

CHEMISTRY

SECTION-A

51. Select the **correct** statements from the following
- A. Atoms of all elements are composed of two fundamental particles.
  - B. The mass of the electron is  $9.10939 \times 10^{-31}$  kg.
  - C. All the isotopes of a given element show same chemical properties.
  - D. Protons and electrons are collectively known as nucleons.
  - E. Dalton's atomic theory, regarded the atom as an ultimate particle of matter.

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

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

**Answer (4)**

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

**Assertion A** : A reaction can have zero activation energy.

**Reasons R** : The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy.

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

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

**Answer (2)**

53. A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy  $1/3$  of tetrahedral voids. If the formula of the compound is  $A_xB_y$ , then the value of  $x + y$  is in option

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

**Answer (1)**

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

**Assertion A** : Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic.

**Reason R** : The deep blue solution is due to the formation of amide.

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

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

**Answer (3)**

55. Amongst the following the total number of species NOT having eight electrons around central atom in its outermost shell, is

$\text{NH}_3$ ,  $\text{AlCl}_3$ ,  $\text{BeCl}_2$ ,  $\text{CCl}_4$ ,  $\text{PCl}_5$  :

- (1) 3 (2) 2  
 (3) 4 (4) 1

**Answer (1)**

56. Which amongst the following molecules on polymerization produces neoprene?

- (1)  $\text{H}_2\text{C}=\text{CH}-\text{CH}=\text{CH}_2$  (2)  $\text{H}_2\text{C}=\overset{\text{Cl}}{\underset{|}{\text{C}}}-\text{CH}=\text{CH}_2$   
 (3)  $\text{H}_2\text{C}=\text{CH}-\text{C}\equiv\text{CH}$  (4)  $\text{H}_2\text{C}=\overset{\text{CH}_3}{\underset{|}{\text{C}}}-\text{CH}=\text{CH}_2$

**Answer (2)**

57. In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red colour with  $\text{Fe}^{3+}$  due to the formation of

- (1)  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 \cdot x\text{H}_2\text{O}$  (2)  $\text{NaSCN}$   
 (3)  $[\text{Fe}(\text{CN})_5\text{NOS}]^{4-}$  (4)  $[\text{Fe}(\text{SCN})]^{2+}$

**Answer (4)**

58. Weight (g) of two moles of the organic compound, which is obtained by heating sodium ethanoate with sodium hydroxide in presence of calcium oxide is :

- (1) 16 (2) 32  
 (3) 30 (4) 18

**Answer (2)**

59. Some tranquilizers are listed below. Which one from the following belongs to barbiturates?

- (1) Chlordiazepoxide (2) Meprobamate  
 (3) Valium (4) Veronal

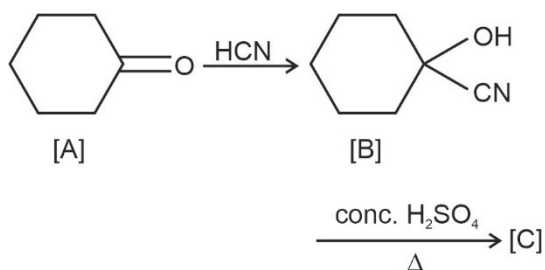
**Answer (4)**

60. The conductivity of centimolar solution of KCl at 25°C is  $0.0210 \text{ ohm}^{-1} \text{ cm}^{-1}$  and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is

- (1)  $1.34 \text{ cm}^{-1}$  (2)  $3.28 \text{ cm}^{-1}$   
(3)  $1.26 \text{ cm}^{-1}$  (4)  $3.34 \text{ cm}^{-1}$

**Answer (3)**

61. Complete the following reaction



[C] is \_\_\_\_\_

- (1) (2)   
(3) (4)

**Answer (4)**

62. Homoleptic complex from the following complexes is

- (1) Potassium trioxalatoaluminate (III)  
(2) Diamminechloridonitrito-N-platinum (II)  
(3) Pentaamminecarbonatocobalt (III) chloride  
(4) Triamminetriaquachromium (III) chloride

**Answer (1)**

63. The relation between  $n_m$ , ( $n_m$  = the number of permissible values of magnetic quantum number ( $m$ )) for a given value of azimuthal quantum number ( $l$ ), is

- (1)  $l = \frac{n_m - 1}{2}$  (2)  $l = 2n_m + 1$   
(3)  $n_m = 2l^2 + 1$  (4)  $n_m = l + 2$

**Answer (1)**

64. The stability of  $\text{Cu}^{2+}$  is more than  $\text{Cu}^+$  salts in aqueous solution due to
- |                               |                                |
|-------------------------------|--------------------------------|
| (1) First ionisation enthalpy | (2) Enthalpy of atomization    |
| (3) Hydration energy          | (4) Second ionisation enthalpy |

**Answer (3)**

65. Taking stability as the factor, which one of the following represents **correct** relationship?

- |                     |                   |
|---------------------|-------------------|
| (1) $TlCl_3 > TlCl$ | (2) $InI_3 > InI$ |
| (3) $AlCl > AlCl_3$ | (4) $TlI > TlI_3$ |

**Answer (4)**

66. Which one is an example of heterogenous catalysis?

- (1) Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxides of nitrogen
- (2) Hydrolysis of sugar catalysed by  $\text{H}^+$  ions
- (3) Decomposition of ozone in presence of nitrogen monoxide
- (4) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron

**Answer (4)**

67. The number of  $\sigma$  bonds,  $\pi$  bonds and lone pair of electrons in pyridine, respectively are:

- |              |              |
|--------------|--------------|
| (1) 11, 2, 0 | (2) 12, 3, 0 |
| (3) 11, 3, 1 | (4) 12, 2, 1 |

**Answer (3)**

68. The **correct** order of energies of molecular orbitals of  $\text{N}_2$  molecule, is

- (1)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$
- (2)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$
- (3)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < \sigma^* 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y)$
- (4)  $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma 2p_z < \sigma^* 2p_z$

**Answer (1)**

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

**Assertion A** : Helium is used to dilute oxygen in diving apparatus.

**Reason R** : Helium has high solubility in  $\text{O}_2$ .

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

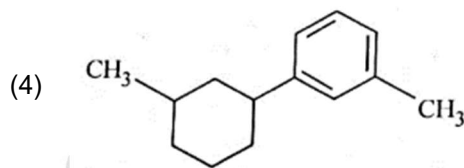
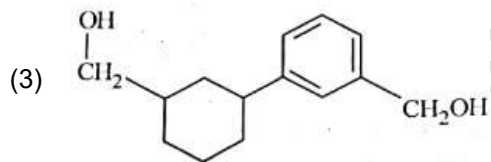
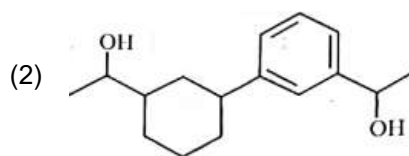
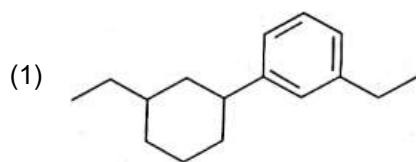
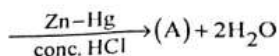
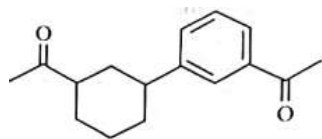
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- (2) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**
- (3) **A** is true but **R** is false
- (4) **A** is false but **R** is true

**Answer (2)**

70. For a certain reaction, the rate =  $k[A]^2[B]$ , when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would
- (1) Decrease by a factor of nine  
 (2) Increase by a factor of six  
 (3) Increase by a factor of nine  
 (4) Increase by a factor of three

**Answer (3)**

71. Identify product (A) in the following reaction:



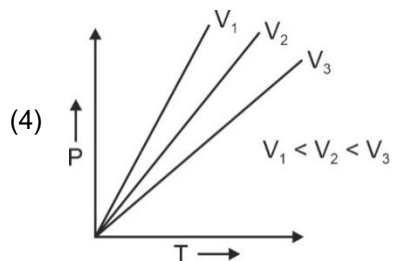
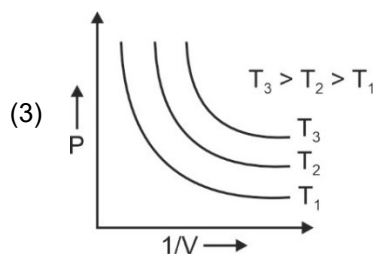
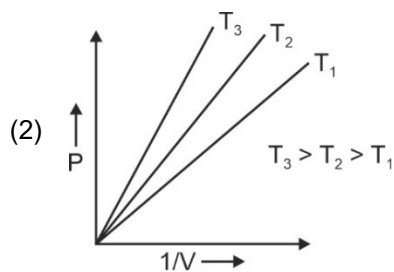
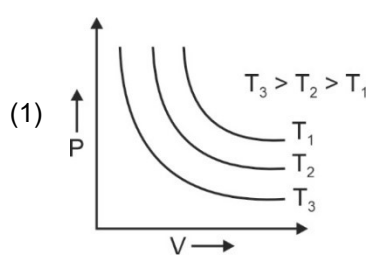
**Answer (1)**

72. Which of the following reactions will NOT give primary amine as the product?



**Answer (3)**

73. Which amongst the following options is **correct** graphical representation of Boyle's law?



**Answer (2)**

74. Amongst the given options which of the following molecules/ ion acts as a Lewis acid?

- (1)  $\text{NH}_3$  (2)  $\text{H}_2\text{O}$   
 (3)  $\text{BF}_3$  (4)  $\text{OH}^-$

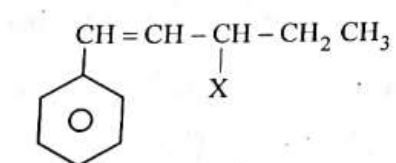
**Answer (3)**

75. The element expected to form largest ion to achieve the nearest noble gas configuration is

- (1) O (2) F  
 (3) N (4) Na

**Answer (3)**

76. The given compound



is an example of \_\_\_\_\_.

- (1) Benzylic halide (2) Aryl halide  
 (3) Allylic halide (4) Vinylic halide

**Answer (3)**

77. Given below are two statements :

**Statement I** : A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside.

**Statement II** : When nucleoside is linked to phosphorous acid at 5' -position of sugar moiety, we get nucleotide.

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

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

**Answer (3)**

78. Intermolecular forces are forces of attraction and repulsion between interacting particles that will include :

- A. dipole - dipole forces  
 B. dipole - induced dipole forces  
 C. hydrogen bonding  
 D. covalent bonding  
 E. dispersion forces

Choose the **most appropriate** answer from the options given below :

- (1) B, C, D, E are correct (2) A, B, C, D are correct  
 (3) A, B, C, E are correct (4) A, C, D, E are correct

**Answer (3)**

79. Which of the following statements are **NOT** correct?
- Hydrogen is used to reduce heavy metal oxides to metals.
  - Heavy water is used to study reaction mechanism.
  - Hydrogen is used to make saturated fats from oils.
  - The H–H bond dissociation enthalpy is lowest as compared to a single bond between two atoms of any elements.
  - Hydrogen reduces oxides of metals that are more active than iron.

Choose the **most appropriate** answer from the options given below:

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

**Answer (3)**

80. Which one of the following statements is **correct**?
- The daily requirement of Mg and Ca in the human body is estimated to be 0.2-0.3 g
  - All enzymes that utilise ATP in phosphate transfer require Ca as the cofactor
  - The bone in human body is an inert and unchanging substance
  - Mg plays roles in neuromuscular function and interneuronal transmission

**Answer (1)**

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

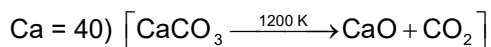
<b>List-I</b>	<b>List-II</b>
A. Coke	I. Carbon atoms are $sp^3$ hybridised
B. Diamond	II. Used as a dry lubricant
C. Fullerene	III. Used as a reducing agent
D. Graphite	IV. Cage like molecules

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

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

**Answer (3)**

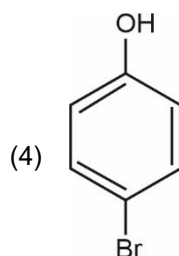
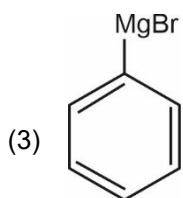
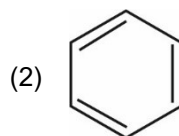
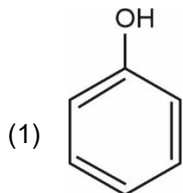
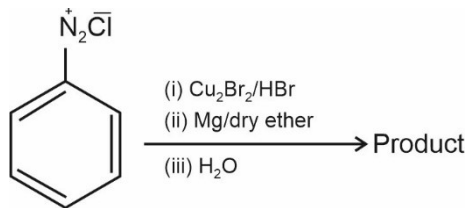
82. The **right** option for the mass of  $CO_2$  produced by heating 20 g of 20% pure limestone is (Atomic mass of



- 1.12 g
- 1.76 g
- 2.64 g
- 1.32 g

**Answer (2)**

83. Identify the product in the following reaction:



**Answer (2)**

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

**Assertion A** : In equation  $\Delta_r G = -nFE_{\text{cell}}$  value of  $\Delta_r G$  depends on  $n$ .

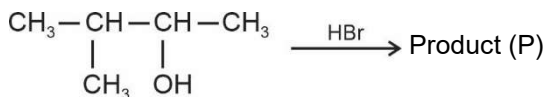
**Reasons R** :  $E_{\text{cell}}$  is an intensive property and  $\Delta_r G$  is an extensive property.

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

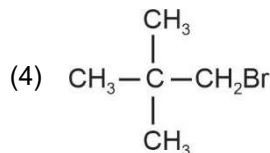
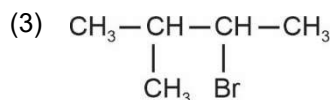
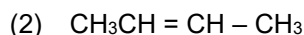
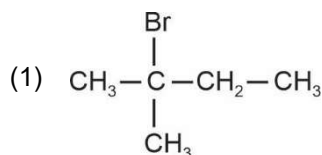
- (1) Both **A** and **R** are true and **R** is the correct explanation of **A**
- (2) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**
- (3) **A** is true but **R** is false
- (4) **A** is false but **R** is true

**Answer (2)**

85. Consider the following reaction and identify the product (P).



3-Methylbutan-2-ol

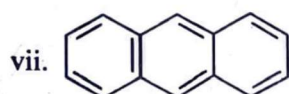
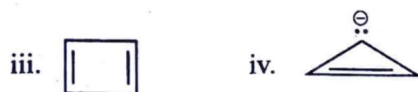
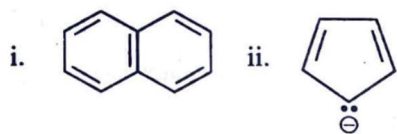


**Answer (1)**



SECTION-B

86. Consider the following compounds/species:



The number of compounds/species which obey Huckel's rule is \_\_\_\_\_.

(1) 4

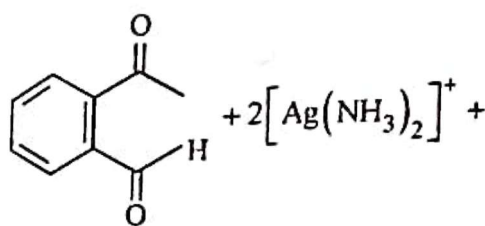
(2) 6

(3) 2

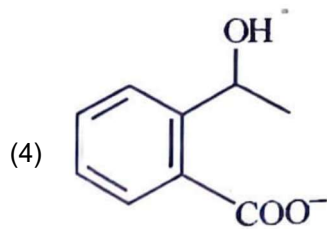
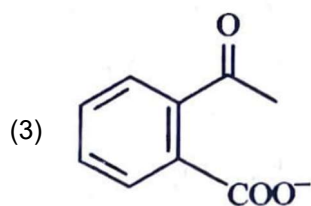
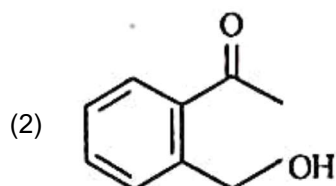
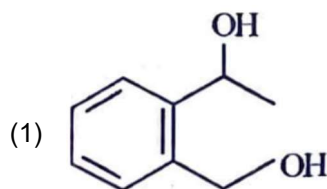
(4) 5

**Answer (1)**

87. Identify the major product obtained in the following reaction:



$3^- \text{OH} \xrightarrow{\Delta}$  major product



**Answer (3)**

88. Which of the following statements are **INCORRECT**?
- All the transition metals except scandium form MO oxides which are ionic.
  - The highest oxidation number corresponding to the group number in transition metal oxides is attained in  $\text{Sc}_2\text{O}_3$  to  $\text{Mn}_2\text{O}_7$ .
  - Basic character increases from  $\text{V}_2\text{O}_3$  to  $\text{V}_2\text{O}_4$  to  $\text{V}_2\text{O}_5$ .
  - $\text{V}_2\text{O}_4$  dissolves in acids to give  $\text{VO}_4^{3-}$  salts.
  - $\text{CrO}$  is basic but  $\text{Cr}_2\text{O}_3$  is amphoteric.

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

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

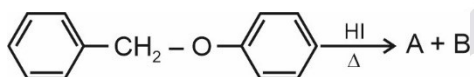
**Answer (3)**

89. Which amongst the following will be most readily dehydrated under acidic conditions?

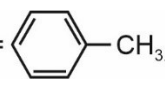
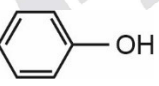
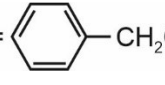
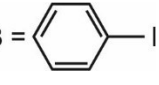
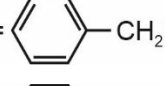
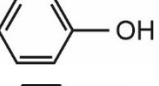
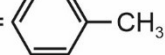
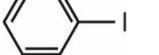


**Answer (2)**

90. Consider the following reaction :



Identify products A and B.

- |   |
|---|
| (1) A =  and B =  |
| (2) A =  and B =  |
| (3) A =  and B =  |
| (4) A =  and B =  |

**Answer (3)**

91. The reaction that does **NOT** take place in a blast furnace between 900 K to 1500 K temperature range during extraction of iron is :

- |   |  |
|---|--|
| (1) $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow 2\text{FeO} + \text{CO}_2$ | (2) $\text{FeO} + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$ |
| (3) $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$                           | (4) $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$       |

**Answer (1)**



97. Which complex compound is most stable?

- (1)  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Br}](\text{NO}_3)_2$                       (2)  $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$   
 (3)  $[\text{CoCl}_2(\text{en})_2]\text{NO}_3$                                       (4)  $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3$

**Answer (3)**

98. Match List-I with List-II :

**List-I (Oxoacids of Sulphur)**

**List-II (Bonds)**

- |                           |                                      |
|---------------------------|--------------------------------------|
| A. Peroxodisulphuric acid | I. Two S–OH, Four S=O, One S–O–S     |
| B. Sulphuric acid         | II. Two S–OH, One S=O                |
| C. Pyrosulphuric acid     | III. Two S–OH, Four S=O, One S–O–O–S |
| D. Sulphurous acid        | IV. Two S–OH, Two S=O                |

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

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

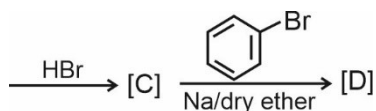
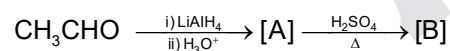
**Answer (2)**

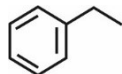
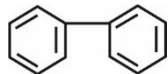
99. Pumice stone is an example of

- (1) Sol    (2) Gel  
 (3) Solid sol    (4) Foam

**Answer (3)**

100. Identify the final product [D] obtained in the following sequence of reactions.



- (1)   
 (2)   
 (3)  $\text{C}_4\text{H}_{10}$   
 (4)  $\text{HC} \equiv \text{C}^\ominus\text{Na}^+$

**Answer (1)**