1. In which one of the following reactions, rate constant has the unit mol $L^{-1}s^{-1}$?

   (A) $CHCl_3 + Cl_2 \rightarrow CCl_4 + HCl$

   (B) $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_2(g)$

   (C) Decomposition of HI on the surface of Gold

   (D) Acid catalysed hydrolysis of CH_3COOCH_3

2. For a reaction, the value of rate constant at 300K is $6.0\times10^5 s^{-1}$. The value of Arrhenius factor A at infinitely high temperature is : **[Question Wrong]**

   (A) $e^{-Ea/300R}$ (B) $\frac{6\times10^{-5}}{300}$ (C) 6×10^5 (D) $6\times10^5\times e^{-Ea/300R}$

3. The rate constants k_1 and k_2 for two different reactions are $10^{16}\times e^{-2000/T}$ and $10^{15}\times e^{-1000T}$ respectively. The temperature at which $k_1 = k_2$ is :

   (A) 2000K (B) $\frac{1000}{2.303}$K (C) 1000K (D) $\frac{2000}{2.303}$K

4. During the electrolysis of brine, by using inert electrodes,

   (A) H_2 liberates at anode (B) Na deposits on cathode

   (C) Cl_2 liberates at anode (D) O_2 liberates at anode

5. Consider the following 4 electrodes

   $A: Ag^+(0.0001M)/Ag_{(s)}$; $B: Ag^+(0.1M)/Ag_{(s)}$

   $C: Ag^+(0.01M)/Ag_{(s)}$; $D: Ag^+(0.001M)/Ag_{(s)}$; $E^\circ_{Ag^+/Ag} = +0.80V$

   Then reduction potential in volts of the electrodes in the order

   (A) C > D > A > B (B) A > D > C > B (C) A > B > C > D (D) B > C > D > A

6. The resistance of 0.1M weak acid HA in a conductivity cell is 2×10^3Ohm . The cell constant of the cell is $0.78 Cm^{-1}$ and λ°_m of acid HA is $390 Scm^2mol^{-1}$. The pH of the solution is

   (A) 4.2 (B) 5 (C) 3 (D) 3.3

7. The reducing agent in the given equations :

   $$4Ag_{(s)} + 8CN^-_{(aq)} + 2H_2O_{(aq)} + O_2(g) \rightarrow 4\left[Ag(CN)_2\right]^-_{(aq)} + 4OH^-_{(aq)}$$

   $$2\left[Ag(CN)_2\right]^-_{(mq)} + Zn_{(s)} \rightarrow \left[Zn(CN)_4\right]^{2-}_{(iq)} + 2Ag_{(s)}$$

   (A) O_2 (B) H_2O (C) CN^- (D) Zn

8. For the formation of which compound in Ellingham diagram ΔG° becomes more and more negative with increase in temperature?

   (A) FeO (B) ZnO (C) Cu_2O (D) CO

9. Which of the following compound does not give dinitrogen on heating?

(A) NH_4NO_2 (B) NH_4NO_3 (C) $(NH_4)_2Cr_2O_7$ (D) $Ba(N_3)_2$

10. Aqueous solution of raw sugar when passed over beds of animal charcoal, it becomes colourless. Pick the correct set of terminologies that can be used for the above example.

	Adsorbent	Adsorbate	Process
(A)	Animal Charcoal	Solution of sugar	Absorption
(B)	Animal Charcoal	Colouring substance	Adsorption
(C)	Colouring Substance	Animal Charcoal	Adsorption
(D)	Solution of Sugar	Animal Charcoal	Sorption

11. For Freundlich adsorption isotherm, a graph of $\log(x/m)$ Vs. $\log(P)$ gives a straight line. The slope of line and its Y-axis intercept respectively are

(A) $\frac{1}{n}, \log K$ (B) $\log\left(\frac{1}{n}\right), \log K$ (C) $\frac{1}{n}K$ (D) $\log\left(\frac{1}{n}\right), K$

12. When $FeCl_3$ is added to excess of hot water gives a sol 'X'. When $FeCl_3$ is added to $NaOH_{(aq)}$ solution, gives sol 'Y'.

X and Y formed in the above processes respectively are

(A) $Fe_2O_3 \cdot xH_2O / H^+$ and $Fe_2O_3 \cdot xH_2O / Na^+$

(B) $Fe_2O_3 \cdot xH_2O / Cl^-$ and $Fe_2O_3 \cdot xH_2O / OH^-$

(C) $Fe_2O_3 \cdot xH_2O / Fe^{3+}$ and $Fe_2O_3 \cdot xH_2O / OH^-$

(D) $Fe_2O_3 \cdot xH_2O / OH^-$ and $Fe_2O_3 \cdot xH_2O / Fe^{3+}$

13. In which one of the following pairs, both the elements does not have $(n-1)d^{10}ns^2$ configuration in its elementary state?

(A) Cd, Hg (B) Hg_g, Cn (C) Cu, Zn (D) Zn, Cd

14. Which of the following is CORRECT with respect to melting point of a transition element?

(A) Cr > Mn (B) Mn > Fe (C) Ti > V (D) V > Cr

15. $aMnO_4^- + bS_2O_3^{-2} + H_2O \rightarrow xMnO_2 + ySO_4^{-2} + zOH^-$

a and y respectively are

(A) 8; 6 (B) 3; 6 (C) 8; 8 (D) 8; 3

16. Which formula and name combination is INCORRECT?

(A) $\left[Pt(NH_3)_2Cl(NO_2)\right]$ - Diamminechloridonitrito $-N$ -platinum (II)

(B) $\left[CoCl_2(en)_2\right]Cl$ - Dichloridodiethylenediammine cobalt (II) chloride

(C) $\left[Co(NH_3)_4(H_2O)Cl\right]Cl_2$ - Tetraammineaquachloridocobalt (III) chloride

(D) $K_3\left[A1(C_2O_4)_3\right]$ - Potassium trioxalatoaluminate (III)

17. Which of the following system in an octahedral complex has maximum unpaired electrons ?

(A) d^6 (low spin) (B) d^4 (low spin) (C) d^7 (high spin) (D) d^9 (high spin)

18. The correct decreasing order of basicity of hydrides of Group-15 elements is

(A) $PH_3 > As_3 > SbH_3 > NH_3$ (B) $AsH_3 > SbH_3 > NH_3 > PH_3$

(C) $NH_3 > PH_3 > AsH_3 > SbH_3$ (D) $SbH_3 > AsH_3 > PH_3 > NH_3$

19. Which one of the following oxoacids of phosphorus can reduce $AgNO_3$ to metallic silver?

(A) $H_4P_2O_7$ (B) $H_4P_2O_6$ (C) H_3PO_4 (D) H_3PO_2

20. In solid state, PCl_5 is a/an

(A) Ionic solid with $\left[PCl_6\right]^+$ and $\left[PCl_4\right]^-$

(B) Ionic solid with $\left[PCl_4\right]^+$ and $\left[PCl_6\right]^-$

(C) Covalent solid present in the form of P_2Cl_{10}

(D) Octahedral structure

21. Identify A, B and C in the sequence:

$$CH_3CH_2Br \xrightarrow[alc]{KCN} A \xrightarrow{LiAlH_4} B \xrightarrow[0°C]{HNO_2} C$$

(A) $CH_3CH_2NC, CH_3CH_2OH, CH_3CH_2CH_2NH_2$

(B) $CH_3CH_2CN, C_2H_5OH, C_2H_5N_2Cl$

(C) $CH_3CH_2CN, CH_3CH_2NH_2, C_2H_5OH$

(D) $CH_3CH_2CN, CH_3CH_2CH_2NH_2, CH_3CH_2CH_2OH$.

22. $CH_3-CH=CH-CH_2OH \xrightarrow{PCC} CH_3-CH=CH-CHO$

Hybridisation change involved at C-1 in the above reaction

(A) sp^3 to sp^2 (B) sp^2 to sp^3 (C) sp to sp^2 (D) sp^3 to sp

23. If a didentate ligand ethane $-1,2$ - diamine is progressively added in the molar ratio en : Ni ::1:1,2:1,3:1 to $\left[Ni(H_2O)_6\right]^{2+}$ aq solution, following co-ordination entities are formed.

I. $\left[Ni(H_2O)_4\, en\right]^{2+}_{(aq)}$ - pale blue

II. $\left[Ni(H_2O)_2(en)_2\right]^{2+}_{(aq)}$ – blue/purple

III. $\left[Ni(en)_3\right]^{2+}_{(aq)}$ – violet

The wavelength in nm of light absorbed in case of I and III are respectively

(A) 300nm and 475nm (B) 310nm and 500nm (C) 600nm and 535nm (D) 475nm and 310nm

24. Which of the following is an organometallic compound?

(A) CH_3CH_2MgBr (B) $(CH_3COO)_2Ca$ (C) CH_3ONa (D) CH_3COONa

25. A pair of compounds having the same boiling points are

(A) n-hexane and neo-hexane

(B) benzene and naphthalene

(C) (+) butan –2– ol and (-) butan -2 -ol

(D) cis but-2-ene and trans but-2-ene

26. In the reaction:

$$C_6H_5CN \xrightarrow[(ii)\,H_3O^+]{(i)\,SnCl_2+HCl} X \xrightarrow{con.\ KOH} Y + Z\ ,$$

Formation of X, formation of Y and Z are known by

(A) Clemmensen reduction, Sandmeyer reaction.

(B) Wolff-Kishner reduction, Wurtz reaction.

(C) Stephen reaction, Cannizaro reaction.

(D) Rosenmund reduction, Cannizaro reaction.

27. Compounds P and R in the following reaction are

$$CH_3CHO \xrightarrow[(ii)\,H_3O^+]{(i)\,CH_3MgBr} P \xrightarrow[\text{heat}]{conc.\ H_2SO_4} Q \xrightarrow[(ii)\,H_2O_2OH^-]{(i)\,B_2H_6} R$$

(A) Functional isomers (B) Metamers (C) Identical (D) Position isomers

28. Aniline does not undergo

(A) Sulphonation

(B) Friedel-Craft reaction

(C) Bromination

(D) Nitration

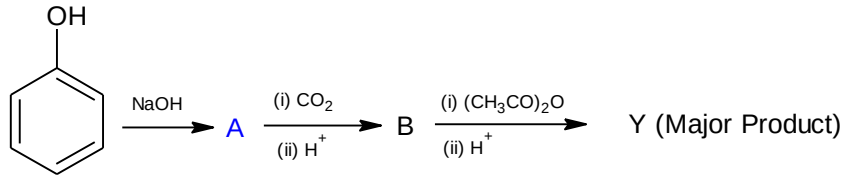
29. The heating of phenyl methyl ether with HI produces an aromatic compound A which on treatment with con. HNO_3 gives B. A and B respectively are,

(A) Picric acid, Phenol

(B) Iodobenzene, 1-Iodo-4-nitrobenzene

(C) Phenol, Picric acid

(D) Methanol, Ethanoic acid

30. 

Y in the above reaction is

(A) Aspirin (B) Cumene (C) Picric acid (D) Salicylaldehyde

31. A better reagent to oxidize primary alcohols into aldehyde is :

(A) Alkaline $KMnO_4$ (B) Acidified $K_2Cr_2O_7$ (C) CrO_3 (D) PCC

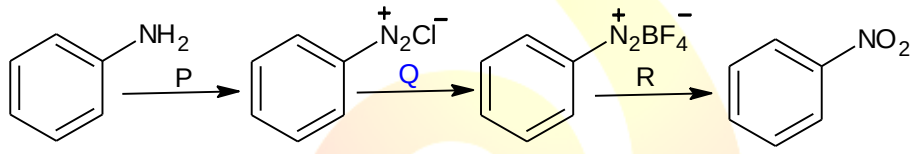
32. The correct order of match between column X and column Y is :

	X		Y
I.	Vitamin A	i.	Muscular weakness
II.	Vitamin D	ii.	Increased blood clotting time
III.	Vitamin E	iii.	Night-blindness
IV.	Vitamin K	iv.	Osteomalacia

(A) I- ii, II-i, III - iii, IV – iv (B) I-iii, II - ii, III-iv, IV-i

(C) I-iii, II-iv, III-i, IV-ii (D) I-iv, II - iii, III - ii, IV -i

33. In the reaction:



P, Q and R respectively are :

(A) $NaNO_2$ + con. $HCl, F_2, Cu + NaNO_3$ (B) $NaNO_2$ + dil. $HCl, BF_3, Cu + NaNO_2$

(C) $NaNO_3$ + dil. $HCl, F_2, Cu + NaNO_3$ (D) $NaNO_2$ + dil. $HCl, HBF_4, Cu + NaNO_2$

34. Thyroxine produced in the thyroid gland is an iodinated derivative of

(A) lysine (B) tyrosine (C) tryptophan (D) threonine

35. Sucrose is dextrorotatory but after hydrolysis the mixture show laevorotation, this is because of

(A) Sucrose is a non-reducing sugar

(B) Recemic mixture is formed

(C) Laevorotation of fructose is more than dextrorotation of glucose

(D) Laevorotation of glucose is more than dextrorotation of fructose

36. Receptors are proteins and crucial to body communication process. These receptors are embedded in

(A) Protein (B) Endocrine gland (C) Chromosomes (D) Cell membrane

37. Which of the following monomers form biodegradable polymers

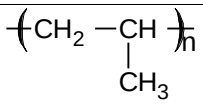
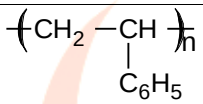
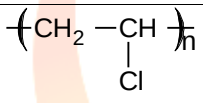
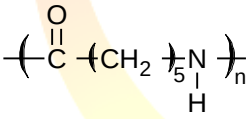
(A) Caprolactum and 1,3-Butadiene

(B) Phenol and formaldehyde

(C) 3-hydroxybutanoic acid and 3-hydroxypentanoic acid

(D) Ethylene glycol and pthalic acid

38. Match the List-I with List-II in the following:

	List – I		List – II
1	Caprolactum	(a)	
2	Vinyl chloride	(b)	
3	Styrene	(c)	
4	Propene	(d)	

(A) 1-a, 2-d, 3-c, 4-b (B) 1-d, 2-c, 3-a, 4-b (C) 1-d, 2-c, 3-b, 4-a (D) 1-c, 2-d, 3-a, 4-b

39. Which one of the following is a non-narcotic analgesic?

(A) Codeine (B) Aspirin (C) Morphine (D) Heroin

40. Which of the following statement is INCORRECT?

(A) Bond order of O_2^+ < Bond order of O_2^{2-}

(B) Bond length of O_2 < Bond length of O_2^{2-}

(C) Bond order of O_2 > Bond order of O_2^{2-}

(D) Bond length of O_2 > Bond length of O_2^{2+}

41. A gas at a pressure of $2atm$ is heated from $25^\circ C$ to $323^\circ C$ and simultaneously compressed to $\frac{2^{rd}}{3}$ of its original value. Then the final pressure is

(A) $6atm$ (B) $2atm$ (C) $4atm$ (D) $1.33atm$

42. Lattice enthalpy for $NaCl$ is $+788kJmol^{-1}$ and $\Delta H^\circ_{HYD} = -784kJmol^{-1}$. Enthalpy of solution of $NaCl$ is

(A) $+4kJmol^{-1}$ (B) $-572kJmol^{-1}$ (C) $-4kJmol^{-1}$ (D) $+572kJmol^{-1}$

43. At $500K$, for a reversible reaction $A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB(g)$ in a closed container, $K_C = 2\times10^{-5}$. In the presence of catalyst, the equilibrium is attaining 10 times faster. The equilibrium constant K_C in the presence of catalyst at the same temperature is

(A) 2×10^{-6} (B) 2×10^{-10} (C) 2×10^{-5} (D) 2×10^{-4}

44. A weak acid with pK_a 5.9 and weak base with pK_b 5.8 are mixed in equal proportions. pH of the resulting solution is

(A) 7.5 (B) 7 (C) 7.05 (D) 7.005

45. Temperature of $25^\circ C$ in Fahrenheit and Kelvin scale respectively are

(A) $17^\circ F$ and 298.15K (B) $45^\circ F$ and 260.15K (C) $47^\circ F$ and 312.15K (D) $77^\circ F$ and 298.15K

46. The number of protons, neutrons and electrons in the ion $^{32}_{16}S^{2-}$ respectively are

(A) 16,16,18 (B) 18,16,16 (C) 16,16,16 (D) 16,18,16

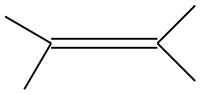
47. The correct order of first ionisation enthalpy of given elements is

(A) Be < Li < B < C (B) C < B < Be < Li (C) Li < Be < B < C (D) Li < B < Be < C

48. The composition of water gas is

(A) CH_4 (B) $CO_{(g)} + H_2O_{(g)}$ (C) $CO_{(g)} + H_{2(g)}$ (D) $CO_{(g)} + N_2(g)$

49. IUPAC name of the compound is



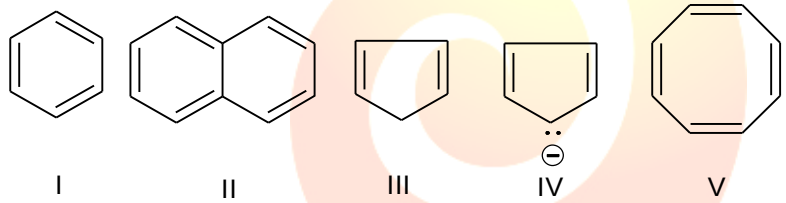
(A) 2, 3-dimethyl butyne

(B) 1,1,2,2-tetra methylethene

(C) 2,3-dimethyl butene

(D) 2,3-dimethylbut-2-ene

50. Among the following:



I II III IV V

I II III IV V The set which represents aromatic species is

(A) III, IV and V (B) II and III (C) I, II and IV (D) I, II and III

51. Which one of the following gases converts haemoglobin into carboxy haemoglobin?

(A) O_2 (B) NO (C) CO_2 (D) CO

52. What is the oxidation number of S in $H_2S_2O_8$?

(A) +4 (B) +7 (C) +6 (D) +5

53. A 30% solution of hydrogen peroxide is

(A) '10 volume' hydrogen peroxide (B) '50 volume' hydrogen peroxide

(C) '100 volume' hydrogen peroxide (D) '30 volume' hydrogen peroxide

54. A pair of amphoteric oxides is

(A) BeO, BO_3 (B) BeO, MgO (C) BeO, ZnO (D) Al_2O_3, Li_2O .

55. Dimerisation of solute molecules in low dielectric constant solvent is due to :

(A) Covalent bond (B) Co-ordinate bond (C) Ionic bond (D) Hydrogen bond

56. The swelling in feet and ankles of an aged person due to sitting continuously for long hours during travel, is reduced by soaking the feet in warm salt water. This is because of:

(A) Osmosis (B) Edema (C) Diffusion (D) Reverse Osmosis

57. A sample of water is found to contain $5.85\%\left(\frac{w}{w}\right)$ of AB (molecular mass 58.5) and $9.50\%\left(\frac{w}{w}\right) XY_2$ (molecular mass 95). Assuming 80% ionisation of AB and 60% ionisation of XY_2, the freezing point of water sample is [Given: K_f for water $1.86\,\text{K kgmol}^{-1}$, Freezing point of pure water is 273K and A, B, and Y are monovalent ions]

(A) 265.56K (B) 280.44K (C) 281.75K (D) 264.25K

58. Match the column A (type of crystalline solid) with the column B (example for each type):

	A		B
P	Molecular Solid	i	SiC
Q	Ionic solid	ii	Mg
R	Metallic Solid	iii	H_2O
S	Network Solid	iv	MgO

(A) P-iv, Q-iii, R-ii, S-i (B) P-ii, Q-iv, R-iii, S-i (C) P-iii, Q-iv, R-ii, S-i (D) P-iii, Q-i, R-ii, S-iv

59. A metal crystallises in a body centered cubic lattice with the metallic radius $\sqrt{3}$ Å . The volume of the unit cell in m^3 is

(A) 4×10^{-29} (B) 6.4×10^{-29} (C) 4×10^{-10} (D) 64×10^{-29}

60. If ' a ' stands for the edge length of the cubic systems - The ratio of radii in simple cubic, body centered cubic and face centered cubic unit cells is

(A) $\frac{1}{2}a:\frac{\sqrt{3}}{4}a:\frac{1}{2\sqrt{2}}a$ (B) $\frac{1}{2}a:\frac{\sqrt{3}}{2}a:\frac{\sqrt{2}}{2}a$ (C) $\frac{1}{2}a:\sqrt{3}a:\frac{1}{\sqrt{2}}a$ (D) $1a:\sqrt{3}a:\sqrt{2}a$