SECTION II: MORE THAN ONE OPTION CORRECT

- 1 mol benzene ($P_{benzene}^{o}$ = 42 mm) and 2 mol toluene ($P_{toluene}^{o}$ = 30 mm) will have 220.
 - (A) total pressure 38 mm
 - (B) mol fraction of vapours of benzene above liquid mixture is 7/19
 - (C) positive deviation from Raoult's law
 - (D) negative deviation from Raoult's law
- 221. Which of the following statements are correct?
 - (A) The rate of the reaction involving the conversion of ortho-hydrogen to parahydrogen is

 $-\frac{d[H_2]}{dt} = k[H_2]^{3/2}$

- (B) The rate of the reaction involving the thermal decomposition of acetaldehyde is k[CH₂CHO]^{3/2}
- (C) In the formation of phosgene gas from CO and Cl₂, the rate of the reaction is k[CO][Cl₂]^{1/2}
- (D) In the decomposition of H_2O_2 , the rate of the reaction is $k[H_2O_2]$.
- 222. Emulsion can be destroyed by
 - (A) the addition of an emulsifier which tends to form an emulsion of the same type
 - (B) electrophoresis with a high potential
 - (D) all of these (C) freezing
- 223. Which of the following statements are correct
 - (A) ΔE_{cell} is temperature independent
 - (B) A reaction is spontaneous from left to right if $Q < K_{eq}$ in which case $\Delta E_{cell} > 0$
 - (C) A reaction occurs from right to left if $K_{eq} < Q$, in which case $\Delta E_{cell} < 0$
 - (D) none of these
- 224. During discharging of lead storage battery, which of the following is/are true ?
 - (A) H_2SO_4 is produced

- (B) H₂O is consumed
- (C) $PbSO_4$ is formed at both electrodes (D) Density of electrolytic solution decreases
- 225. Isoelectric point is the pH at which colloidal particles
 - (A) coagulate

- (B) becomes electrically neutral
- (C) can move toward either electrode (D) none of these

226. To 10 mL of 1 M BaCl₂ solution 5 mL of 0.5 M K₂SO₄ is added, BaSO₄ is precipitated out. What will happen?

- (A) F. pt. is increased (B) B. pt. is increased
- (C) F. pt. is lowered (D) B. pt. is lowered
- 227. Which of the following is/are correct
 - (A) α -rays are more penetrating than β -rays
 - (B) α -rays have greater ionizing power than β -rays
 - (C) β -particles are not present in the nucleus, yet they are emitted from the nucleus
 - (D) γ -rays are not emitted simultaneously with α and β -rays
- 228. Which of the following arrangement will produce oxygen at anode during electrolysis ?
 - (A) Dilute H_2SO_4 solution with Cu electrodes.
 - (B) Dilute H_2SO_4 solution with inert electrodes.
 - (C) Fused NaOH with inert electrodes.
 - (D) Dilute NaCl solution with inert electrodes.

- **229.** The azeotropic solution of two miscible liquids
 - (A) can be separated by simple distillation
 - (B) may show positive or negative deviation from raoult's law
 - (C) are super saturated solutions
 - (D) behave like a single component and boil at a constant temperature
- Which of the following are macromolecular colloids
 (A) starch
 (B) soap
 (C) detergent
 (D) cellulose
- 231. Which of the following statements is correct for electrophoresis ?
 - (A) colloids are uncharged particles and do not migrate towards the electrodes when electric field is applied
 - (B) in electrophoresis, solution migrates either to the anode or to the cathode depending on the positively or negatively charged solution
 - (C) electrophoresis is a useful method for finding the charge of a solution
 - (D) none of these
- **232.** The basic theory of Arrhenius's equation is that
 - (A) the number of effective collisions is proportional to the number of molecules above a certain threshold energy
 - (B) as the temperature increases, the number of molecules with energies exceeding the threshold energy increases
 - (C) the rate constant is a function of temperature
 - (D) activation energy and pre-exponentional factors are always temperature independent
- **233.** Pick out the **correct** statements among the following from inspection of standard reduction potentials (Assume standard state conditions).

Cl ₂ (aq.) + 2e	1	2Cl [_] (aq.)	$E^{o}_{Cl_2/Cl^-}$ = + 1.36 volt
Br ₂ (aq.) + 2e	1	2Br⁻(aq.)	$E^{o}_{Br_{2}/Br^{-}}$ = + 1.09 volt
l ₂ (s) + 2e	1	2l⁻ (aq.)	$E^{o}_{I_{2}/I^{-}}$ = + 0.54 volt
$S_2O_8^{2-}$ (aq.) + 2e	1	$2\mathrm{SO}_4^{2-}$ (aq.)	$E^{o}_{S_2O_8^{2^-}/SO_4^{2^-}}$ = + 2.00 volt

- (A) Cl_2 can oxidise SO_4^{2-} from solution
- (B) Cl_2 can oxidise Br⁻ and I⁻ from aqueous solution
- (C) $S_2O_8^{2-}$ can oxidise CI⁻, Br⁻ and I⁻ from aqueous solution
- (D) $S_2O_8^{2-}$ is added slowly, Br⁻ can be reduce in presence of Cl⁻
- 234. Effect of adding a non volatile solute to a solvent is

 (A) to lower the vapour pressure
 (B) to increase its freezing point
 (C) to increase its boiling point
 (D) to decrease its osmotic pressure

 235. Methods used for the preparation of colloidal solutions are

 (A) peptisation
 (B) hydrolysis
 (C) ultrasonic dispersion
 (D) coagulation
- 236. The correct starting material and product of different disintegration series are (A) ²³²Th, ²⁰⁸Pb (B) ²³⁵U, ²⁰⁶Pb (C) ²³⁸U, ²⁰⁷Pb (D) ²³⁷Np, ²⁰⁹Bi

- **237.** Surfactant molecules or ions can cluster together as micelles, which
 - (A) are colloid-sized cluster of molecules
 - (B) due to their hydrophobic tails tend to congregate
 - (C) due to their hydrophobic head provide protection
 - (D) none of these
- **238.** Which of the following are correctly matched?
 - (A) Butter-gel (B) Milk-emulsion (C) Fog-aerosol (D)

(D) Dust-solid sol

- **239.** Which of the following are incorrect statements?
 - (A) Hardy schulz rule is related to coagulation
 - (B) Brownian moment and Tyndall effect are the characteristic of colloids.
 - (C) In gel, the liquid is dispersed in liquid
 - (D) Lower the gold number, more is the protective power of lyophillic sols.
- 240. Which of the following are multimolecular colloids?
 - (A) Sulphur
 - (C) Gold sol (D) So
- **241.** The origin of charge on colloidal solution is
 - (A) Frictional rubbing
 - (B) Electron capture during Bredig's arc method
 - (C) Selective adsorption of ion on their surface
 - (D) It is due to addition of protective colloids
- 242. Which of the following are based on Tyndall effect.(A) Ultra microscope (B) Deltas (C) Blue colour of sky (D) Coagulation
- **243.** If 270.0 g of water is electrolysed during an experiment performed by miss Abhilasha with 75% current efficiency then
 - (A) 168 L of O_2 (g) will be evolved at anode at 1 atm & 273 K
 - (B) Total 504 L gases will be produced at 1 atm & 273 K.
 - (C) 336 L of H_2 (g) will be evolved at anode at 1 atm & 273 K
 - (D) 45 F electricity will be consumed
- 244. Which of the following reactions is of the first order ?
 - (A) The decomposition of ammonium nitrate in an aqueous solution
 - (B) The inversion of cane-sugar in the presence of an acid
 - (C) The acidic hydrolysis of ethyl acetate
 - (D) All radioactive decays.
- **245.** If two solution are isotonic then : [C is concentration of solution and i is vant Hoff factor] (A) $C_1 = C_2$ (if both are non-electrolyte)
 - (B) $i \times C_1 = C_2$ (If one is electrolyte and another is non-electrolyte)
 - (C) $i_1 \times C_1 = i_2^2 \times C_2$ (if both are electrolytes)
 - (D) none of these

(B) Egg albumin in water(D) Soap solution

246. Which of the following is correctly matched (where Z is number of atoms per unit cell, a is edge lenght of cube and r is radius of atom)

(A)	SCC	Z = 1	a = $\sqrt{2}$ r
(B)	BCC	Z = 2	a = $\frac{4}{\sqrt{3}}$ r
(C)	FCC	Z = 4	a = 2 $\sqrt{2}$ r
(D)	HCP	Z = 4	a = 2 r

- **247.** Which of the following statements are correct ?
 - (A) the work done by the system on the surrounding is negative
 - (B) the work done on the system by the surroundings is positive
 - (C) the heat absorbed by the system from the surroundings is positive
 - (D) the heat absorbed by the surroundings from the system is negative
- **248.** Oxygen and hydrogen gas are produced at anode and cathode during the electrolysis of dilute aqueous solution of

(A) Na_2SO_4 (B) $AgNO_3$ (C) H_2SO_4 (D) NaOH

- **249.** The calculation of the pre-exponential factor is based on the
 - (A) idea that, for a reaction to take place, the reactant species must come together
 - (B) Calculation of the molecularity of the reaction
 - (C) idea that the reactant species must come together, leading to the formation of the transition state which then transforms into the products
 - (D) calculation of the order of the reaction
- 250. In which of the following ways does an activated complex differ from an ordinary molecule ?
 - (A) It is quite unstable and has no independent existence.
 - (B) ΔH°_{f} is probably positive
 - (C) The system has a greater vibrational character.
 - (D) The system has no vibrational character.

251.
$$Zn + 2H^+ \longrightarrow Zn^{2+} + H_2$$

Half-life period is independent of concentration of zinc at constant pH. For the constant concentration of Zn, rate becomes 100 times when pH is decreased from 3 to 2. Hence

(A)
$$\frac{\mathrm{dx}}{\mathrm{dt}} = k[\mathrm{Zn}]^{\circ}[\mathrm{H}^{+}]2$$

(B)
$$\left(\frac{\mathrm{d}x}{\mathrm{d}t}\right) = k \, [\mathrm{Zn}] \, [\mathrm{H}^+]^2$$

- (C) rate is not affected if concentration of zinc is made four times and that of H⁺ ions is halved.
- (D) rate becomes four times if concentration of H⁺ ion is doubled at constant Zn concentration,.
- 252. Which of the following statements are correct ?

(A) The electrolysis of aqueous NaCl produces hydrogen gas at the cathode and chlorine gas at the anode.

(B) The electrolysis of a dilute solution of sodium fluoride produces oxygen gas at the anode and O_2 gas at the cathode.

(C) The electrolysis of concentrated sulphuric acid produces SO_2 gas at the anode and O_2 gas at the cathode.

(D) After the electrolysis of aqueous sodium sulphate, the solution becomes acidic.

- **253.** Which of the following statements are correct ?
 - (A) The electrolysis of concentrated H_2SO_4 at 0–5°C using a Pt electrode produces $H_2S_2O_8$.
 - (B) The electrolysis of a brine solution produces NaClO₃ and NaClO.

(C) The electrolysis of a CuSO₄ solution using Pt electrodes causes the liberation of O₂

- at the anode and the deposition of copper at the cathode
- (D) All electrolytic reactions are redox reactions.
- **254.** In an electrochemical process, a slat bridge is used :
 - (A) to maintain electroneutrality in each solution
 - (B) to complete the circuit so that current can flow
 - (C) as an oxidizing agent
 - (D) as a colour indicator
- 255. The decomposition of hydrogen peroxide is an example of
 - (A) Exothermic reaction (B) Endothermic reaction
 - (C) Negative catalysis (D) Auto-oxidation
- **256.** A concentration cell is a galvanic cell in which :
 - (A) the electrode material and the solutions in both half-cells are composed of the same substances
 - (B) only the concentrations of the two solutions differ
 - (C) $\Delta E_{cell}^{0} = 0$

(D) the Nernst equation reduces to $\Delta E_{cell} = -\left(\frac{0.0592}{n}\right) \log Q$ at 25°C

257. Pb(s)| PbSO₄ | PbI₂ | Pb(s) saturated solution solution

Which of the following expressions represent the emf of the above cell at 25 °C ?

(A)
$$E = \frac{0.0592}{2} \log \frac{(a_{pb^{2+}})_2}{(a_{pb^{2+}})_1}$$
 (B) $E = \frac{0.0592}{2} \log \frac{(a_{pb^{2+}})_1}{(a_{pb^{2+}})_2}$
(C) $E = \frac{0.0592}{2} \log \frac{[K_{sp}(PbI_2)]^{1/3}}{[K_{sp}(PbSO_4)]^{1/2}}$ (D) $E = \frac{0.0592}{2} \log \frac{K_{sp}(PbI_2)}{K_{sp}(PbSO_4)}$

258. When a non-volatile solute is added to a pure solvent, the

- (A) vapour pressure of the solution becomes lower than that of the pure solvent
- (B) rate of evaporation of the pure solvent is reduced
- (C) solute does not affect the rate of condensation
- (D) rate of evaporation of the solution is equal to the rate of condensation of the solution at a lower vapour pressure than that in the case of the pure solvent.
- **259.** Which of the following combinations are correct for a binary solution, in which the solute as well as the solvent are liquid?

260. Which of the following statements are correct for a binary solution which shows negative deviation from Raoult's law? (A) The negative deviation from linearity diminishes and tends to zero as the concentration of the solution component approaches unity. When solutions from, their volumes are smaller than the sum of the volumes of their (B) components (C) Heat is released during the formation of the solution. (D) Heat is absorbed during the formation of the solution. Which of the following structures have layered lattices ? 261. (A) cadmium iodide ice (B) (C) graphite (D) diamond 262. A binary liquid (AB) shows positive deviation from Raoult's law wen (B) intermolecular forces: A-A, B-B > A-B(A) $p_A > p_A^0 X_A^{\text{liq}} > p_B^0 X_B^{\text{liq}}$ (C) $\Delta V_{mix} > 0$ (D) $\Delta H_{mix} > 0$ 263. Lead metal has a density of 11.34 g/cm³ and crystallizes in a face-centered lattice. Choose the correct alternatives (A) the volume of one unit celt is 1.214×10^{-22} cm³ (B) the volume of one unit cell is 1.214 × 10⁻¹⁹ cm³ (C) the atomic radius of lead is 165 pm (D) the atomic radius of lead is 155.1 pm 264. Consider following solutions: I: 1 M aq. glucose II: 1 M aq. sodium chloride III: 1 M benzoic acid in benzene IV: 1 M ammonium phosphate Select correct statement (s) (A) all are isotonic solutions (B) III is hypotonic of I, II, IV (C) I, II, IV are hypertonic of III (D) IV is hypertonic of I, II, III Which of the following is (are) lyophobic colloids? 265. (A) Gold sol (B) $As_2 S_3$ sol (C) Starch sol (D) Fe(OH)₃ sol 266. The ionic radii of Cs and Cl are 0.165 nm and 0.181nm respectively. Their atomic weights are 133 and 35.5. Then, (A) the lattice parameter is 0.4 nm (B) the lattice parameter can not be determined from this data (C) the density of CsCl is 4.37×10^3 kg/m³ (D) the CsCI structure has a fcc structure with a basis 267. Which of the following statements are correct about half-life period (A) it is proportional to initial concentration for zeroth order (B) average life = 1.44 half-life for first order reaction (C) time of 75% reaction is thrice of half-life period in second order (D) 99.9% reaction takes place in 100 minutes for the case when rate constant is 0.0693 min⁻¹ 268. Which type of crystals contain one Bravais lattice? (A) hexagonal (B) triclinic (C) rhombohedral (D) monoclinic 269. TiO₂(rutile) shows 6 : 3 coordination. Which of the following solids have a rutile-like structure ? (A) MnO₂ (B) ZnS (C) KCl (D) SnO₂ 270. The hcp and ccp structure for a given element would be expected to have (A) the same coordination number (B) the same density (C) the same packing fraction (D) all the above

- 271. Two reaction A \rightarrow products and B \rightarrow products have rate constant k_A and k_B at temperature T and activation energies E_A and E_B respectively. If $k_A > k_B$ and $E_A < E_B$ and assuming that A for both the reactions is same, then
 - (A) at higher temperatures $k_{_{\rm A}}$ will be greater than $k_{_{\rm B}}$
 - (B) at lower temperatures k_A and k_B will be close to each other in magnitude (C) as temperature rises, k_A and k_B will be close to each other in magnitude

 - (D) at lower temperatures $k_{B} > k_{A}$
- 272. Which of the following statements are correct for the rock-salt structure ?
 - (A) the tetrahedral sites are smaller than the octahedral sites
 - the octahedral sites are occupied by cations and the tetrahedral sites are empty (B)
 - (C) the radius ratio is 0.732
 - (D) the radius ratio is 0.999
- 273. Which of the following statements are correct ?
 - (A) the coordination number of each type of ion in a CsCl crystal is eight
 - (B) a metal that crystallizes in a bcc structure has a coordination number of twelve
 - (C) a unit cell of an ionic crystal shares some of its ions with other unit cells
 - (D) the length of the unit cell is NaCl is 552 pm (given that r_{Na^+} = 95 pm and r_{Cl} = 181 pm)
- Which of the followings are examples of pseudo-unimolecular reaction : 274.

(A)
$$CH_3CO_2C_2H_5 + H_2O \xrightarrow{H^{\oplus}} CH_3CO_2H + C_2H_5OH$$

(B) $C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^{\oplus}} C_6H_{12}O_6 + C_6H_{12}O_6$

(glucose) (Fructose)

(C)
$$CH_3COCI + H_2O \longrightarrow CH_3CO_2H + HCI$$

- (D) $CH_3CO_2C_2H_5 + H_2O \xrightarrow{OH^{\Theta}} CH_3CO_2H + C_2H_5OH$
- Which of the following compounds represent a normal 2 : 3 spinel structure ? 275. (A) $Mg^{\parallel}Al_2^{\parallel \parallel}O_4$ (B) $Co^{\parallel}(Co^{\parallel \parallel})_2O_4$ (C) $Zn(TiZn)O_4$ (D) $Ni(CO)_4$

Answer Key

Qs.	Ans.	Qs.	Ans.
220	AB	251	BCD
221	ABCD	252	AB
222	BC	253	ABCD
223	BC	254	AB
224	CD	255	ACD
225	ABC	256	ABCD
226	BC	257	AC
220		258	ABCD
227	BCD	259	BD
228	BCD	260	ABC
229	BC	261	AC
230	AD	262	ABC
231	BC	263	AC
232	ABC	264	BCD
233	BC	265	ABD
234	AC	266	AC
235	ABC	267	ABCD
236	AD	268	ABC
237	ABC	269	AD
238	ABC	270	AC
239	CD	271	AC
240	AC	272	AC
241	ABC	273	AC
242	AC	274	ABC
243	AB	275	AB
244	ABCD		
245	ABC		
246	BC		
247	ABCD		
248	ACD		
249	AC		
250	AC		