PU PG Diploma in Green Energy Technology

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What among following is used to produce artificial rain?

○ Silver iodide

○ Carbon monoxide

○ Copper oxide

○ Silver nitrate

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The chemical used as a fixer in photography is:-

○ Sodium thiosulphate

○ Borax

○ Ammonium sulphate

○ Sodium sulphate

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The point group of CO_2 is:-

○ D_{3h}

○ $C_{\alpha v}$

○ D_{2h}

○ $D_{\alpha h}$

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Photosynthesis requires:-

○ CH_4

○ CO_2

○ O_2

○ N_2

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If A and B are symmetric matrices, then AB is symmetric if:-

○ $AB \neq BA$

○ $AB = BA$

○ $AB > BA$

○ AB < BA

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If $y = \sum_{m=0}^{\infty} C_m x^{r+m}$ is assumed to be a solution of the differential equation

$x^2 y'' - xy' - 3(1+x^2)y = 0$, then the values of r are:-

○ -1 and -3

○ 1 and 3

○ -1 and 3

○ 1 and -3

170 PU_2015_483
The structure of O_3 and N_3- are:-

○ Both linear

○ Both bent

○ Linear and bent, respectively

○ Bent and linear, respectively

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Which of the following is a greenhouse gas?

○ SO_2

○ CO_2

○ CO

○ NO_2

112 PU_2015_483
The straight lines L1: x = 0, L_2: y = 0 and L_3: x + y = 1 are mapped by the transformation w = z^2 into the curves C_1, C_2 and C_3 respectively. The angle of intersection between the curves at w = 0 is:-

○ π

○ $\pi/4$

○ 0

○ $\pi/4$

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Ferromagnetic metal among the following is:-

- Cu
- Co
- Na
- Mg

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Solution of the differential equation $\frac{d^2x}{dy^2} + x = 0, x = 0$ at $y = 0$ and $x = 1$ at $y = \pi/2$:-

- $x = \cos(y)$
- $\sin^{-1}(y)$
- $x = \sin(y)$
- $x = \sin(y) + \cos(y)$

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Phytochrome pigment is present in:-

- Stems
- Flowers
- Leaves
- Fruits

212 PU_2015_483
Beta sheets in a protein are formed due to:-

- Ionic bond between the residues
- Due to sulphur bridge between two residues
- Covalent bonding between amino acids in a polypeptide
- Hydrogen bonding between polypeptide chain

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The more stable carbon ion among the following is:-

- Cyclopentadienyl anion
- Alkyl anion
- Methyl anion
- Pentadienyl anion

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cDNA is:-

C Complementary of genomic DNA

C Complementary of plasmid DNA

C Complementary of mRNA

C Complementary of B-DNA

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Dark reaction refers to the reduction of:-

C Oxygen

C CO_2

C Water

C Hydrogen

164 PU_2015_483
Osmimum tetroxide is a reagent used for:-

C Hydroxylation of olefins to give trans diols

C Hydroylation of acetylene

C Hydroxylation of carbonyl compounds

C Hydroxylation of olefins to give cisdiols

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Among the following, the power device is:-

C Battery

C Fuel cells

C Supercapacitors

C None

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Number of hydrogen bonds between Thiamine and Adenosine is:-

C Four

C Three

C One

C Two

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Which part of the embryo comes out first of all from the seed during germination?

C Radicle

C Hypocotyle

C Plumule

C Cotyledon

132 PU_2015_483
If Pdx + xsin(y) dy = 0 is exact, then p can be:-

C -sin(y)

C x^2 - cos(y)

C cos(y)

C Sin(y) + cos(y)

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The criteria for spontaneity of a reaction is:-

C ΔG = +ve

C ΔG = 0

C ΔG = - ve

C None

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An element 'X' emits successively two α particles. The mass and atomic numbers of the element are decreased by, respectively:-

C 4 and 8

C 4 and 4

C 4 and 6

C 2 and 4

215 PU_2015_483
Okazaki fragment relate to:-

C Partially synthesized mRNA

C DNA fragment that help synthesis of lagging strand

C SiRNA fragments

C DNA primers for leading strand synthesis

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The coefficient of $(z - \pi)^2$ in the Taylor expansion of $f(z)\begin{cases} \dfrac{\sin(z)}{z-\pi} & if\, z \neq \pi \\ -1 & if\, z = \pi \end{cases}$ around π is:-

☐ 1/6

☐ -1/6

☐ -1/2

☐ 1/2

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Study of Epigenetic gene regulation relates to:-

☐ Cytosine deletion causing genetic disease

☐ Methylation of cytosine regulating gene expression

☐ Transformation of cytosine to Uracil

☐ Base pair mismatch due to mutation

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Enzyme that are used to hydrolyse fats into diglycerides, monoglycerides, fatty acids and glycerol is:-

☐ Lipase

☐ Zymase

☐ Cellulase

☐ Protease

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The matrix $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ is:-

☐ Orthogonal

☐ Hermitian

☐ Unitary

☐ Skew Hermitian

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The number of peaks in the EPR spectrum of $CH_3^{\bullet}$ radical is:-

☐ 1

- [ ] 2
- [ ] 4
- [ ] 3

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Which of the following is an ore of magnesium?

- [ ] Limonite
- [ ] Dolomite
- [ ] Hematite
- [ ] Goethite

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An example for the species having quadruple bond is:-

- [ ] $Cr_2O_7^{2-}$
- [ ] $Re_2Cl_8^{2-}$
- [ ] $Hg_2(CH_3COO)_2$
- [ ] $Mn_2(CO)_{10}$

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Component of the blood which help in clotting at the site of injury are:-

- [ ] WBCs
- [ ] Platelets
- [ ] RBCs
- [ ] Plasma serum

131 PU_2015_483
Which of the following is a linear differential equation?

- [ ] $\frac{dy}{dx} + y(y + x) = x^2$
- [ ] $(1 + y)\frac{dy}{dx} + + \sin(x) = 0$
- [ ] $\frac{dy}{dx} - x^2 y = \sin(x)$
- [ ] $\frac{dy}{dx} + x^2 y = \sin(y)$

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The most symmetrical crystal system is:-

◻ Trigonal

◻ Cubic

◻ Triclinic

◻ Rhombohedral

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Which of the following molecules show EPR resonance?

◻ CO_2

◻ O_2

◻ H_2O

◻ H_2O_2

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The flight or flight response is developed by hormone of the:-

◻ Medulla oblongata

◻ Adrenal medulla

◻ Hypothalamus

◻ Adrenal cortex

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Photorespiration is:-

◻ Sequestration of O_2

◻ Sequestration of CO_2

◻ Consumption of CO_2 and release of O_2

◻ Consumption of O_2 and release of CO_2

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The value of $\int_{-1}^{2} x^3 \, dx$ is:-

◻ -9

◻ 15

◻ 15/4

◻ 17/4

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The directional movement or orientation of a plant part in response to light is termed as:-

○ Thigmotaxis

○ Chemotropism

○ Photoperiodism

○ Phototropism

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An example for a thermodynamic state function is:-

○ Temperature

○ Pressure

○ Volume

○ All

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The possible set of eigen values of a 4 x 4 skew-symmetric orthogonal real matrix is:-

○ $\{\pm i\}$

○ $\{0, \pm i\}$

○ $\{\pm i, \pm 1\}$

○ $\{\pm 1\}$

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Let $f(x) = \sum_{n=1}^{\infty} \frac{\sin(nx)}{n^2}$ then:-

○ $\lim_{x \to 0} f(x) = 1$

○ $\lim_{x \to 0} f(x) = \pi^6/2$

○ $\lim_{x \to 0} f(x)$ does not exist

○ $\lim_{x \to 0} f(x) = 0$

210 PU_2015_483
RNA Polymerase is an enzyme that:-

○ Replicate RNA

○ Translate RNA

○ Replicate DNA

○ Transcribe DNA

109 PU_2015_483
The volume of the parallelepiped above whose edges are represented

by $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ $\vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$ is:-

O 15

O 7

O 28

O 6

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The absorption maximum of CdS is 470 nm. The approximate band gap in eV is:-

O 4.63

O 3.63

O 1.63

O 2.63

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The triangle of maximum area inscribed in a circle of radius r is:-

O An equilateral triangle

O A right angled triangle with hypotenuse measuring 2r

O An isosceles triangle of height r

O None of the above

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The electrolyte used in lead-acid battery is:-

O H_2SO_4

O HNO_3

O H_2O

O HCl

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A compound shows IR absorption at 1800 cm^{-1}. The compound can be:-

O Acid chloride

O Aryl ketone

O Ester

O Amide

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A complex compound in which the oxidation number of a metal is zero is:-

- ☐ $Ni[CO]_4$
- ☐ $K_4[Fe(CN)_6]$
- ☐ $K_3[Fe(CN)_6]$
- ☐ $[Pt(NH_3)_4]Cl_2$

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The maximum value of $\frac{1}{\sqrt{2}}(sinx - cosx)$ is:-

- ☐ $\sqrt{2}$
- ☐ 1
- ☐ $\frac{1}{\sqrt{2}}$
- ☐ 0

153 PU_2015_483
An octahedral metal ion M^{2+} has magnetic moment of 4.0 BM. The correct combination of metal ion and 'd' electron configuration is:-

- ☐ $Fe^{2+}, t_2g^4 eg^2$
- ☐ $Cr^{2+}, t_2g^4 eg^1$
- ☐ $Mn^{2+}, t_2g^3 eg^1$
- ☐ $Co^{2+}, t_2g^5 eg^2$

208 PU_2015_483
For an ecosystem, which of the following is incorrect?

- ☐ Energy movement is unidirectional
- ☐ Energy movement is from higher to lower trophic level
- ☐ Energy is lost irretrievably
- ☐ Energy movement is non-cyclic

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Phytoplanktons are:-

- ☐ Primary consumers
- ☐ Secondary consumers

Tertiary consumers

Producers

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For XOR operator $\ominus$, which one is not correct?

$0 \ominus 1 = 1$

$1 \ominus 1 = 0$

$1 \ominus 0 = 1$

$0 \ominus 0 = 1$

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Chloroflorocarbon in the atmosphere causes depletion of:-

Oxygen

Carbondioxide

Ozone

Nitrogen

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Of the following metals, the softest is:-

Al

Na

Mo

Rb

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End product of glycolysis is:-

Ethanol

Pyruvic acid

Glycol

Glucose

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$\int_a^b x^{-1+\varepsilon} \, dx$ where $\varepsilon \to 0$ is :-

0

$$\frac{1}{\varepsilon}$$

○ ln(b/a)

○ $b^{\varepsilon} - a^{\varepsilon}$

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Psychrophiles are bacteria that grow in the temperature range of:-

○ -10° C to 20° C

○ 15° C to 45° C

○ 30° C to 75° C

○ Above 100° C

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Which of the following can terminate the continuation of phosphodiester bonding?

○ DNA hybridization

○ Nucleotides

○ Dideoxynucleotides

○ Deoxynucleotides

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No two electrons will have all the four quantum numbers equal. This statement is known as:-

○ Pauli exclusion principle

○ Aufbau's principle

○ Uncertainty principle

○ Hund's rule

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The rank of the matrix is $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ is:-

○ 3

○ 1

○ 2

○ 0

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The one which is not compatible with crystal symmetry is:-

□ One-fold symmetry

□ Three-fold symmetry

□ Six-fold symmetry

□ Five-fold symmetry

224 PU_2015_483
Electronic contribution to the specific heat of a metal at low temperature is:-

□ A linear function of T

□ An exponential function of T

□ Zero

□ None of the above

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At ordinary temperatures the molecules remain in their:-

□ Can remain in any vibrational level

□ Lowest vibrational level

□ Highest vibrational level

□ Does not show any type of vibration

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The probability that in a family of 4 children there will be at least one Boy is:-

□ $\dfrac{5}{16}$

□ $\dfrac{15}{16}$

□ $\dfrac{1}{16}$

□ $\dfrac{3}{16}$

244 PU_2015_483
Stars twinkle, whereas planets do not, because:-

□ Planets merely reflect light, whereas stars emit light

□ Stars pulsate

Stars are more point like us

None of the above

241 PU_2015_483
The frequency of a television transmitter is:-

100 MHz

1 MHz

10 MHz

100 kHz

228 PU_2015_483
The temperature at which a conductor becomes a superconductor is called:-

Superconducting temperature

Transition temperature

Onne's temperature

Curie temperature

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The equation $x^5 + x^4 + x^3 + 1 = 0$.

Has 5 roots

Has no roots

Has 4 roots

Has 6 roots

245 PU_2015_483
Materials that are good electrical conductors also tend to be good thermal conductors because:-

Surface states are important in both processes

Conduction electrons contribute to both processes

They have energy gaps between the allowed electron energy bands

They have highly elastic lattice structures

259 PU_2015_483
A second order phase transition is characterized by:-

A discontinuous change in its specific heat

Irreversible behaviour during warming and cooling

○ A latent heat

○ A change in volume

255 PU_2015_483
Boolean algebra is based on:-

○ Symbols

○ Logic

○ Numbers

○ All of the above

226 PU_2015_483
A semiconductor with equal concentration of acceptor and donor type of impurities is termed as:-

○ Intrinsic

○ Amphoteric

○ Compensated

○ None of the above

230 PU_2015_483
The energy of a phonon is:-

○ Infinite

○ $\hbar v$

○ $\hbar \omega$

○ $\hbar k$

257 PU_2015_483
Matter waves are:-

○ Always travel with speed of light

○ Electromagnetic

○ Show diffraction

○ Longitudinal

238 PU_2015_483

Which one of the following particles does not have a spin $\frac{1}{2}$?

○ Photon

○ Neutron

○ Proton

○ Neutrino

247 PU_2015_483
Physical origin of optical theorem is the conservation of:-

○ Mass

○ Energy

○ Momentum

○ Particles

240 PU_2015_483

If L = inductance and R = resistance, what unit does $\dfrac{L}{R}$ have?

○ Amperes

○ Sec

○ Sec^{-1}

○ None of the above

251 PU_2015_483
For obtaining maximum power from a solar cell, it should be operated on:-

○ Horizontal part of the curve

○ Falling portion of V-I characteristics

○ The knee of the V-I characteristics

○ Any part of the V-I characteristics as power does not depend on it

268 PU_2015_483
Which of the following is an intensive property of a thermodynamic system?

○ Temperature

○ Energy

○ Volume

○ Mass

298 PU_2015_483
Air can be best heated by steam in a heat exchanger of:-

○ Shell and tube type

○ Double pipe type with fins on steam side

○ Double pipe type with fins on air side

○ Plate type

297 PU_2015_483
Thermal diffusivity of a substance is:-

○ Directly proportional to the square of thermal conductivity

○ Inversely proportional to thermal conductivity

○ Inversely proportional to the square of thermal conductivity

○ Directly proportional to thermal conductivity

275 PU_2015_483
In vapour compression cycle, the condition of refrigerant is superheated vapour:-

○ After passing through the expansion or throttle valve

○ Before entering the expansion valve

○ Before passing through the condenser

○ After passing through the condenser

264 PU_2015_483
The measurement of a thermodynamic property known as temperature is based on:-

○ First law of thermodynamics

○ Zeroth law of thermodynamics

○ Second law of thermodynamics

○ None of the above

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A cycle consisting of _____ and two isothermal processes is known as Stirling cycle.

○ Two constant pressure

○ Two constant volume

○ Two isentropic

○ One constant pressure, one constant volume

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Metals are good conductors of heat because:-

They contain free electrons

Their atoms are relatively far apart

They have high density

Their atoms collide frequently

278 PU_2015_483
LMTD in case of counter flow heat exchanger as compared to parallel flow heat exchanger is:-

Depends on the area of heat exchanger

Lower

Same

Higher

260 PU_2015_483
A closed system is one in which:-

Both energy and mass cross the boundaries of the system

Neither mass nor energy cross the boundaries of the system

Mass crosses the boundary but not the energy

Mass does not cross boundaries of the system, though energy may do so

261 PU_2015_483
For a perfect gas, according to Boyle's law (where p = Absolute pressure, v = Volume and T = Absolute temperature):-

p v = constant, if T is kept constant

p/T = constant, if v is kept constant

T/p = constant, if v is kept constant

v/T = constant, if p is kept constant

272 PU_2015_483
Thermal conductivity of solid metals with rise in temperature normally:-

Remains constant

May increase or decrease depending on temperature

Increases

Decreases

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Where does the lowest temperature occur in a vapour compression cycle?

◯ Evaporator

◯ Condenser

◯ Compressor

◯ Expansion valve

277 PU_2015_483
A non‑dimensional number generally associated with natural convection heat transfer is:-

◯ Nusselt number

◯ Prandtl number

◯ Grashoff number

◯ Weber number

286 PU_2015_483
In vapour compression cycle, the condition of refrigerant is saturated liquid:-

◯ Before passing through the condenser

◯ After passing through the expansion throttle valve

◯ Before entering the expansion valve

◯ After passing through the condenser

293 PU_2015_483
The value of solar constant is:-

◯ 1763 W/m^2

◯ 1000 W/m^2

◯ 1637 W/m^2

◯ 1367 W/m^2

290 PU_2015_483
Two plates spaced 150 mm apart are maintained at 1000°C and 70°C. The heat transfer will take place mainly by:-

◯ Convection

◯ Forced convection

◯ Free convection

◯ Radiation

284 PU_2015_483
The critical radius is the insulation radius at which the resistance to heat flow is:-

○ Zero

○ Minimum

○ Maximum

○ None of the above

271 PU_2015_483
According to First law of thermodynamics:-

○ Internal energy, enthalpy and entropy during a process remains constant

○ Total internal energy of a system during a process remains constant

○ Work done by a system is equal to the heat transferred by the system

○ Total energy of a system remains constant

279 PU_2015_483
Fourier's law of heat conduction is valid for:-

○ One dimensional cases only

○ Two dimensional cases only

○ Regular surfaces having non-uniform temperature gradients

○ Three dimensional cases only

281 PU_2015_483
In free convection, heat transfer transition from laminar to turbulent flow is governed by the critical value of the:-

○ Reynold's number, Grashoff's number

○ Reynold's number

○ Grashoff's number

○ Prandtl number, Grashoff's number