3. ✔ $1 + x^2$

4. ✖ $1 + 2x$

Question Number : 115 Question Id : 7520767675 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The number of linearly independent solutions of the differential equation

$\frac{d^4y}{dx^4} - \frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 2y = 0$ of the form e^{ax} (a is a real number) is

Options :

1. ✖ 1

2. ✔ 2

3. ✖ 3

4. ✖ 4

Question Number : 116 Question Id : 7520767676 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

If the probability distribution of a random variable X is as follows.

x	1	2	3	4
$P(X = x)$	k	$4k$	$4k$	k

Then, the value of k is _____

Options :

1. ✔ 0.1

2. ✖ 0.2

3. ✖ 0.3

4. ✖ 0.4

Question Number : 117 Question Id : 7520767677 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The inverse Laplace transform of $F(s) = \frac{s^2-3s+4}{s^3}$ is _____

Options :

1. ✔ $1 - 3t + 2t^2$

2. ✖ $1 - 3t + 4t^2$

3. ✖ $1 + 3t + 2t^2$

4. ✖ $1 + 3t + 4t^2$

Question Number : 118 Question Id : 7520767678 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

The general solution of $(x^2D^2 - xD)y = 0$ is

Options :

1. ✖ $y = c_1 + c_2e^x$

2. ✖ $y = c_1 + c_2x$

3. ✔ $y = c_1 + c_2x^2$

4. ✖ $y = c_1x + c_2x^2$

Question Number : 119 Question Id : 7520767679 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Two independent random variables X and Y have variances 0.2 and 0.5 respectively.

Let $Z = 5X - 2Y$. The variance of Z is

Options :

1. ✖ 3

2. ✔ 7

3. ✖ 4

4. ✖ 5

Question Number : 120 Question Id : 7520767680 Question Type : MCQ
Correct Marks : 1 Wrong Marks : 0

Consider the function $f(x) = x^3 - x - 1$ for finding the root the equation $f(x) = 0$. If the initial approximation is $x_0 = 1$, then the next approximation x_1 using the Newton–Raphson method is

Options :

1. ✖ 1.25
2. ✖ 1.75
3. ✔ 1.5
4. ✖ 2