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Scientific officer document

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1. The factor/factors that limit the response speed of a photodiode is/are

A) Diffusion of carriers

B) The carrier transit time through the junction depletion region

C) The depletion region capacitance

D) All the above

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2. Which of these factors doesn't affect CMRR of an op-amp ?

A) Differential voltage gain

B) Input common mode voltage

C) Output common mode voltage

D) None of the above

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3. The output voltage of an open loop differential amplifier with input dc voltages at inverting and non inverting terminals 6 microvolts and –8 microvolts respectively is (Given amplifier gain is 100000 and input resistance is 2 megaohms)

A) 1.4 V

B) 14 V

C) 0.7 V

D) 2.8 V

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4. For an AM BSBFC modulator with a carrier frequency of 100 kHz and a maximum modulating signal frequency of 5 kHz the bandwidth is

A) 95 kHz

B) 105 kHz

C) 10 kHz

D) 200 kHz

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5. For self-bias configuration of FET V_{GS} is

A) Function of output current

B) A constant

C) Function of source current

D) Both A and C

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6. Which nucleus is expected to have the highest binding energy per nucleon based on typical nuclear stability trends ?

A) ^{7}Li B) ^{20}Ne C) ^{56}Fe D) ^{235}U

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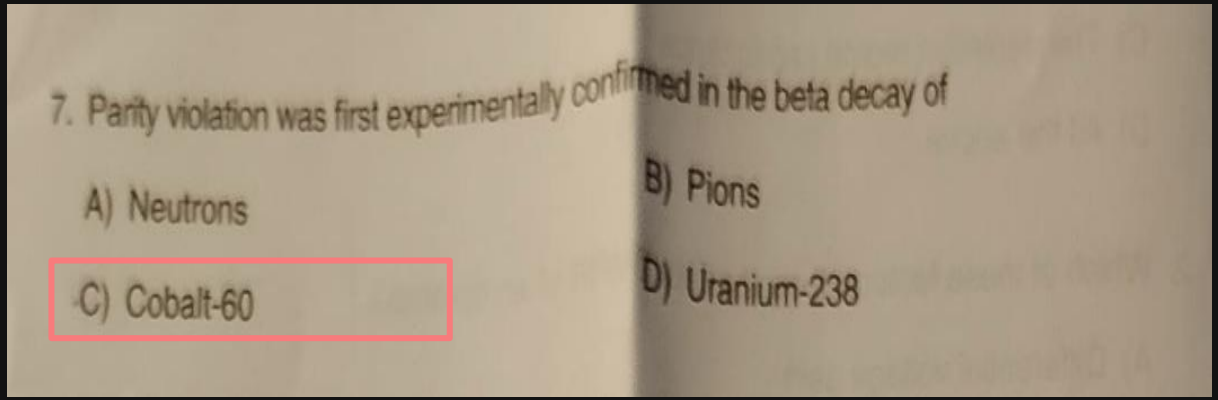

7. Parity violation was first experimentally confirmed in the beta decay of

A) Neutrons

B) Pions

C) Cobalt-60

D) Uranium-238

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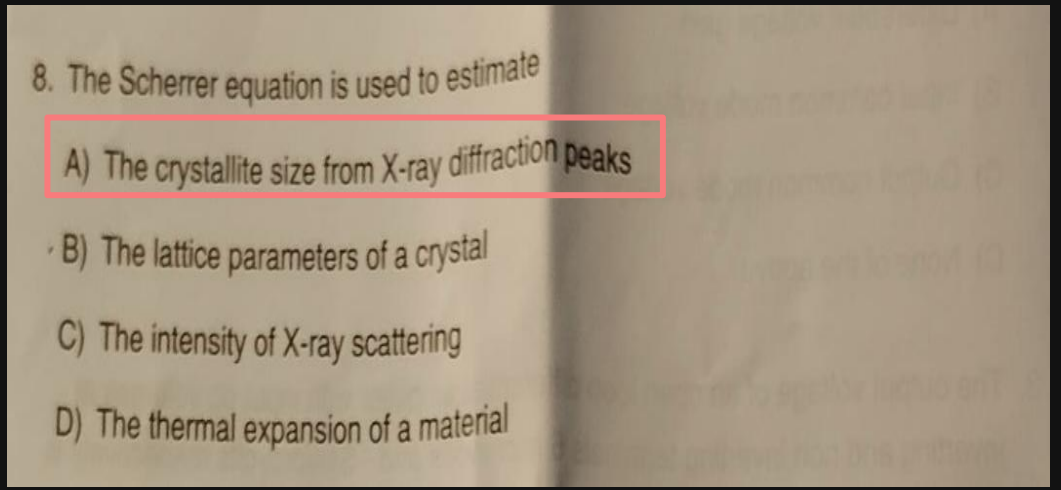

8. The Scherrer equation is used to estimate

A) The crystallite size from X-ray diffraction peaks

B) The lattice parameters of a crystal

C) The intensity of X-ray scattering

D) The thermal expansion of a material

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9. Which of the following properties of nuclear forces is explained by the exchange of Mesons according to Yukawa's theory ?

A) The charge independence of nuclear forces

B) The short-range nature of the nuclear force

C) The spin dependence of nuclear forces

D) The Coulomb repulsion between protons

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. In the context of the Eightfold Way in particle physics, which of the following particle families are arranged in an octet ?

A) Mesons and Baryons

B) Quarks and Leptons

C) Leptons and Gauge Bosons

D) Gluons and Neutrinos

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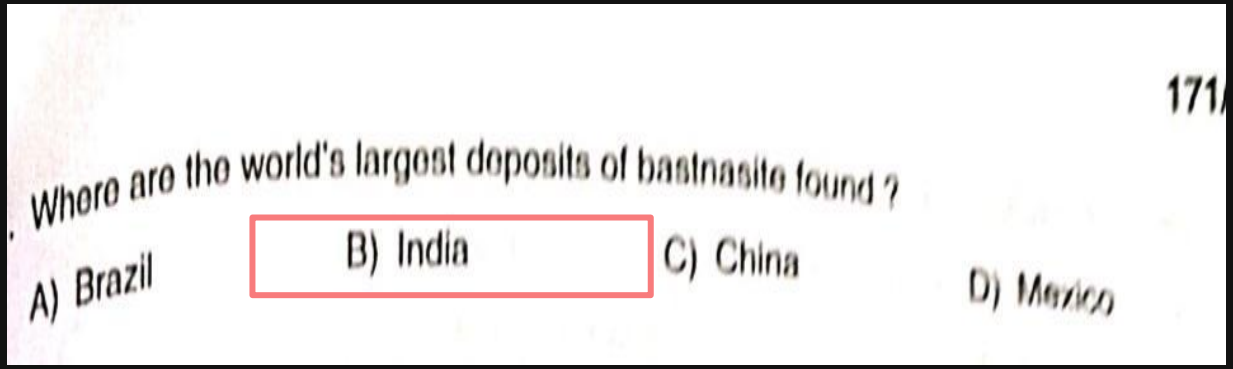
171
Where are the world's largest deposits of bastnasite found ?
A) Brazil
B) India
C) China
D) Mexico

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12. According to Pearson's classification of acids and bases, which of the following is considered a soft base ?

A) H^-

B) F^-

C) CO_3^{2-}

D) NH_3

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13. The addition of SbF_5 to HSO_3F results in an increase in the concentration of

A) H_2F^+

B) $H_2SO_3F^+$

C) $[HSO_2F_2]^-$.

D) $[F_5SbSO_2F]^-$

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14. Which of these is not a metalloid ?

A) Germanium

B) Tin

C) Antimony

D) Tellurium

15. Which of the following is not an example of an *arachno* species ?

A) $[B_4H_9]^-$

B) B_5H_{11}

C) B_6H_{10}

D) $C_2B_7H_{13}$

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16. Which of the following statement is correct ?

A) OH^- is not a leaving group in E_2 reactions

B) Nucleophile that are strong bases favours substitution over elimination

C) High temperature favours substitution over elimination

D) Both B and C

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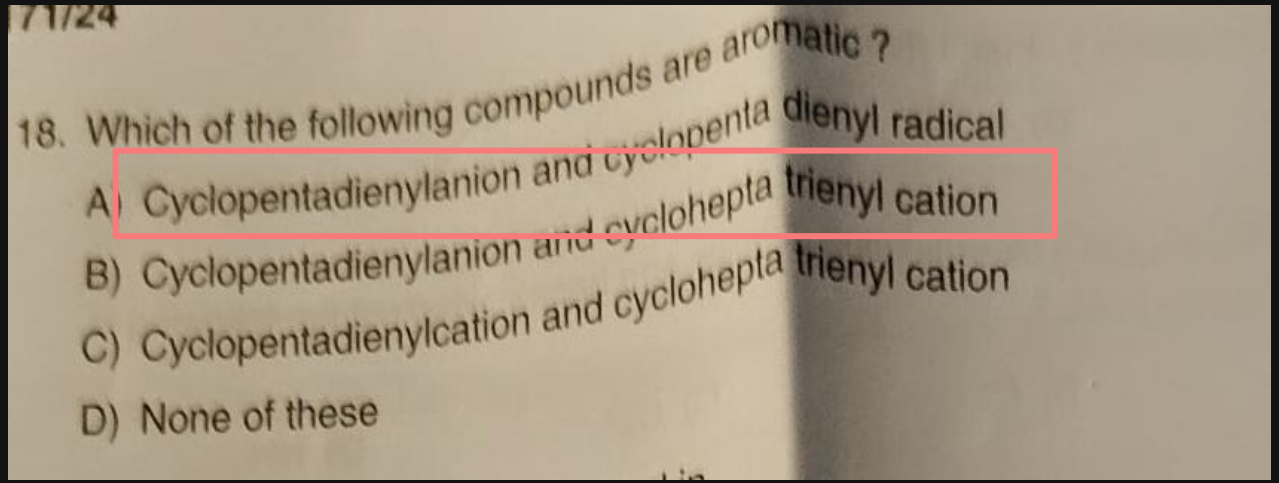
17. Which of the following statement is true about Mitsunobu reaction ?

A) This reaction is used to replace OH by another group with inversion of configuration

B) It is a modern SN^2 reaction

C) Triphenyl phosphine is used as a reagent

D) All of the above


71/24
18. Which of the following compounds are aromatic ?
A) Cyclopentadienylanion and cyclopenta dienyl radical
B) Cyclopentadienylanion and cyclohepta trienyl cation
C) Cyclopentadienylcation and cyclohepta trienyl cation
D) None of these

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19. Iminonitrile is initial product formed in

A) Michael addition

B) Aldol condensation

C) Thorpe reaction

D) Benzoin condensation

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20. Which of the following reactions are involved in Robinson annulation ?

A) Mannich reaction and Aldol condensation

B) Reformatsky reaction and Benzoin condensation

C) Michael addition and Aldol condensation

D) None of the above

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21. Which of the following statements is incorrect ?

A) The entropy of a system increases as the volume increases, keeping other factors constant

B) The entropy of a system increases with an increase in molar mass when other factors are held constant

C) The entropy of a system increases with an increase in pressure when the temperature is constant

D) The entropy of a system increases with temperature, keeping other factors constant

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22. Which of the following represents the ratio among the average, most probable and root mean square velocities of a gas ?

A) 1:00 : 0.92 : 0.82

B) 0.92 : 1:00 : 0.82

C) 0.82 : 0.92 : 1:00

D) 0.92 : 0.82 : 1:00

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23. The entropy change associated with conversion of 1 mole of water to steam is ... (Latent heat of vaporization of water is 2.257 kJg^{-1})

A) 109 JK^{-1}

B) 406 JK^{-1}

C) 1961 JK^{-1}

D) 22.6 JK^{-1}

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24. At what pressure will the dissociation of 1 mole of PCl_5 to PCl_3 and Cl_2 be 20% at 225°C (Assume Kp = 0.5 atmosphere) ?

A) 24 atmosphere

B) 10 atmosphere

C) 1 atmosphere

D) 12 atmosphere

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25. From a crystal containing N atoms, if n cations and n anions are removed, the different ways in which defects can be formed is given by the expression ?

A) $\frac{N!}{(N-n!)\,n!}$

B) $\left[\frac{N!}{(N-n)!n!}\right]^2$

C) $\left[\frac{N!}{(N-n!)n!}\right]^2$

D) $\frac{N!}{(N-n)!\,n!}$

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26. The statements 'inter nuclear distance remain constant during electronic excitation' and 'the nuclei can be treated as stationary so that electrons move relative to them' are respectively.

A) Frank Condon Principle and Born-Oppenheimer approximation

B) Oppenheimer approximation and Frank-Condon Principle

C) Frank-Condon Principle and Morse approximation

D) Morse approximation and Hunds rule

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27. Boron trichloride is a

A) Prolate symmetric top

B) Oblate symmetric top

C) Spherical top

D) Asymmetric top

28. The rotational Constant of $^{16}O_2$ is 4 cm^{-1}. The wave number of incident radiation in a Raman spectrometer is 20450 cm^{-1}. What is the wave number of first scattered stokes line (in cm^{-1}) of $^{16}O_2$?

A) 20434 cm^{-1}

B) 20442 cm^{-1}

C) 20426 cm^{-1}

D) 20474 cm^{-1}

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29. The vibrational energy levels, $v''= 0$ and $v' = 1$ of a diatomic molecule are separated by 2200 cm^{-1}. Its anharmonicity ($\omega_e x_e$) is 10 cm^{-1}. The values of ω_e (in cm^{-1}) and first overtone (in cm^{-1}) of this molecules are respectively.

A) 2210 cm^{-1} and 4320 cm^{-1}

B) 2240 cm^{-1} and 4380 cm^{-1}

C) 2280 cm^{-1} and 4360 cm^{-1}

D) 2220 cm^{-1} and 4340 cm^{-1}

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30. Which of the following nuclei has a magnetic moment ?

A) $^{2}D_{1}$ B) $^{4}He_{2}$ C) $^{12}C_{6}$ D) $^{40}Ca_{20}$

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31. Which of the following synthetic method is a top-down approach for the synthesis of nanomaterials ?

A) Laser ablation

B) Sol-gel synthesis

C) Chemical precipitation

D) Microwave-assisted synthesis

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32. An example for magnetostrictive material is

A) Barium titanate

B) Iron-Nickel alloy

C) Gallium nitride

D) Lead telluride

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33. How many significant figures are there in the numbers 0.0090500 and 0.00905 respectively ?

A) 7, 5

B) 3, 5

C) 5, 3

D) 5, 5

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34. Craig's method is an example for

A) Chromatography

B) Thermal analysis

C) Viscometry

D) Solvent extraction

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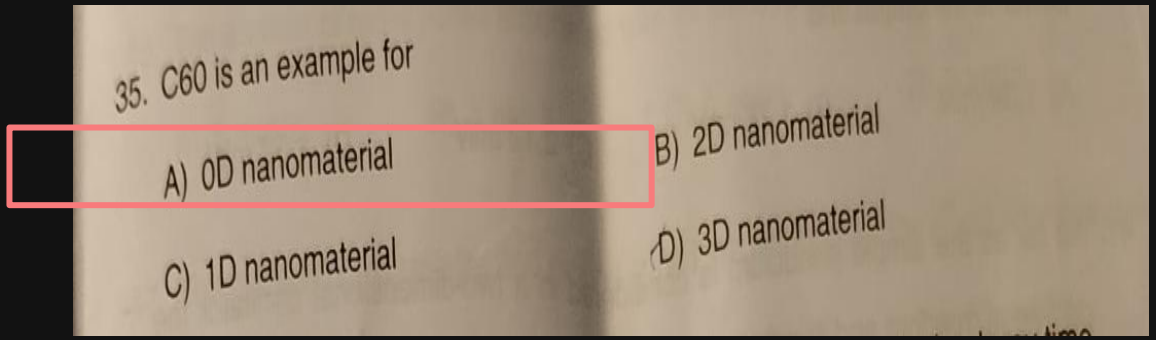

35. C60 is an example for

A) 0D nanomaterial

B) 2D nanomaterial

C) 1D nanomaterial

D) 3D nanomaterial

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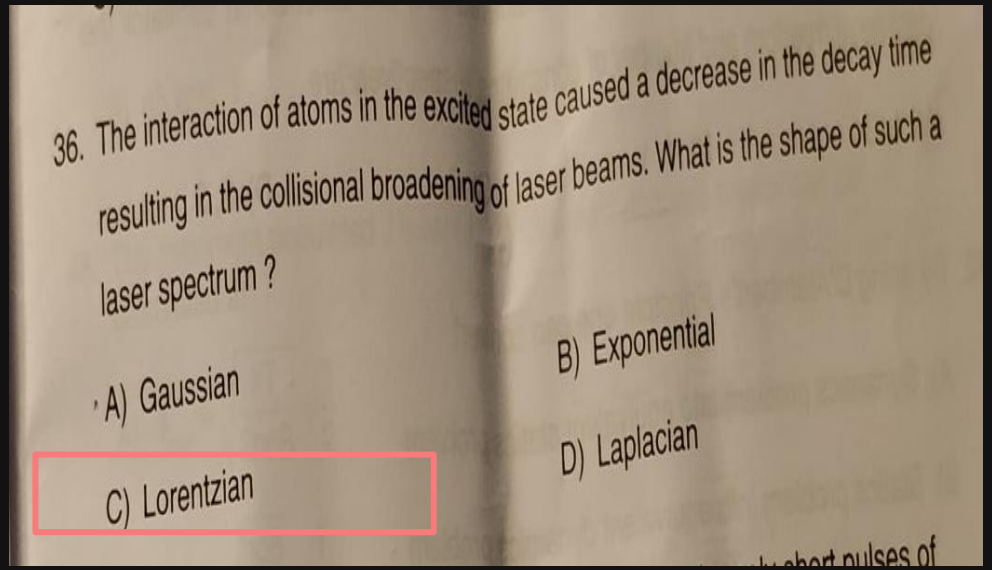

36. The interaction of atoms in the excited state caused a decrease in the decay time resulting in the collisional broadening of laser beams. What is the shape of such a laser spectrum ?

A) Gaussian

B) Exponential

C) Lorentzian

D) Laplacian

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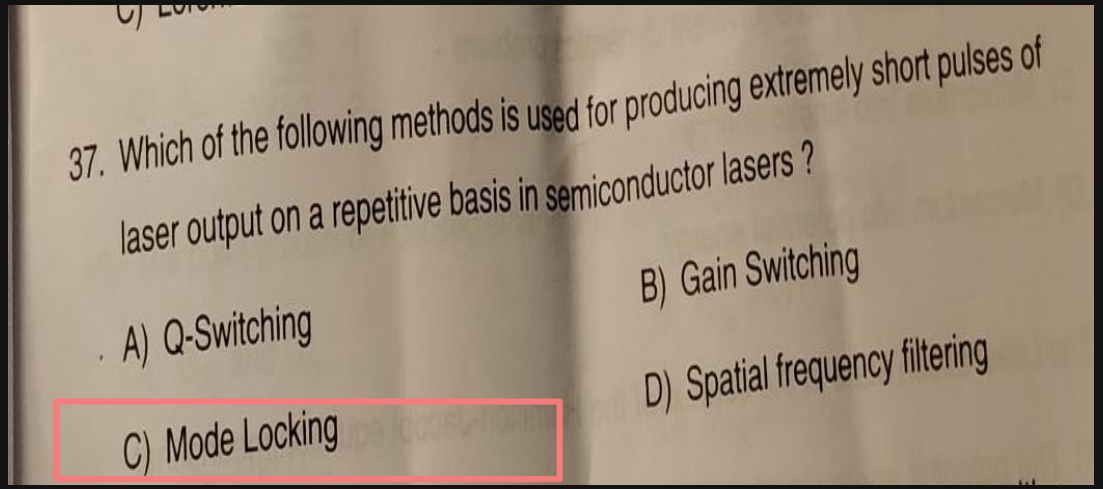

37. Which of the following methods is used for producing extremely short pulses of laser output on a repetitive basis in semiconductor lasers ?

A) Q-Switching

B) Gain Switching

C) Mode Locking

D) Spatial frequency filtering

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38. What is the external power efficiency of LASER with GaAs active region with a band gap of 1.43 eV, when the total injection efficiency is 19% and a voltage of 3.2 volt is applied to the device.

A) 8.49%

B) 10.02%

C) 9.28%

D) 42.51%

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39. Which of the following statements is not true ?

A) endoscopes use coherent bundles of fibers

B) a photocell converts light into electric current

C) plastic fiber is normally used for long distance communications and has low loss

D) silica glass fiber can support both single mode and multimode communication

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40. A 6 mW laser beam passes through a 32 km fiber of loss 0.2 dB/km. What is the power at the output end ?

A) 1.09 mW B) 1.76 mW C) 2.12 mW D) 1.37 mW

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41. As far as the simple pendulum is considered in a two-dimensional oscillator the degree of freedom and number of constrains respectively are

. A) 1, 2 B) 1, 1 C) 2, 1 D) 2, 2

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12. By using D'Alembert's Principle one can convert

A) Dynamics problem into equivalent statics problem

B) Statics problem into equivalent dynamics problem

C) Momentum into kinetic energy

D) Momentum into potential energy

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43. The Least action state in the context of the Hamilton-Jacobi equation means that

A) The potential energy is minimized along the path

B) The kinetic energy is minimized at all times

C) The action is minimized along the actual path taken by the system

D) The total energy is conserved

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44. What is the stable fixed point of the logistic map when $r = 3$?

A) ½ B) 0 C) 1 D) $(r-1)/r$

45. The commonly used sequence of rotations in the ZYX convention for the Euler Angle is

A) Roll, Yaw, Pitch

B) Roll, Pitch, Yaw

C) Pitch, Roll, Yaw

D) Yaw, Pitch, Roll

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46. The number of radial nodes associated with 3s and 3p orbitals are respectively

A) 3 and 2 B) 3 and 3 C) 0 and 1 D) 2 and 1

47. The number of microstates and ground state term symbols for the d^8 configuration are

A) 45 and $^3F_2$ B) 45 and $^3F_4$ C) 15 and $^3F_4$ D) 10 and $^3D_{3/2}$

48. The maximum populated J level (J_{max}) for a rigid diatomic rotator can be calculated as

A) $J_{max} = \sqrt{\frac{kT}{2hcB}} - \frac{1}{2}$

B) $J_{max} = \sqrt{\frac{2kT}{hcB}} - \frac{1}{2}$

C) $J_{max} = \sqrt{\frac{hcB}{2kT}} - \frac{1}{2}$

D) $J_{max} = \sqrt{\frac{hcB}{2kT}} - 1$

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49. The point groups of *eclipsed* ethane and *staggered* ferrocene are

A) D_{3h} and C_{5h}

B) C_{2h} and C_{5v}

C) D_{3h} and D_{5d}

D) D_{3d} and D_{5h}

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50. Entropy (S) of a system is related to thermodynamic probability (W) through Boltzmann constant (k_B) as

A) $S = k_B \ln W$

B) $W = k_B \ln S$

C) $S = -k_B \ln W$

D) $W = -k_B \ln S$

51. For a radioactive disintegration series $A \rightarrow B \rightarrow C \rightarrow \ldots\ldots$, N_1, N_2, N_3, etc. designate the number of atoms of A, B, C, etc. $\lambda_1, \lambda_2, \lambda_3$, etc. are representing their corresponding decay constants and l_1 and l_2 are the average life periods of A and B. Then pick the right equation representing the radioactive equilibrium.

A) $\frac{N_1}{N_2} = \frac{\lambda_1}{\lambda_2} = \frac{l_1}{l_2}$

B) $\frac{N_1}{N_2} = \frac{\lambda_2}{\lambda_1} = \frac{l_1}{l_2}$

C) $\frac{N_1}{N_2} = \frac{\lambda_1}{\lambda_2} = \frac{l_2}{l_1}$

D) $\frac{N_2}{\lambda_2} = \frac{N_1}{\lambda_1} = \frac{l_1}{l_2}$

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52. NaCl crystal contains

A) 6 planes of symmetry and 6 axes of symmetry

B) 6 planes of symmetry and 3 axes of symmetry

C) 9 planes of symmetry and 13 axes of symmetry

D) 6 planes of symmetry and 13 axes of symmetry

53. In a mixed metal oxide AB_2O_4 crystal, all A atoms and half of the B atoms have been in the octahedral holes and half of the B atoms have been in the tetrahedral holes. The structure of the metal oxide is

A) Spinel

B) Inverse spinel

C) Ilmenite

D) Perovskite

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54. Which of the following statements are correct ?

i. A piezoelectric material generates a voltage when deformed.

ii. Piezoelectric effect is a reversible process.

iii. Piezoelectric effect is an irreversible process.

iv. Piezoelectricity means electricity results from pressure.

A) i, ii and iii

B) ii, iii and iv

C) i, ii and iv

D) i, iii and iv

55. Pick up the characteristics of SOFC.

i. Oxidation of a fuel produces electricity.

ii. They operate at very low temperatures.

iii. Solid electrolyte conducts negative oxygen ions from the cathode to the anode.

iv. Solid electrolyte conducts negative oxygen ions from the anode to the cathode.

A) i and ii

B) ii and iii

C) i and iv

D) i and iii

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56. The absorption at Lmax 279nm(e=15) in the UV spectrum of acetone is due to

A) $\pi - \pi^*$ transition

B) $n - \pi^*$ transition

C) $\sigma - \sigma^*$ transition

D) $\pi - \sigma^*$ transition

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57. The order of carbonyl stretching frequency in the IR spectra of ketone, amide and anhydride is

A) anhydride> amide> ketone

B) ketone> amide> anhydride

C) amide> anhydride> ketone

D) anhydride> ketone> amide

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58. An organic compound with molecular formula $C_3H_6Cl_2$ exhibits only one signal in the Proton nmr spectrum. The compound is

A) 2,2-dichloropropane

B) 1,2-dichloropropane

C) 1,3-dichloropropane

D) 1,1-dichloropropane

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59. What is DEPT technique ?

A) Direct Electron Polarisation Transfer

B) Decoupled Electron Polarisation Transfer

C) Distortionless Enhancement by Polarisation Transfer

D) Distortionless Enhancement by Proton Transfer

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60. Natural product abietic acid is a

A) Monoterpene

B) Sesquiterpene

C) Diterpene

D) Triterpene

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61. A point at which a function f(z) ceases to be analytic is called

A) Zero

B) Singularity

C) Pole

D) Limit point

62. Residue of $f(z) = \dfrac{z^3}{(z-1)^4(z-2)(z-3)}$ at $z = 3$ is

A) $\dfrac{101}{16}$ B) -8 C) $\dfrac{27}{16}$ D) 0

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63. The value of $f(x)\,\delta(x-a)$ is

A) 0

B) a

C) $f(x)$

D) $f(a)\,\delta(x-a)$

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64. The value of Legendre polynomial $P_n(1)$ is

A) 0 B) 1 C) -1 D) $(-1)^n$

65. The value of the Gamma function $\Gamma\left(\frac{1}{2}\right)$ is

A) 0 B) $\frac{\pi}{2}$ C) π D) $\sqrt{\pi}$

66. Match the following methods for surface area determination with their principles

Method	Principle
1. BET Method	P. Multilayer adsorption behavior
2. Langmuir Method	Q. Monolayer adsorption model
3. Point B Method	R. Intersection of adsorption isotherms
4. Harkins-Jura	S. Absolute adsorption technique

A) 1 – P, 2 – Q, 3 – S, 4 – R

B) 1 – Q, 2 – R, 3 – S, 4 – P

C) 1 – R, 2 – Q, 3 – P, 4 – S

D) 1 – P, 2 – Q, 3 – R, 4 – S

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67. Which technique provides information on the oxidation states of surface atoms through the study of core-level binding energies ?

A) Scanning Probe Microscopy (SPM)

B) Auger Electron Spectroscopy (AES)

C) X-ray Photoelectron Spectroscopy (XPS)

D) Electron Energy Loss Spectroscopy (EELS)

68. Match the following electrochemical concepts with their corresponding descriptions.

Concept	Description
1. Debye-Hückel theory	a. Describes ionic activity in electrolyte solutions
2. Onsager equation	b. Describes the logarithmic dependence of overpotential on current density
3. Butler-Volmer equation	c. Relates molar conductivity with ion mobility
4. Tafel equation	d. Expresses the current potential relationship in electrode kinetics

A) 1 – a, 2 – b, 3 – c, 4 – d

B) 1 – a, 2 – c, 3 – d, 4 – b

C) 1 – a, 2 – d, 3 – b, 4 – c

D) 1 – b, 2 – a, 3 – d, 4 – c

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'69. A solution contains 0.2 M NaCl and 0.05 M $CaCl_2$. The ionic strength (I) of the solution is

A) 0.30 M B) 0.35 M C) 0.40 M D) 0.45 M

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70. The Hammett equation is expressed as

log (k/ko) = ρσ. The parameter ρ represent in this equation is

A) The sensitivity of the reaction to electronic effects

B) The activation energy of the reaction

C) The resonance effect of substituents

D) The steric effect of substituents

71. Which among the following statement is wrong according to the Mutual Exclusion Principle ?

A) No normal vibrational modes can be both infrared and Raman active in a molecule that possesses a center of symmetry

B) All vibrational modes that are Raman active will be infrared inactive and vice versa for molecules with center of symmetry

C) Some vibrations (not all) can be both infrared and Raman active for molecules which do not possess a center of symmetry

D) If there is no center of symmetry for a molecule, no vibrational modes can be both infrared and Raman active

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72. Which hybridization occurs in Fe(II) orbitals in ferrocene, to accommodate the electron pairs donated by $C_5H_5^-$ rings, according to the valence bond theory ?

A) sp^3 B) dsp^2 C) d^2sp^3 D) $sp^3 d^2$

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73. Which is the chlorophyll molecular dimer at the reaction center associated with the photosystem II (PSII) in plants, algae and cyanobacteria ?

A) P_{600} B) P_{680} C) P_{700} D) P_{780}

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74. Which among the following species are isoelectronic with Na^+ ?

i. O^{2-} ii. F^- iii. Ne iv. Mg^+

A) i and ii

B) i, ii and iii

C) i, ii and iv

D) i, ii, iii and iv

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75. The oxidation numbers of the central metal ions in the complexes $[Cr(PPh_3)(CO)_5]$, $[Ag(NH_3)_2]Cl$, $[Cu(NH_3)_4]SO_4$ and $[Co(en)_2Cl_2]Cl$ are respectively

A) 0, +1, +2, +3

B) +1, +1, +2, +3

C) +1, 0, +2, +2

D) +2, 0, +3, +3

76. Select the correct statements from the following :

1. In Benzilic acid rearrangement, the aryl groups with electron withdrawing groups migrate fastest than aryl group and alkyl group.
2. The Fries rearrangement reaction is ortho and para selective and one of the two products can be favoured by changing reaction conditions, such as temperature and solvent.
3. In Benzidine rearrangement, the rate determining step is the cleavage of the N-N bond and formation of the C-C bond.
4. In Wolff Rearrangement, the course of the reaction and the migratory preferences can depend on the conditions (thermal, photochemical, metal ion catalysis) of the reaction.

A) 1, 2 and 3 are correct

B) 2, 3 and 4 are correct

C) 3, 4 and 1 are correct

D) All statements are correct ✓

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77. DIBAL-H

A) is a successful reagent for the reduction of an ester to an aldehyde which save an extra step relative to $LiAlH_4$

B) is insoluble soluble in toluene, THF & ether and carries one equivalent of hydride

C) reduces nitriles to imines by the coordination of the Lewis-basic nitrile nitrogen to nitrile carbon followed by delivery of hydride to the nitrogen atom

D) does not reduces ketones and aldehydes to secondary and primary alcohols, respectively

78. Riley oxidations is

A) The oxidation of methylene groups using Selenium dioxide

B) The oxidation of a unsaturated alcohols to an aldehyde using oxalyl chloride and dimethyl sulfoxide

C) The oxidations of methylene group using dicyclohexylcarbodiimide

D) The oxidation of a Nitriles to an amine using mCPBA

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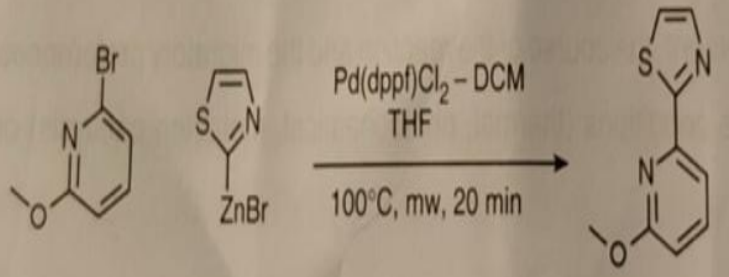
79. Identify the name of the following reaction.



A) Negishi Coupling

B) Suzuki Coupling

C) Kumada Coupling

D) Stille Coupling

80. The catalytic oxidation of cyclohexene to adipic acid 1,6-hexanedioic acid is carried out by

A) Jones Reagent

B) Tebbe Reagent

C) Starks Catalyst

D) Grubbs' Catalyst

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81. In the 8085 microprocessor during PUSH operation

A) The value of the Stack pointer decremented by two

B) The value of the Stack pointer incremented d by one

C) The value of the Stack pointer incremented d by two

D) No change in the value of Stack pointer

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82. To interface the ADC 0808/0809 with 8085 microprocessor which one of the following chip is essential ?

A) 8353 B) 8279 C) 8255 D) 8251

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83. In 8051 microcontroller the internal architecture consists of

A) Two 16 bit Timers/Counters

B) Two 8 bit Timers/Counters

C) One 8-bit Timer and One 8-bit Counter separately

D) One 16-bit Timer and One 8-bit Counter separately

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84. Which of the following is the correct sequence of operations in a microprocessor ?

A) Opcode fetch, memory write, memory read, I/O read, I/O write

B) I/O read, opcode fetch, memory read, memory write, I/O write

C) Opcode fetch, memory read, memory write, I/O read, I/O write

D) I/O read, opcode fetch, memory write, memory read, I/O write

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85. In an 8085 microprocessor DMA facility increase the data transfer speed between

A) Microprocessor and memory

B) Microprocessor and the I/O devices

C) Memory and Register

D) Memory and I/O devices

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86. Consider the case of mixing of two gases initially at two different temperatures T_1 and T_2. The entropy of the resultant mixture will be

A) Greater than zero only if the two gases are different

B) Greater than zero irrespective of identical or different gases

C) Equal to zero if the two gases are identical

D) Equal to zero irrespective of identical or different gases

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87. In an ideal Fermi gas, how does the Fermi energy ϵ_F depend on the particle density n at absolute zero temperature ?

A) $\epsilon_F \alpha n^{\frac{2}{3}}$ B) $\epsilon_F \alpha n^{\frac{1}{3}}$ C) $\epsilon_F \alpha n^2$ D) $\epsilon_F \alpha n^{\frac{1}{2}}$

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88. In a system of N ideal monatomic gas particles at thermal equilibrium, what is the total internal energy U of the gas as described by the equipartition theorem ?

A) $U = \frac{9}{2}NkT$

B) $U = \frac{5}{2}NkT$

C) $U = \frac{3}{2}NkT$

D) $U = \frac{1}{2}NkT$

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89. What happens to the internal energy of an ideal Fermi gas as the temperature increases from absolute zero ?

A) The internal energy remains constant because all states are filled at zero temperature

B) The internal energy decreases due to the increase in kinetic energy of particles

C) The internal energy becomes negative as the temperature increases, due to the repulsion between fermions

D) The internal energy increases, reflecting the thermal excitation of particles into higher energy states

90. At what temperature does a significant fraction of an ideal Bose gas begin to occupy the ground state, leading to Bose-Einstein condensation ?

A) The temperature is equal to the Fermi temperature of the gas

B) The temperature is below the critical temperature, which depends on the particle density and particle mass of the gas

C) The temperature must be at absolute zero for Bose-Einstein condensation to occur

D) The temperature can be any value, as Bose-Einstein condensation occurs at all temperatures

ENTRI

91. The product of the pressure and volume of an electron gas at 0 K is

A) $-\frac{3}{5}E_{f(0)}$

B) $\frac{2}{5}E_{f(0)}$

C) $-\frac{2}{3}E_{f(0)}$

D) $\frac{3}{5}E_{f(0)}$

ENTRI

92. The Hall effect is an experiment used to measure

A) e/m in a solid

B) Susceptibility X_m

C) Fermi energy ϵ_F

D) Sign of charge carriers

ENTRI

D) Sign of charge carriers

93. The atomic radius of potassium is 0.235 nm. What is its Fermi energy at absolute zero ?

A) 0.5 eV B) 1 eV C) 1.5 eV D) 2 eV

ENTRI

94. What is the maximum frequency of phonon when visible light with a wavelength of 5000Å scatters from a crystal with a refractive index of 1.5 ? Given the velocity of sound in the crystal as 4000 m/s.

A) 1×10^{11} rad/s

B) 0.5×10^{10} rad/s

C) 1.5×10^{11} rad/s

D) 1×10^{10} rad/s

ENTRI

95. Given an X-ray beam with a wavelength of 1.54Å that is diffracted by a cubic KCl crystal with a density 1.99×10^3 kg/m^3, calculate the interplanar spacing for the (200) planes. Given the molecular weight of KCl is 74.6 amu and the Avogadro's number is 6.023×10^{26} kg^{-1}mol^{-1}.

A) 1.54Å B) 1.12Å C) 2.1Å D) 3.14Å

ENTRI

96. Which among the following statements are correct in the case of Stark Effect and Zeeman Effect ?

i. First order Stark Effect occur in degenerate states only.

ii. The D_1 and D_2 components of Sodium Yellow Doublet give 6 and 4 lines respectively in Anomalous Zeeman Effect.

iii. The D_1 and D_2 components of Sodium Yellow Doublet give 4 and 6 lines respectively in Anomalous Zeeman Effect.

iv. First order Stark Effect occur in non-degenerate states only.

A) i and ii are correct

B) ii and iv are correct

C) i and iii are correct

D) None of the above

97. Which among the following equations is Lorentz invariant ?

A) $\left[-\left[\frac{h}{2\pi}\right]^2 c^2\nabla^2 + m^2c^2\right]\psi = -\left[\frac{h}{2\pi}\right]^2 \frac{\delta\psi}{\delta t}$

B) $\left[-\left[\frac{h}{2\pi}\right]^2 c^2\nabla^2 + m^2c^4\right]\psi = -\left[\frac{h}{2\pi}\right]^2 \frac{\partial^2\psi}{\partial t^2}$

C) $\left[-\left[\frac{h}{2\pi}\right]^2 c^2\nabla^2 + m^2c^4\right]\psi = i\left[\frac{h}{2\pi}\right]\frac{\partial\psi}{\partial t}$

D) None of the above

98. Which among the following is correct ?

i. Weyl equation is Lorentz invariant.

ii. Weyl equation is obeyed by elementary particles in Standard model.

iii. Weyl equation is not obeyed by elementary particles in Standard model.

iv. Weyl equation is obeyed by all spin 1/2 particles.

A) i and iii are correct

B) i and ii are correct

C) i and iv are correct

D) i only is correct

99. Which one among the following is the eigen values of L^2 and L_z are

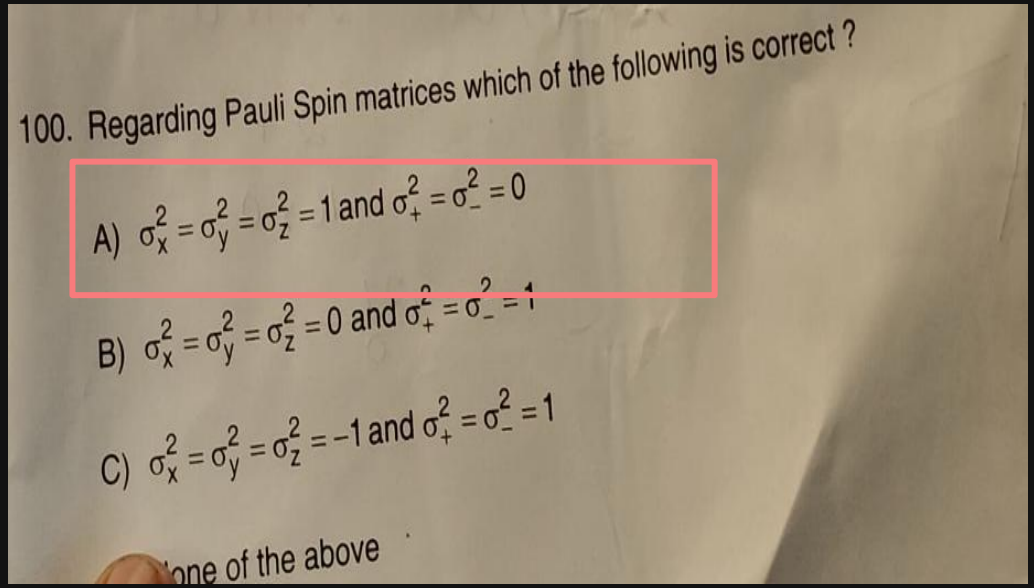
A) $\sqrt{l(l+1)}\left(\frac{h}{2\pi}\right), m\left(\frac{h}{2\pi}\right)$

B) $l(l+1)\left(\frac{h}{2\pi}\right)^2, m\left(\frac{h}{2\pi}\right)$

C) $l(l+1)\left(\frac{h}{2\pi}\right), m\left(\frac{h}{2\pi}\right)$

D) $l(l+1)\left(\frac{h}{2\pi}\right)^2, m\left(\frac{h}{2\pi}\right)^2$

ENTRI


100. Regarding Pauli Spin matrices which of the following is correct ?
A) $\sigma_x^2 = \sigma_y^2 = \sigma_z^2 = 1$ and $\sigma_+^2 = \sigma_-^2 = 0$
B) $\sigma_x^2 = \sigma_y^2 = \sigma_z^2 = 0$ and
C) $\sigma_x^2 = \sigma_y^2 = \sigma_z^2 = -1$ and $\sigma_+^2 = \sigma_-^2 = 1$
one of the above

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THANK YOU