1. The sp^3 hybridisation is present on the central atom of
(a) HCHO (b) BCl_3
(c) PCl_3 (d) SO_3

2. The number of unit cells in the 5.85 g crystals of NaCl are
(a) 1.5×10^{23} (b) 1.5×10^{22}
(c) 3.0×10^{22} (d) 3.0×10^{23}

3. The oxidation number of sulphur is -1 in
(a) H_2S (b) FeS_2
(c) CS_2 (d) Cu_2S

4. For which of the following metals, the electronic configuration of valence shell is not d^6?
(a) Fe (II) (b) Mn (II)
(c) Co (III) (d) Ni (IV)

5. 68 g sugar ($C_{12}H_{22}O_{11}$) is dissolved in 1 kg of water. What is the mole fraction of sugar?
(a) 0.018 (b) 0.036
(c) 0.0018 (d) 0.0036

6. The pH of 0.1 M aqueous ammonia ($K_b = 1.8 \times 10^{-5}$) is
(a) 9.13 (b) 10.13
(c) 11.13 (d) 12.13

7. From the following mixtures, which is not a buffer (concentration level 0.5 M)?
(a) $CH_3COOH + NaOH$ (2 : 1)
(b) $HCl + NH_3$ (aq) (1 : 2)
(c) $CH_3COOH + NaOH$ (1 : 2)
(d) $HCl + NH_3$ (2 : 3)

8. How much volume (in litre) of 3M NaOH is obtained from 80 g NaOH? (Atomic mass of Na = 23 u)
(a) 2.67 (b) 1.34
(c) 0.67 (d) 0.33

9. The initial concentration of sugar solution is 0.12 M. On doing fermentation the concentration of sugar decreases to 0.06 M in 10 h and to 0.045 M in 15 h. The order of the reaction is
(a) 0.5 (b) 1.0
(c) 1.5 (d) 2.0

10. For the decomposition of N_2O and O_2 in presence of Ar, the velocity constant, k is

$$k = 5 \times 10^{11}\, e^{-30,000/T}$$

For this, the activation energy is (in kJ mol^{-1})
(a) 2.494 (b) 24.94
(c) 249.4 (d) 2494

11. The following equilibrium establishes on heating 0.2 mole of H_2 and 1.0 mole of sulphur in 1 L vessel at 90°C.

$$H_2(g) + S(s) \rightleftharpoons H_2S(g);\ K = 6.8 \times 10^{-2}$$

The partial pressure of H_2S in equilibrium state is
(a) 4.20 (b) 0.42
(c) 0.21 (d) 0.042

12. An aqueous solution boils at 100.2°C. At which temperature this will freeze.
($K_b = 0.5°C/m$, $K_f = 1.9°C/m$)
(a) + 0.76 (b) − 0.76
(c) − 0.38 (d) + 0.38

13. The lowest pK_a value is for
(a) phenol (b) *m*-cresol
(c) *o*-cresol (d) *p*-cresol

14. At room temperature, the least stable compound is
(a) CH_3COCl (b) HCOCl
(c) CH_3COOH (d) $(CH_3CO)_2O$

15. For the conversion of $CH_2{=}CH_2$ into $HOOC.CH_2CH_2COOH$, the minimum number of steps required are
(a) 2 (b) 3
(c) 4 (d) 5

16. Which of the following compounds does not give two isomer compounds on reaction with NH_2OH?
(a) $CH_3COC_2H_5$ (b) CH_3COCH_3
(c) CH_3CHO (d) $PhCOCH_3$

17. From the following which is not a reactant, reagent or product in Hoffmann reaction?
(a) $RCONH_2$ (b) RNH_2
(c) Br_2, OH^- (d) H_2SO_4

18. The total number of isomers for cyclic alcohol C_4H_7OH is
(a) 2 (b) 3 (c) 4 (d) 5

19. The least stable free radical is
(a) $\dot{C}H_2CH_2CH(CH_3)_2$ (b) $CH_3\dot{C}HCH(CH_3)_2$
(c) $CH_3CH_2\dot{C}(CH_3)_2$ (d) $\dot{C}H_3$

20. The suitable reagent for the reduction of C_2H_5COOH into C_3H_7OH is
(a) BH_3 / THF and H_3O^+
(b) $NaBH_4$
(c) Na / EtOH
(d) H_2 / catalyst

21. The blue colour of acidic solution of $Cr_2O_7^{2-}$ is not changed into green by
(a) $C_6H_5CH_2OH$
(b) $(CH_3)_2CHOH$
(c) $CH_3CH_2CH_2CH_2OH$
(d) $(CH_3)_3COH$

22. The reaction of C_2H_5Cl with Li and CuI gives mainly
(a) 2-butene (b) 1,3-butadiene
(c) *n*-butane (d) *n*-butyl chloride

23. The reagent which does not convert *n*-butyl chloride into *n*-butane is
(a) Zn, HCl
(b) $LiAlH_4$
(c) Mg, Anhydrous ether, H_2O
(d) B_2H_6 in THF

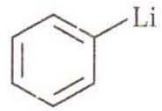
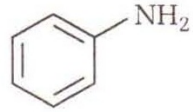
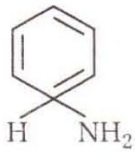
24. The correct order of stability is
(a) Pentane < *iso*-pentane < *neo*-pentane
(b) *iso*-pentane < *neo*-pentane < pentane
(c) *neo*-pentane < *iso*-pentane < pentane
(d) Pentane < *neo*-pentane < *iso*-pentane

25. The correct order of boiling point of ethyl dimethyl amine (*A*), *n*-butyl amine (*B*) and diethyl amine (*C*) is
(a) $B > C > A$ (b) $B > A > C$
(c) $A > B > C$ (d) $C > B > A$

26. Which of the following compounds does not give iodoform test?
(a) $CH_3COCH_2COOC_2H_5$
(b) $PhCH_2COCH_3$
(c) $Me_3C.COCH_3$
(d) CH_3COCH_3

27. The species which acts as both nucleophile and electrophile is
(a) CH_3CN (b) NH_3
(c) $P(CH_3)_2$ (d) H_2

28. The most basic from the following is
(a) NH_3 (b) CH_3NH_2
(c) NF_3 (d) $N(SiH_3)_3$

29. The main product of the reaction of benzene with lithium in liquid ammonia and EtOH is
(a) 
(b) 
(c) 
(d) 

30. The rate of free radical chlorination of CH_4 is
(a) equal to CD_4
(b) double the rate of CD_4
(c) 12 times the rate of CD_4
(d) less than the rate of CD_4

31. The first ionisation energy difference is maximum for which pair?
(a) Na, Mg (b) K, Ca
(c) Rb, Sr (d) Cs, Ba

32. The ratio of third Bohr orbit radius and second Bohr orbit radius for the hydrogen atom is
(a) 0.5 (b) 1.5
(c) 0.75 (d) 2.25

33. The principal quantum number of Mn for those valence shell orbits in which electrons are filled
(a) 4, 3 (b) 4, 4
(c) 3, 3 (d) 5, 4

34. From the generally known oxidation states, the oxidation number is maximum for
(a) Mn (b) Cu
(c) Sn (d) Sc

35. The number of molecules in 180 g of heavy water are
(a) 6.02×10^{24} (b) 6.02×10^{22}
(c) 5.42×10^{24} (d) 5.42×10^{23}

36. Which of the following is reduced by H_2O_2?
(a) Cl_2 (b) $[Fe(CN)_6]^{4-}$
(c) NH_2OH (d) SO_3^{2-}

37. The maximum energy molecular orbit filled by electron in nitrogen molecule is/are
(a) $\sigma 2p_z$ (b) $\pi 2p_x \approx \pi 2p_y$
(c) $\pi^* 2p_x \approx \pi^* 2p_y$ (d) $\sigma^* 2p_z$

38. Which of the following is correct order for density ?
(a) Cs > Rb > K > Na (b) Cs > Rb > Na > K
(c) Rb > Cs > K > Na (d) Rb > Cs > Na > K

39. The correct order of dipole moment is
(a) $BF_3 < H_2S < H_2O$ (b) $H_2S < BF_3 < H_2O$
(c) $H_2O < H_2S < BF_3$ (d) $H_2O < BF_3 < H_2S$

40. Which of the following bond has minimum bond energy?
(a) C — H
(b) N — H
(c) O — H
(d) F — H

Answer – Key

1. c	**2. b**	**3. b**	**4. b**	**5. d**	**6. c**	**7. c**	**8. c**	**9. b**	**10. c**
11. b	12. b	13. a	14. b	15. a	16. b	17. d	18. b	19. d	20. a
21. d	22. c	23. d	24. a	25. a	26. a	27. a	28. b	29. c	30. c
31. a	32. d	33. a	34. a	35. c	36. a	37. a	38. b	39. a	40. b