1. How many moles of helium gas occupy 22.4 L at 0°C and 1 atm pressure?
   (a) 0.11 (b) 1.11
   (c) 0.90 (d) 1.0
2. The compound which contains both ionic and covalent bond
   (a) KCl (b) KCN
   (c) CH_4 (d) H_2
3. The following is endothermic reaction
   (a) Decomposition of water
   (b) Conversion of graphite to diamond
   (c) Dehydrogenation of ethane to ethylene
   (d) All of the above
4. A saturated solution of Ag_2SO_4 is 2.5×10^{-2} M. The value of its solubility product is
   (a) 62.5×10^{-6} (b) 6.25×10^{-4}
   (c) 15.625×10^{-6} (d) 3.125×10^{-6}
5. The enthalpies of combustion of carbon and carbon monoxide are –393.5 and –283 kJ mol^{-1} respectively. The enthalpy of formation of carbon monoxide per mole is
   (a) 110.5 kJ (b) 676.5 kJ
   (c) –676.5 kJ (d) –110.5 kJ
6. 1 g ice absorbs 335 J of heat to melt at 0°C. The entropy change will be
   (a) 1.2 J K^{-1} mol^{-1} (b) 335 JK^{-1} mol^{-1}
   (c) 22.1 JK^{-1} mol^{-1} (d) 0.8 JK^{-1} mol^{-1}
7. An ideal gas can't be liquefied because
   (a) its critical temperature is always above 0°C
   (b) its molecules are relatively smaller in size
   (c) it solidifies before becoming a liquid
   (d) forces operative between its molecules are negligible
8. What type of crystal defect is indicated in the diagram below?

   Na^+ Cl^- Na^+ Cl^- Na^+ Cl^-

   Cl^- Cl^- Na^+ Na^+

   Na^+ Cl^- Cl^- Na^+ Cl^-

   Cl^- Na^+ Cl^- Na^+ Na^+

   (a) Frenkel defect
   (b) Schottky defect
   (c) Interstitial defect
   (d) Frenkel and Schottky defects
9. A metal has bcc structure and the edge length of its unit cell is 3.04 Å. The volume of the unit cell in cm^3 will be
   (a) 1.6×10^{-21} cm^3 (b) 2.81×10^{-23} cm^3
   (c) 6.02×10^{-23} cm^3 (d) 6.6×10^{-24} cm^3
10. Peptisation denotes
    (a) digestion of food
    (b) hydrolysis of proteins
    (c) breaking and dispersion into the colloidal state
    (d) precipitation of solid from colloidal dispersion
11. Plaster of Paris is
    (a) $CaSO_4 \cdot 2H_2O$ (b) $CaSO_4 \cdot H_2O$
    (c) $CaSO_4 \cdot \frac{1}{2} H_2O$ (d) $CaSO_4 \cdot 4H_2O$
12. Conc. HNO_3 reacts with I_2 to form
    (a) HI (b) HOI
    (c) HIO_2 (d) HIO_3

13. Coal gas is a mixture of
(a) H_2O and CO (b) H_2, CO and CH_4
(c) H_2 and CO (d) CH_4 and CO

14. Stainless steel contains
(a) Fe + Cr + Cu (b) Fe + Cu + Ni
(c) Fe + Cr + Ni (d) Fe +Ni + Cu

15. The isomers which can be converted into another form by rotation of the molecule around single bond are
(a) geometrical isomers
(b) conformers
(c) enantiomers
(d) diastereomers

16. An organic compound contains 49.3% carbon, 6.84% hydrogen and its vapour density is 73. Molecular formula of the compound is
(a) $C_3H_5O_2$ (b) $C_4H_{10}O_2$
(c) $C_6H_{10}O_4$ (d) $C_3H_{10}O_2$

17. Ozone in stratosphere is depleted by
(a) CF_2Cl_2 (b) C_7F_{16}
(c) $C_6H_6Cl_6$ (d) C_6F_6

18. Iodine is formed when KI reacts with a solution of
(a) $CuSO_4$ (b) $(NH_4)_2SO_4$
(c) $ZnSO_4$ (d) $FeSO_4$

19. Select the correct order of the strength of acids given below
(a) $HClO_4 < HClO_3 < HClO < HClO_2$
(b) $HClO_4 < HClO_3 < HClO_2 < HClO$
(c) $HClO < HClO_2 < HClO_3 < HClO_4$
(d) None of the above

20. Which one of the following statements regarding helium is incorrect?
(a) It is used to fill gas balloons instead of hydrogen because it is lighter and non-inflammable
(b) It is used as a cryogenic agent for carrying out experiments at low temperatures
(c) It is used to produce and sustain powerful superconducting magnets
(d) It is used in gas-cooled nuclear reactors

21. One would expect proton to have very large
(a) ionisation potential
(b) radius
(c) charge
(d) hydration energy

22. What is the correct orbital designation of an electron with the quantum number,
$n = 4, l = 3, m = -2, s = \frac{1}{2}$?
(a) $3s$ (b) $4f$
(c) $5p$ (d) $6s$

23. The energy of an electron in second Bohr orbit of hydrogen atom is
(a) -5.44×10^{-19} eV (b) -5.44×10^{-19} cal
(c) -5.44×10^{-19} kJ (d) -5.44×10^{-19} J

24. One of the following has greatest electron affinity. Identify it.
(a) O (b) S
(c) Se (d) Te

25. The ONO angle is maximum in
(a) NO_3^- (b) NO_2^-
(c) NO_2 (d) NO_2^+

26. The pH value for $\frac{1}{1000}$ N-KOH solution is
(a) 3 (b) 10^{-11}
(c) 2 (d) 11

27. The equilibrium constant for a reaction,
$$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$$
is 4×10^{-4} at 2000 K. In the presence of catalyst, the equilibrium is attained 10 times faster. The equilibrium constant in presence of catalyst at 2000 K is
(a) 10×10^{-4} (b) 4×10^{-2}
(c) 4×10^{-4} (d) 40×10^{-4}

28. Consider the following $E°$ values
$$E^\circ_{Fe^{3+}/Fe^{2+}} = +0.77\ V$$
$$E^\circ_{Sn^{2+}/Sn} = -0.14\ V$$
Under standard conditions the potential for the reaction,
$Sn(s) + 2Fe^{3+}(aq) \longrightarrow 2Fe^{2+}(aq) + Sn^{2+}(aq)$
is
(a) 1.68 V (b) 1.40 V
(c) 0.91 V (d) 0.63 V

29. The relationship between the values of osmotic pressure of 0.1 M solutions of $KNO_3(p_1)$ and $CH_3COOH(p_2)$ is
(a) $\frac{p_1}{p_1 + p_2} = \frac{p_2}{p_1 + p_2}$ (b) $p_1 > p_2$
(c) $p_2 > p_1$ (d) $p_1 = p_2$

30. Volume of 0.6 M NaOH required to neutralise 30 cm^3 of 0.4 M HCl is

(a) 30 cm^3 (b) 45 cm^3
(c) 20 cm^3 (d) 50 cm^3

31. For *n*th order reaction, the half-life period, $t_{1/2}$ is proportional to initial concentration as
(a) $\frac{1}{a^{n-1}}$ (b) a^{n+1}
(c) a^{n-1} (d) $\frac{1}{a^n}$

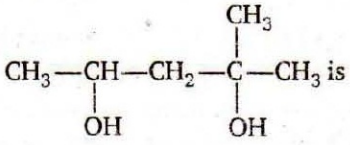
32. Thermite is a mixture of
(a) $Cr_2O_3 + Al_2O_3$ (b) $Fe_2O_3 + Al$
(c) $Fe_2O_3 + Al_2O_3$ (d) $Al_2O_3 + 2Cr$

33. Of the ions Zn^{2+}, Ni^{2+} ad Cr^{3+} (atomic number of Zn = 30, Ni = 28 and Cr = 24)
(a) all these are colourless
(b) all these are coloured
(c) only Ni^{2+} is coloured and Zn^{2+} and Cr^{3+} are colourless
(d) only Zn^{2+} is colourless and Ni^{2+} and Cr^{3+} are coloured

34. The coordination number of a central metal atom in a complex is determined by
(a) the number of ligands around a metal ion bonded by σ-bonds
(b) the number of ligands around a metal ion bonded by π-bonds
(c) the number of ligands around a metal ion bonded by σ and π-bonds both
(d) the number of only anionic ligands bonded to the metal ion

35. Potassium ferricyanide on ionisation produces
(a) 2 ions (b) 1 ion
(c) 3 ions (d) 4 ions

36. The IUPAC name of



(a) 1,1-dimethyl-1,3-butanediol
(b) 2-methyl-2,4-pentanediol
(c) 4-methyl-2,4-pentanediol
(d) 1,3,3-trimethyl-1,3-propane diol

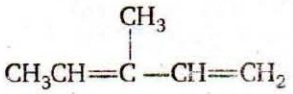
37. The order of decreasing stability of the carbanions is

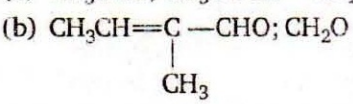
$(CH_3)_3\bar{C}(1)$, $(CH_3)_2\bar{C}H(2)$, $CH_3\bar{C}H_2(3)$,

$C_6H_5\bar{C}H_2(4)$

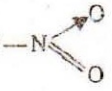
(a) 1 > 2 > 3 > 4 (b) 4 > 3 > 2 > 1
(c) 1 > 2 > 4 > 3 (d) 4 > 1 > 2 > 3

38. Which set of products is expected on reductive ozonolysis of the following diolefin?



(a) CH_3CHO; $CH_3COCH{=}CH_2$
(b) 
(c) CH_3CHO; CH_3COCHO; CH_2O
(d) CH_3CHO; CH_3COCH_3; CH_2O

39. Which of the following pairs is/are correctly matched?

	Reaction	Product
I.	$RX + AgCN$	RNC
II.	$RX + KCN$	RCN
III.	$RX + KNO_2$	
IV.	$RX + AgNO_2$	$R-O-N=O$

Select the correct answer using the codes given below
(a) I alone (b) I and II
(c) III and IV (d) I, II, III and IV

40. A mixture of benzaldehyde and formaldehyde on heating with aqueous NaOH solution gives
(a) benzyl alcohol and sodium formate
(b) sodium benzoate and methyl alcohol
(c) sodium benzoate and sodium formate
(d) benzyl alcohol and methyl alcohol

41. Which of the following react with NaOH to produce an acid and an alcohol?
(a) HCHO (b) CH_3COOH
(c) CH_3CH_2COOH (d) C_6H_5COOH

42. Which of the following has the maximum acidic strength?
(a) *o*-nitrobenzoic acid
(b) *m*-nitrobenzoic acid
(c) *p*-nitrobenzoic acid
(d) *p*-nitrophenol

43. Fenton's reagent is
(a) Zn + HCl (b) Sn + HCl
(c) $FeSO_4 + H_2O_2$ (d) None of these

44. The energy stored in the cells of a living body is in the form of
(a) fats (b) glucose
(c) ATP (d) proteins

45. Saccharin is a/an
(a) aliphatic hydrocarbon
(b) polynuclear compound
(c) sweetening agent
(d) sugar

46. The nucleic acid the purine base having two possible binding sites is
(a) thymine (b) cytosine
(c) guanine (d) adenine

47. On reduction secondary amine is given by
(a) nitroethane (b) methylcyanide
(c) methylisocyanide (d) nitrobenzene

48. In chlorobenzene solution, the basic strength of amines increases in the order
(a) $(C_2H_5)_3N < (C_2H_5)_2NH < C_2H_5NH_2$
(b) $C_2H_5NH_2 < (C_2H_5)_2NH < (C_2H_5)_3N$
(c) $(C_2H_5)_2NH < C_2H_5NH_2 < (C_2H_5)_3N$
(d) $(C_2H_5)_3N < C_2H_5NH_2 < (C_2H_5)_2NH$

49. Dimethyl terephthalate and ethylene glycol react to form
(a) nylon-6 (b) nylon-66
(c) dacron (d) neoprene

50. Gasoline is a mixture of
(a) C_6—C_{11} alkanes (b) C_3—C_5 alkanes
(c) C_7—C_9 alkanes (d) C_{15}—C_{20} alkanes

Answer – Key

1. d	2. b	3. d	4. a	5. d	6. c	7. d	8. b	9. b	10. c
11. c	12. d	13. b	14. c	15. b	16. c	17. a	18. a	19. c	20. c
21. d	22. b	23. d	24. b	25. d	26. d	27. c	28. c	29. b	30. c
31. a	32. b	33. d	34. a	35. d	36. b	37. b	38. c	39. b	40. a
41. a	42. a	43. c	44. c	45. c	46. d	47. c	48. b	49. c	50. c