CHEMISTRY

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.
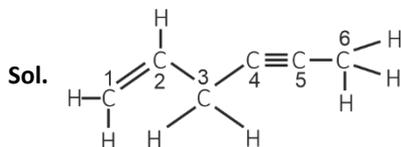
Choose the correct answer :

1. Which one of the following forms most stable carbocation ?

    (1) $(Ph)_3C-Br$

    (2) $C_6H_5CH_2Br$

    (3) $C_6H_5CH(Br)CH_3$

    (4) $CH_3CH_2CH_2CH_2Br$

Answer (1)

Sol. $(Ph)_3C - Br$ Forms $Ph - \overset{\oplus}{\underset{Ph}{C}} - Ph$ as the most stable intermediate among the given compounds.

2. Number of σ and π bonds respectively in hex-1-en-4-yne are

    (1) 13, 3   (2) 14, 3

    (3) 3, 14   (4) 14, 13

Answer (1)
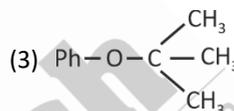
Sol.

Hex-1-en-4-yne

$\Rightarrow$ 13 σ and 3π bonds

3. Which element in group 15 has the lowest Ionisation Energy

    (1) Bi   (2) P
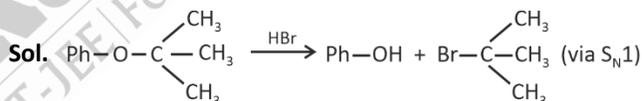
    (3) As   (4) Sb

Answer (1)

Sol. $\underset{1402}{N} > \underset{1012}{P} > \underset{947}{As} > \underset{834}{Sb} > \underset{703 \text{ kJ/mol}}{Bi}$

4. Which of the following ether react with HBr to form phenol?

    (1) $Ph - CH_2 - O - CH_2 - CH_3$

    (2) $Ph - CH_2 - OCH_3$

    (3) $Ph - O - \overset{CH_3}{\underset{CH_3}{C}} - CH_3$

    (4) $Ph - CH_2 - O - CH_2 - Ph$

Answer (3)

Sol. $Ph - O - \overset{CH_3}{\underset{CH_3}{C}} - CH_3 \xrightarrow{HBr} Ph - OH + Br - \overset{CH_3}{\underset{CH_3}{C}} - CH_3$ (via S_N1)

5. Consider the following thermochemical reactions and choose the correct option.

    C(diamond) $\rightarrow$ C(graphite) + x KJ

    C(diamond) + O_2 $\rightarrow$ CO_2 + y KJ

    C(graphite) + O_2 $\rightarrow$ CO_2 + z KJ
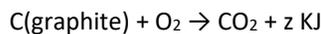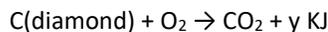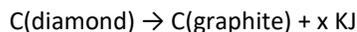
    (1) x = y + z   (2) x = y − z

    (3) x + y = z   (4) x + y = −z

Answer (2)

Sol.

(1) $C(\text{diamond}) \rightarrow C(\text{graphite})$ $\Delta H_1 = -x\,kJ$

(2) $C(\text{diamond}) + O_2(g) \rightarrow CO_2(g)$ $\Delta H_2 = -y\,kJ$

(3) $C(\text{graphite}) + O_2(g) \rightarrow CO_2(g)$ $\Delta H_3 = -z\,kJ$
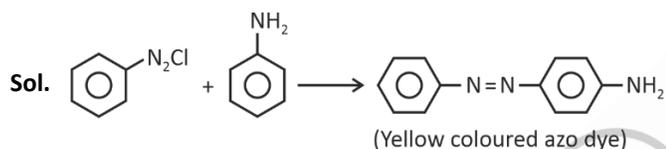
From (1), (2) and (3), we get

$\Delta H_1 = \Delta H_2 - \Delta H_3$

$-x = -y + z$

$x = y - z$

6. Which of the following will give azo dye test?

(1) Aniline   (2) Anisole

(3) Benzene   (4) Benzaldehyde

Answer (1)

Sol.

(Yellow coloured azo dye)

7. Which of the following is an essential amino acid?

(1) Alanine   (2) Glycine

(3) Valine   (4) Aspartic acid

Answer (3)

Sol. Tryptophan, Threonine, Histidine, Valine, Isoleucine, Phenylalanine, Methionine, Arginine, Leucine and Lysine are essential amino acids.

8. A drug becomes ineffective when it decomposes to 50 % its concentration. If 16 mg of said drug becomes 4 mg in 12 months, find the time in which drug becomes ineffective given that decomposition of drug follows first order kinetics.

(1) 6 months   (2) 3 months

(3) 2 months   (4) 12 months

Answer (1)

Sol. Drug $\xrightarrow{\text{1}^{\text{st}}\text{ order}}$ Products

Initial mass of drug = 16 mg

Mass of drug after 12 months = 4 mg

$t_{3/4} = 12$ months

$2t_{1/2} = 12$ months

$t_{1/2} = 6$ months

$\therefore$ Drug becomes ineffective in 6 months.

9. Which of the following gives O_2 predominantly on electrolysis among the following?

A. Aq. $AgNO_3$ (Pt electrodes)

B. Aq. $AgNO_3$ (Ag electrodes)

C. Conc. H_2SO_4 (Pt electrodes)

D. Dilute H_2SO_4 (Pt electrodes)

(1) A, B only

(2) B, C only

(3) A, B, C only

(4) A, D only

Answer (4)

Sol. Aq. $AgNO_3$ (Pt electrodes)

Cathode : $Ag^+ + e^- \rightarrow Ag$

Anode : $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$

Dilute H_2SO_4 (Pt electrodes)

Cathode : $2H_2O + 2e^- \rightarrow H_2 + OH^-$

Anode : $2H_2O \rightarrow O_2 + 4H^+ + e^-$

10. Determine the type of oxide formed by an element (A) which has the smallest size among following.

Li, Na, K, Be, B, Mg

(1) A_2O_3
(2) AO

(3) AO_2
(4) A_2O_2

Answer (1)

Sol. Among the given elements, boron (A) has the smallest size. The oxide of A is A_2O_3.

11. **Statement-I:** In partition chromatography a thin film of liquid acts as stationary phase.

Statement-II: Paper chromatography is not a type of partition chromatography.

(1) Statement-I is correct and statement-II is incorrect

(2) Statement-I is incorrect and statement-II is correct

(3) Both statement-I and statement-II are correct

(4) Both statement-I and statement-II are incorrect

Answer (1)

Sol. Paper chromatography is a type of partition chromatography, in which liquid acts as stationary phase.

12. 7.3g Benzalacetone is synthesized from 10.6 g of benzaldehyde using acetone as other reactant. Percentage yield of Benzalacetone is

(1) 50%

(2) 27%

(3) 90%

(4) 40%

Answer (1)

Sol. $C_6H_5CHO + CH_3COCH_3 \xrightarrow{\text{Base}} C_6H_5-CH=CH-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$

1 mole   1 mole

(106 g)   (146 g)

10.6 g should give 14.6 g for 100% yield

10.6 g give 7.3 of Benzalacetone in this question. So,

percentage yield = $\dfrac{7.3}{14.6} \times 100 = 50\%$

13. Some substances can effectively convert heat energy to electrical energy. For the conversion of thermal energy to electrical energy, the substance should have:

(1) Low thermal and low electrical conductivity

(2) High thermal and high electrical conductivity

(3) High thermal and low electrical conductively

(4) Low thermal and high electrical conductivity

Answer (4)

Sol. Substance should have low thermal and high electrical conductivity as it should readily conduct electricity while poorly transferring heat.

14.

15.

16.

17.

18.

19.

20.

SECTION - B

Numerical Value Type Questions: This section contains 5 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

21. 0.41 g of $BaSO_4$ is obtained from 0.2 g of organic compound in Carius method. What is the percentage of sulphur present in organic compound?

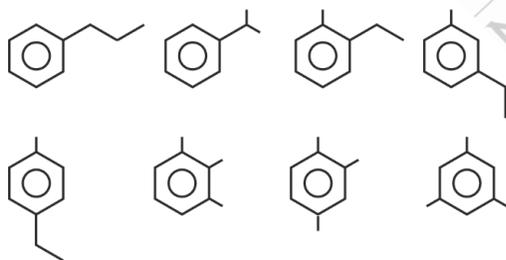**Answer (28)**

Sol. Moles of $BaSO_4 = \dfrac{0.41}{233}$ mol

Mass of sulphur $= \dfrac{0.41}{233} \times 32$ g

$= 0.056$ g

% of sulphur in organic compound $= \dfrac{0.056}{0.2} \times 100$

$= 28\%$

22. The number of benzenoid structural isomers having molecular formula C_9H_{12} which do not give Baeyer's reagent test is ?

Answer (8)

Sol. D.U. $= \dfrac{18+2-12}{2} = 4$

Baeyer's Reagent (cold dil. $KMnO_4$) reacts with alkene and alkynes and not with benzene.

23. How many maximum spectral lines are observed when a sample of hydrogen atoms de-excited from n = 4 to n = 1?
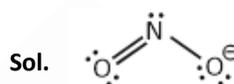
Answer (6)

Sol. Maximum number of spectral lines $= \dfrac{n(n-1)}{2}$

$= \dfrac{4(4-1)}{2} = \dfrac{12}{2} = 6$

24. Find number of non-bonding electron in NO_2^- ion is _____.

Answer (12)

Sol.
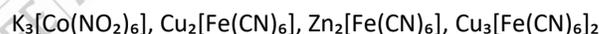

Number of non-bonding electrons will be

$= 4 + 2 + 6$

$= 12$

25. Find spin only magnetic moment of yellow coloured complex compound

$K_3[Co(NO_2)_6]$, $Cu_2[Fe(CN)_6]$, $Zn_2[Fe(CN)_6]$, $Cu_3[Fe(CN)_6]_2$

Answer (0)

Sol. $Cu_2[Fe(CN)_6]$ = Chocolate brown ppt

$Zn_2[Fe(CN)_6]$ = White ppt

$Cu_3[Fe(CN)_6]_2$ = Green ppt

$K_3[Co(NO_2)_6]$ = Yellow ppt

In $K_3[Co(NO_2)_6]$, Co^{3+} with $SFL(NO_2^-)$ has electronic configuration $t_{2g}^6 eg^0$

Number of unpaired e^- = 0

So, $\mu = 0$