1. Which of the following is a basic amino acid ?

(1) Serine

(2) Alanine

(3) Tyrosine

(4) Lysine

2. The correct option for free expansion of an ideal gas under adiabatic condition is :

(1) $q = 0$, $\Delta T = 0$ and $w = 0$

(2) $q = 0$, $\Delta T < 0$ and $w > 0$

(3) $q < 0$, $\Delta T = 0$ and $w = 0$

(4) $q > 0$, $\Delta T > 0$ and $w > 0$

3. Measuring Zeta potential is useful in determining which property of colloidal solution ?

(1) Viscosity

(2) Solubility

(3) Stability of the colloidal particles

(4) Size of the colloidal particles

4. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 3.87 BM

(2) 4.90 BM

(3) 5.92 BM

(4) 2.84 BM

5. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

(a) β-Elimination reaction

(b) Follows Zaitsev rule

(c) Dehydrohalogenation reaction

(d) Dehydration reaction

(1) (a), (b), (c)

(2) (a), (c), (d)

(3) (b), (c), (d)

(4) (a), (b), (d)

6. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

(1) Hydrogen gas

(2) Oxygen gas

(3) H_2S gas

(4) SO_2 gas

7. Which of the following is **not** correct about carbon monoxide ?

(1) It forms carboxyhaemoglobin.

(2) It reduces oxygen carrying ability of blood.

(3) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.

(4) It is produced due to incomplete combustion.

8. Sucrose on hydrolysis gives :

(1) β-D-Glucose + α-D-Fructose

(2) α-D-Glucose + β-D-Glucose

(3) α-D-Glucose + β-D-Fructose

(4) α-D-Fructose + β-D-Fructose

9. Match the following and identify the **correct** option.

(a)	$CO(g) + H_2(g)$	(i)	$Mg(HCO_3)_2 + Ca(HCO_3)_2$
(b)	Temporary hardness of water	(ii)	An electron deficient hydride
(c)	B_2H_6	(iii)	Synthesis gas
(d)	H_2O_2	(iv)	Non-planar structure

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(ii)	(iv)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(i)	(iii)	(ii)	(iv)

10. An increase in the concentration of the reactants of a reaction leads to change in :

(1) activation energy

(2) heat of reaction

(3) threshold energy

(4) collision frequency

11. Which of the following is a natural polymer ?

(1) *cis*-1,4-polyisoprene

(2) poly (Butadiene-styrene)

(3) polybutadiene

(4) poly (Butadiene-acrylonitrile)

12. The rate constant for a first order reaction is $4.606 \times 10^{-3}\ s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 100 s

(2) 200 s

(3) 500 s

(4) 1000 s

13. Identify the **correct** statements from the following :

(a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(d) CO is colorless and odourless gas.

(1) (a), (b) and (c) only

(2) (a) and (c) only

(3) (b) and (c) only

(4) (c) and (d) only

14. A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is :

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 9 bar

(2) 12 bar

(3) 15 bar

(4) 18 bar

15. Which of the following set of molecules will have zero dipole moment ?

(1) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

(2) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

(3) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

(4) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

16. Hydrolysis of sucrose is given by the following reaction.

$$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$$

If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :

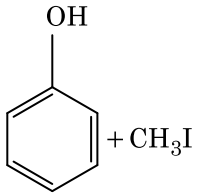
(1) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

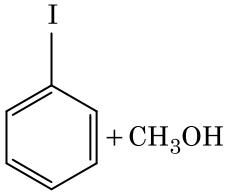
(2) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

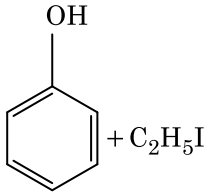
(3) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$

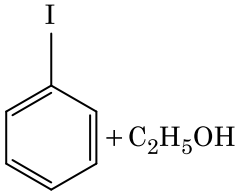
(4) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$

17. Anisole on cleavage with HI gives :

(1) 

(2) 

(3) 

(4) 

18. The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are :

(1) 71, 104 and 71

(2) 104, 71 and 71

(3) 71, 71 and 104

(4) 175, 104 and 71

19. Paper chromatography is an example of :

(1) Adsorption chromatography

(2) Partition chromatography

(3) Thin layer chromatography

(4) Column chromatography

20. Identify the **incorrect** match.

	Name	**IUPAC Official Name**	
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Unununnium	(iv)	Darmstadtium

(1) (a), (i)

(2) (b), (ii)

(3) (c), (iii)

(4) (d), (iv)

21. Which one of the followings has maximum number of atoms ?

(1) 1 g of Ag(s) [Atomic mass of Ag = 108]

(2) 1 g of Mg(s) [Atomic mass of Mg = 24]

(3) 1 g of O_2(g) [Atomic mass of O = 16]

(4) 1 g of Li(s) [Atomic mass of Li = 7]

22. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

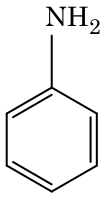
(1) $-$I effect of $-CH_3$ groups

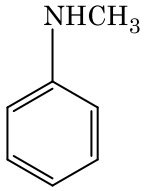
(2) $+$R effect of $-CH_3$ groups

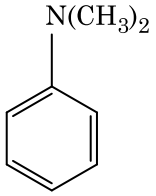
(3) $-$R effect of $-CH_3$ groups

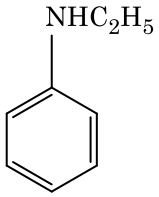
(4) Hyperconjugation

23. Which of the following amine will give the carbylamine test ?

(1) 

(2) 

(3) 

(4) 

24. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

(1) n-Hexane

(2) 2,3-Dimethylbutane

(3) n-Heptane

(4) n-Butane

25. The mixture which shows positive deviation from Raoult's law is :

(1) Ethanol + Acetone

(2) Benzene + Toluene

(3) Acetone + Chloroform

(4) Chloroethane + Bromoethane

26. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

(1) Aldol condensation

(2) Cannizzaro's reaction

(3) Cross Cannizzaro's reaction

(4) Cross Aldol condensation

27. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?

(1) $SCN^- < F^- < C_2O_4^{2-} < CN^-$

(2) $SCN^- < F^- < CN^- < C_2O_4^{2-}$

(3) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

(4) $CN^- < C_2O_4^{2-} < SCN^- < F^-$

28. Which of the following is a cationic detergent ?

(1) Sodium lauryl sulphate

(2) Sodium stearate

(3) Cetyltrimethyl ammonium bromide

(4) Sodium dodecylbenzene sulphonate

29. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

(1) Isopropyl alcohol

(2) Sec. butyl alcohol

(3) Tert. butyl alcohol

(4) Isobutyl alcohol

30. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu^{2+} (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

(1) $CuSO_4$

(2) $[Cu(NH_3)_4]^{2+}$

(3) $Cu(OH)_2$

(4) $CuCO_3 \cdot Cu(OH)_2$

31. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 1

(2) 2

(3) 3

(4) 4

32. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the **correct** option is :

(1) $\Delta_r H > 0$ and $\Delta_r S > 0$

(2) $\Delta_r H > 0$ and $\Delta_r S < 0$

(3) $\Delta_r H < 0$ and $\Delta_r S > 0$

(4) $\Delta_r H < 0$ and $\Delta_r S < 0$

33. Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.

(1) 2×10^{-13} M

(2) 2×10^{-8} M

(3) 1×10^{-13} M

(4) 1×10^{8} M

34. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

(1) 0.20 K

(2) 0.80 K

(3) 0.40 K

(4) 0.60 K

35. Identify the **incorrect** statement.

(1) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

(2) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

(3) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

(4) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.

36. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

(1) $\frac{\sqrt{3}}{4} \times 288$ pm

(2) $\frac{\sqrt{2}}{4} \times 288$ pm

(3) $\frac{4}{\sqrt{3}} \times 288$ pm

(4) $\frac{4}{\sqrt{2}} \times 288$ pm

37. Identify a molecule which does **not** exist.

(1) He_2

(2) Li_2

(3) C_2

(4) O_2

38. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?

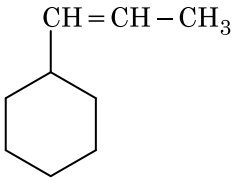
(1) H_2SO_3, sulphurous acid

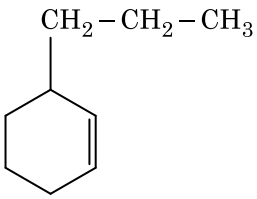
(2) H_2SO_4, sulphuric acid

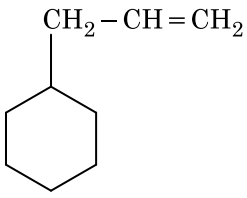
(3) $H_2S_2O_8$, peroxodisulphuric acid

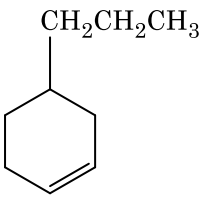
(4) $H_2S_2O_7$, pyrosulphuric acid

39. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

(1) 

(2) 

(3) 

(4) 

40. HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s) ?

(1) Both $MgCl_2$ and $CaCl_2$

(2) Only NaCl

(3) Only $MgCl_2$

(4) NaCl, $MgCl_2$ and $CaCl_2$

41. Match the following :

	Oxide		**Nature**
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is **correct** option ?

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(ii)	(i)

42. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

(1) Iron

(2) Copper

(3) Calcium

(4) Potassium

43. What is the change in oxidation number of carbon in the following reaction ?

$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$

(1) $+4$ to $+4$

(2) 0 to $+4$

(3) -4 to $+4$

(4) 0 to -4

44. Identify the **correct** statement from the following :

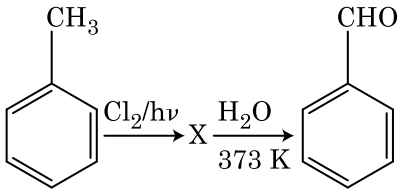
(1) Wrought iron is impure iron with 4% carbon.

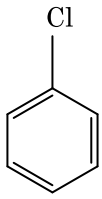
(2) Blister copper has blistered appearance due to evolution of CO_2.

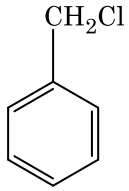
(3) Vapour phase refining is carried out for Nickel by Van Arkel method.

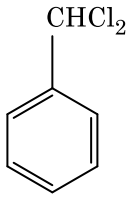
(4) Pig iron can be moulded into a variety of shapes.

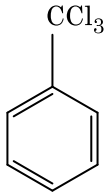
45. Identify compound X in the following sequence of reactions :



(1) 

(2) 

(3) 

(4) 

46. Which of the following regions of the globe exhibits highest species diversity ?

(1) Western Ghats of India
(2) Madagascar
(3) Himalayas
(4) Amazon forests

47. In water hyacinth and water lily, pollination takes place by :

(1) insects or wind
(2) water currents only
(3) wind and water
(4) insects and water

48. The enzyme enterokinase helps in conversion of :

(1) protein into polypeptides
(2) trypsinogen into trypsin
(3) caseinogen into casein
(4) pepsinogen into pepsin

49. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

(1) Uremia and Ketonuria
(2) Uremia and Renal Calculi
(3) Ketonuria and Glycosuria
(4) Renal calculi and Hyperglycaemia

50. Experimental verification of the chromosomal theory of inheritance was done by :

(1) Mendel
(2) Sutton
(3) Boveri
(4) Morgan

51. Which of the following is **not** an attribute of a population ?

(1) Sex ratio
(2) Natality
(3) Mortality
(4) Species interaction

52. Goblet cells of alimentary canal are modified from :

(1) Squamous epithelial cells
(2) Columnar epithelial cells
(3) Chondrocytes
(4) Compound epithelial cells

53. Floridean starch has structure similar to :

(1) Starch and cellulose
(2) Amylopectin and glycogen
(3) Mannitol and algin
(4) Laminarin and cellulose