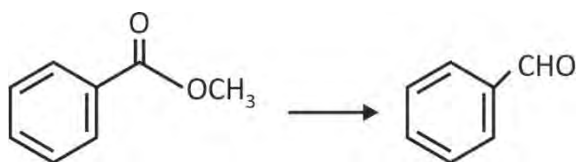


CHEMISTRY

46. Identify the suitable reagent for the following conversion.



- (1) (i) NaBH_4 , (ii) $\text{H}^+/\text{H}_2\text{O}$
- (2) $\text{H}_2/\text{Pd}-\text{BaSO}_4$
- (3) (i) LiAlH_4 , (ii) $\text{H}^+/\text{H}_2\text{O}$
- (4) (i) $\text{AlH}(\text{iBu})_2$, (ii) H_2O

Answer (4)

47. The correct order of decreasing acidity of the following aliphatic acids is

- (1) $\text{HCOOH} > \text{CH}_3\text{COOH} > (\text{CH}_3)_2\text{CHCOOH} > (\text{CH}_3)_3\text{CCOOH}$
- (2) $\text{HCOOH} > (\text{CH}_3)_3\text{CCOOH} > (\text{CH}_3)_2\text{CHCOOH} > \text{CH}_3\text{COOH}$
- (3) $(\text{CH}_3)_3\text{CCOOH} > (\text{CH}_3)_2\text{CHCOOH} > \text{CH}_3\text{COOH} > \text{HCOOH}$
- (4) $\text{CH}_3\text{COOH} > (\text{CH}_3)_2\text{CHCOOH} > (\text{CH}_3)_3\text{CCOOH} > \text{HCOOH}$

Answer (1)

48. Which one of the following reactions does **NOT** belong to "Lassaigne's test"?

- (1) $\text{Na} + \text{X} \xrightarrow{\Delta} + \text{NaX}$
- (2) $2\text{CuO} + \text{C} \xrightarrow{\Delta} 2\text{Cu} + \text{CO}_2$
- (3) $\text{Na} + \text{C} + \text{N} \xrightarrow{\Delta} \text{NaCN}$
- (4) $2\text{Na} + \text{S} \xrightarrow{\Delta} \text{Na}_2\text{S}$

Answer (2)

49. If the rate constant of a reaction is 0.03 s^{-1} , how much time does it take for 7.2 mol L^{-1} concentration of the reactant to get reduced to 0.9 mol L^{-1} ?

(Given: $\log 2 = 0.301$)

- (1) 210 s
- (2) 21.0 s
- (3) 69.3 s
- (4) 23.1 s

Answer (3)

50. Given below are two statements :

Statement I : A hypothetical diatomic molecule with bond order zero is quite stable.

Statement II : As bond order increases, the bond length increases.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement I is true but Statement II is false
- (2) Statement I is false but Statement II is true
- (3) Both Statement I and Statement II are true
- (4) Both Statement I and Statement II are false

Answer (4)

51. Out of the following complex compounds, which of the compound will be having the minimum conductance in solution?

- (1) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
- (2) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}$
- (3) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
- (4) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]$

Answer (Both 3 & 4)

52. Which of the following aqueous solution will exhibit highest boiling point?

- (1) 0.01M Na_2SO_4
- (2) 0.015M $\text{C}_6\text{H}_{12}\text{O}_6$
- (3) 0.01M Urea
- (4) 0.01M KNO_3

Answer (1)

53. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :  undergoes $\text{S}_{\text{N}}2$ reaction faster than .

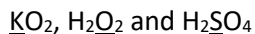
Reason (R) : Iodine is a better leaving group because of its large size.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) **A** is true but **R** is false
- (2) **A** is false but **R** is true
- (3) Both **A** and **R** are true and **R** is the correct explanation of **A**
- (4) Both **A** and **R** are true but **R** is **not** the correct explanation of **A**

Answer (3)

54. Consider the following compounds :



The oxidation state of the underlined elements in them are, respectively,

- (1) +1, -2, and +4
- (2) +4, -4, and +6
- (3) +1, -1, and +6
- (4) +2, -2, and +6

Answer (3)

55. Match List-I with List-II.

	List-I		List-II
A.	Haber process	I.	Fe catalyst
B.	Wacker oxidation	II.	PdCl_2
C.	Wilkinson catalyst	III.	$[(\text{PPh}_3)_3\text{RhCl}]$
D.	Ziegler catalyst	IV.	TiCl_4 with $\text{Al}(\text{CH}_3)_3$

Choose the **correct** answer from the options given below :

- (1) A-I, B-II, C-III, D-IV
- (2) A-I, B-IV, C-III, D-II
- (3) A-I, B-II, C-IV, D-III
- (4) A-II, B-III, C-I, D-IV

Answer (1)

56. Given below are two statements :

Statement I : Like nitrogen that can form ammonia, arsenic can form arsine.

Statement II : Antimony cannot form antimony pentoxide.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Statement I is correct but Statement II is incorrect
- (2) Statement I is incorrect but Statement II is correct
- (3) Both Statement I and Statement II are correct
- (4) Both Statement I and Statement II are incorrect

Answer (1)

57. Given below are two statements :

Statement I : Ferromagnetism is considered as an extreme form of paramagnetism.

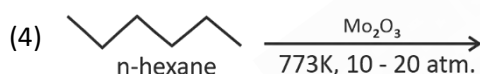
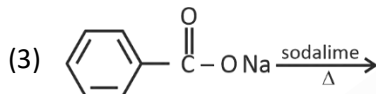
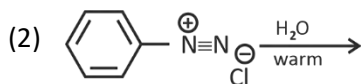
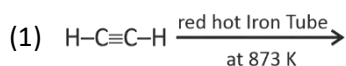
Statement II : The number of unpaired electrons in a Cr^{2+} ion ($Z = 24$) is the same as that of a Nd^{3+} ion ($Z = 60$).

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) Statement I is true but Statement II is false
- (2) Statement I is false but Statement II is true
- (3) Both Statement I and Statement II are true
- (4) Both Statement I and Statement II are false

Answer (1)

58. Which one of the following reactions does **NOT** give benzene as the product?



Answer (2)

59. Match List-I with List-II

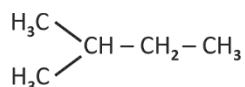
	List-I		List-II
A.	XeO_3	(I)	sp^3d ; linear
B.	XeF_2	(II)	sp^3 ; pyramidal
C.	XeOF_4	(III)	sp^3d^3 ; distorted octahedral
D.	XeF_6	(IV)	sp^3d^2 ; square pyramidal

Choose the **correct** answer from the options given below :

- (1) A-IV, B-II, C-III, D-I
- (2) A-IV, B-II, C-I, D-III
- (3) A-II, B-I, C-IV, D-III
- (4) A-II, B-I, C-III, D-IV

Answer (3)

60. How many products (including stereoisomers) are expected from monochlorination of the following compound?



- (1) 5 (2) 6
(3) 2 (4) 3

Answer (2)

61. Which of the following statements are true?

- A. Unlike Ga that has a very high melting point, Cs has a very low melting point.
B. On Pauling scale, the electronegativity values of N and Cl are not the same.
C. Ar, K⁺, Cl⁻, Ca²⁺, and S²⁻ are all isoelectronic species.
D. The correct order of the first ionization enthalpies of Na, Mg, Al, and Si is Si > Al > Mg > Na.
E. The atomic radius of Cs is greater than that of Li and Rb.

Choose the **correct** answer the options given below :

- (1) C and D only
(2) A, C, and E only
(3) A, B, and E only
(4) C and E only

Answer (4)

62. The standard heat of formation, in kcal/mol of Ba²⁺ is :

[Given : standard heat of formation of SO₄²⁻ ion (aq) = -216 kcal/mol, standard heat of crystallisation of

BaSO₄(s) = -4.5 kcal/mol, standard heat of formation of BaSO₄(s) = -349 kcal/mol]

- (1) +133.0 (2) +220.5
(3) -128.5 (4) -133.0

Answer (3)

63. Match List-I with List-II

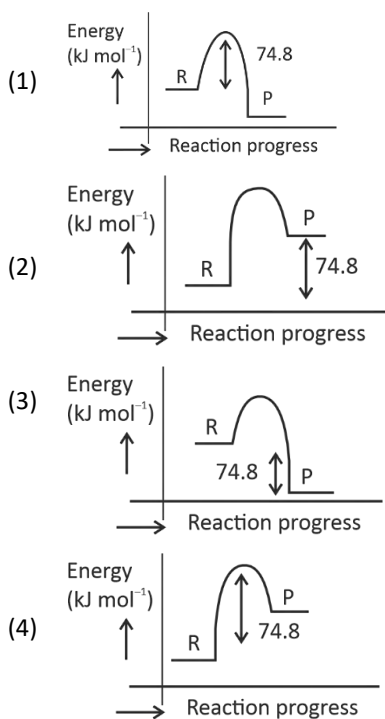
List-I	List-II
(Example)	(Type of Solution)
A. Humidity	I. Solid in solid
B. Alloys	II. Liquid in gas
C. Amalgams	III. Solid in gas
D. Smoke	IV. Liquid in solid

Choose the **correct** answer from the options given below:

- (1) A-III, B-I, C-IV, D-II (2) A-III, B-II, C-I, D-IV
(3) A-II, B-IV, C-I, D-III (4) A-II, B-I, C-IV, D-III

Answer (4)

64. $C(s) + 2H_2(g) \rightarrow CH_4(g)$; $\Delta H = -74.8 \text{ kJ mol}^{-1}$. Which of the following diagrams gives an accurate representation of the above reaction? [R \rightarrow reactants; P \rightarrow products]



Answer (3)

65. Sugar 'X'
- is found in honey
 - is a keto sugar
 - exists in α and β – anomeric forms.
 - Is laevorotatory.

'X' is :

- Maltose
- Sucrose
- D-Glucose
- D-Fructose

Answer (4)

66. Total number of possible isomers (both structural as well as stereoisomers) of cyclic ethers of molecular formula C_4H_8O is :

- 10
- 11
- 6
- 8

Answer (1)

67. For the reaction $A(g) \rightleftharpoons 2B(g)$, the backward reaction rate constant is higher than the forward reaction rate constant by a factor of 2500, at 1000 K.

[Given : $R = 0.0831 \text{ L atm mol}^{-1} \text{ K}^{-1}$]

K_p for the reaction at 1000 K is

- (1) 0.033
- (2) 0.021
- (3) 83.1
- (4) 2.077×10^5

Answer (1)

68. The ratio of the wavelengths of the light absorbed by a Hydrogen atom when it undergoes $n = 2 \rightarrow n = 3$ and $n = 4 \rightarrow n = 6$ transitions, respectively, is

- (1) $\frac{1}{9}$
- (2) $\frac{1}{4}$
- (3) $\frac{1}{36}$
- (4) $\frac{1}{16}$

Answer (2)

69. If the molar conductivity (Λ_m) of a 0.050 mol L^{-1} solution of a monobasic weak acid is $90 \text{ S cm}^2 \text{ mol}^{-1}$, its extent (degree) of dissociation will be

[Assume $\Lambda_+^\circ = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$ and $\Lambda_-^\circ = 50.4 \text{ S cm}^2 \text{ mol}^{-1}$.]

- | | |
|-----------|-----------|
| (1) 0.225 | (2) 0.215 |
| (3) 0.115 | (4) 0.125 |

Answer (1)

70. 5 moles of liquid X and 10 moles of liquid Y make a solution having a vapour pressure of 70 torr. The vapour pressures of pure X and Y are 63 torr and 78 torr respectively. Which of the following is true regarding the described solution?

- (1) The solution is ideal.
- (2) The solution has volume greater than the sum of individual volumes.
- (3) The solution shows positive deviation.
- (4) The solution shows negative deviation.

Answer (4)

71. Among the following, choose the ones with equal number of atoms.

- A. 212 g of $\text{Na}_2\text{CO}_3(\text{s})$ [molar mass = 106 g]
- B. 248 g of $\text{Na}_2\text{O}(\text{s})$ [molar mass = 62 g]
- C. 240 g of $\text{NaOH}(\text{s})$ [molar mass = 40 g]
- D. 12 g of $\text{H}_2(\text{g})$ [molar mass = 2 g]
- E. 220 g of $\text{CO}_2(\text{g})$ [molar mass = 44 g]

Choose the **correct** answer from the options given below :

- (1) B, C, and D only
- (2) B, D, and E only
- (3) A, B, and C only
- (4) A, B, and D only

Answer (4)

72. Which of the following are paramagnetic?

- A. $[\text{NiCl}_4]^{2-}$
- B. $\text{Ni}(\text{CO})_4$
- C. $[\text{Ni}(\text{CN})_4]^{2-}$
- D. $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
- E. $\text{Ni}(\text{PPh}_3)_4$

Choose the **correct** answer from the options given below :

- (1) A and D only
- (2) A, D and E only
- (3) A and C only
- (4) B and E only

Answer (1)

73. If the half-life ($t_{1/2}$) for a first order reaction is 1 minute, then the time required for 99.9% completion of the reaction is closest to :

- (1) 5 minutes
- (2) 10 minutes
- (3) 2 minutes
- (4) 4 minutes

Answer (2)

74. Energy and radius of first Bohr orbit of He^+ and Li^{2+} are

[Given $R_H = 2.18 \times 10^{-18} \text{ J}$, $a_0 = 52.9 \text{ pm}$]

(1) $E_n(\text{Li}^{2+}) = -19.62 \times 10^{-16} \text{ J}$;

$r_n(\text{Li}^{2+}) = 17.6 \text{ pm}$

$E_n(\text{He}^+) = -8.72 \times 10^{-16} \text{ J}$;

$r_n(\text{He}^+) = 26.4 \text{ pm}$

(2) $E_n(\text{Li}^{2+}) = -8.72 \times 10^{-16} \text{ J}$;

$r_n(\text{Li}^{2+}) = 17.6 \text{ pm}$

$E_n(\text{He}^+) = -19.62 \times 10^{-16} \text{ J}$;

$r_n(\text{He}^+) = 17.6 \text{ pm}$

(3) $E_n(\text{Li}^{2+}) = -19.62 \times 10^{-18} \text{ J}$;

$r_n(\text{Li}^{2+}) = 17.6 \text{ pm}$

$E_n(\text{He}^+) = -8.72 \times 10^{-18} \text{ J}$;

$r_n(\text{He}^+) = 26.4 \text{ pm}$

(4) $E_n(\text{Li}^{2+}) = -8.72 \times 10^{-18} \text{ J}$;

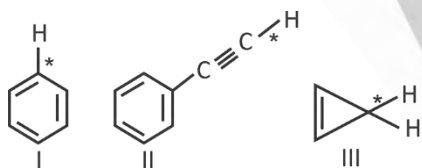
$r_n(\text{Li}^{2+}) = 26.4 \text{ pm}$

$E_n(\text{He}^+) = -19.62 \times 10^{-18} \text{ J}$;

$r_n(\text{He}^+) = 17.6 \text{ pm}$

Answer (3)

75. Among the given compounds I-III, the correct order of bond dissociation energy of C-H bond marked with * is :



(1) $\text{III} > \text{II} > \text{I}$

(2) $\text{II} > \text{III} > \text{I}$

(3) $\text{II} > \text{I} > \text{III}$

(4) $\text{I} > \text{II} > \text{III}$

Answer (3)

76. Dalton's Atomic theory could not explain which of the following?

(1) Law of multiple proportion

(2) Law of gaseous volume

(3) Law of conservation of mass

(4) Law of constant proportion

Answer (2)

77. Identify the correct orders against the property mentioned

- A. $\text{H}_2\text{O} > \text{NH}_3 > \text{CHCl}_3$ – dipole moment
 B. $\text{XeF}_4 > \text{XeO}_3 > \text{XeF}_2$ – number of lone pairs on central atom
 C. $\text{O-H} > \text{C-H} > \text{N-O}$ – bond length
 D. $\text{N}_2 > \text{O}_2 > \text{H}_2$ – bond enthalpy

Choose the **correct** answer from the options given below:

- (1) A, C only (2) B, C only
 (3) A, D only (4) B, D only

Answer (3)

78. Match List-I with List-II.

	List-I (Name of Vitamin)		List-II (Deficiency disease)
A.	Vitamin B ₁₂	I.	Cheilosis
B.	Vitamin D	II.	Convulsions
C.	Vitamin B ₂	III.	Rickets
D.	Vitamin B ₆	IV.	Pernicious anaemia

Choose the **correct** answer from the options given below:

- (1) A-II, B-III, C-I, D-IV (2) A-IV, B-III, C-II, D-I
 (3) A-I, B-III, C-II, D-IV (4) A-IV, B-III, C-I, D-II

Answer (4)

79. The correct order of decreasing basic strength of the given amines is:

- (1) N-ethylethanamine > ethanamine > N-methylaniline > benzenamine
 (2) benzenamine > ethanamine > N-methylaniline > N-ethylethanamine
 (3) N-methylaniline > benzenamine > ethanamine > N-ethylethanamine
 (4) N-ethylethanamine > ethanamine > benzenamine > N-methylaniline

Answer (1)

80. The correct order of the wavelength of light absorbed by the following complexes is,

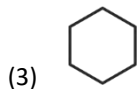
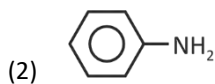
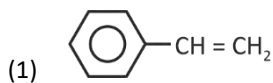
- A. $[\text{Co}(\text{NH}_3)_6]^{3+}$
 B. $[\text{Co}(\text{CN})_6]^{3-}$
 C. $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$
 D. $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$

Choose the **correct** answer from the options given below:

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

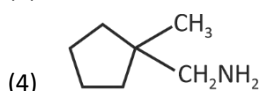
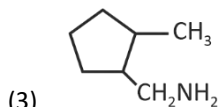
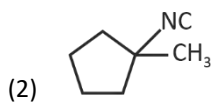
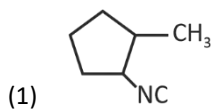
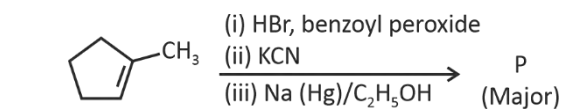
Answer (4)

81. Which one of the following compounds **does not** decolourize bromine water?



Answer (3)

82. Predict the major product 'P' in the following sequence of reactions-



Answer (3)

83. Match List I with List II

	List-I (Mixture)		List-II (Method of separation)
A.	$\text{CHCl}_3 + \text{C}_6\text{H}_5\text{NH}_2$	(I)	Distillation under reduced pressure
B.	Crude oil in petroleum industry	(II)	Steam distillation
C.	Glycerol from spent-lye	(III)	Fractional distillation
D.	Aniline - water	(IV)	Simple distillation

Choose the **correct** answer from the options given below:

(1) A-III, B-IV, C-I, D-II

(2) A-III, B-IV, C-II, D-I

(3) A-IV, B-III, C-I, D-II

(4) A-IV, B-III, C-II, D-I

Answer (3)

84. Which among the following electronic configurations belong to main group elements?

- A. $[\text{Ne}]3s^1$ B. $[\text{Ar}]3d^34s^2$
 C. $[\text{Kr}]4d^{10}5s^25p^5$ D. $[\text{Ar}]3d^{10}4s^1$
 E. $[\text{Rn}]5f^06d^27s^2$

Choose the correct answer from the option given below :

- (1) D and E only
 (2) A, C and D only
 (3) B and E only
 (4) A and C only

Answer (4)

85. Which one of the following compounds can exist as cis-trans isomers?

- (1) 1, 1-Dimethylcyclopropane (2) 1, 2-Dimethylcyclohexane
 (3) Pent-1-ene (4) 2-Methylhex-2-ene

Answer (2)

86. Phosphoric acid ionizes in three steps with their ionization constant values K_{a_1} , K_{a_2} and K_{a_3} , respectively, while K is the overall ionization constant. Which of the following statements are true ?

- A. $\log K = \log K_{a_1} + \log K_{a_2} + \log K_{a_3}$
 B. H_3PO_4 is a stronger acid than H_2PO_4^- and HPO_4^{2-}
 C. $K_{a_1} > K_{a_2} > K_{a_3}$
 D. $K_{a_1} = \frac{K_{a_3} > K_{a_2}}{2}$

Choose the correct answer from the options given below :

- (1) B, C and D only (2) A, B and C only
 (3) A and B only (4) A and C only

Answer (2)

87. Match List I with List II

	List-I (Ion)		List-II (Group Number in Cation Analysis)
A.	Co^{2+}	I.	Group-I
B.	Mg^{2+}	II.	Group-III
C.	Pb^{2+}	III.	Group-IV
D.	Al^{3+}	IV.	Group-VI

Choose the **correct** answer from the options given below :

(1) A-III, B-II, C-IV, D-I

(2) A-III, B-II, C-I, D-IV

(3) A-III, B-IV, C-II, D-I

(4) A-III, B-IV, C-I, D-II

Answer (4)

88. Higher yield of NO in $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$ can be obtained at

$[\Delta H \text{ of the reaction} = +180.7 \text{ kJ mol}^{-1}]$

A. Higher temperature

B. Lower temperature

C. Higher concentration of N_2

D. Higher concentration of O_2

Choose the **correct** answer from the options given below :

(1) B, C, D only

(2) A, C, D only

(3) A, D only

(4) B, C only

Answer (2)

89. Given below are two statements :

Statement-I : Benzenediazonium salt is prepared by the reaction of aniline with nitrous acid at 273 – 278 K. It decomposes easily in the dry state.

Statement-II : Insertion of iodine into the benzene ring is difficult and hence iodobenzene is prepared through the reaction of benzenediazonium salt with KI.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect

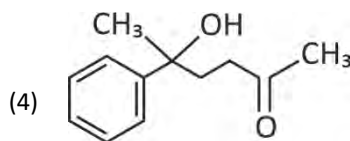
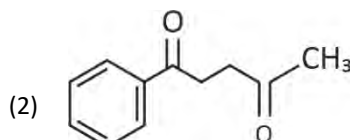
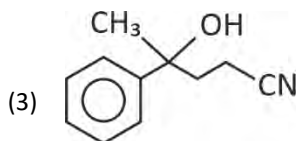
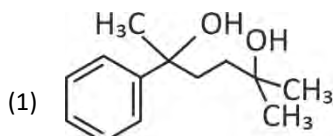
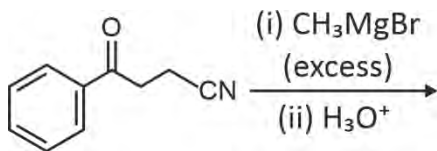
(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Answer (3)

90. The major product of the following reaction is



Answer (4)