

CHEMISTRY

SECTION-A

51. Which amongst the following is **incorrect** statement?
- (1) The bond orders of O_2^- , O_2 , O_2^+ and O_2^{2+} are 2.5, 2, 1.5 and 1, respectively
 - (2) C_2 molecule has four electrons in its two degenerate π molecular orbitals
 - (3) H_2^+ ion has one electron
 - (4) O_2^+ ion is diamagnetic

Answer (4)

52. Gadolinium has a low value of third ionisation enthalpy because of
- (1) small size
 - (2) high exchange enthalpy
 - (3) high electronegativity
 - (4) high basic character

Answer (2)

53. Identify the **incorrect** statement from the following.
- (1) All the five $5d$ orbitals are different in size when compared to the respective $4d$ orbitals.
 - (2) All the five $4d$ orbitals have shapes similar to the respective $3d$ orbitals.
 - (3) In an atom, all the five $3d$ orbitals are equal in energy in free state.
 - (4) The shapes of d_{xy} , d_{yz} and d_{zx} orbitals are similar to each other; and $d_{x^2-y^2}$ and d_{z^2} are similar to each other.

Answer (4)

54. Which of the following p-V curve represents maximum work done?



Answer (2)

55. Match **List-I** with **List-II**

List-I

- (a) Li
- (b) Na
- (c) KOH
- (d) Cs

List-II

- (i) absorbent for carbon dioxide
- (ii) electrochemical cells
- (iii) coolant in fast breeder reactors
- (iv) photoelectric cell

Choose the correct answer from the options given below :

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

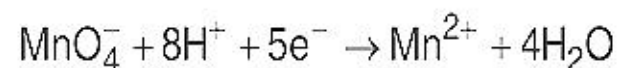
Answer (4)

56. The **incorrect** statement regarding enzymes is

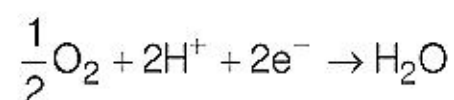
- (1) Enzymes are biocatalysts.
- (2) Like chemical catalysts enzymes reduce the activation energy of bio processes.
- (3) Enzymes are polysaccharides.
- (4) Enzymes are very specific for a particular reaction and substrate.

Answer (3)

57. Given below are half cell reactions:



$$E_{\text{Mn}^{2+}/\text{MnO}_4^-}^\circ = -1.510 \text{ V}$$



$$E_{\text{O}_2/\text{H}_2\text{O}}^\circ = +1.223 \text{ V}$$

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid?

- (1) Yes, because $E_{\text{cell}}^\circ = + 0.287 \text{ V}$
- (2) No, because $E_{\text{cell}}^\circ = - 0.287 \text{ V}$
- (3) Yes, because $E_{\text{cell}}^\circ = + 2.733 \text{ V}$
- (4) No, because $E_{\text{cell}}^\circ = - 2.733 \text{ V}$

Answer (1)

58. Which one is not correct mathematical equation for Dalton's Law of partial pressure? Here p = total pressure of gaseous mixture

(1) $p = p_1 + p_2 + p_3$

(2) $p = n_1 \frac{RT}{V} + n_2 \frac{RT}{V} + n_3 \frac{RT}{V}$

(3) $p_i = \chi_i p$,

where p_i = partial pressure of i^{th} gas

χ_i = mole fraction of i^{th} gas in gaseous mixture

(4) $p_i = \chi_i p_i^\circ$,

where χ_i = mole fraction of i^{th} gas in gaseous mixture

p_i° = pressure of i^{th} gas in pure state

Answer (4)

59. The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is [Given pK_a of $\text{CH}_3\text{COOH} = 4.57$]

(1) 5.57

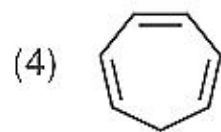
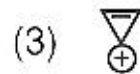
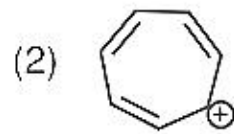
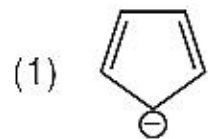
(2) 3.57

(3) 4.57

(4) 2.57

Answer (1)

60. Which compound amongst the following is **not** an aromatic compound?



Answer (4)

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

Assertion (A): In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.

Reason (R): In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

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

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

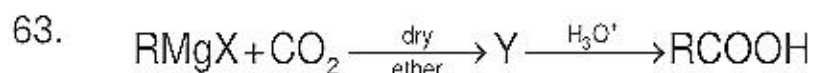
(4) (A) is not correct but (R) is correct

Answer (2)

62. In one molal solution that contains 0.5 mole of a solute, there is

- (1) 500 mL of solvent
- (2) 500 g of solvent
- (3) 100 mL of solvent
- (4) 1000 g of solvent

Answer (2)



What is Y in the above reaction?

- (1) $\text{RCOO}^-\text{Mg}^+\text{X}$
- (2) $\text{R}_3\text{CO}^-\text{Mg}^+\text{X}$
- (3) RCOO^-X^+
- (4) $(\text{RCOO})_2\text{Mg}$

Answer (1)

64. Which of the following statement is not correct about diborane?

- (1) There are two 3-centre-2-electron bonds.
- (2) The four terminal B-H bonds are two centre two electron bonds.
- (3) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.
- (4) Both the Boron atoms are sp^2 hybridised.

Answer (4)

65. Given below are two statements :

Statement I : The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole - dipole interactions.

Statement II : The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.

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

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

Answer (1)

66. Amongst the following which one will have maximum 'lone pair - lone pair' electron repulsions?

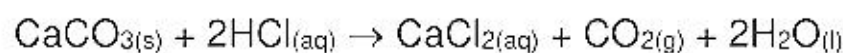
- (1) ClF_3
- (2) IF_5
- (3) SF_4
- (4) XeF_2

Answer (4)

67. Identify the incorrect statement from the following
- (1) Alkali metals react with water to form their hydroxides.
 - (2) The oxidation number of K in KO_2 is +4.
 - (3) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.
 - (4) Lithium is the strongest reducing agent among the alkali metals.

Answer (2)

68. What mass of 95% pure CaCO_3 will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction?

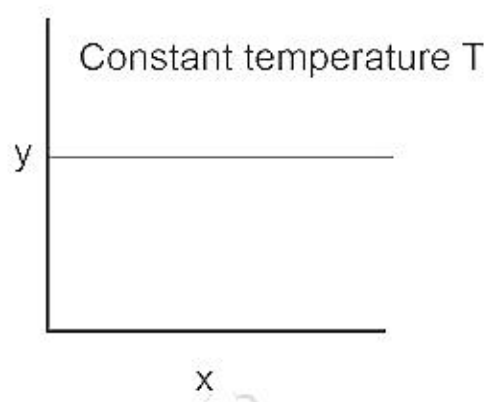


[Calculate upto second place of decimal point]

- (1) 1.25 g
- (2) 1.32 g
- (3) 3.65 g
- (4) 9.50 g

Answer (2)

69. The given graph is a representation of kinetics of a reaction.



The y and x axes for zero and first order reactions, respectively are

- (1) zero order ($y = \text{concentration}$ and $x = \text{time}$), first order ($y = t_{1/2}$ and $x = \text{concentration}$)
- (2) zero order ($y = \text{concentration}$ and $x = \text{time}$), first order ($y = \text{rate constant}$ and $x = \text{concentration}$)
- (3) zero order ($y = \text{rate}$ and $x = \text{concentration}$), first order ($y = t_{1/2}$ and $x = \text{concentration}$)
- (4) zero order ($y = \text{rate}$ and $x = \text{concentration}$), first order ($y = \text{rate}$ and $x = t_{1/2}$)

Answer (3)

70. The IUPAC name of the complex-

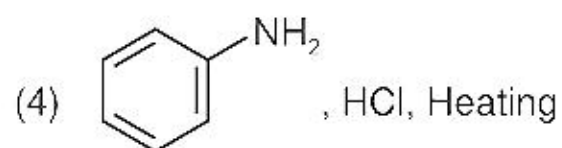
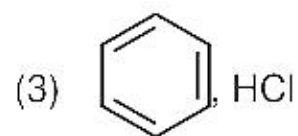
$[\text{Ag}(\text{H}_2\text{O})_2][\text{Ag}(\text{CN})_2]$ is:

- (1) dicyanosilver(II) diaquaargentate(II)
- (2) diaquasilver(II) dicyanidoargentate(II)
- (3) dicyanosilver(I) diaquaargentate(I)
- (4) diaquasilver(I) dicyanidoargentate(I)

Answer (4)

71. Which of the following sequence of reactions is suitable to synthesize chlorobenzene?

- (1) Benzene, Cl_2 , anhydrous FeCl_3
- (2) Phenol, NaNO_2 , HCl , CuCl



Answer (1)

72. At 298 K, the standard electrode potentials of $\text{Cu}^{2+} / \text{Cu}$, $\text{Zn}^{2+} / \text{Zn}$, $\text{Fe}^{2+} / \text{Fe}$ and Ag^+ / Ag are 0.34 V, -0.76 V, -0.44 V and 0.80 V, respectively.

On the basis of standard electrode potential, predict which of the following reaction cannot occur?

- (1) $\text{CuSO}_4(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}(\text{s})$
- (2) $\text{CuSO}_4(\text{aq}) + \text{Fe}(\text{s}) \rightarrow \text{FeSO}_4(\text{aq}) + \text{Cu}(\text{s})$
- (3) $\text{FeSO}_4(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Fe}(\text{s})$
- (4) $2\text{CuSO}_4(\text{aq}) + 2\text{Ag}(\text{s}) \rightarrow 2\text{Cu}(\text{s}) + \text{Ag}_2\text{SO}_4(\text{aq})$

Answer (4)

73. Given below are two statements

Statement I : The boiling points of the following hydrides of group 16 elements increases in the order –
 $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$

Statement II : The boiling points of these hydrides increase with increase in molar mass.

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

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

Answer (2)

74. The IUPAC name of an element with atomic number 119 is

- (1) ununennium
- (2) unnilennium
- (3) unununnium
- (4) ununoctium

Answer (1)

75. Given below are two statements

Statement I: Primary aliphatic amines react with HNO_2 to give unstable diazonium salts.

Statement II: Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K. In the light of the above statements, choose the most **appropriate** answer from the options given below

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

Answer (3)

76. Match **List-I** with **List-II**.

| List-I (Drug class) | List-II (Drug molecule) |
|--------------------------------------|--|
| (a) Antacids | (i) Salvarsan |
| (b) Antihistamines | (ii) Morphine |
| (c) Analgesics | (iii) Cimetidine |
| (d) Antimicrobials | (iv) Seldane |

Choose the correct answer from the options given below :

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

Answer (2)

77. Choose the correct statement:

- (1) Diamond and graphite have two dimensional network.
- (2) Diamond is covalent and graphite is ionic.
- (3) Diamond is sp^3 hybridised and graphite is sp^2 hybridized.
- (4) Both diamond and graphite are used as dry lubricants.

Answer (3)

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

Assertion (A): ICl is more reactive than I_2 .

Reason (R): I-Cl bond is weaker than I-I bond.

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

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

Answer (1)

79. The **incorrect** statement regarding chirality is

- (1) S_N1 reaction yields 1 : 1 mixture of both enantiomers
- (2) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration
- (3) Enantiomers are superimposable mirror images on each other
- (4) A racemic mixture shows zero optical rotation

Answer (3)

80. Match **List-I** with **List-II**.

| List-I | List-II |
|-------------------|-------------------------|
| (Hydrides) | (Nature) |
| (a) MgH_2 | (i) Electron precise |
| (b) GeH_4 | (ii) Electron deficient |
| (c) B_2H_6 | (iii) Electron rich |
| (d) HF | (iv) Ionic |

Choose the correct answer from the options given below

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

Answer (1)

81. Which statement regarding polymers is **not correct**?

- (1) Elastomers have polymer chains held together by weak intermolecular forces
- (2) Fibers possess high tensile strength
- (3) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively
- (4) Thermosetting polymers are reusable

Answer (4)

82. Given below are two statements

Statement I: The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

Statement II: *o*-nitrophenol, *m*-nitrophenol and *p*-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

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

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

Answer (3)

83. Given below are two statements

Statement I: In the coagulation of a negative sol, the flocculating power of the three given ions is in the order $\text{Al}^{3+} > \text{Ba}^{2+} > \text{Na}^+$

Statement II: In the coagulation of a positive sol, the flocculating power of the three given salts is in the order $\text{NaCl} > \text{Na}_2\text{SO}_4 > \text{Na}_3\text{PO}_4$

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

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

Answer (3)

84. Match List-I with List-II.

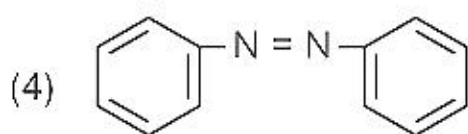
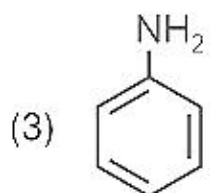
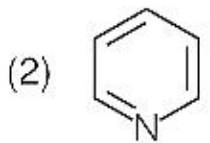
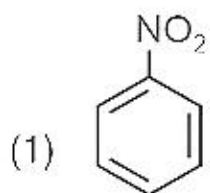
| List-I (Products formed) | List-II (Reaction of carbonyl compound with) |
|-----------------------------|---|
| (a) Cyanohydrin | (i) NH_2OH |
| (b) Acetal | (ii) RNH_2 |
| (c) Schiff's base | (iii) alcohol |
| (d) Oxime | (iv) HCN |

Choose the correct answer from the options given below

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

Answer (4)

85. The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds?



Answer (3)

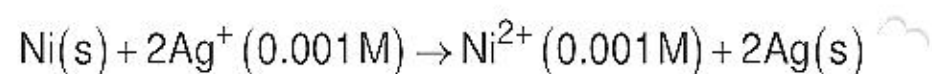
SECTION-B

86. In the neutral or faintly alkaline medium, KMnO_4 oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from

- (1) +7 to +4
(2) +6 to +4
(3) +7 to +3
(4) +6 to +5

Answer (1)

87. Find the emf of the cell in which the following reaction takes place at 298 K



$$\left(\text{Given that } E_{\text{cell}}^{\circ} = 10.5\text{ V}, \frac{2.303 RT}{F} = 0.059 \text{ at } 298\text{ K} \right)$$

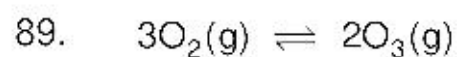
- (1) 1.0385 V
(2) 1.385 V
(3) 0.9615 V
(4) 1.05 V

Answer (NA)

88. Compound X on reaction with O_3 followed by $\text{Zn}/\text{H}_2\text{O}$ gives formaldehyde and 2-methyl propanal as products. The compound X is

- (1) 3-Methylbut-1-ene
(2) 2-Methylbut-1-ene
(3) 2-Methylbut-2-ene
(4) Pent-2-ene

Answer (1)

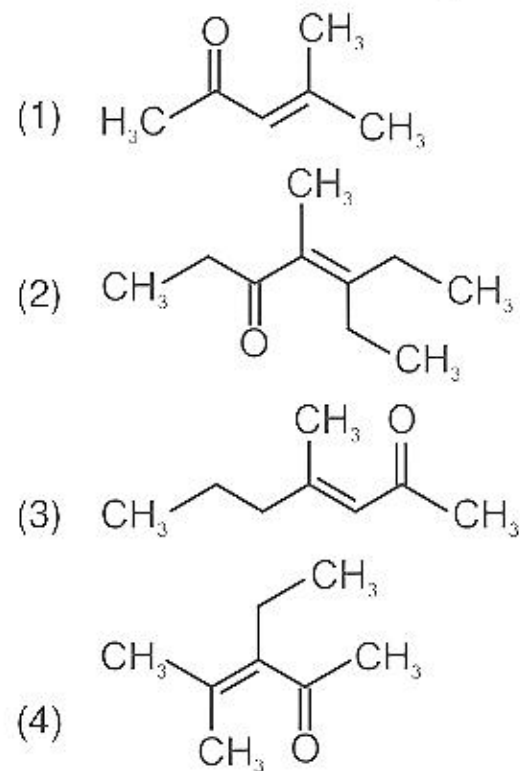


for the above reaction at 298 K, K_c is found to be 3.0×10^{-59} . If the concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is

- (1) 4.38×10^{-32}
- (2) 1.9×10^{-63}
- (3) 2.4×10^{31}
- (4) 1.2×10^{21}

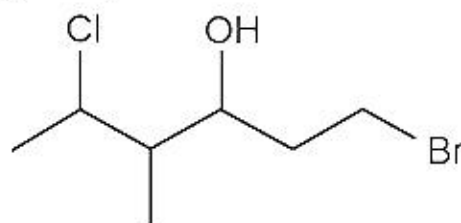
Answer (1)

90. Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating?



Answer (2)

91. The correct IUPAC name of the following compound is



- (1) 1-bromo-5-chloro-4-methylhexan-3-ol
- (2) 6-bromo-2-chloro-4-methylhexan-4-ol
- (3) 1-bromo-4-methyl-5-chlorohexan-3-ol
- (4) 6-bromo-4-methyl-2-chlorohexan-4-ol

Answer (1)

92. If radius of second Bohr orbit of the He^+ ion is 105.8 pm, what is the radius of third Bohr orbit of Li^{2+} ion?

- (1) 158.7 pm
- (2) 15.87 pm
- (3) 1.587 pm
- (4) 158.7 Å

Answer (1)

93. The order of energy absorbed which is responsible for the color of complexes

- (A) $[\text{Ni}(\text{H}_2\text{O})_2(\text{en})_2]^{2+}$
(B) $[\text{Ni}(\text{H}_2\text{O})_4(\text{en})]^{2+}$ and
(C) $[\text{Ni}(\text{en})_3]^{2+}$

is

- (1) (A) > (B) > (C)
(2) (C) > (B) > (A)
(3) (C) > (A) > (B)
(4) (B) > (A) > (C)

Answer (3)

94. Copper crystallises in fcc unit cell with cell edge length of 3.608×10^{-8} cm. The density of copper is 8.92 g cm^{-3} . Calculate the atomic mass of copper.

- (1) 63.1 u
(2) 31.55 u
(3) 60 u
(4) 65 u

Answer (1)

95. A 10.0 L flask contains 64 g of oxygen at 27°C . (Assume O_2 gas is behaving ideally). The pressure inside the flask in bar is (Given $R = 0.0831 \text{ L bar K}^{-1} \text{ mol}^{-1}$)

- (1) 2.5
(2) 498.6
(3) 49.8
(4) 4.9

Answer (4)

96. Match List-I with List-II.

| List-I (Ores) | List-II (Composition) |
|------------------|--|
| (a) Haematite | (i) Fe_3O_4 |
| (b) Magnetite | (ii) ZnCO_3 |
| (c) Calamine | (iii) Fe_2O_3 |
| (d) Kaolinite | (iv) $[\text{Al}_2(\text{OH})_4\text{Si}_2\text{O}_5]$ |

Choose the correct answer from the options given below:

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

Answer (2)

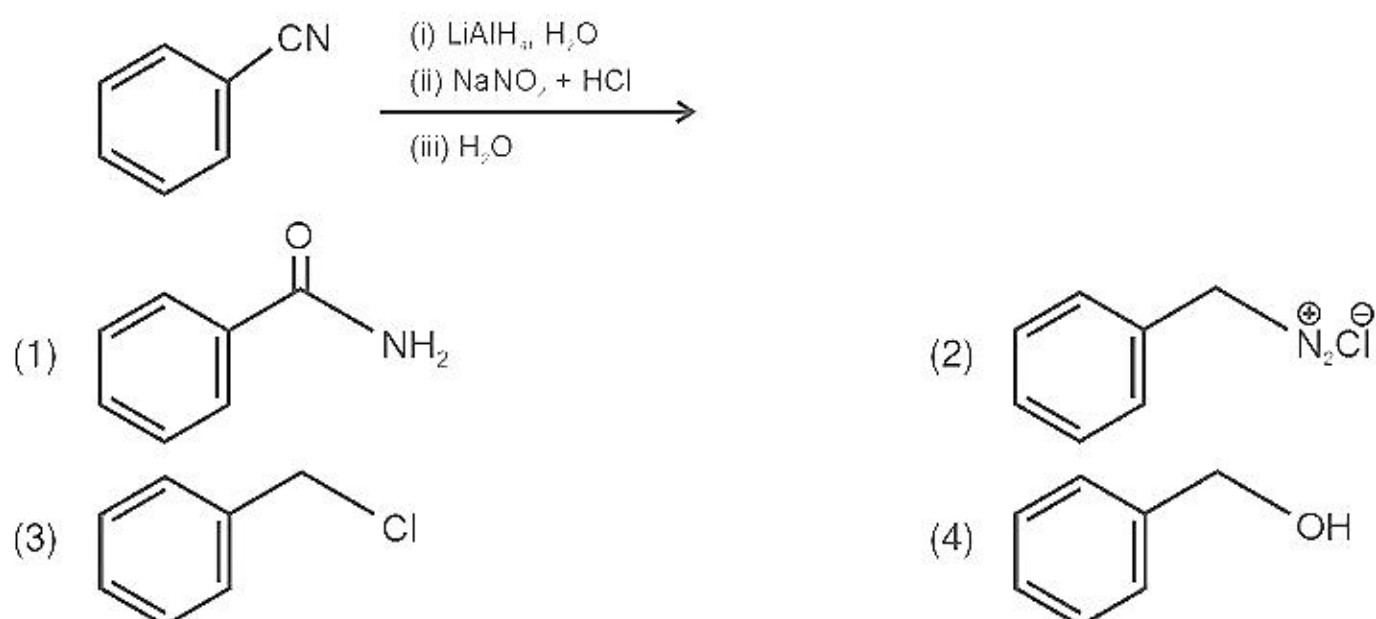
97. The pollution due to oxides of sulphur gets enhanced due to the presence of:
- particulate matter
 - ozone
 - hydrocarbons
 - hydrogen peroxide

Choose the most appropriate answer from the options given below:

- (a), (d) only
- (a), (b), (d) only
- (b), (c), (d) only
- (a), (c), (d) only

Answer (2)

98. The product formed from the following reaction sequence is



Answer (4)

99. For a first order reaction $A \rightarrow \text{Products}$, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min^{-1} is

- 1.3818
- 0.9212
- 0.4606
- 0.2303

Answer (2)

100. Given below are two statements:

Statement I: In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $\text{HCl} + \text{ZnCl}_2$, known as Lucas Reagent.

Statement II: Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

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

- Both Statement I and Statement II are correct
- Both Statement I and Statement II are incorrect
- Statement I is correct but Statement II is incorrect
- Statement I is incorrect but Statement II is correct

Answer (3)