Question 1: The unit cell with crystallographic dimensions, a $\neq$b $\neq$c, α =γ= 90 and $\beta\neq$90 is

1. a. Triclinic
2. b. Monoclinic
3. c. Orthorhombic
4. d. Tetragonal

Question 2: While charging the lead storage battery._____.

1. a. $PbSO_4$ on anode is reduced to Pb
2. b. $PbSO_4$ on cathode is reduced to Pb
3. c. $PbSO_4$ on cathode is oxidized to Pb
4. d. $PbSO_4$ on anode is oxidized to PbO_2

Question 3: Adenosine is an example of

1. a. Nucleotide
2. b. Purine base
3. c. Pyrimidine base
4. d. Nucleoside

Question 4: Orlon has a monomeric unit

1. a. Acrolein
2. b. Glycol
3. c. Vinyl cyanide
4. d. Isoprene

Question 5: The two electrons have the following set of quantum numbers:

P = 3, 2, −2, + 1/2

Q = 3, 0, 0, + 1/2

Which of the following statement is true?

1. a. P and Q have the same energy
2. b. P has greater energy than Q
3. c. P has lesser energy than Q
4. d. P and Q represent same electron

Question 6: H_2O_2 cannot oxidise

1. a. PbS
2. b. Na_2SO_3
3. c. O_3
4. d. KI

Question 7: In the given set of reactions, 2-Bromopropane

$$\xrightarrow[\text{alc./heat}]{\text{AgCN}} X \xrightarrow{\text{LiA/H}_4} Y$$ the IUPAC name of product 'Y' is

1. a. N-Methylpropanamine
2. b. N-Isopropylmethanamine
3. c. Butan-2-amine
4. d. N-Methylpropan-2-amine

Question 8: On heating with concentrated NaOH solution in an inert atmosphere of CO_2, white phosphorous gives a gas. Which of the following statement is incorrect about the gas?

1. a. It is less basic than NH_3
2. b. It is more basic than NH3
3. c. It is highly poisonous and has a smell like rotten fish
4. d. It's solution in water decomposes in the presence of light

---

Question 9: Sodium metal crystallizes in B.C.C. lattice with an edge length of 4.29 Å. The radius of the sodium atom is

1. a. 2.857 Å
2. b. 1.601 Å
3. c. 2.145 Å
4. d. 1.857 Å

Question 10: 0.06% (w/v) aqueous solution of urea is isotonic with

1. a. 0.06% glucose solution
2. b. 0.6% glucose
3. c. 0.01 M glucose solution
4. d. 0.1 M glucose solution

Question 11: In a first-order reaction, the concentration of the reactant is reduced to 12.5% in one hour. When was it half completed?

a. 3 hr

1. a. 3 hr
2. b. 20 min
3. c. 30 min
4. d. 15 min

Question 12: The electrolyte having maximum flocculation value for AgI/Ag^+ sol. is

1. a. NaCl
2. b. Na_2S
3. c. Na_2SO_4
4. d. Na_3PO_4

Question 13: Copper is extracted from Copper pyrites by heating in a Bessemer converter. The method is based on the principle that

1. a. Copper has more affinity for oxygen than Sulphur at high temperature
2. b. Iron has less affinity for oxygen than Sulphur at high temperature
3. c. Copper has less affinity for oxygen than Sulphur at high temperature
4. d. Sulphur has less affinity for oxygen at high temperature

Question 14: Which of the following will be able to show geometrical isomerism?

1. a. $MA_3 B$ – Square planar
2. b. $MA_2 B_2$ – Tetrahedral
3. c. MABCD – Square planar
4. d. MABCD – Tetrahedral

Question 15: The electronic configuration of Gd $^{2+}$ is (at. No. of Gd is 64)

1. a. [Xe] 4f^{+8}
2. b. [Xe] 4f^8
3. c. [Xe] 4f^{+7} 5d^1 6s^2
4. d. [Xe] 4f^{+7} 5d^1

Question 16: Here M and Z are

$$MSO_4 \xrightarrow{NH_4OH} \downarrow \underset{white}{X} \xrightarrow[excess]{NH_4OH} Y \xrightarrow{H_2S} \downarrow Z$$
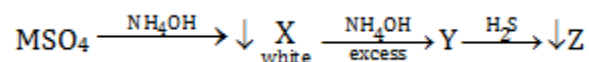
1. a. Cu, ZnS
2. b. Zn, ZnS
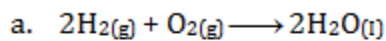3. c. Fe, FeS
4. d. Al, Al$_2$S$_3$

Question 17: The hydrolysis of optically active 2-bromobutane with aqueous NaOH result in the formation of

1. a. (+) butan-2-ol
2. b. (−) butan-2-ol
3. c. (±) butan-1-ol
4. d. (±) butan-2-ol

Question 18: The distinguishing test between methanoic acid and ethanoic acid is

1. a. Litmus test
2. b. Tollen's test
3. c. Esterification test
4. d. Sodium bicarbonate test

Question 19: In H$_2$–O$_2$ fuel cell the reaction occurring at the cathode is

a. $2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(l)}$

b. $O_{2(g)} + 2H_2O_{(l)} + 4e^- \longrightarrow 4\bar{O}H_{(aq)}$

c. $H^+ + e^- \longrightarrow \frac{1}{2}H_2$

d. $H^+_{(aq)} + \bar{O}H_{(aq)} \longrightarrow H_2O_{(l)}$
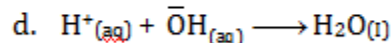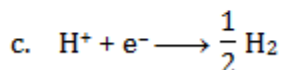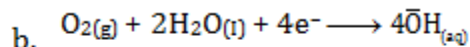
Question 20: Which of the following curve is in accordance with Freundlich adsorption isotherm?
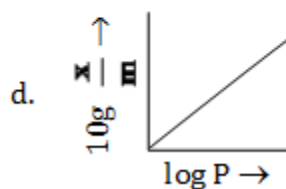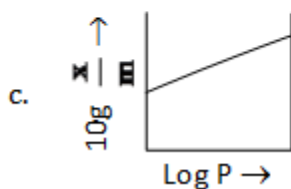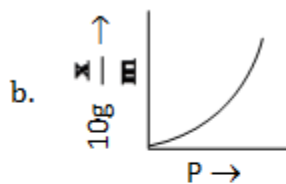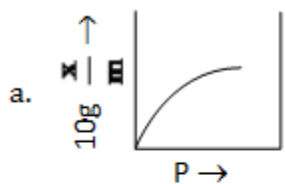
Question 21: How many ions per molecule are produced in the solution when Mohr salt is dissolved in excess of water?

1. a. 4
2. b. 5
3. c. 6
4. d. 10

Question 22: Glycogen is

1. a. a polymer of β-D-glucose units
2. b. a structural polysaccharide
3. c. structurally very much similar to amylopectin
4. d. structurally similar to amylopectin but extensively branched

Question 23: Number of possible alkynes with formula C_5H_8 is

1. a. 2
2. b. 3
3. c. 4
4. d. 5

Question 24: Which of the following aqueous solution has the highest freezing point?

1. a. 0.1 M Sucrose
2. b. 0.01 M NaCl
3. c. 0.1 M NaCl
4. d. 0.01 M Na_2SO_4

Question 25: Half life period of a first-order reaction is 10 min. Starting with initial concentration of 12 M, the rate after 20 min is

1. a. 0.0693 M min^{-1}
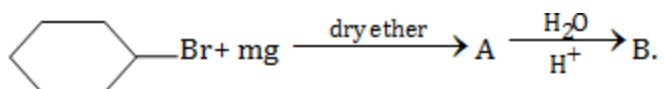2. b. 0.693 × 3 M min^{-1}
3. c. 0.0693 × 3 M min^{-1}
4. d. 0.0693 × 4 min^{-1}

Question 26: The salt which responds to dilute and concentrated H_2SO_4 is

1. a. CaF_2
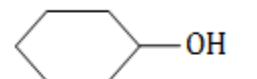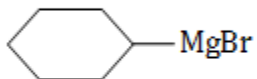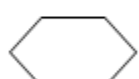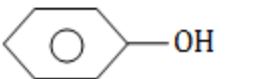2. b. $Ba(NO_3)_2$
3. c. Na_2SO_4
4. d. Na_3PO_4

Question 27: On heating potassium permanganate, one of the following compound is not obtained:

1. a. O_2
2. b. MnO
3. c. MnO_2
4. d. K_2MnO_4

Question 28:

dry ether → A $\xrightarrow[H^+]{H_2O}$ B.

The product 'B' is

a. —OH

b. —MgBr

c.

d. —OH

Question 29: The formation of cyanohydrins from a ketone is an example of

1. a. Nucleophilic substitution
2. b. Nucleophilic addition
3. c. Electrophilic addition
4. d. Electrophilic substitution

Question 30: One of the following is an essential amino acid

1. a. Tyrosine
2. b. Cysteine
3. c. Isoleucine
4. d. Serine

Question 31: The aqueous solution of the following salt will have the lowest pH:

1. a. $NaClO_3$
2. b. $NaClO$
3. c. $NaClO_2$
4. d. $NaClO_4$

Question 32: For one of the elements various successive ionization enthalpies (in kJ mol⁻¹) are given below:

I.E	1st	2nd	3rd	4th	5th
	577.5	1810	2750	11,580	14,820

The element is

1. a. Si
2. b. P
3. c. Al
4. d. Mg

Question 33: 0.30 g of an organic compound containing C, H and Oxygen on combustion yields 0.44 g CO_2 and 0.18 g H_2O. If one mol of compound weight 60, then the molecular formula of the compound is

1. a.CH_2O
2. b. C_3H_8O
3. c.C_4H_6O
4. d.$C_2H_4O_2$

Question 34: One of the following amides will not undergo Hoffmann bromamide reaction:

1. a. CH_3CONH_2
2. b. $CH_3CONHCH_3$
3. c. $C_6H_5CONH_2$
4. d. $CH_3CH_2CONH_2$

Question 35: Cheilosis and digestive disorders are due to the deficiency of

1. a. Thiamine
2. b. Ascorbic acid
3. c. Riboflavin
4. d. Pyridoxine

Question 36: How many Coulombs of electricity are required for the oxidation of one mole of water to dioxygen?

1. a. 9.65×10^4 C
2. b. 1.93×10^4 C
3. c. 1.93×10^5 C
4. d. 19.3×10^5 C

Question 37: 100 cm³ of 1 M CH_3COOH was mixed with 100 cm³ of 2 M CH_3OH to form an ester. The change in the initial rate if each solution is diluted with an equal volume of water would be

1. a. 2 times
2. b. 4 times
3. c. 0.5 times
4. d. 0.25 times

Question 38: Which of the following colloids cannot be easily coagulated?

1. a. Lyophobic colloids
2. b. Multimolecular colloids
3. c. Macromolecular colloids
4. d. Irreversible colloids

Question 39:. The complex ion having a minimum magnitude of Δ_0(CFSE) is

1. a. $[Cr(CN)_6]^{3-}$
2. b. $[Co(NH3)_6]^{3+}$
3. c. $[Co(Cl)_6]^{3-}$
4. d. $[Cr(H_2O)_6]^{3+}$

Question 40: The arrangement of following compounds:

i. bromomethane

ii. bromoform

iii. chloromethane

iv. dibromomethane

In the increasing order of their boiling point is

1. a. iii <i<iv < ii
2. b. iv < iii <i< ii
3. c. ii < iii <i< iv
4. d. i< ii < iii < iv

Question 41: Iodoform can be prepared from all, except

1. a. propan-2-ol
2. b. butan-2-one
3. c. propan-1-ol
4. d. acetophenone

Question 42: Identify 'Q' in the following sequence of reactions:

$COCH_3$

$\xrightarrow{PCl_5} P \xrightarrow[excess]{NaNH_2} Q$

a.

b.

c.

d.
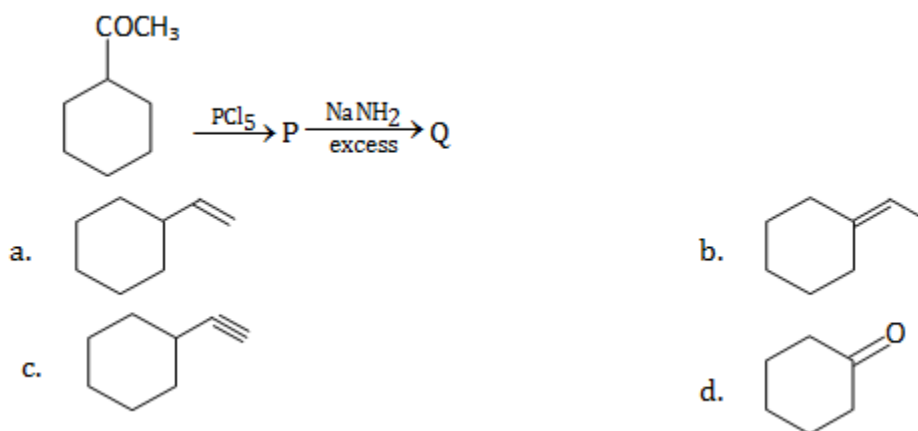
Question 43: Cryolite is

1. a. Na_3AlF_6 and is used in the electrolysis of alumina for decreasing electrical conductivity
2. b. Na_3AlF_6 and is used in the electrolysis of alumina for lowering the melting point of alumina only
3. c. Na_3AlF_6 and is used in the electrolysis of alumina for lowering the melting point and increasing the conductivity of alumina
4. d. Na_3AlF_6 and is used in the electrolytic refining of alumina

Question 44: Which of the following compound of Xenon has pyramidal geometry?

1. a. $XeOF_4$
2. b. XeF_2
3. c. XeO_3
4. d. XeF_4

Question 45: After adding a non-volatile solute freezing point of water decreases to – 0.186°C. Calculate ΔT_b if K_f = 1.86 K kg mol^{-1} and K_b = 0.521 K kg mol^{-1}

1. a. 0.521
2. b. 0.0521
3. c. 1.86
4. d. 0.0186

Question 46: Plot of Maxwell's distribution of velocities is given below:

Molecular Velocity
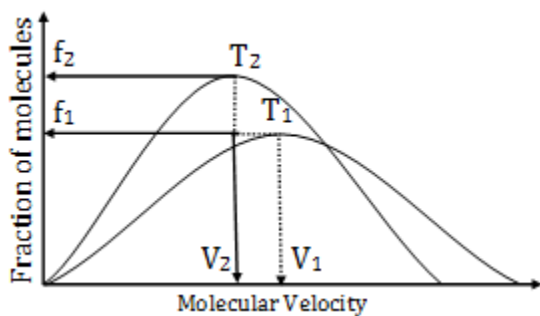
1. a. $T_1 < T_2$
2. b. $f_1 > f_2$
3. c. $T_1 > T_2$
4. d. $V_1 < V_2$

Question 47: The pair of compounds which cannot exist together in solution is

1. a. $NaHCO_3$ and $NaOH$
2. b. $NaHCO_3$ and H_2O
3. c. $NaHCO_3$ and Na_2CO_3
4. d. Na_2CO_3 and $NaOH$

Question 48: What amount of dioxygen (in gram) contains 1.8×10^{22} molecules?

1. a. 0.0960
2. b. 0.960
3. c. 9.60
4. d. 96.0

Question 49: Using MOT, compare and species and choose the incorrect option

1. a. O_{+2} have a higher bond order than
2. b. O_{-2} is less stable
3. c. O_{+2} is diamagnetic while is paramagnetic
4. d. Both O_{+2} and O_{-2} are paramagnetic

Question 50: Which of the following is not true?

1. a. Erythromycin is a bacteriostatic antibiotic
2. b. Ampicillin is not a natural antibiotic
3. c. Prontosil is not converted into sulfanilamide in the body
4. d. Vancomycin is a broad-spectrum antibiotic.

Question 51: In the reaction

$$S + \frac{3}{2}O_2 \longrightarrow SO_3 + 2x \text{ kJ and } SO_2 + \frac{1}{2}O_2 \longrightarrow SO_3 + y \text{ kJ}$$
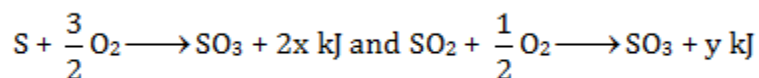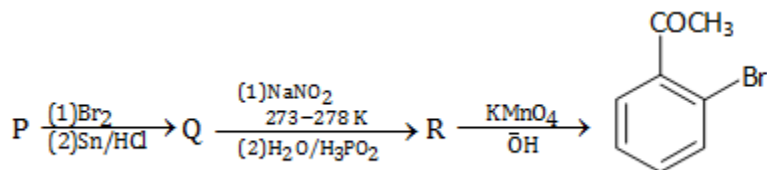
Heat of formation of SO_2 is

1. a. x + y
2. b. x −y
3. c. 2x − y
4. d. 2x + y

Question 52: Arrange the following compounds in the increasing order of their acidic strength:

i. m-nitrophenol

ii. m-cresol

iii. phenol

iv. m-chlorophenol

1. a. iii < ii < I < iv
2. b. ii < iv < iii <i
3. c. ii < iii < iv <i
4. d. ii < iii < I < iv

Question 53: In the sequence of following reactions:

$$P \xrightarrow[\text{(2)Sn/HCl}]{\text{(1)Br}_2} Q \xrightarrow[\text{(2)H}_2\text{O/H}_3\text{PO}_2]{\substack{\text{(1)NaNO}_2 \\ 273-278\,K}} R \xrightarrow[\text{ŌH}]{\text{KMnO}_4}$$

with product being a benzene ring bearing $COCH_3$ and Br (ortho).

The starting compound 'P' is

1. a. o-nitro toluene
2. b. m-nitro toluene c. o-bromo toluene
3. d. p-nitro toluene

Question 54: Acetic acid is treated with $Ca(OH)_2$ and the product so obtained is subjected to dry distillation. The final product is

1. a. ethanal
2. b. propanal
3. c. propanone
4. d. ethanol

Question 55: The correct statement is

1. a. BF_3 is the strongest Lewis acid among the other boron halides
2. b. BI_3 is the weakest Lewis acid among the boron halides
3. c. There is maximum pπ–pπ back bonding in BF_3
4. d. There is minimum pπ–pπ back bonding in BF_3

Question 56: Which of the following compound possesses the "C – H" bond with the lowest bond dissociation energy?

1. a. Toluene
2. b. Benzene
3. c. n-pentane
4. d.2, 2-dimethyl propane

Question 57: In presence of HCl, H_2S results in the precipitation of Group-2 elements but not Group-4 elements during qualitative analysis. It is due to

1. a. higher concentration of S^{2-}
2. b. higher concentration of H^+
3. c. lower concentration of S^{2-}
4. d. lower concentration of H^+

Question 58: One of the following conversion results in the change of hybridization and geometry:

a. CH_4 to C_2H_6

b. NH_3 to $\overset{+}{N}H_4$

c. BF_3 to $B\bar{F}_4$

d. H_2O to $H_2\overset{+}{O}$
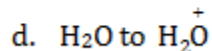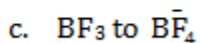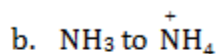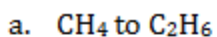
Question 59: Water softening by Clark's process uses

1. a. $CaHCO_3$
2. b. $NaHCO_3$
3. c. Na_2CO_3
4. d. $Ca(OH)_2$

Question 60: An alkali metal hydride (NaH) reacts with diborane in 'A' to give a tetrahedral compound 'B' which is extensively used as a reducing agent in organic synthesis. The compounds 'A' and 'B' respectively are

1. a. C_2H_6 and C_2H_5Na
2. b. CH_3COCH_3 and $B_3N_3H_6$
3. c. C_6H_6 and $NaBH_4$
4. d. $(C_2H_5)_2O$ and $NaBH_4$