

**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)  $(\text{Ph})_3\text{C}-\text{Br}$
- (2)  $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$
- (3)  $\text{C}_6\text{H}_5\text{CH}(\text{Br})\text{CH}_3$
- (4)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$

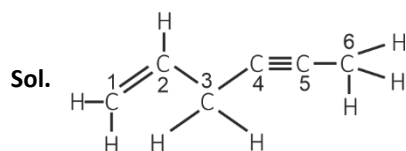
**Answer (1)**

**Sol.**  $(\text{Ph})_3\text{C}-\text{Br}$  Forms  $\text{Ph}-\overset{\oplus}{\underset{\text{Ph}}{\text{C}}}-\text{Ph}$  as the most stable intermediate among the given compounds.

2. Number of  $\sigma$  and  $\pi$  bonds respectively in hex-1-en-4-yne are

- (1) 13, 3
- (2) 14, 3
- (3) 3, 14
- (4) 14, 13

**Answer (1)**



Hex-1-en-4-yne

$\Rightarrow 13 \sigma$  and  $3 \pi$  bonds

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

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

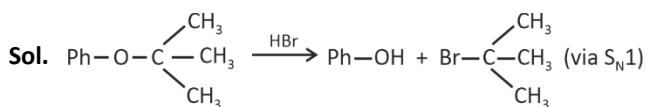
**Answer (1)**

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

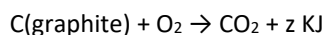
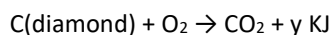
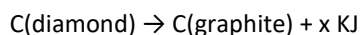
4. Which of the following ether react with HBr to form phenol?

- (1)  $\text{Ph}-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_3$
- (2)  $\text{Ph}-\text{CH}_2-\text{OCH}_3$
- (3)  $\text{Ph}-\text{O}-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}-\text{CH}_3$
- (4)  $\text{Ph}-\text{CH}_2-\text{O}-\text{CH}_2-\text{Ph}$

**Answer (3)**



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



- (1)  $x = y + z$
- (2)  $x = y - z$
- (3)  $x + y = z$
- (4)  $x + y = -z$

**Answer (2)**

- Sol.** (1)  $\text{C(diamond)} \rightarrow \text{C(graphite)} \quad \Delta H_1 = -x\text{kJ}$   
 (2)  $\text{C(diamond)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) \quad \Delta H_2 = -y\text{kJ}$   
 (3)  $\text{C(graphite)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) \quad \Delta H_3 = -z\text{kJ}$

From (1), (2) and (3), we get

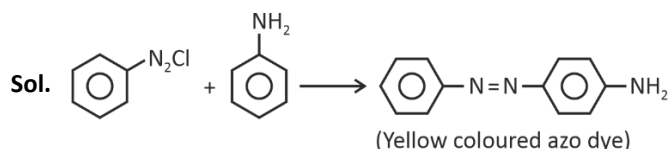
$$\Delta H_1 = \Delta H_2 - \Delta H_3$$

$$-x = -y + z$$

$$x = y - z$$

6. Which of the following will give azo dye test?  
 (1) Aniline (2) Anisole  
 (3) Benzene (4) Benzaldehyde

**Answer (1)**



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  $\xrightarrow{\text{1st order}}$  Products

Initial mass of drug = 16 mg

Mass of drug after 12 months = 4 mg

$$t_{3/4} = 12 \text{ months}$$

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

$$t_{1/2} = 6 \text{ months}$$

$\therefore$  Drug becomes ineffective in 6 months.

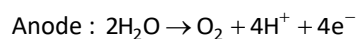
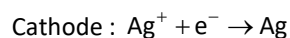
9. Which of the following gives  $\text{O}_2$  predominantly on electrolysis among the following?

- A. Aq.  $\text{AgNO}_3$  (Pt electrodes)  
 B. Aq.  $\text{AgNO}_3$  (Ag electrodes)  
 C. Conc.  $\text{H}_2\text{SO}_4$  (Pt electrodes)  
 D. Dilute  $\text{H}_2\text{SO}_4$  (Pt electrodes)

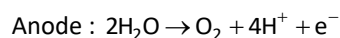
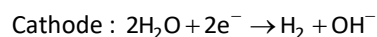
- (1) A, B only  
 (2) B, C only  
 (3) A, B, C only  
 (4) A, D only

**Answer (4)**

**Sol.** Aq.  $\text{AgNO}_3$  (Pt electrodes)



Dilute  $\text{H}_2\text{SO}_4$  (Pt electrodes)



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)  $\text{A}_2\text{O}_3$                       (2)  $\text{AO}$   
(3)  $\text{AO}_2$                       (4)  $\text{A}_2\text{O}_2$

**Answer (1)**

**Sol.** Among the given elements, boron (A) has the smallest size. The oxide of A is  $\text{A}_2\text{O}_3$ .

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

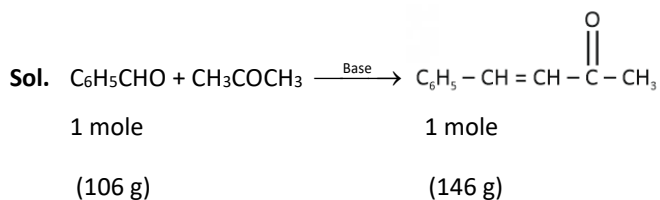
**Answer (1)**

**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)**



10.6 g should give 14.6 g for 100% yield

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

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

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 conductivity  
(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  $\text{BaSO}_4$  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  $\text{BaSO}_4 = \frac{0.41}{233} \text{ mol}$

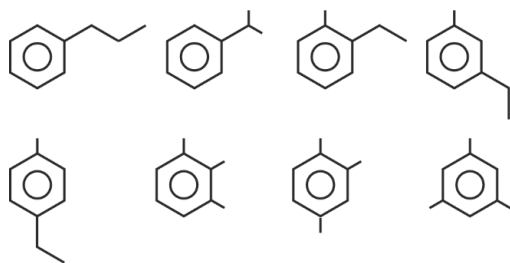
$$\begin{aligned} \text{Mass of sulphur} &= \frac{0.41}{233} \times 32 \text{ g} \\ &= 0.056 \text{ g} \end{aligned}$$

$$\begin{aligned} \% \text{ of sulphur in organic compound} &= \frac{0.056}{0.2} \times 100 \\ &= 28\% \end{aligned}$$

22. The number of benzenoid structural isomers having molecular formula  $\text{C}_9\text{H}_{12}$  which do not give Baeyer's reagent test is ?

**Answer (8)**

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



Baeyer's Reagent (cold dil.  $\text{KMnO}_4$ ) 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  $n = 1$ ?

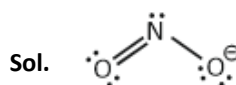
**Answer (6)**

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

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

24. Find number of non-bonding electron in  $\text{NO}_2^-$  ion is \_\_\_\_\_.

**Answer (12)**



$$\begin{aligned} \text{Number of non-bonding electrons will be} \\ &= 4 + 2 + 6 \\ &= 12 \end{aligned}$$

25. Find spin only magnetic moment of yellow coloured complex compound
- $\text{K}_3[\text{Co}(\text{NO}_2)_6]$ ,  $\text{Cu}_2[\text{Fe}(\text{CN})_6]$ ,  $\text{Zn}_2[\text{Fe}(\text{CN})_6]$ ,  $\text{Cu}_3[\text{Fe}(\text{CN})_6]_2$

**Answer (0)**

**Sol.**  $\text{Cu}_2[\text{Fe}(\text{CN})_6]$  = Chocolate brown ppt

$\text{Zn}_2[\text{Fe}(\text{CN})_6]$  = White ppt

$\text{Cu}_3[\text{Fe}(\text{CN})_6]_2$  = Green ppt

$\text{K}_3[\text{Co}(\text{NO}_2)_6]$  = Yellow ppt

In  $\text{K}_3[\text{Co}(\text{NO}_2)_6]$ ,  $\text{Co}^{3+}$  with  $\text{SFL}(\text{NO}_2^-)$  has electronic configuration  $t_{2g}^6 e_g^0$

Number of unpaired  $e^-$  = 0

So,  $\mu = 0$