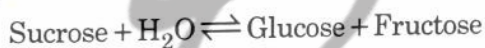


1. Identify the **incorrect** statement.

- (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 $\text{Cr}_2\text{O}_7^{2-}$ are not the same.

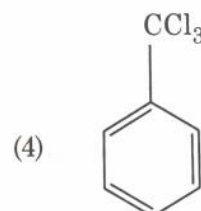
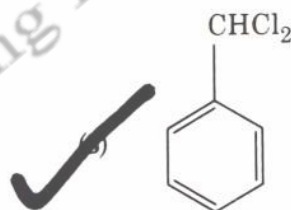
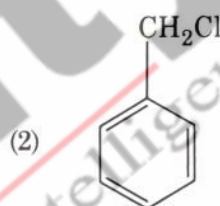
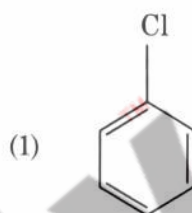
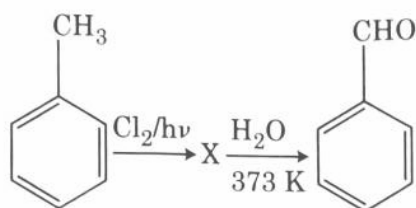
2. Hydrolysis of sucrose is given by the following reaction.



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) $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- (2) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- (3) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
- (4) $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$

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



4. Identify the **incorrect** match.

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

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

Röntgenium

5. Which of the following is **not** correct about carbon monoxide ?
- It forms carboxyhaemoglobin.
 - It reduces oxygen carrying ability of blood. The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
 - It is produced due to incomplete combustion.
6. Which of the following alkane cannot be made in good yield by Wurtz reaction ?
- n-Hexane
 - 2,3-Dimethylbutane
 - n-Heptane
 - n-Butane
7. Paper chromatography is an example of :
- Adsorption chromatography
 - Partition chromatography
 - Thin layer chromatography
 - Column chromatography
8. Identify the **correct** statement from the following :
- Wrought iron is impure iron with 4% carbon.
 - Blister copper has blistered appearance due to evolution of CO_2 .
 - Vapour phase refining is carried out for Nickel by Van Arkel method.
 - Pig iron can be moulded into a variety of shapes.
9. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?
- $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
 - $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
 - $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
 - $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
10. 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 ?
- CuSO_4
 - $[\text{Cu}(\text{NH}_3)_4]^{2+}$
 - $\text{Cu}(\text{OH})_2$
 - $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
11. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl . Which of the following compound(s) crystallise(s) ?
- Both MgCl_2 and CaCl_2
 - Only NaCl
 - Only MgCl_2
 - NaCl , MgCl_2 and CaCl_2
12. The calculated spin only magnetic moment of Cr^{2+} ion is :
- 3.87 BM
 - 4.90 BM
 - 5.92 BM
 - 2.84 BM
13. Match the following and identify the **correct** option.
- | | |
|--|---|
| (a) $\text{CO}(\text{g}) + \text{H}_2(\text{g})$ | (i) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$ |
| (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) |
14. For the reaction, $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$, the **correct** option is :
- $\Delta_r H > 0$ and $\Delta_r S > 0$
 - $\Delta_r H > 0$ and $\Delta_r S < 0$
 - $\Delta_r H < 0$ and $\Delta_r S > 0$
 - $\Delta_r H < 0$ and $\Delta_r S < 0$
15. 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}): $\text{N} = 14$, $\text{Ar} = 40$]
- 9 bar
 - 12 bar
 - 15 bar
 - 18 bar

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

- (1) Hydrogen gas
 (2) Oxygen gas
 (3) H₂S gas
 (4) SO₂ gas

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

- (1) -I effect of -CH₃ groups
 (2) +R effect of -CH₃ groups
 (3) -R effect of -CH₃ groups
 (4) Hyperconjugation

18. 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

19. The number of Faradays (F) required to produce 20 g of calcium from molten CaCl₂ (Atomic mass of Ca = 40 g mol⁻¹) is :

- (1) 1
 (2) 2
 (3) 3
 (4) 4

20. Sucrose on hydrolysis gives :

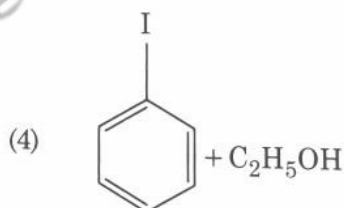
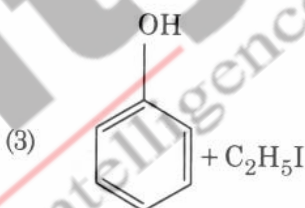
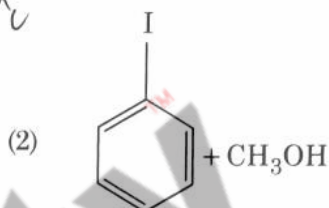
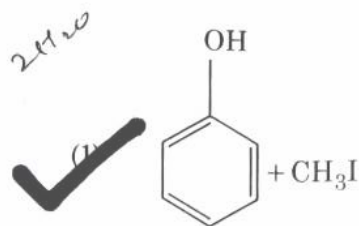
- (1) β-D-Glucose + α-D-Fructose
 (2) α-D-Glucose + β-D-Glucose
 (3) α-D-Glucose + β-D-Fructose
 (4) α-D-Fructose + β-D-Fructose

21. The rate constant for a first order reaction is $4.606 \times 10^{-3} \text{ s}^{-1}$. 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

$$k = \frac{2.303}{t} \log \frac{[A]_0}{[A]}$$

22. Anisole on cleavage with HI gives :



23. 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

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

- (1) Serine
 (2) Alanine
 (3) Tyrosine
 (4) Lysine

25. 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)

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

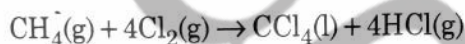
- (1) activation energy
 (2) heat of reaction
 (3) threshold energy
 (4) collision frequency

27. The number of protons, neutrons and electrons in

${}_{71}^{175}\text{Lu}$ respectively, are :

- (1) 71, 104 and 71
 (2) 104, 71 and 71
 (3) 71, 71 and 104
 (4) 175, 104 and 71

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



- (1) +4 to +4
 (2) 0 to +4
 (3) -4 to +4
 (4) 0 to -4

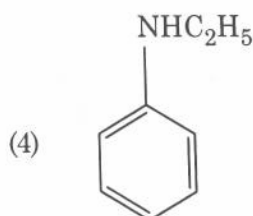
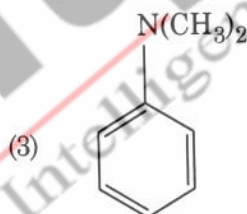
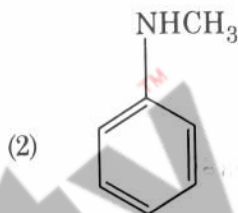
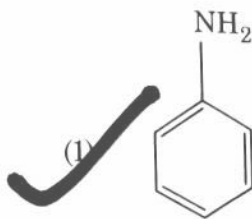
29. Match the following :

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)

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



31. 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 $w > 0$

32. Identify a molecule which does not exist.

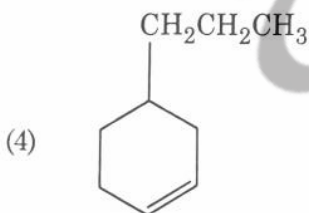
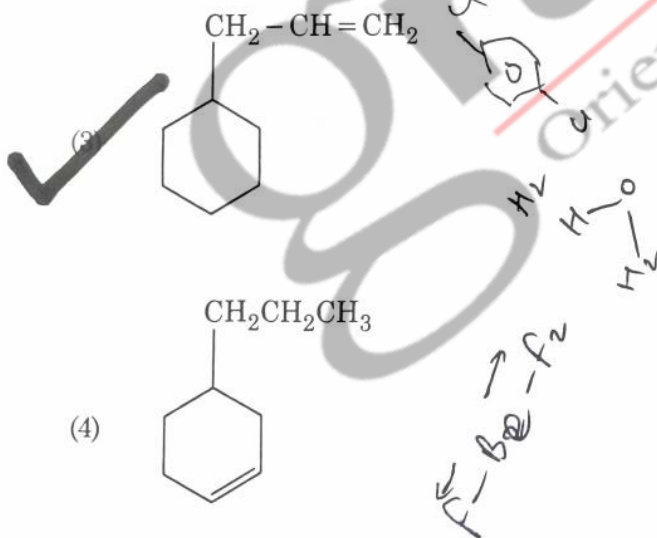
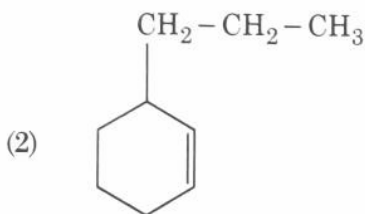
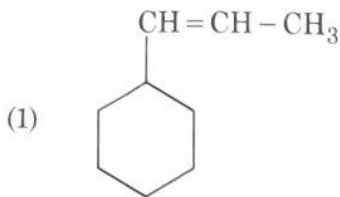
- (1) He_2
 (2) Li_2
 (3) C_2
 (4) O_2

E4

33. Which of the following is a natural polymer ?

- (1) *cis*-1,4-polyisoprene
- (2) poly (Butadiene-styrene)
- (3) polybutadiene
- (4) poly (Butadiene-acrylonitrile)

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



35. 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

6

36. The freezing point depression constant (K_f) of benzene is $5.12 \text{ K kg mol}^{-1}$. 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

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

- (1) Ethanol + Acetone
- (2) Benzene + Toluene
- (3) Acetone + Chloroform
- (4) Chloroethane + Bromoethane

38. 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]

39. 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

40. 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

41. 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
42. Which of the following is a cationic detergent ?
- (1) Sodium lauryl sulphate
 - (2) Sodium stearate
 - (3) Cetyltrimethyl ammonium bromide
 - (4) Sodium dodecylbenzene sulphonate
43. 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
44. Find out the solubility of $\text{Ni}(\text{OH})_2$ in 0.1 M NaOH. Given that the ionic product of $\text{Ni}(\text{OH})_2$ is 2×10^{-15} .
- (1) 2×10^{-13} M
 - (2) 2×10^{-8} M
 - (3) 1×10^{-13} M
 - (4) 1×10^8 M
45. Which of the following oxoacid of sulphur has -O-O- linkage ?
- (1) H_2SO_3 , sulphurous acid
 - (2) H_2SO_4 , sulphuric acid
 - (3) $\text{H}_2\text{S}_2\text{O}_8$, peroxodisulphuric acid
 - (4) $\text{H}_2\text{S}_2\text{O}_7$, pyrosulphuric acid
46. Bilaterally symmetrical and acoelomate animals are exemplified by :
- (1) Ctenophora
 - (2) Platyhelminthes
 - (3) Aschelminthes
 - (4) Annelida
47. Which of the following is **not** an inhibitory substance governing seed dormancy ?
- (1) Gibberellic acid
 - (2) Abscisic acid
 - (3) Phenolic acid
 - (4) Para-ascorbic acid
48. Match the following columns and select the **correct** option.
- | | Column - I | Column - II |
|-----|-----------------------|---|
| (a) | Placenta | (i) Androgens |
| (b) | Zona pellucida | (ii) Human Chorionic Gonadotropin (hCG) |
| (c) | Bulbo-urethral glands | (iii) Layer of the ovum |
| (d) | Leydig cells | (iv) Lubrication of the Penis |
- | | (a) | (b) | (c) | (d) |
|-----|-------|-------|------|-------|
| (1) | (iv) | (iii) | (i) | (ii) |
| (2) | (i) | (iv) | (ii) | (iii) |
| (3) | (iii) | (ii) | (iv) | (i) |
| (4) | (ii) | (iii) | (iv) | (i) |
49. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?
- (1) ZIFT and IUT
 - (2) GIFT and ZIFT
 - (3) ICSI and ZIFT
 - (4) GIFT and ICSI
50. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :
- (1) CH_4 , H_2 , NH_3 and water vapor at 800°C
 - (2) CH_3 , H_2 , NH_4 and water vapor at 800°C
 - (3) CH_4 , H_2 , NH_3 and water vapor at 600°C
 - (4) CH_3 , H_2 , NH_3 and water vapor at 600°C