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

(1) 5.92 BM

(2) 2.84 BM

(3) 3.87 BM

(4) 4.90 BM

2. Which of the following is a cationic detergent ?

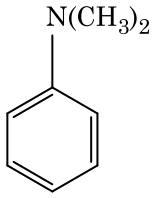
(1) Cetyltrimethyl ammonium bromide

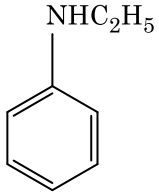
(2) Sodium dodecylbenzene sulphonate

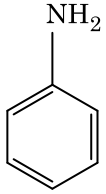
(3) Sodium lauryl sulphate

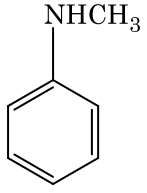
(4) Sodium stearate

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

(1) 

(2) 

(3) 

(4) 

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

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

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

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

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

5. Which of the following is a natural polymer ?

(1) polybutadiene

(2) poly (Butadiene-acrylonitrile)

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

(4) poly (Butadiene-styrene)

6. 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)	(iv)	(ii)	(i)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(iii)	(i)	(ii)	(iv)
(4)	(iii)	(ii)	(i)	(iv)

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

(1) threshold energy

(2) collision frequency

(3) activation energy

(4) heat of reaction

8. 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) 0.40 K

(2) 0.60 K

(3) 0.20 K

(4) 0.80 K

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

(1) C_2

(2) O_2

(3) He_2

(4) Li_2

10. 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 $+4$

11. 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) Calcium

(2) Potassium

(3) Iron

(4) Copper

12. 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)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(ii)	(i)	(iv)	(iii)

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

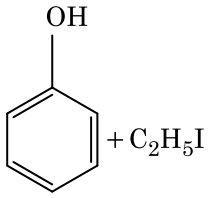
(1) Cross Cannizzaro's reaction

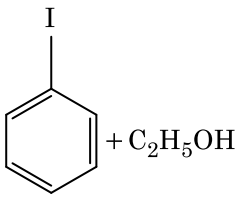
(2) Cross Aldol condensation

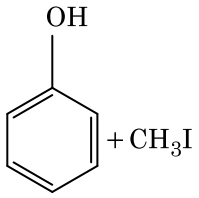
(3) Aldol condensation

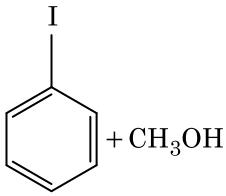
(4) Cannizzaro's reaction

14. Anisole on cleavage with HI gives :

(1) 

(2) 

(3) 

(4) 

15. 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 $\Delta_r S < 0$

16. 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) (b) and (c) only

(2) (c) and (d) only

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

(4) (a) and (c) only

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

(1) n-Heptane

(2) n-Butane

(3) n-Hexane

(4) 2,3-Dimethylbutane

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

(1) Only $MgCl_2$

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

(3) Both $MgCl_2$ and $CaCl_2$

(4) Only NaCl

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

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

(2) 1 g of Li(s) [Atomic mass of Li = 7]

(3) 1 g of Ag(s) [Atomic mass of Ag = 108]

(4) 1 g of Mg(s) [Atomic mass of Mg = 24]

20. 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) 15 bar

(2) 18 bar

(3) 9 bar

(4) 12 bar

21. Identify the **incorrect** statement.

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

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

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

(4) 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.

22. 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 $w > 0$

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

(1) Acetone + Chloroform

(2) Chloroethane + Bromoethane

(3) Ethanol + Acetone

(4) Benzene + Toluene

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

(1) $H_2S_2O_8$, peroxodisulphuric acid

(2) $H_2S_2O_7$, pyrosulphuric acid

(3) H_2SO_3, sulphurous acid

(4) H_2SO_4, sulphuric acid

25. Sucrose on hydrolysis gives :

(1) α-D-Glucose + β-D-Fructose

(2) α-D-Fructose + β-D-Fructose

(3) β-D-Glucose + α-D-Fructose

(4) α-D-Glucose + β-D-Glucose

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

(1) 71, 71 and 104

(2) 175, 104 and 71

(3) 71, 104 and 71

(4) 104, 71 and 71

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

(1) H_2S gas

(2) SO_2 gas

(3) Hydrogen gas

(4) Oxygen gas

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

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

(2) Hyperconjugation

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

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

29. 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) $Cu(OH)_2$

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

(3) $CuSO_4$

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

30. 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) (c), (iii)

(2) (d), (iv)

(3) (a), (i)

(4) (b), (ii)

31. 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) 500 s

(2) 1000 s

(3) 100 s

(4) 200 s

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

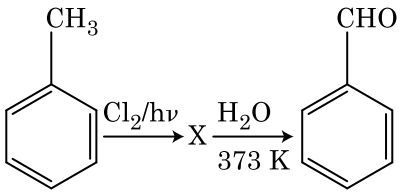
(1) $\frac{4}{\sqrt{3}} \times 288$ pm

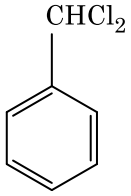
(2) $\frac{4}{\sqrt{2}} \times 288$ pm

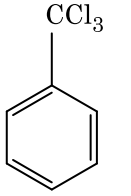
(3) $\frac{\sqrt{3}}{4} \times 288$ pm

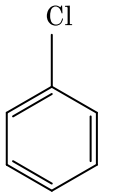
(4) $\frac{\sqrt{2}}{4} \times 288$ pm

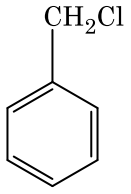
33. Identify compound X in the following sequence of reactions :



(1) 

(2) 

(3) 

(4) 

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

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

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

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

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

35. Paper chromatography is an example of :

(1) Thin layer chromatography

(2) Column chromatography

(3) Adsorption chromatography

(4) Partition chromatography

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

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

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

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

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

37. 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) $8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(3 \times 10^{13})$

(2) $-8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(4 \times 10^{13})$

(3) $-8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(2 \times 10^{13})$

(4) $8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(2 \times 10^{13})$

38. 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) 3

(2) 4

(3) 1

(4) 2

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

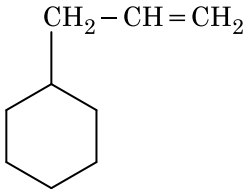
(1) Tyrosine

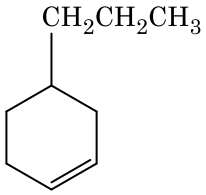
(2) Lysine

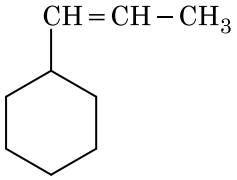
(3) Serine

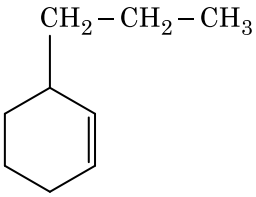
(4) Alanine

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

(1) 

(2) 

(3) 

(4) 

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

(1) Stability of the colloidal particles

(2) Size of the colloidal particles

(3) Viscosity

(4) Solubility

42. 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) 1×10^{-13} M

(2) 1×10^{8} M

(3) 2×10^{-13} M

(4) 2×10^{-8} M

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

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

(2) It is produced due to incomplete combustion.

(3) It forms carboxyhaemoglobin.

(4) It reduces oxygen carrying ability of blood.

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

(1) Tert. butyl alcohol

(2) Isobutyl alcohol

(3) Isopropyl alcohol

(4) Sec. butyl alcohol

45. 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) (b), (c), (d)

(2) (a), (b), (d)

(3) (a), (b), (c)

(4) (a), (c), (d)

46. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	*Clostridium butylicum*	(i)	Cyclosporin-A
(b)	*Trichoderma polysporum*	(ii)	Butyric Acid
(c)	*Monascus purpureus*	(iii)	Citric Acid
(d)	*Aspergillus niger*	(iv)	Blood cholesterol lowering agent

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

47. Match the organism with its use in biotechnology.

(a)	*Bacillus thuringiensis*	(i)	Cloning vector
(b)	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
(c)	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
(d)	*Salmonella typhimurium*	(iv)	Cry proteins

Select the **correct** option from the following :

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

48. Which of the following would help in prevention of diuresis ?

(1) Atrial natriuretic factor causes vasoconstriction

(2) Decrease in secretion of renin by JG cells

(3) More water reabsorption due to undersecretion of ADH

(4) Reabsorption of Na^+ and water from renal tubules due to aldosterone

49. The enzyme enterokinase helps in conversion of :

(1) caseinogen into casein

(2) pepsinogen into pepsin

(3) protein into polypeptides

(4) trypsinogen into trypsin

50. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Pituitary gland	(i)	Grave's disease
(b)	Thyroid gland	(ii)	Diabetes mellitus
(c)	Adrenal gland	(iii)	Diabetes insipidus
(d)	Pancreas	(iv)	Addison's disease

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