Kerala Medical Entrance Examination 2007
Chemistry and Physics

1. Which one of the following is **not** a correct match

Polymer	*Monomer/s*
(A) Teflon	Tetrafluoroethylene
(B) Plexi glass	Methyl methacrylate
(C) Orlon	Glycerol, Phthalic anhydride
(D) Buna-S	Styrene, 1,3-butadiene
(E) Thiokol	Ethylene dichloride, sodium tetrasulphide

2. Which one of the following statements about aminoacids is **not** true ?

(A) They are constituents of all proteins

(B) They are all high melting solids

(C) Most naturally occuring aminoacids have D-configuration

(D) They are characterized by isoelectric point

(E) Glycine is the only naturally occurring aminoacid which is optically inactive

3. The vitamin which is neither soluble in water nor in fat is

(A) biotin (B) phylloquinone (C) thiamine

(D) ergocalciferol (E) pyridoxine

4. Which of the following is used as a "morning after pill"

(A) Norethindrone (B) Ethynylestradiol (C) Mifepristone

(D) Bithional (E) Promethazine

5. An insoluble dye is reduced to a soluble colourless leuco form by an alkaline reducing agent. The fibre is soaked in the dye solution and then exposed to air to develop the colour. The dye is

(A) mordant dye (B) vat dye (C) azo dye (D) direct dye (E) disperse dye

6. Detergents are known to pollute rivers and waterways. However, detergents can be made biodegradable and pollution free by taking

(A) cyclic hydrocarbon chain (B) shorter hydrocarbon chain

(C) unbranched hydrocarbon chain (D) hydrocarbon with more branching

(E) benzenoid hydrocarbons

7. The crystalline salt $Na_2SO_4.xH_2O$ on heating loses 55.9% of its weight. The formula of crystalline salt is

(A) $Na_2SO_4.5H_2O$ (B) $Na_2SO_4.7H_2O$ (C) $Na_2SO_4.2H_2O$

(D) $Na_2SO_4.10H_2O$ (E) $Na_2SO_4.6H_2O$

8. 10 litres of O_2 gas is reacted with 30 litres of CO gas at STP. The volumes of each gas present at the end of the reaction are

(A) CO = 10 litres, CO_2 = 20 litres (B) O_2 = 10 litres, CO = 30 litres

(C) CO = 20 litres, CO_2 = 10 litres (D) O_2 = 10 litres, CO_2 = 20 litres

(E) O_2 = 10 litres, CO = 10 litres

9. What is the maximum number of electrons in an atom that can have the following quantum numbers $n = 4$, $m_l = +1$

(A) 4 (B) 15 (C) 3 (D) 1 (E) 6

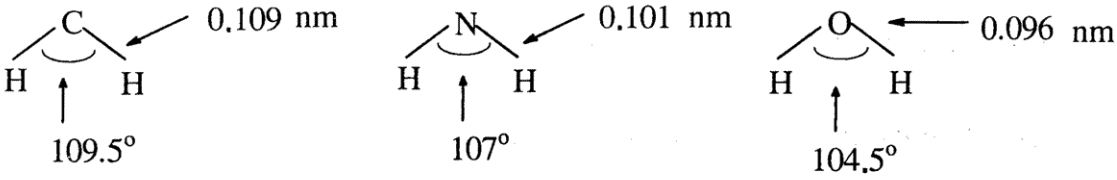
10. The correct order of bond order values among the following

a. NO^- b. NO^+ c. NO d. NO^{2+} e. NO^{2-} is

(A) a < d < c < b < e (B) d = b < a < e < c (C) e < a < d = c < b

(D) b < c < d < a < e (E) e < a < d < c < b

11. The bond lengths and bond angles in the molecules of methane, ammonia and water are given below



This variation in bond angle is a result of

1. the increasing repulsion between hydrogen atoms as the bond length decreases
2. the number of non-bonding electron pairs in the molecule
3. A non-bonding electron pair having a greater repulsive force than a bonding electron pair

(A) 1, 2 and 3 are correct (B) 1 and 2 only are correct

(C) 2 and 3 only are correct (D) 1 only is correct (E) 3 only is correct

12. Which one of the following pairs consists of only paramagnetic species ?

(A) [O_2, NO] (B) [O_2^+, O_2^{2-}] (C) [CO, NO]

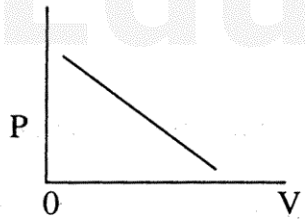
(D) [NO, NO^+] (E) [O_2^{2-}, N_2^-]

13. A 4:1 mixture of helium and methane is contained in a vessel at 10 bar pressure. Due to a hole in the vessel, the gas mixture leaks out. The composition of mixture effusing out initially is

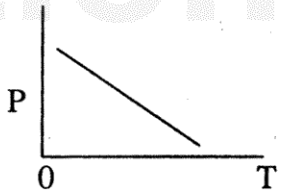
(A) 8 : 1 (B) 8 : 3 (C) 4 : 1 (D) 1 : 1 (E) 2 : 1

14. Which of the following diagrams correctly describes the behaviour of a fixed mass of an ideal gas ? (T is measured in K)

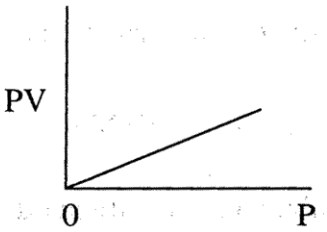
(A) Constant T



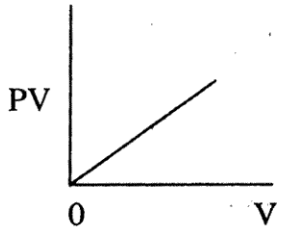
(B) Constant V



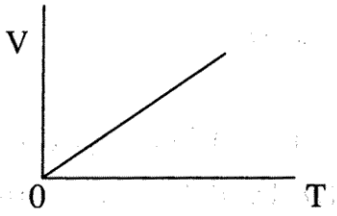
(C) Constant T



(D) Constant T



(E) Constant P



15. If the ratio of masses of SO_3 and O_2 gases confined in a vessel is 1:1, then the ratio of their partial pressures would be

(A) 5 : 2 (B) 2 : 5 (C) 2 : 1 (D) 1 : 2 (E) 1 : 1

16. The hybridization of oxygen atom in H_2O_2 is

(A) sp^3d (B) sp (C) sp^2 (D) sp^3 (E) sp^3d^2

17. The electronic configurations of four elements are given below. Arrange these elements in the correct order of the magnitude (without sign) of their electron affinity

1. $2s^2\ 2p^5$
2. $3s^2\ 3p^5$
3. $2s^2\ 2p^4$
4. $3s^2\ 3p^4$

Select the correct answer using the codes given below

(A) $1 < 2 < 4 < 3$ (B) $2 < 1 < 4 < 3$ (C) $1 < 3 < 4 < 2$

(D) $3 < 4 < 2 < 1$ (E) $3 < 4 < 1 < 2$

18. The electronic configuration of the atom having maximum difference in first and second ionization energies is

(A) $1s^2, 2s^2, 2p^6, 3s^1$ (B) $1s^2, 2s^2, 2p^6, 3s^2$ (C) $1s^2, 2s^2, 2p^1$

(D) $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$ (E) $1s^2, 2s^2, 2p^3$

19. Among the metals Cr, Fe, Mn, Ti, Ba and Mg, the one that cannot be obtained by reduction of its metal oxide by aluminium is

(A) Cr (B) Fe (C) Mn (D) Ba (E) Mg

20. Potassium superoxide finds use in breathing equipment and safeguards the user to breathe in oxygen generated internally in the apparatus without being exposed to the toxic fumes outside. The supply of oxygen is due to

1. Slow decomposition of KO_2
2. Reaction of superoxide with moisture in the exhaled air
3. Reaction of KO_2 with CO_2 in the exhaled air

(A) 1, 2 and 3 are correct (B) 2 and 3 only are correct

(C) 3 only is correct (D) 1 and 2 only are correct

(E) 2 only is correct

21. For which one of the following minerals, the composition given is incorrect ?

(A) Glauber's salt – $Na_2SO_4.10H_2O$

(B) Borax – $Na_2B_4O_7.7H_2O$

(C) Carnallite – $KCl.MgCl_2.6H_2O$

(D) Soda ash – Na_2CO_3

(E) Epsom salt – $MgSO_4.7H_2O$

22. Which of the following is the correct order of increasing enthalpy of vapourisation ?

(A) $NH_3<PH_3<AsH_3$ (B) $AsH_3<PH_3<NH_3$ (C) $PH_3<AsH_3<NH_3$

(D) $NH_3<AsH_3<PH_3$ (E) $AsH_3<NH_3<PH_3$

23. Chlorine reacts with excess of ammonia to form

(A) NH_4Cl (B) $N_2 + HCl$ (C) $N_2 + NH_4Cl$

(D) $N_2 + NCl_3$ (E) $NCl_3 + HCl$

24. Match the compounds in the List I with that in List II

List I		List II
a.	XeO_3	1. Planar triangular
b.	$XeOF_4$	2. T-shape
c.	BO_3^{3-}	3. Trigonal pyramid
d.	ClF_3	4. Square pyramid
e.	$I_{3\,(aq.)}^-$	5. Linear
		6. Bent

(A) a – 1, b – 4, c – 3, d – 2, e – 5 (B) a – 2, b – 4, c – 1, d – 3, e – 6

(C) a – 3, b – 4, c – 1, d – 2, e – 6 (D) a – 3, b – 4, c – 1, d – 2, e – 5

(E) a – 3, b – 4, c – 2, d – 1, e – 5

25. The dark blue colour of the solution formed when excess of ammonia is added to a solution of copper (II) sulphate is due to the presence of the ion

(A) $[Cu(OH)_4(H_2O)_2]^{2-}$ (B) $[Cu(H_2O)_6]^{2+}$ (C) $[Cu(NH_4)_2(H_2O)_4]^{4+}$

(D) $[Cu(NH_3)_2(H_2O)_4]^{2+}$ (E) $[Cu(NH_3)_4(H_2O)_2]^{2+}$

26. $KMnO_4$ is a strong oxidizing agent in acid medium. To provide acid medium H_2SO_4 is used instead of HCl. This is because

(A) H_2SO_4 is a stronger acid than HCl (B) HCl is oxidized by $KMnO_4$ to Cl_2

(C) H_2SO_4 is a dibasic acid (D) Rate is faster in the presence of H_2SO_4

(E) Only H_2SO_4 is completely ionized

27. The correct order of ionic radii of Y^{3+}, La^{3+}, $Eu^{3+}$and Lu^{3+} is

(A) $Y^{3+}<La^{3+}<Eu^{3+}<Lu^{3+}$ (B) $Lu^{3+}<Eu^{3+}<La^{3+}<Y^{3+}$

(C) $La^{3+}<Eu^{3+}<Lu^{3+}<Y^{3+}$ (D) $Y^{3+}<Lu^{3+}<Eu^{3+}<La^{3+}$

(E) $Eu^{3+}<La^{3+}<Lu^{3+}<Y^{3+}$

28. A freshly cut tree and a wooden artifact have 30.4 and 15.2 counts $g^{-1}min^{-1}$ of C–14 of half-life of 5700 years. The age of the artifact in years would be

(A) 2850 (B) 5700 (C) 570 (D) 6930 (E) 11400

29. Which among the following are correct with respect to the unit of radioactivity ?

1. The SI unit of radioactivity is curie (Ci)
2. 1 Ci = 3.7×10^{-10} disintegrations s^{-1}
3. 1 Bq = 3.7×10^{-10}Ci
4. The SI unit of radioactivity is becquerel (Bq)
5. 1 Ci = 3.7×10^{10} Bq

(A) 1 and 3 (B) 4 and 5 (C) 1 and 2 (D) 2 and 4 (E) 1 and 5

30. Consider the decay series

$$A \longrightarrow B \longrightarrow C \longrightarrow D$$

where A, B and C are radioactive elements with half-life of 4.5 seconds, 15.0 days and 1.00 second respectively and D is non-radioactive element. Starting with 1.00 mol of A, the number of moles of A, B, C and D left after 30 days are

(A) One mole of D and none of A, B or C

(B) ¾ mol of B , ¼ mol of D and none of A or C

(C) ¼ mol of B , ¾ mol of D and none of A or C

(D) ½ mol of B, ¼ mol of C , ¼ mol of D and none of A

(E) ¼ mol of each A, B, C & D

31. If 150 kJ of energy is needed for muscular work to walk a distance of one km, then how much of glucose one has to consume to walk a distance of five km, provided only 30% of energy is available for muscular work. The enthalpy of combustion of glucose is 3000 kJ mol^{-1}.

(A) 75 g (B) 30 g (C) 180 g (D) 150 g (E) 45 g

32. The decomposition of limestone

$$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$$

is non spontaneous at 298 K. The $\Delta H°$ and $\Delta S°$ values for the reaction are 176.0 kJ and 160 JK^{-1} respectively. At what temperature the decomposition becomes spontaneous ?

(A) at 1000 K (B) below 500°C (C) at 500°C

(D) between 500°C and 600°C (E) above 827°C

33. The bond dissociation energies of H_2, Cl_2 and HCl are 104, 58 and 103 kcal. mol^{-1} respectively. The enthalpy of formation of HCl would be

(A) –22 kcal. mol^{-1} (B) –44 kcal. mol^{-1} (C) +44 kcal. mol^{-1}

(D) +22 kcal. mol^{-1} (E) –11 kcal. mol^{-1}

34. The equilibrium constant (K_p) for the decomposition of gaseous H_2O

$$H_2O(g) \rightleftharpoons H_2(g) + \tfrac{1}{2} O_2(g)$$

is related to degree of dissociation (α) at a total pressure p is given by

(A) $K_P = \dfrac{\alpha^3 p^{1/2}}{(1+\alpha)(2+\alpha)^{1/2}}$ (B) $K_P = \dfrac{\alpha^3 p^{3/2}}{(1-\alpha)(2+\alpha)^{1/2}}$

(C) $K_P = \dfrac{\alpha^{3/2} p^2}{(1-\alpha)(2+\alpha)^{1/2}}$ (D) $K_P = \dfrac{\alpha^{3/2} p^{1/2}}{(1-\alpha)(2+\alpha)^{1/2}}$

(E) $K_P = \dfrac{\alpha^2 p}{\sqrt{2}}$

35. At the equilibrium of the reaction

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

the observed molecular weight of N_2O_4 is 80 g mol^{-1} at 350 K. The percentage of dissociation of N_2O_4 (g) at 350 K is

(A) 10% (B) 15% (C) 20% (D) 18% (E) 13%

36. The aqueous solutions of HCOONa, $C_6H_5NH_3Cl$ and KCN are respectively

(A) acidic, acidic, basic (B) acidic, basic, neutral

(C) basic, neutral, neutral (D) basic, neutral, basic

(E) basic, acidic, basic

37. The van't Hoff factor for a solute that associates in solution is

(A) zero (B) 1.0 (C) less than 1 (D) more than 1

(E) between 1 and 2

38. Consider the following aqueous solutions and assume 100% ionization in electrolytes

1. 0.1 m urea
2. 0.04 m $Al_2(SO_4)_3$
3. 0.05 m $CaCl_2$
4. 0.005 m NaCl

The correct statement regarding the above solutions is

(A) Freezing point will be lowest for solution 1

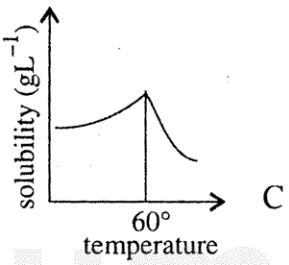
(B) Freezing point will be highest for solution 4

(C) Boiling point will be highest for solution 4

(D) Vapour pressure will be highest for solution 2

(E) Osmotic pressure will be highest for solution 3

39. Solubility curve of a hydrated salt in water with temperature is given. The curve indicates that the solution process is



(A) exothermic

(B) exothermic till 60°C and endothermic after 60° C

(C) endothermic till 60°C and exothermic thereafter

(D) endothermic

(E) proceeding to maintain the same ΔH

40. Which of the following is a redox reaction ?

(A) $2CuSO_4 + 4KI \rightarrow Cu_2I_2 + 2K_2SO_4 + I_2$

(B) $SO_2 + H_2O \rightarrow H_2SO_3$

(C) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

(D) $CuSO_4 + 4NH_3 \rightarrow [Cu(NH_3)_4]SO_4$

(E) $C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$

41. In an experiment 0.04 F was passed through 400 ml of a 1 M solution of NaCl. What would be the pH of the solution after the electrolysis ?

(A) 8 (B) 10 (C) 13 (D) 6 (E) 9

42. The resistance of N/10 solution is found to be 2.5×10^3 ohms. The equivalent conductance of the solution is (cell constant = 1.25 cm^{-1})

(A) 2.5 $ohm^{-1}cm^2$ equiv.$^{-1}$ (B) 5.0 $ohm^{-1}cm^2$ equiv.$^{-1}$

(C) 2.5 $ohm^{-1}cm^{-2}$ equiv.$^{-1}$ (D) 5.0 $ohm^{-1}cm^{-2}$ equiv.$^{-1}$

(E) 1.25 $ohm^{-1}cm^2$ equiv.$^{-1}$

43. For the reaction $Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$, the initial concentration of I^- was 0.20 mol lit^{-1} and the concentration after 20 min was 0.18 mol lit^{-1}. Then the rate of formation of I_2 in mol lit^{-1} min^{-1} would be

(A) 1×10^{-3} (B) 5×10^{-4} (C) 1×10^{-4} (D) 2×10^{-3} (E) 5×10^{-3}

44. Predict the rate law of the following reaction based on the data given below

$2A + B \rightarrow C + 3D$

[A], M	[B], M	Magnitude of the initial rate, Ms^{-1}
1	1	x
2	1	2x
1	2	4x
2	2	8x

(A) Rate = k [A] $[B]^2$ (B) Rate = k $[A]^2$[B] (C) Rate = k [A][B]

(D) Rate = k $[A]^2$ $[B]^2$ (E) Rate = k $[A]^2$

45. If the initial concentration of the reactant is doubled, the time for half reaction is also doubled. Then the order of the reaction is

(A) zero (B) fraction (C) three

(D) one (E) two

46. Which one of the following is a **false** statement ?

(A) Cell fluid is an example of sol

(B) Butter is an example of gel

(C) Hair cream is an example of emulsion

(D) Whipped cream is an example of foam

(E) Cheese is an example of emulsion

47. Which one of the following acts as the best coagulating agent of ferric hydroxide sol ?

(A) magnesium chloride (B) hydrochloric acid

(C) aluminium chloride (D) potassium oxalate

(E) potassium ferricyanide

48. Which among the following statements are correct with respect to adsorption of gases on a solid ?

1. The extent of adsorption is equal to kP^n according to Freundlich isotherm
2. The extent of adsorption is equal to $kP^{1/n}$ according to Freundlich isotherm
3. The extent of adsorption is equal to $(1+bP)/aP$ according to Langmuir isotherm
4. The extent of adsorption is equal to $aP/(1+bP)$ according to Langmuir isotherm
5. Freundlich adsorption isotherm fails at low pressure

where, k, a and b are constants and P is pressure

(A) 1 and 3 (B) 1 and 4 (C) 2 and 3 (D) 2 and 4 (E) 2 and 5

49. Fac-Mer isomerism is associated with which one of the following complexes ? (M=central metal)

(A) $[M(AA)_2]$ (B) $[MA_3B_3]$ (C) $[M(AA)_3]$

(D) $[MABCD]$ (E) $[MA_4B_2]$

50. The increasing order of the crystal field splitting power of some common ligands is

(A) $H_2O < OH^- < Cl^- < F^- < CN^-$

(B) $H_2O < Cl^- < OH^- < CN^- < F^-$

(C) $CN^- < H_2O < OH^- < F^- < Cl^-$

(D) $F^- < CN^- < OH^- < Cl^- < H_2O$

(E) $Cl^- < F^- < OH^- < H_2O < CN^-$

51. Which one of the following is tridentate ligand ?

(A) NO_2^- (B) oxalate ion (C) glycinate ion

(D) diene (E) EDTA

52. A pure dextrorotatory monocarboxylic acid is treated with racemic mixture of an alcohol containing one chiral carbon. The ester formed will be

(A) Pure dextrorotatory (B) Racemic mixture (C) Meso compound

(D) Optically active mixture containing excess dextrorotatory compound

(E) Optically active mixture containing excess levorotatory compound

53. For the purification, isolation and separation of organic compounds, the latest technique followed is

(A) chromatography (B) steam distillation

(C) fractional crystallization (D) sublimation

(E) vacuum distillation

54. An organic compound weighing 0.31 g gave 0.444 g of magnesium pyrophosphate in the estimation of phosphorus by Carius method. The % of P in the compound is

(A) 20 (B) 60 (C) 15 (D) 30 (E) 40

55. A hydrocarbon of molecular formula C_6H_{10} reacts with sodamide and the same on ozonolysis followed by hydrogen peroxide oxidation gives two molecules of carboxylic acids, one being optically active. Then the hydrocarbon may be

(A) 1-hexyne (B) 2-hexyne (C) 3-hexyne

(D) 3-methyl-1-pentyne (E) 3,3-dimethyl-1-butyne

56. Which of the following is not aromatic ?

(A) cyclopentadienyl cation (B) cyclopentadienyl anion

(C) cycloheptatrienyl cation (D) anthracene

(E) phenanthrene

57. Oxidation of an alkene X gives a diol; further oxidation gives a diketone. Which one of the following could be X

(A) $(CH_3)_2C=C(CH_3)_2$ (B) $CH_3CH=C(CH_3)_2$

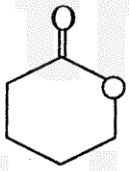
(C) $(CH_3)_2CHCH=CH_2$ (D) $C_6H_5CH=CHC_6H_5$

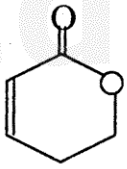
(E) $(C_6H_5)_2C=CHCH_3$

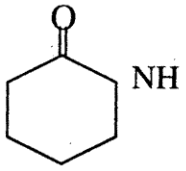
58. Which one of the following compounds cannot show tautomerism ?

(A) $CH_3-\underset{\underset{O}{\|}}{C}-CH_3$

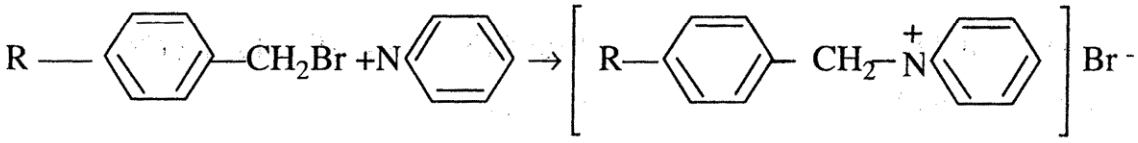
(B) $CH_2=CH-OH$

(C) 

(D) 

(E) 

59. The rate of the reaction



is influenced by the hyperconjugation effect of group R. If R sequentially is

I. CH_3 II. CH_3-CH_2- III. $H_3C-\underset{\underset{CH_3}{|}}{CH}-$ IV. $H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-$

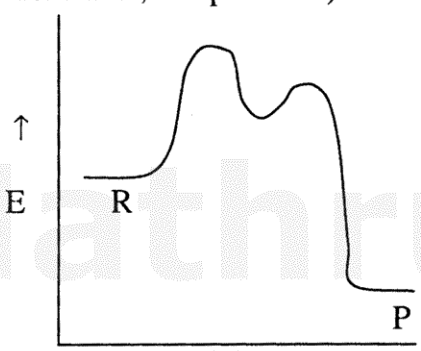
the increasing order of speed of the above reaction is

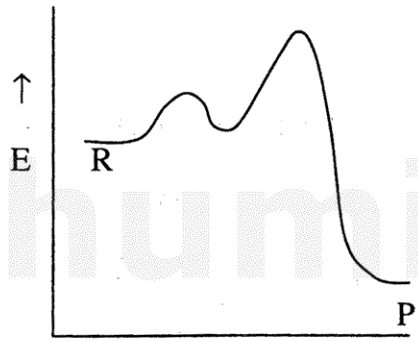
(A) IV, III, II, I (B) I, II, III, IV (C) I, IV, III, II

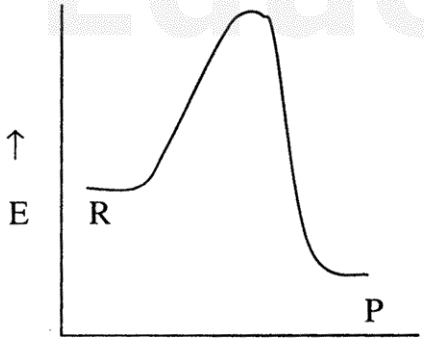
(D) III, II, I, IV (E) II, III, I, IV

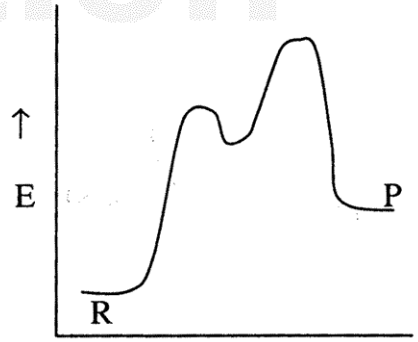
60. The energy level diagrams for exothermic S_N1 and S_N2 reactions could be respectively

(R–reactants, P–products)





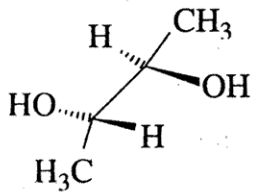




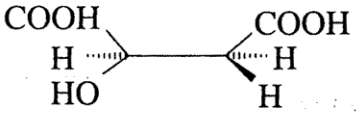
(A) (2) and (3) (B) (1) and (3) (C) (1) and (2)

(D) (4) and (3) (E) (1) and (4)

61. Which of the following molecules will not show optical activity ?

(A) 

(B) $H_3C–\underset{\underset{OH}{|}}{CH}–CD_3$

(C) 

(D) 

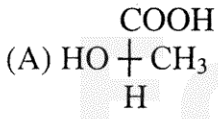
(E) $H_3C–\underset{\underset{Cl}{|}}{CH}–CH_2–CH_3$

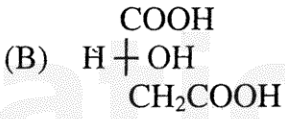
62. Pick out the correct statements

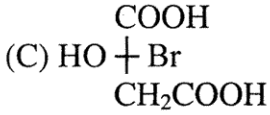
1. If a compound has no asymmetric carbon atom it is always achiral
2. If a compound has just one asymmetric carbon atom, it is chiral
3. If a compound has more than one asymmetric carbon atom, it may or may not be chiral

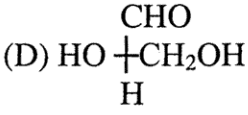
(A) 1, 2 and 3 are correct (B) 1 and 2 only are correct
(C) 2 and 3 only are correct (D) 2 only is correct (E) 1 only is correct

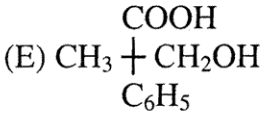
63. Which one of the following molecules has S-configuration ?

(A) 

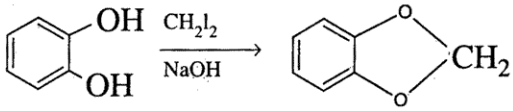
(B) 

(C) 

(D) 

(E) 

64. The reaction



is an example of

(A) Wurtz reaction (B) Wittig reaction (C) Ullmann reaction
(D) Willamson reaction (E) Wurtz-Fittig reaction

65. Chloroform gives a trichloro derivative of an alcohol on reaction with

(A) conc. nitric acid (B) aq. alkali
(C) acetone and alkali (D) sodium ethoxide
(E) a primary amine and an alkali

66. Which one of the following is **not** the correct order of boiling points of the alkyl/aryl halides ?

(A) $CHCl_3 > CH_2Cl_2$

(B) $CH_3(CH_2)_3Cl > CH_3(CH_2)_2Cl$

(C) $(CH_3)_3CCl > (CH_3)_2CHCH_2Cl$

(D) $CH_3(CH_2)_3Cl > CH_3CH_2CHClCH_3$

(E) $C_6H_5Br > C_6H_5Cl$

67. The major product formed when 3,3-dimethylbutan-2-ol is heated with conc. sulphuric acid is

(A) 2,3-dimethyl-2-butene

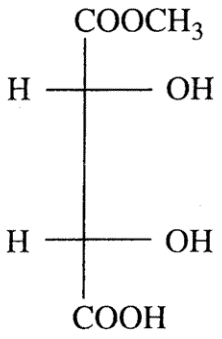
(B) 2,3-dimethyl-1-butene

(C) 3,3-dimethyl-1-butene

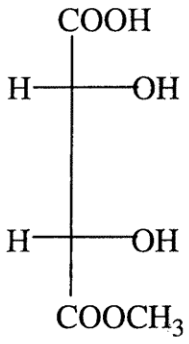
(D) cis and trans isomers of 2,3-dimethyl-1-butene

(E) cis and trans isomers of 3,3-dimethyl-2-butene

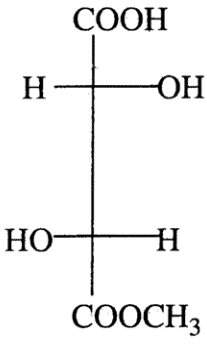
68. The correct statement about the compounds I, II and III is



(I)



(II)



(III)

(A) I and II are identical

(B) I and II are diastereomers

(C) I and III are enantiomers

(D) I and II are enantiomers

(E) II and III are enantiomers

69. Which among the following compounds will give a secondary alcohol on reaction with Grignard reagent followed by acid hydrolysis ?

1. HCHO
2. C_2H_5CHO
3. CH_3COCH_3
4. $HCOOC_2H_5$

Select the correct answer using the codes given below

(A) 2 only

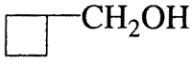
(B) 3 only

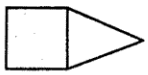
(C) 1 and 4

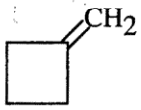
(D) 2 and 3

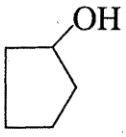
(E) 2 and 4

70. Treatment of cyclobutylmethyl amine with nitrous acid does not give

(A) 

(B) 

(C) 

(D) 

(E) 

71. Which of the following amines can be directly oxidized to the corresponding nitrocompound by potassium permanganate ?

(A) CH_3NH_2

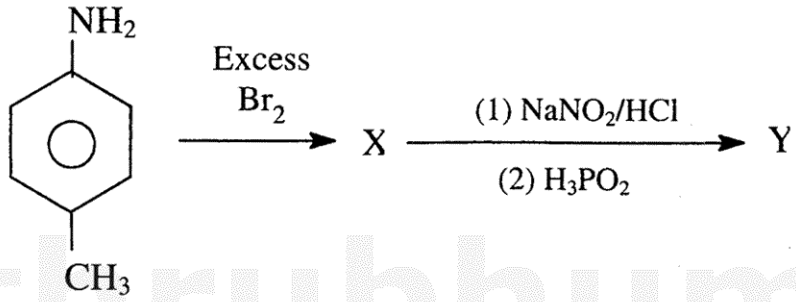
(B) $CH_3–\underset{\displaystyle NH_2}{\underset{|}{C}}H–CH_3$

(C) $(CH_3)_2NH$

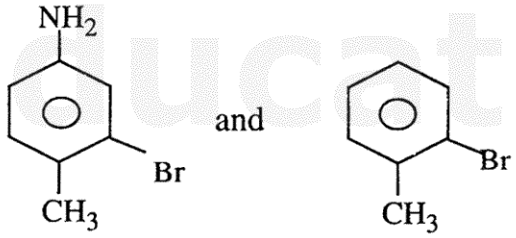
(D) $C_6H_5NH_2$

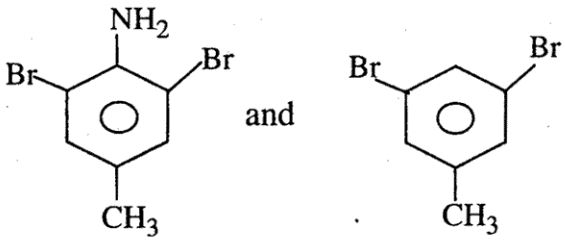
(E) $(CH_3)_3C–NH_2$

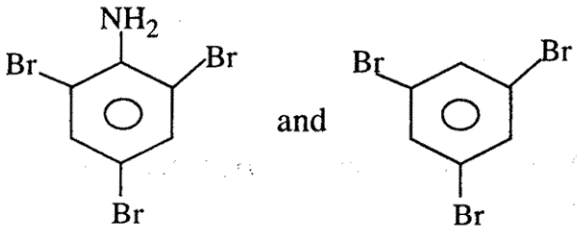
72. In the following reaction sequence predict the compounds X and Y

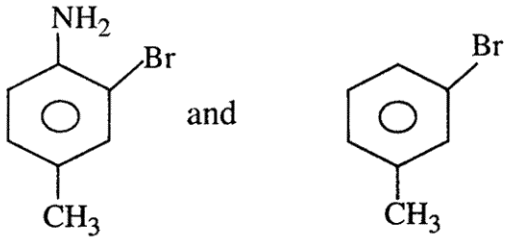


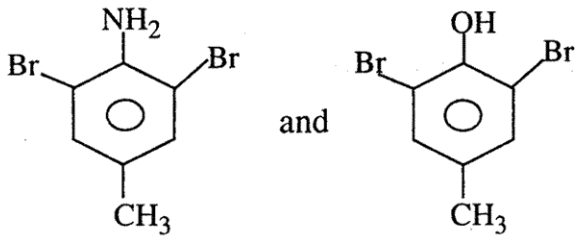
The compounds X and Y are respectively

(A) 

(B) 

(C) 

(D) 

(E) 

73. The electrical conductivity of an intrinsic semiconductor at 0 K is

(A) less than that of an insulator

(B) is equal to zero

(C) is equal to infinity

(D) more than that of an insulator

(E) is equal to that of a metal

74. The principle used for the transmission of light signals through the optical fibre is

(A) reflection (B) refraction (C) interference

(D) diffraction (E) total internal reflection

75. The sky wave propagation is suitable for radio-waves of frequency

(A) upto 2 MHz

(B) from 2 MHz to 20 MHz

(C) from 2 MHz to 30 MHz

(D) from 2 MHz to 50 MHz

(E) from 2 MHz to 80 MHz

76. Modulation is the process of superposing

(A) low frequency audio signal on high frequency radio waves

(B) low frequency radio signal on low frequency audio waves

(C) high frequency radio signal on low frequency audio signal

(D) high frequency audio signal on low frequency radio waves

(E) low frequency radio signal on high frequency audio waves

77. If voltage V = (100 ± 5)V and current I = (10 ± 0.2)A, the percentage error in resistance R is

(A) 5.2% (B) 25% (C) 7% (D) 10% (E) 2.5%

78. A body starting from rest moves with uniform acceleration. The distance covered by the body in time t is proportional to

(A) $\sqrt{t}$ (B) $t^{3/2}$ (C) $t^{2/3}$ (D) t^3 (E) t^2

79. A pendulum of length 1 m is released from $\theta = 60°$. The rate of change of speed of the bob at $\theta = 30°$ is ($g = 10\ \text{ms}^{-2}$)

(A) 10 ms^{-2} (B) 7.5 ms^{-2} (C) 5 ms^{-2} (D) 5 $\sqrt{3}$ ms^{-2} (E) 2.5 ms^{-2}

80. A body constrained to move in the y-direction is subjected to a force $\vec{F} = 2\hat{i} + 15\hat{j} + 6\hat{k}$ newton. The work done by this force in moving the body through a distance of 10 m along y-axis is

(A) 100 J (B) 150 J (C) 120 J (D) 200 J (E) 50 J

81. A particle is projected with a speed v at 45° with the horizontal. The magnitude of angular momentum of the projectile about the point of projection when the particle is at its maximum height h is

(A) zero (B) $\frac{mvh^2}{\sqrt{2}}$ (C) $\frac{mv^2h}{2}$ (D) $\frac{mvh^3}{\sqrt{2}}$ (E) $\frac{mvh}{\sqrt{2}}$

82. A gun fires bullets each of mass 1 g with velocity of 10 ms^{-1} by exerting a constant force of 5 g weight. Then the number of bullets fired per second is (Take g =10 ms^{-2})

(A) 50 (B) 5 (C) 10 (D) 25 (E) 15

83. Two equal forces are acting at a point with an angle of 60° between them. If the resultant force is equal to $40\sqrt{3}$ N, the magnitude of each force is

(A) 40 N (B) 20 N (C) 80 N (D) 30 N (E) 10 N

84. A man pushes against a wall but fails to move it. He does

(A) negative work
(B) positive but not maximum work
(C) maximum positive work
(D) no work at all
(E) maximum negative work

85. When a bullet is fired at a target, its velocity decreases by half after penetrating 30 cm into it. The additional thickness it will penetrate before coming to rest is

(A) 30 cm (B) 40 cm (C) 10 cm (D) 50 cm (E) 20 cm

86. The moment of inertia of a fly wheel having kinetic energy 360 J and angular speed of 20 rad/s is

(A) 18 kg m^2 (B) 1.8 kg m^2 (C) 2.5 kg m^2
(D) 9 kg m^2 (E) 0.9 kg m^2

87. Four point masses P, Q, R and S with respective masses 1 kg, 1 kg, 2 kg and 2 kg form the corners of a square of side a. The centre of mass of the system will be farthest from

(A) P only (B) R and S (C) R only
(D) P and Q (E) P and R

88. The satellite of mass m revolving in a circular orbit of radius r around the earth has kinetic energy E. Then its angular momentum will be

(A) $\sqrt{\frac{E}{mr^2}}$ (B) $\frac{E}{2mr^2}$ (C) $\sqrt{2Emr^2}$

(D) $\sqrt{2Emr}$ (E) $\sqrt{\frac{E}{2mr^2}}$

89. The escape velocity from the earth is 11.2 km/s. The escape velocity from a planet having twice the radius and the same mean density is (in km/s)

(A) 11.2 (B) 5.6 (C) 15 (D) 22.4 (E) 33.6

90. The excess of pressure inside the first soap bubble is three times that inside the second bubble. The ratio of volume of the first to that of the second bubble is

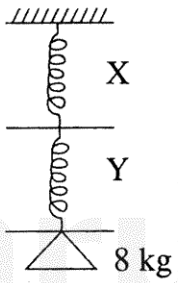
(A) 1 : 3 (B) 1 : 9 (C) 1 : 27 (D) 9 : 1 (E) 27 : 1

91. Bernoulli's principle is based on the law of conservation of

(A) mass (B) momentum (C) pressure

(D) energy (E) volume

92. A body of mass 8 kg is suspended through two light springs X and Y connected in series as shown below. The readings in X and Y respectively are



(A) 8 kg, zero (B) zero, 8 kg (C) 6 kg, 2 kg
(D) 2 kg, 6 kg (E) 8 kg, 8 kg

93. A body cools from 62°C to 50°C in 10 minutes and to 42°C in the next 10 minutes. The temperature of the surrounding is

(A) 16°C (B) 26°C (C) 36°C (D) 21°C (E) 31°C

94. At what temperature the kinetic energy of a gas molecule is half of the value at 27°C ?

(A) 13.5°C (B) 150°C (C) 75 K (D) 13.5 K (E) –123 K

95. A black body emits radiations of maximum intensity for the wavelength of 5000 Å, when the temperature of the body is 1227°C. If the temperature of the body is increased by 1000°C, the maximum intensity would be observed at

(A) 1000 Å (B) 2000 Å (C) 5000 Å (D) 4000 Å (E) 3000 Å

96. A simple pendulum has a time period T in vacuum. Its time period when it is completely immersed in a liquid of density one-eighth of the density of material of the bob is

(A) $\sqrt{\frac{7}{8}}$ T (B) $\sqrt{\frac{5}{8}}$ T (C) $\sqrt{\frac{3}{8}}$ T (D) $\sqrt{\frac{8}{7}}$ T (E) $\sqrt{\frac{8}{5}}$ T

97. A body of mass 20 g connected to spring of constant K executes SHM with a frequency of $(5/\pi)$ Hz. The value of spring constant is

(A) 4 Nm^{-1} (B) 3 Nm^{-1} (C) 2 Nm^{-1} (D) 5 Nm^{-1} (E) 2.5 Nm^{-1}

98. Two waves are given by $y_1 = \cos(4t - 2x)$ and $y_2 = \sin\left(4t - 2x + \frac{\pi}{4}\right)$. The phase difference between the two waves is

(A) $\frac{\pi}{4}$ (B) $-\frac{\pi}{4}$ (C) $\frac{3\pi}{4}$ (D) $\frac{\pi}{2}$ (E) $\frac{3\pi}{2}$

99. A wave represented by the equation $y = a\cos[kx - \omega t]$ is superposed with another wave to form a stationary wave such that the point $x = 0$ is a node. The equation for the other wave is

(A) $y = a\cos[kx + \omega t]$

(B) $y = a\sin[kx + \omega t]$

(C) $y = -a\sin[kx + \omega t]$

(D) $y = -a\sin[kx - \omega t]$

(E) $y = -a\cos[kx + \omega t]$

100. An electric dipole consists of two opposite charges each 0.05 μC separated by 30 mm. The dipole is placed in an uniform external electric field of 10^6 NC^{-1}. The maximum torque exerted by the field on the dipole is

(A) 6×10^{-3} Nm (B) 3×10^{-3} Nm (C) 15×10^{-3} Nm

(D) 1.5×10^{-3} Nm (E) 9×10^{-3} Nm

101. Two identical spheres carrying charges –9 μC and 5 μC respectively are kept in contact and then separated from each other. Point out **true** statement from the following

In each sphere

(A) 1.25×10^{13} electrons are in deficit

(B) 1.25×10^{13} electrons are in excess

(C) 2.15×10^{13} electrons are in excess

(D) 2.15×10^{13} electrons are in deficit

(E) 1.52×10^{13} electrons are in excess

102. The capacitance of a parallel plate capacitor with air as medium is 3 μF. With the introduction of a dielectric medium between the plates, the capacitance becomes 15 μF. The permitivity of the medium is

(A) 5 (B) 15 (C) $0.44\times10^{-10}C^2N^{-1}m^{-2}$

(D) $8.854\times10^{-11}C^2N^{-1}m^{-2}$ (E) $5\ C^2N^{-1}m^{-2}$

103. The colour code for a resistor of resistance 3.5 kΩ with 5% tolerance is

(A) orange, green, orange and gold

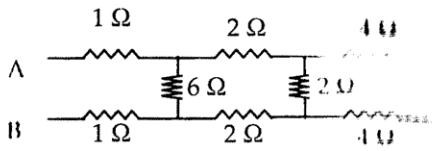
(B) red, yellow, black and gold

(C) orange, green, orange and silver

(D) orange, green, red and silver

(E) orange, green, red and gold

104. In the adjoining figure the equivalent resistance between A and B is



(A) 5 Ω (B) 8 Ω (C) 2.5 Ω (D) 6.8 Ω (E) 7.8 Ω

105. In a Wheatstone's network P = 2 Ω, Q = 2 Ω, R = 2 Ω and S = 3 Ω. The resistance with which S is to be shunted in order that the bridge may be balanced is

(A) 1 Ω (B) 2 Ω (C) 4 Ω (D) 6 Ω (E) 8 Ω

106. The strength of the magnetic field around a long straight wire, carrying current, is

(A) same everywhere around the wire at any distance

(B) inversely proportional to the distance from the wire

(C) inversely proportional to the square of the distance from the wire

(D) directly proportional to the square of the distance from the wire

(E) directly proportional to the distance from the wire

107. A proton with energy of 2 MeV enters a uniform magnetic field of 2.5 T normally. The magnetic force on the proton is (Take mass of proton to be 1.6×10^{-27} kg)

(A) 3×10^{-11}N (B) 8×10^{-10}N (C) 8×10^{-12}N

(D) 2×10^{-10}N (E) 3×10^{-10}N

108. If a current of 500 mA produces a deflection of 30° in a tangent galvanometer, then the current that produces a deflection of 60° is

(A) 1.5 A (B) 1 A (C) 500 mA (D) 866 mA (E) 2 A

109. A wire of length 50 cm moves with a velocity of 300 m/min, perpendicular to a magnetic field. If the emf induced in the wire is 2 V, the magnitude of the field in tesla is

(A) 2 (B) 5 (C) 0.4 (D) 2.5 (E) 0.8

110. Whenever a magnet is moved either towards or away from a conducting coil, an emf is induced, the magnitude of which is independent of

(A) the strength of the magnetic field

(B) the speed with which the magnet is moved

(C) the number of turns in the coil

(D) the resistance of the coil

(E) the area of cross section of the coil

111. The instantaneous voltage through a device of impedance $20\,\Omega$ is $e = 80 \sin 100\,\pi t$. The effective value of the current is

(A) 3 A (B) 2.828 A (C) 1.732 A (D) 4 A (E) $\sqrt{2}$ A

112. An electromagnetic radiation has an energy of 13.2 keV. Then the radiation belongs to the region of

(A) visible light (B) ultraviolet (C) infrared

(D) X-ray (E) microwave

113. Two convex lenses of focal lengths 0.3 m and 0.05 m are used to make a telescope. The distance kept between the two in order to obtain an image at infinity is

(A) 0.35 m (B) 0.25 m (C) 0.175 m (D) 0.15 m (E) 0.20 m

114. The refractive indices of glass and water with respect to air are 3/2 and 4/3 respectively. Then the refractive index of glass with respect to water is

(A) 8/9 (B) 9/8 (C) 7/6 (D) 2 (E) 0.5

115. In a two slit experiment, with monochromatic light, fringes are obtained on a screen placed at some distance from the slits. If the screen is moved by 5×10^{-2} m towards the slits, the change in fringe width is 10^{-3} m. Then the wavelength of light used is (given that distance between the slits is 0.03 mm)

(A) 4000 Å (B) 4500 Å (C) 5000 Å

(D) 5500 Å (E) 6000 Å

116. The photosensitive surface is receiving light of wavelength 5000 Å at the rate of 10^{-8} J/s. The number of photons received per second is

(A) 2.5×10^{10} (B) 2.5×10^{11} (C) 2.5×10^{12}

(D) 2.5×10^{9} (E) 2.5×10^{13}

117. The nucleus ${}_6C^{12}$ absorbs an energetic neutron and emits a beta particle (β). The resulting nucleus is

(A) ${}_7N^{14}$ (B) ${}_7N^{13}$ (C) ${}_5B^{13}$ (D) ${}_6C^{13}$ (E) ${}_5B^{12}$

118. Select the **true** statement from the following
Nuclear force is

(A) strong, short range and charge independent force

(B) charge independent, attractive and long range force

(C) strong, charge dependent and short range attractive force

(D) long range, charge dependent and attractive force

(E) charge independent, short range and strong repulsive force

119. In CE mode, the input characteristics of a transistor is the variation of

(A) I_B against V_{BE} at constant V_{CE}

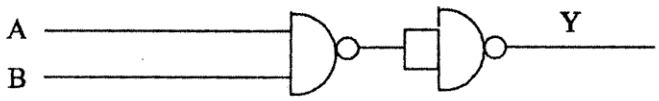
(B) I_C against V_{CE} at constant V_{BE}

(C) I_B against I_C

(D) I_E against I_C

(E) I_C against V_{CE} at constant I_B

120. The arrangement shown in the figure performs the logic function of



(A) AND gate (B) OR gate (C) NAND gate

(D) NOR gate (E) NOT gate