

## FINAL ANSWER KEY

Question 10/2026/OL

Paper Code:

Category 186/2025, 278/2024

Code:

Exam: Junior Chemist/Assistant Conservation Officer

Date of Test 20-01-2026

Department Mining And Geology

Question1:-A cation  $X^{3+}$  possess an electronic configuration of  $[\text{Kr}]4d^{10}$ . The element X belongs to

A:-s-block

B:-p-block

C:-d-block

D:-f-block

Correct Answer:- Option-B

Question2:-Which of the following is true about the ion-exchange process of separation of rare earth elements?

A:-Separation of lanthanides is based on their solubility

B:-Synthetic anion exchange resins are more effective for separating lanthanides

C:- $\text{Lu}^{3+}$  has minimum firmness in column compared to  $\text{La}^{3+}$

D:-Basicity of lanthanides is a crucial factor during separation

Correct Answer:- Option-C

Question3:-Synthetic zeolite HZSM-5 is obtained by

A:-Reducing ZSM-5

B:-Replacing  $\text{Al}^{3+}$  with  $\text{H}^+$

C:-Replacing  $\text{H}^+$  with  $\text{Si}^+$

D:-Replacing  $\text{H}^+$  with  $\text{Na}^+$

Correct Answer:- Option-D

Question4:-The structure of a borane is edge contracted icosahedron with two missing vertices. Identify from the following.

A:- $\text{C}_2\text{B}_7\text{H}_{13}$

B:- $\text{B}_6\text{H}_{10}$

C:- $[\text{B}_{13}\text{H}_{13}]^{2-}$

D:- $\text{C}_2\text{B}_4\text{H}_6$

Correct Answer:- Option-A

Question5:-The configuration which exhibits *z-in* Jahn Teller distortion is

A:-Octahedral  $d^2$

B:-Octahedral  $d^1$

C:-Low Spin  $d^8$

D:-None of these

Correct Answer:- Option-B

Question6:-The energy trend in LMCT transition follows the order

A:- $\text{MnO}_4^- < \text{CrO}_4^{2-} < \text{VO}_4^{3-}$

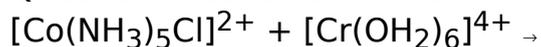
B:- $\text{CrO}_4^{2-} < \text{VO}_4^{3-} < \text{MnO}_4^-$

C:- $\text{MnO}_4^- < \text{VO}_4^{3-} < \text{CrO}_4^{2-}$

D:- $\text{VO}_4^{3-} < \text{MnO}_4^- < \text{CrO}_4^{2-}$

Correct Answer:- Option-A

Question7:-Consider the reaction



This belongs to

A:-Substitution reaction involving water exchange

B:-Inner sphere process

C:-Outer sphere process

D:-Eigen - Wilkins mechanism

Correct Answer:-**Question Cancelled**

Question8:-The  $[\text{NiCl}_4]^{2-}$  is paramagnetic while  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic. The correct explanation for this finding is

A:-Jahn - Teller distortion

B:-Tetrahedral and Square planar field respectively

C:-Ligand to metal back bonding

D:-Metal - ligand  $\pi$ -bonding

Correct Answer:- Option-B

Question9:-The electronic spectrum of  $[\text{Ti}(\text{H}_2\text{O})]^{3+}$  shows a single broad peak with maximum at  $20300 \text{ cm}^{-1}$ . The CFSE is found to be

A:- $241 \text{ KJ mol}^{-1}$

B:- $146 \text{ KJ mol}^{-1}$

C:- $97 \text{ KJ mol}^{-1}$

D:- $194 \text{ KJ mol}^{-1}$

Correct Answer:-**Question Cancelled**

Question10:-When tris (pentafluorophenyl) borane is treated with XeF<sub>2</sub> in dichloromethane, the process of xenodeborylation is characterised by the formation of

A:-Xe-Xe bond

B:-Xe-C bond

C:-Xe-Cl bond

D:-Xe-B bond

Correct Answer:- Option-B

Question11:-Which of the following term symbol cannot exist for Ti<sup>2+</sup> ion?

A:-<sup>3</sup>F

B:-<sup>3</sup>P

C:-<sup>1</sup>G

D:-<sup>3</sup>S

Correct Answer:- Option-D

Question12:-For the complex ion [Cr(H<sub>2</sub>O)<sub>6</sub>]<sup>3+</sup>, the transition which is not allowed in electronic spectrum is

A:-<sup>4</sup>T<sub>2g</sub> → <sup>4</sup>T<sub>1g</sub>

B:-<sup>4</sup>A<sub>2g</sub> → <sup>4</sup>T<sub>2g</sub>

C:-<sup>4</sup>A<sub>2g</sub> → <sup>4</sup>T<sub>1g</sub>(P)

D:-<sup>4</sup>A<sub>2g</sub> → <sup>4</sup>T<sub>1g</sub>(F)

Correct Answer:- Option-A

Question13:-Which of the following species has the lowest value C-O stretching frequency?

A:-[Cr(CO)<sub>6</sub>]

B:-[Ti(CO)<sub>6</sub>]<sup>2-</sup>

C:-[Mn(CO)<sub>6</sub>]<sup>+</sup>

D:-[V(CO)<sub>6</sub>]<sup>-</sup>

Correct Answer:- Option-B

Question14:-The complex which does not obey EAN rule is

A:-[Mn(CO)<sub>5</sub>]<sup>-</sup>

B:-[Fe(CO)<sub>4</sub>]<sup>2+</sup>

C:-[Co(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup>

D:-[Mn(CN)<sub>6</sub>]<sup>4-</sup>

Correct Answer:- Option-B

Question15:-The total number of lines predicted theoretically in ESR spectrum of Bis(Salicylaldimine)copper(II) will be (Given I( $^{63}\text{Cu} = 3/2$ )

A:-15

B:-20

C:-60

D:-75

Correct Answer:- Option-C

Question16:-When bis( $\eta^5$  - cyclopentadienyl) iron (II) is treated with a strong acid like  $\text{HBF}_4$ , it produces

A:- $[\text{HFe}(\text{C}_5\text{H}_5)_2]^+$

B:-Cyclopentadienyl anion

C:-bis( $\eta^1$  - cyclopentadienyl) iron (II)

D:- $[\text{Fe}(\text{C}_5\text{H}_5)_2]^+[\text{BF}_4]^-$

Correct Answer:- Option-D

Question17:-Which of the following can act as superconducting Chevrel phase?

A:- $[\text{FeGe}_{10}]^{3-}$

B:- $\text{Na}_{172}\text{In}_{192}\text{Pt}_2$

C:- $\text{NaSn}_{1.7}$

D:- $\text{Cu}_2\text{Mo}_6\text{Se}_8$

Correct Answer:- Option-D

Question18:-The metal that forms part of active site of nitrogenase enzyme produced by certain bacteria is

A:-Copper

B:-Zinc

C:-Molybdenum

D:-Chromium

Correct Answer:- Option-C

Question19:-Which of the following is not true about sodium-potassium pump in animal cells?

A:-The pump has higher affinity for  $\text{K}^+$  than  $\text{Na}^+$  ions

B:-Potassium binding leads to dephosphorylation

C:-The pump regulates cell volume

D:-The  $\text{Na}^+/\text{K}^+$  - ATPase maintain membrane potential

Correct Answer:- Option-A

Question20:-The heart imaging agent (MIBI scan) cardiolite uses the isotope of

A:-Platinum

B:-Europium

C:-Technetium

D:-Molybdenum

Correct Answer:- Option-C

Question21:-When graphite is treated with excess of potassium, copper-coloured material is resulted. Which of the following is true regarding the intercalation?

A:-Changes staggered layers of graphite to eclipsed layers

B:-Decreases electrical conductivity

C:-It becomes diamagnetic

D:-Interlayer spacing decreases

Correct Answer:- Option-A

Question22:-A radioactive nuclide designated as  ${}^{243}_{93}\text{X}$  emits a  $\beta^-$  particle followed by an  $\alpha$ -particle. The number of neutrons present in the resultant atom is

A:-210

B:-84

C:-82

D:-128

Correct Answer:- Question Cancelled

Question23:-Arsenic poisoning evident from the hair strands can be detected using

A:-Gieger-Muller counter

B:-Neutron activation analysis

C:-Isotope dilution analysis

D:-Radiocarbon dating

Correct Answer:- Option-B

Question24:-Which of the following is true about reaction cross-section in a nuclear reaction?

A:-Slow neutron capture cross section varies inversely with neutron velocity

B:-Unit of cross-section is Bq

C:-Probability of reaction between target and impinging particle is inversely related to cross-section

D:-A plot of log (cross-section) and log (neutron energy) will give gaussian type curve

Correct Answer:- Option-A

Question25:-In a crystalline lattice, element X form ccp lattice and  $1/3^{\text{rd}}$  of tetrahedral voids is filled by atoms of element Y. The formula of the compound will be

A:- $\text{X}_2\text{Y}_3$

B:- $\text{XY}_3$

C:- $\text{X}_3\text{Y}$

D:- $\text{X}_3\text{Y}_2$

Correct Answer:- Option-D

Question26:-Which of the following is a molecular solid?

A:- $\text{SiO}_2$

B:- $\text{SiC}$

C:- $\text{SO}_2$

D:- $\text{AlN}$

Correct Answer:- Option-C

Question27:-The crystal defect arises in compounds of transition metals which exhibit variable oxidation state is

A:-F-centre

B:-Metal deficiency defect

C:-Frenkel defect

D:-Taylor dislocation

Correct Answer:- Option-B

Question28:-Piezoelectric crystals possessing permanent dipoles are said to have

A:-pyroelectricity

B:-ferroelectricity

C:-antiferroelectricity

D:-superconductivity

Correct Answer:- Option-B

Question29:-When fullerene is treated with potassium, the resulting compound is

A:- $\text{K}_2\text{C}_{60}$

B:- $\text{C}_{120}$

C:- $\text{K}_{60}\text{C}_{60}$

D:- $\text{CO}_2$

Correct Answer:- Option-A

Question30:-For an inverse spinel structure with divalent cation ( $X^{II}$ ) and trivalent cation ( $Y^{III}$ ), which of the following statement is true?

A:- $\text{MgAl}_2\text{O}_4$  is an inverse spinel

B:- $X^{II}$  — Transition metal with higher CFSE,  $Y^{III}$  — transition metal with lower CFSE

C:- $\text{Mn}_3\text{O}_4$  is an inverse spinel

D:-The inverse spinels are always ferromagnetic

Correct Answer:- Option-B

Question31:-Select the correct IUPAC name of the following compound



A: -2,2,6-Trimethylbicyclo [3.2.1] hept-2-ene

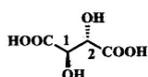
B: -2,6,6-Trimethylbicyclo [1 .3.3] hept-2-ene

C: -2,2,6-Trimethylbicyclo [3.1.1] hex-2-ene

D: -2,6,6-Trimethylbicyclo [3.1.1] hept-2-ene

Correct Answer:- Option-D

Question32:-Assign R & S configuration to the carbon atom labelled as 1 & 2



A: -1S,2S

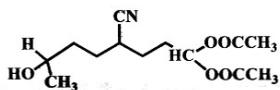
B: -1R,2S

C: -1S,2R

D: -1R,2R

Correct Answer:- Option-B

Question33:-The number of Optical isomers, the below given compound can give will be



A: -4

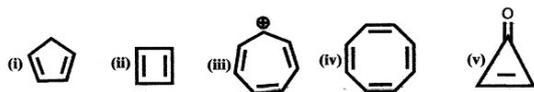
B: -2

C: -8

D: -16

Correct Answer:- Option-A

Question34:-Which of the following species below are aromatic?



A: -(iii), (iv) & (v)

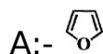
B: -(iii) & (v)

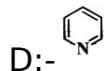
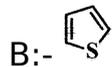
C: -(iii) & (iv)

D: -(i) & (ii)

Correct Answer:- Option-B

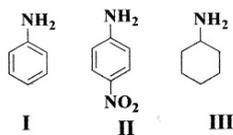
Question35:-Which among the following is a better Diels Alder diene reacting with maleic anhydride?





Correct Answer:- Option-A

Question36:- Arrange the following compounds in the order of decreasing basicity



A:-i, ii, iii

B:-ii, i, iii

C:-iii, i, ii

D:-i, iii, ii

Correct Answer:- Option-C

Question37:- Which among the following statement is NOT true when multiple substituents are present on the aromatic ring:

A:-The directing effects are cumulative.

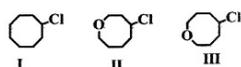
B:-The more activating group will control the regiochemistry when the groups have opposing directive effects.

C:-The less sterically hindered controls the regiochemistry

D:-The stabilization of intermediate carbocation has no effect on directing effect

Correct Answer:- Option-D

Question38:- The correct order of the rate of solvolysis for the following chlorides in acetic acid is



A:-I>II>III

B:-III>II>I

C:-II>I>III

D:-II>III>I

Correct Answer:- Question Cancelled

Question39:- With cis-alkene singlet carbenes give cis-product whereas triplet carbene gives

A:-cis-product

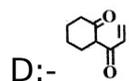
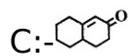
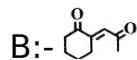
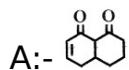
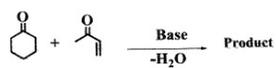
B:-trans-product

C:-both cis- & trans-product

D:-no product

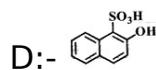
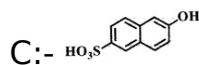
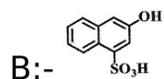
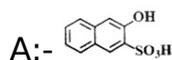
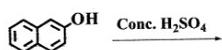
Correct Answer:- Option-C

Question40:- Identify the product of the following reaction:



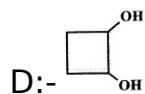
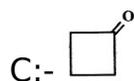
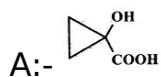
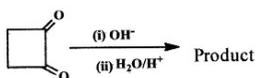
Correct Answer:- Option-C

Question41:- The kinetic product formed in the following reaction is



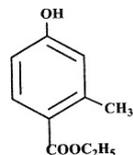
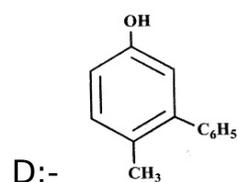
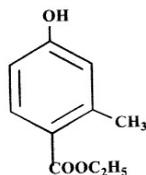
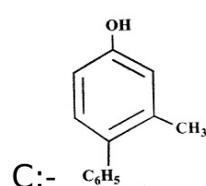
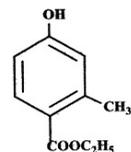
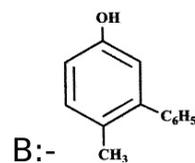
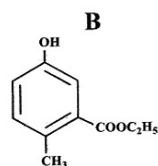
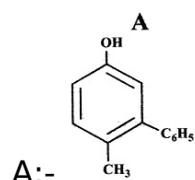
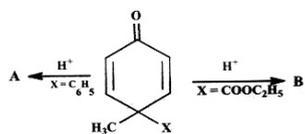
Correct Answer:- Option-D

Question42:- Identify the product.



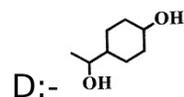
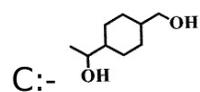
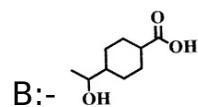
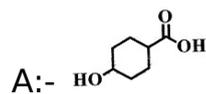
Correct Answer:- Option-A

Question43:- Identify the products A & B in the following reaction



Correct Answer:- Option-A

Question44:- Choose the correct product?

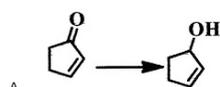


Correct Answer:- Option-C

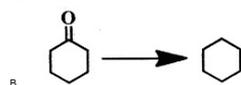
Question45:- Match Column I with Column II and select the correct answer from the options.

Column I

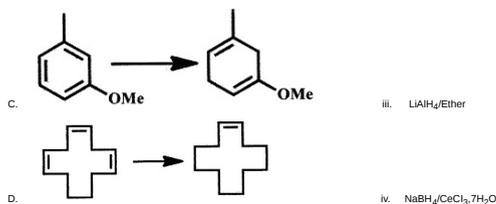
Column II



i.  $\text{Li/Liq. NH}_3$



ii.  $\text{NH}_2\text{NH}_2 \cdot \text{O}_2 / \text{Cu}^{2+}$



A:- A-ii, B-iii, C-iv, D-i

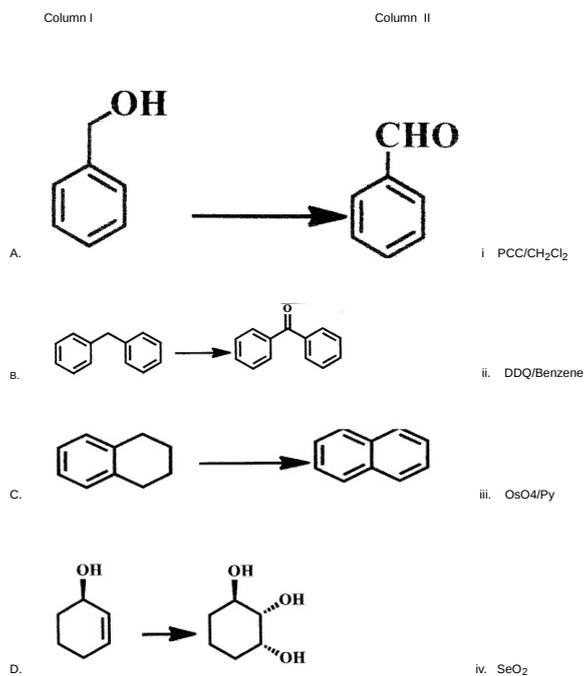
B:- A-iv, B-iii, C-i, D-ii

C:- A-iv, B-ii, C-i, D-iii

D:- A-iii, B-i, C-iv, D-ii

Correct Answer:- **Question Cancelled**

Question46:- Match Column I with Column II and select the correct answer from the options



A:- A-i, B-ii, C-iii, D-iv

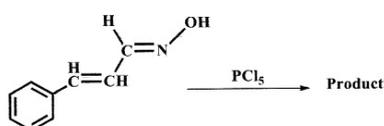
B:- A-iv, B-iii, C-ii, D-i

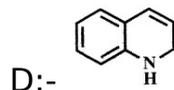
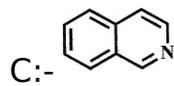
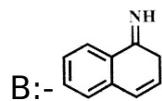
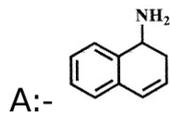
C:- A-iv, B-ii, C-i, D-iii

D:- A-i, B-iv, C-ii, D-iii

Correct Answer:- Option-D

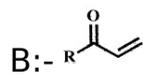
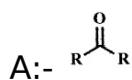
Question47:- Predict the product of the reaction



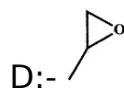


Correct Answer:- Option-C

Question48:- Select the reagent for the synthon



C:- ROTs



Correct Answer:- Option-D

Question49:- Which of the following compounds act as protecting group for alcohols?

A:- Ethers

B:- Acetals

C:- Ketals

D:- All of the above

Correct Answer:- Option-D

Question50:- The first person to separate a racemic mixture into individual enantiomers is

A:- H. E. Fischer

B:- Jean-Baptiste Biot

C:- Louis Pasteur

D:- François Arago

Correct Answer:- Option-C

Question51:- In the Jablonski diagram of energy transitions, non-radiative decay refers to

A:- The forbidden spin flip occurs prior to the process of phosphorescence

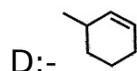
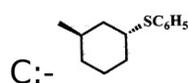
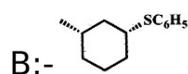
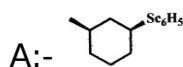
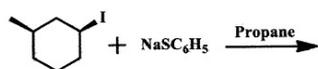
B:- The emission of light in the UV region (emission is not visible)

C:- Energy losses resulting from vibrations and or rotations

D:- The release of electromagnetic radiation which is not from the nucleus

Correct Answer:- Option-C

Question52:- Identify the major product of the reaction



Correct Answer:- Option-C

Question53:- How many different types of protons are present in allyl chloride molecule?

A:-2

B:-3

C:-4

D:-5

Correct Answer:- Option-C

Question54:- What number <sup>1</sup>H NMR signals are observed for the following compound?



A:-7

B:-6

C:-5

D:-4

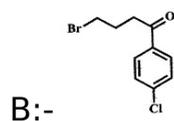
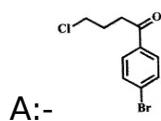
Correct Answer:- Option-D

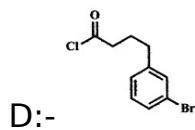
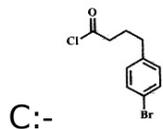
Question55:-

Identify the compound that exhibits the following spectral data.

IR: (ν) 1685 cm<sup>-1</sup>; <sup>1</sup>HNMR: δ(ppm) 7.84 (d, J=8Hz, 2H) 7.60 (d, J=8Hz, 2H), 3.65(t, J = 7 Hz, 2H), 3.18(t, J=7Hz, 2H), 2.25 (pentet, J=7Hz, 2H).

<sup>13</sup>CNMR: δppm: 28.36,45,128, 130, 133, 137, 197. EI MS m/z: 200, 198 (1:1), 185, 183 (1:1)

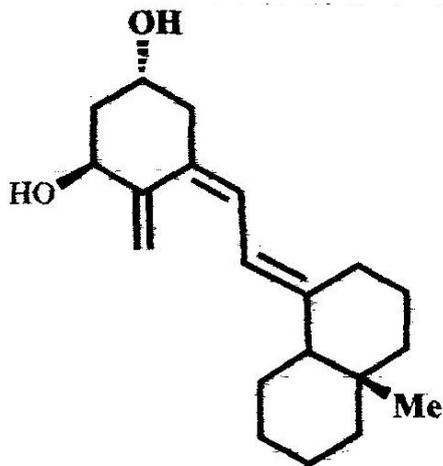




Correct Answer:- Option-A

Question56:-The UV absorption wavelength of 1,3-butadiene is 217 nm. Calculate the absorption wavelength (in nm) of the conjugated system given below. (Use these absorption values for auxochromic groups: substituent /

ring residue: +5, exo-cyclic double bond: +5; every additional conjugated C=C +30)



A:-277 nm

B:-282 nm

C:-222 nm

D:-252 nm

Correct Answer:- Option-B

Question57:-Which one of the following is a bicyclic monoterpene?

A:- $\alpha$ - $\epsilon$ pinene

B:-Menthol

C:-Rubber

D:-Limonene

Correct Answer:- Option-A

Question58:-Which among the following amino acid contains an indole ring?

A:-Tyrosine

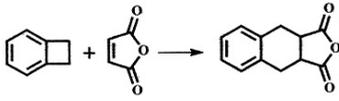
B:-Histidine

C:-Proline

D:-Tryptophan

Correct Answer:- Option-D

Question59:-For the following transformations to occur thermally, what pericyclic reaction must occur?



A:-Sigmatropic rearrangement, Electrocyclic ring closing

B:-Electrocyclic ring opening, Diels Alder Reaction

C:-Sigmatropic rearrangement, Diels Alder Reaction

D:-Electrocyclic ring opening, Electrocyclic ring-closing

Correct Answer:- Option-B

Question60:-If 30% of an organism's DNA is thymine, then it has

A:-70% Guanine

B:-20% Guanine

C:-30% Cytosine

D:-70% Adenine

Correct Answer:- Option-B

Question61:-The temperature at which the second virial coefficient vanishes is known as

A:-Inversion temperature

B:-Neel temperature

C:-Boyle temperature

D:-Critical temperature

Correct Answer:- Option-C

Question62:-The sum of all axes of symmetry elements shown by a cubic crystal will be

A:-23

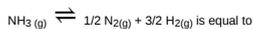
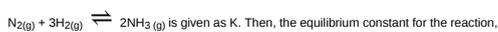
B:-22

C:-9

D:-13

Correct Answer:- Option-D

Question63:-The equilibrium constant for the reaction,



A:- $\frac{1}{k}$

B:- $k^2$

C:- $\sqrt{k}$

D:- $\frac{2}{K}$

Correct Answer:- Option-C

**Question64:-** Consider the following statements about activity (a) and activity coefficient ( $\gamma$ )

(i) For real gases, activity (a) is inversely proportional to pressure (P)

(ii) Activity (a) of a substance in any given state is the ratio of fugacity in that state to fugacity in standard state

(iii) For real gases, activity coefficient ( $\gamma$ ) is related to activity (a) as,  $\gamma a = P/a$

(iv) For real gases, activity coefficient ( $\gamma$ ) is related to activity (a) as,  $\gamma a = a/P$

Which of these statements are correct?

A:-Only (i) and (iv)

B:-Only (ii) and (iv)

C:-Only (ii) and (iii)

D:-Only (i) and (iii)

Correct Answer:- Option-B

**Question65:-**

The internal energy (E) per mole of a gas is related to partition function (q) as

A:-  $E = RT^2 \left[ \frac{\partial \ln q}{\partial T} \right]_V$

B:-  $E = RT \left[ \frac{\partial \ln q}{\partial T} \right]_V$

C:-  $E = RT^2 \left[ \frac{\partial \ln q}{\partial T} \right]_P$

D:-  $E = RT \left[ \frac{\partial \ln q}{\partial T} \right]_P$

Correct Answer:- Option-A

**Question66:-** According to the Maxwell's distribution, the most probable velocity of a gas

A:-Decreases with increase in temperature

B:-Increases with increase in temperature

C:-First increases with increase in temperature and then decreases

D:-Independent on temperature

Correct Answer:- Option-B

**Question67:-** A magenta-coloured non-stoichiometric compound is formed when KCl crystals are exposed to potassium metal vapour. This compound shows

A:-Metal deficiency defects

B:- $K^+$  ion vacancies filled with  $Cl^-$  ions

C:-Frenkel defects

D:- $Cl^-$  ion vacancies filled with electrons

Correct Answer:- Option-D

**Question68:-** The Sucker-Tetrode equation is a statistical-mechanical expression used to calculate

A:-Entropy of ideal monatomic gas

B:-Entropy of crystalline solids

C:-Entropy of real monatomic gas

D:-Entropy of ideal diatomic gas

Correct Answer:- Option-A

Question69:-Based on the Gibbs-Helmholtz relation, under which conditions will a thermodynamic process remain spontaneous at all temperatures?

A:-  $\Delta H > 0$  and  $\Delta S < 0$

B:-  $\Delta H < 0$  and  $\Delta S < 0$

C:-  $\Delta H > 0$  and  $\Delta S > 0$

D:-  $\Delta H < 0$  and  $\Delta S > 0$

Correct Answer:- Option-D

Question70:-Variation of chemical potential of any constituent  $i$  of a gaseous system with pressure,  $\left(\frac{\partial \mu_i}{\partial P}\right)_{T,N}$  will be equal to

A:-Partial molar volume

B:-Partial molar entropy

C:-Partial molar internal energy

D:-Partial molar enthalpy

Correct Answer:- Option-A

Question71:-Which of the following statements is incorrect regarding physisorption?

A:-It occurs due to weak intermolecular (van der Waals) forces

B:-More easily liquefiable gases are adsorbed to a greater extent

C:-At high pressure, it leads to the formation of multiple layers of adsorbed molecules on the surface

D:-The enthalpy change ( $\Delta H_{\text{adsorption}}$ ) is small and positive

Correct Answer:- Option-D

Question72:-In a BET adsorption isotherm, Point B corresponds to:

A:-Beginning of chemisorption

B:-Completion of monolayer adsorption

C:-Onset of capillary condensation

D:-Maximum multilayer thickness

Correct Answer:- Option-B

Question73:-The Auger process involves:

A:-Photon emission

B:-Electron-hole recombination

C:-Non-radiative relaxation with emission of an electron

D:-Nuclear reaction

Correct Answer:- Option-C

Question74:-Consider the following statements about LEED:

(i) It uses electrons of energy 20–200 eV.

(ii) It provides information about surface crystallography.

(iii) Electrons penetrate several micrometers, so bulk structure is studied

Which of the above are correct?

A:-(i) and (ii)

B:-(ii) and (iii)

C:-(i) and (iii)

D:-All

Correct Answer:- Option-A

Question75:-The diffusion current in polarography is proportional to

A:-applied voltage

B:-electrode surface area

C:-concentration of analyte

D:-resistance of solution

Correct Answer:- Option-C

Question76:-Amperometric sensors are highly selective primarily because

A:-they operate at zero current

B:-the applied potential is chosen for a specific redox process

C:-they measure total charge

D:-they use reference electrodes

Correct Answer:- Option-B

Question77:-If the unit of the rate constant of a reaction is  $L^3\text{mol}^{-3}\text{s}^{-1}$ , the order of the reaction is:

A:-1

B:-2

C:-3

D:-4

Correct Answer:- Option-D

Question78:-According to Arrhenius equation ( $k$  = rate constant and  $T$  = temperature)

A:-in  $k$  decreases linearly with  $1/T$

B:-in  $k$  decreases linearly with  $T$

C:-in  $k$  increases linearly with  $1/T$

D:-in  $k$  increases linearly with  $T$

Correct Answer:- Option-A

Question79:-

Assertion (A): In reactions between ionic species, a plot of  $\log k$  versus  $1/r^2$  gives a straight line whose slope depends on the charges of the reacting ions.

Reason (R): According to the Bronsted-Bjerrum equation, the rate constant varies with ionic strength through a term proportional to the product of the ionic charges ( $Z_A Z_B$ ).

Choose the correct option:

A:-Both (A) and (R) are true, and (R) is the correct explanation of (A)

B:-Both (A) and (R) are true, but (R) is not the correct explanation of (A)

C:- (A) is true, but (R) is false

D:- (A) is false, but (R) is true

Correct Answer:- Option-A

Question80:-In homogeneous catalysis, the rate enhancement mainly arises due to:

A:-Increase in collision frequency

B:-

Formation of an intermediate with lower activation energy

C:-Increase in entropy of activation

D:-Increase in surface area

Correct Answer:- Option-B

Question81:-Classical mechanics fails for atomic systems primarily because it assumes that

A:-Energy levels are quantized

B:-Electrons radiate energy continuously when accelerated

C:-Matter behaves only as particles

D:-Forces are velocity dependent

Correct Answer:- Option-B

Question82:-Hermitian operators must have:

A:-Only non-degenerate eigenvalues

B:-Real eigenvalues and orthogonal eigenfunctions

C:-Complex eigenvalues

D:-No physical meaning

Correct Answer:- Option-B

Question83:-The zero-point energy of the harmonic oscillator exists because:

A:-Kinetic energy cannot be zero

B:-Potential energy oscillates

C:- $\Delta_x$  and  $\Delta_p$  cannot both be zero simultaneously

D:-Frequency is quantized

Correct Answer:- Option-C

Question84:-For a particle in a box, which change produces the largest decrease in energy spacing?

A:-Doubling the mass

B:-Doubling the length

C:-Halving the length

D:-Tripling the length

Correct Answer:- Option-D

Question85:-The first excited vibrational state of SHO has how many nodes?

A:-0

B:-1

C:-2

D:-Depends on mass

Correct Answer:- Option-B

Question86:-For the term symbol  $^3P_2$ , the correct values are:

A:- $S=1, L=1, J=2$

B:- $S=0, L=1, J=2$

C:- $S=1, L=2, J=1$

D:- $S=1, L=1, J=1$

Correct Answer:- Option-A

Question87:-Which term is NOT included in a typical molecular mechanics force-field equation?

A:-Bond stretching

B:-Angle bending

C:-Electron correlation energy

D:-Non-bonded interactions

Correct Answer:- Option-C

Question88:-Which heat capacity value is predicted by the Dulong—Petit law at high temperatures?

A:- $\frac{3}{2} R$  per mole

B:- $3 R$  per mole

C:- $\frac{5}{2} R$  per mole

D:- $R$  per mole

Correct Answer:- Option-B

Question89:-For point group  $C_{3v}$ , how many irreducible representations exist?

A:-2

B:-3

C:-4

D:-6

Correct Answer:- Option-B

Question90:-A quadrupole splitting in Mössbauer spectroscopy requires:

A:-A non-zero nuclear quadrupole moment

B:-An unpaired electron

C:-High magnetic fields

D:-Isotopic substitution

Correct Answer:- Option-A

Question91:-The F test is mostly used...

A:-For rejection of data

B:-For testing of significance

C:-For obtaining best fitting line

D:-For completion of data

Correct Answer:- Option-B

Question92:-Identify the techniques which is most likely to be used in quantitative analysis?

A:-Multivariate analysis

B:-Sound-tape recordings

C:-Transcripts

D:-Videos

Correct Answer:- Option-A

Question93:-Which of the following option is appropriate for the TGA and DTA?

A:-TGA and DTA measures only weight

B:-TGA measures only weight while DTA measures other effects

C:-TGA and DTA measures only temperature

D:-TGA measures only temperature while DTA measures other effects

Correct Answer:- Option-B

Question94:-In reverse phase chromatography the stationary phase is made of

A:-Non-polar

B:-Polar

C:-Both "1" and "2"

D:-None of the above

Correct Answer:- Option-A

Question95:-Supercritical CO<sub>2</sub> is used as

A:-Dry ice

B:-Fire fighting

C:-A Solvent for extraction of organic compound from natural sources

D:-A highly inert medium for carrying our various reactions

Correct Answer:- Option-C

Question96:-Which of the following is not a principle of Green Chemistry?

A:-Green solvents and auxiliaries

B:-Use of renewable feedstock

C:-Hazardous chemical synthesis

D:-Design for energy efficiency

Correct Answer:- Option-C

Question97:-What process accounts for the fact that the water on Earth now is the same water that has been on Earth for 4 billion years?

A:-Nitrogen Cycle

B:-Water Cycle

C:-Kreb's Cycle

D:-Life Cycle

Correct Answer:- Option-B

Question98:-Quantum dots can be used in

A:-Crystallography

B:-Optoelectronics

C:-Mechanics

D:-Quantum physics

Correct Answer:- Option-B

Question99:-Piezoelectric effect is observed when materials produce electric charges when

A:-Voltage is applied

B:-Mechanical Stress is applied

C:-Electric field is applied

D:-Magnetic field is applied

Correct Answer:- Option-B

Question100:-Which of the following is a green solvent used for bleaching clothes?

A:-Hydrogen peroxide

B:-Tetrachloroethene

C:-Benzene

D:-Toluene

Correct Answer:- Option-A