

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 :**

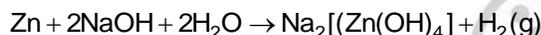


Product for the reaction is

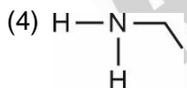
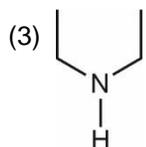
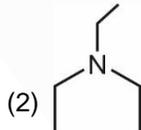
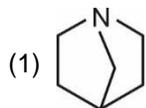
- (1) ZnO (2) ZnO<sub>2</sub>  
(3) [ZnO<sub>3</sub>]<sup>4-</sup> (4) [Zn(OH)<sub>4</sub>]<sup>2-</sup>

**Answer (4)**

**Sol.** Zinc reacts with a base like NaOH to form sodium zincate and hydrogen gas is released.



2. Which of the following is the strongest bronsted base?



**Answer (1)**

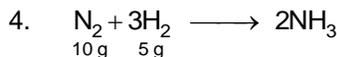
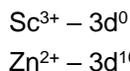
**Sol.** is the strongest base among the given compounds due to maximum +I effect over 'N' atom.

3. Which pair among the following is colourless?

- (1) Sc<sup>3+</sup>, Zn<sup>2+</sup> (2) Cu<sup>2+</sup>, Ti<sup>2+</sup>  
(3) Mn<sup>2+</sup>, Fe<sup>3+</sup> (4) Cu<sup>2+</sup>, Fe<sup>3+</sup>

**Answer (1)**

**Sol.** Species with d<sup>0</sup> and d<sup>10</sup> electronic configuration are colourless as there is no d-d transition of electrons.

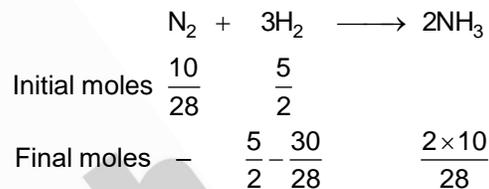


Find limiting reagent and moles of NH<sub>3</sub> produced.

- (1) N<sub>2</sub>, 1.42  
(2) N<sub>2</sub>, 0.71  
(3) H<sub>2</sub>, 1.42  
(4) H<sub>2</sub>, 0.71

**Answer (2)**

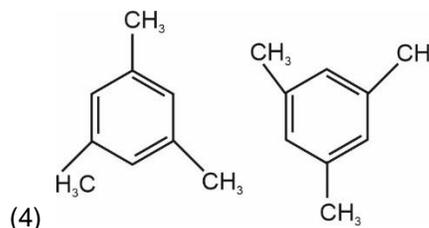
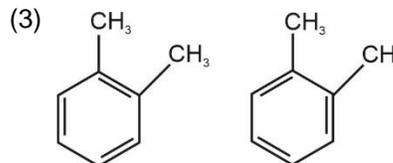
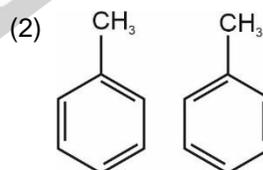
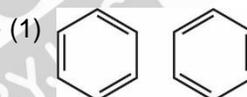
**Sol.** N<sub>2</sub> reacts with H<sub>2</sub> to forms NH<sub>3</sub> as per the reaction given below :



N<sub>2</sub> is the limiting reagent.

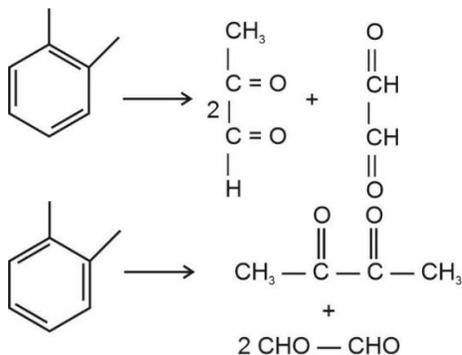
Moles of NH<sub>3</sub> gas formed = 0.71

5. Which of the following pair will give different products on ozonolysis?

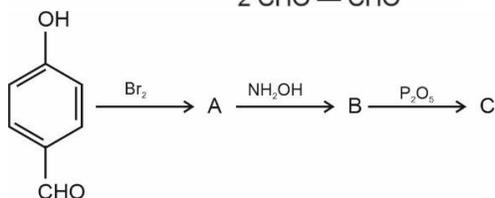


**Answer (3)**

Sol.



6.

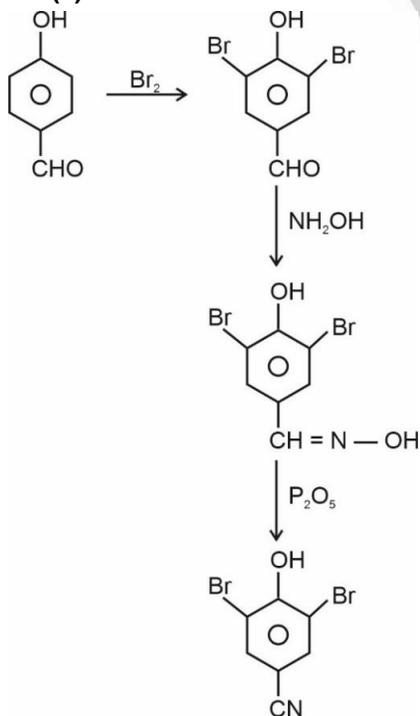


The Product 'C' is?

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

Answer (2)

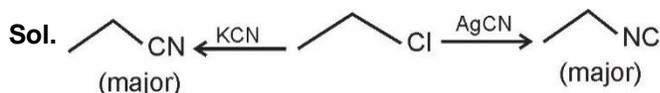
Sol.



Find A and B respectively

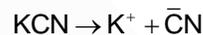
- A =
- (1) B =
- A =
- (2) B =
- A =
- (3) B =
- (4) B =

Answer (1)



Cyanide is ambident nucleophile it can attack through C as well as N

KCN is ionic



Attack occurs through C giving cyanide as major product.

While AgCN has covalent character so attack starts through N

8. Which of the following is hypnotic drug?

- (1) Seldane (2) Terpineol  
(3) Amytal (4) Histamine

Answer (3)

Sol. Seldane → Antihistamine

Terpineol → Antiseptic

Amytal → Barbiturate (Hypnotic)

Histamine → Vasodilator

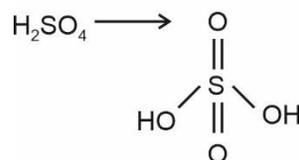
9. Which of the following pairs will have one of the compounds having odd number of electrons and will also contain a compound having expanded octet

- (1) BCl<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub> (2) NO, H<sub>2</sub>SO<sub>4</sub>  
(3) BCl<sub>3</sub>, NO (4) NO, BCl<sub>3</sub>

Answer (2)

Sol.

$$\text{NO} \rightarrow 15 \text{ electrons (odd number)}$$



('S' has expanded octet as represented by the structure)

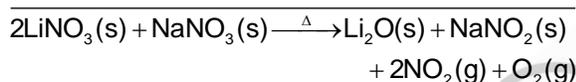
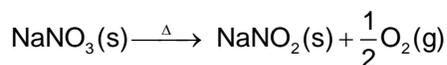
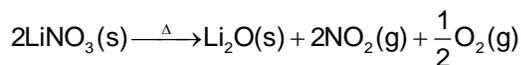
10. Identify the products formed in the following reaction.



- (1)  $\text{Li}_2\text{O} + \text{NaNO}_2$
- (2)  $\text{LiNO}_2 + \text{NaNO}_2$
- (3)  $\text{Li}_2\text{O} + \text{Na}_2\text{O}$
- (4)  $\text{LiNO}_2 + \text{Na}_2\text{O}$

**Answer (1)**

**Sol.** Both  $\text{LiNO}_3$  and  $\text{NaNO}_3$  undergo thermal decomposition according to the following reaction



11. The number of lone pairs present on the following :

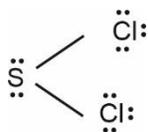
$\text{SCl}_2$ ,  $\text{ClF}_3$ ,  $\text{O}_3$ ,  $\text{SF}_6$  respectively are

- (1) 4, 2, 2, 1
- (2) 6, 4, 4, 9
- (3) 6, 2, 1, 0
- (4) 8, 11, 6, 18

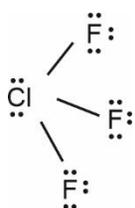
**Answer (4)**

**Sol. Species**

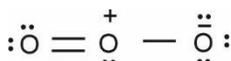
**Lone pairs**



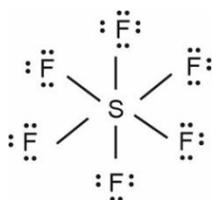
8



11



6



18

12. Which of the following are herbicides

- (1) Sodium chlorate and Sodium Arsenite
- (2) Aldrin and Dieldrin
- (3) Aldrin and Sodium Chlorate
- (4) Dieldrin and Sodium Arsenite

**Answer (1)**

**Sol.** Sodium chlorate ( $\text{NaClO}_3$ ) and sodium Arsenite ( $\text{Na}_3\text{AsO}_3$ ) are examples of Herbicides

Aldrin and dieldrin are examples of pesticides

13. In a 5% w/v  $\text{NaCl}$  solution, we add albumin of egg and stir well. The resultant solution is:

- (1) Lyophobic
- (2) Lyophilic
- (3) Emulsion
- (4) Precipitate

**Answer (2)**

**Sol.** The resultant colloidal solution will have lyophilic colloid as albumin of egg contains, proteins which mix with water on stirring.

14. Calculate the ratio of energy emitted by H atom when electron jumps from infinity to ground state and 1<sup>st</sup> excited state to ground state.

- (1)  $\frac{3}{2}$
- (2)  $\frac{4}{3}$
- (3)  $\frac{4}{5}$
- (4)  $\frac{7}{9}$

**Answer (2)**

**Sol.** Electron of H-atom jumps from infinity to ground state  $E_1$ , magnitude of energy emitted = +13.6 eV.

Electron of H-atom jumps from 1<sup>st</sup> excited state to ground state  $E_2$ , magnitude of energy emitted =

$$= 13.6 \left( 1 - \frac{1}{4} \right) = 13.6 \times \frac{3}{4} \text{ eV}$$

$$\frac{E_1}{E_2} = \frac{13.6 \times 4}{13.6 \times 3} = \frac{4}{3}$$

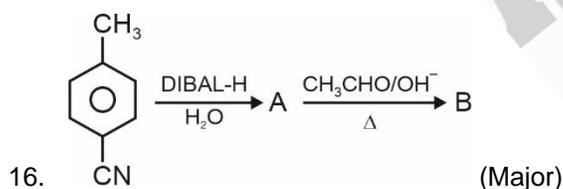
15. The first ionisation enthalpy of Na, Mg and Si are 496, 737 and 786 KJ/mol. Then the value of first ionisation enthalpy of Al is (in kJ/mol)

- (1) 788
- (2) 747
- (3) 577
- (4) 840

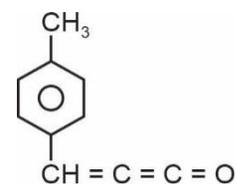
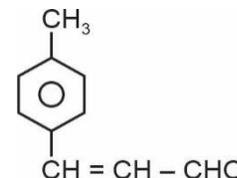
**Answer (3)**

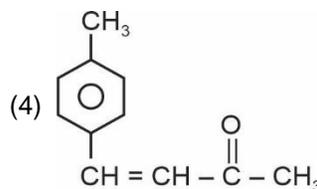
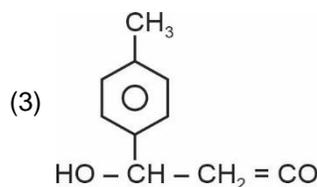
**Sol.** The value of first ionisation enthalpy of Al will be less than Mg, greater than Na and less than the corresponding value of Si.

Thus, the value of first ionisation enthalpy of Al is 577 KJ/mol.



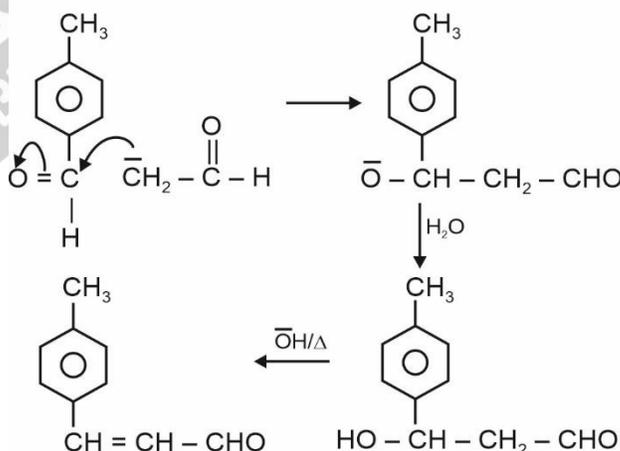
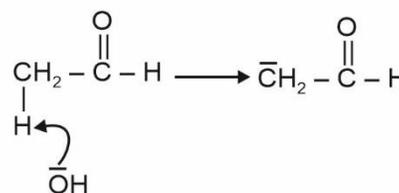
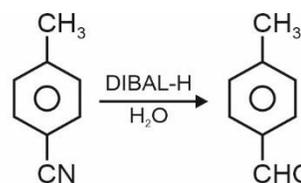
The product B is

- (1) 
- (2) 



**Answer (2)**

**Sol.**



17. What is gangue?

- (1) Impurity in ore
- (2) High quality ore
- (3) Mineral
- (4) Flux

**Answer (1)**

**Sol.** Gangue is impurity in the ore

Eg:→ Silica (SiO<sub>2</sub>) is present as impurity in haematite ore is gangue

18.

19.

20.

**SECTION - B**

**Numerical Value Type Questions:** This section contains 10 questions. In Section B, attempt any five questions out of 10. The answer to each question is a **NUMERICAL VALUE**. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g. 06.25, 07.00, -00.33, -00.30, 30.27, -27.30) using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

21. Ionic radii for A<sup>+</sup> and B<sup>-</sup> are 281 and 108 pm respectively forming a ccp structure. If B<sup>-</sup> forms a ccp lattice and A<sup>+</sup>(in pm) fills the octahedral voids then what is the value of edge length?

**Answer (778)**

**Sol.** 
$$\left( \begin{matrix} r^{\oplus} \\ \text{Radius} \\ \text{of cation} \end{matrix} \right) + \left( \begin{matrix} r^{\ominus} \\ \text{Radius} \\ \text{of anion} \end{matrix} \right) = \frac{a}{2}$$

$$281 + 108 = \frac{a}{2}$$

$$2(389) = a$$

$$a = 778 \text{ pm}$$

22. Consider a complex  $[\text{Fe}(\text{CN})_6]^{-3}$  which acts as an inner orbital complex.

If the CFSE value after ignoring pairing energy is represented as  $-x\Delta_0$ , then x is

[ $\Delta_0$  is splitting energy in octahedral field]

**Answer (02.00)**

**Sol.** In  $[\text{Fe}(\text{CN})_6]^{-3}$ , iron is present in (+3) oxidation state and has a  $d^5$  configuration.

As the complex formed is an inner orbital complex,

CFSE value

$$= -0.4 \Delta_0(5)$$

$$= -2\Delta_0$$

23. The magnitude of change in oxidation state of manganese in KMnO<sub>4</sub> in faintly alkaline or neutral medium is:

**Answer (03.00)**

**Sol.** In faintly alkaline or neutral medium,  $\text{MnO}_4^{\ominus}$  change to MnO<sub>2</sub>.

$$\text{So, change in oxidation state} = 7 - 4 = 3$$

24.  $K_{sp}$  of PbS is given as  $9 \times 10^{-30}$  at a given temperature. Its solubility is 'x'  $\times 10^{-15}$  M.

Find the value of "x".

**Answer (03.00)**



$$K_{sp}(\text{PbS}) = S^2$$

$$\sqrt{K_{sp}} = S$$

$$\Rightarrow S = \sqrt{9 \times 10^{-30}}$$

$$= 3 \times 10^{-15} \text{ M}$$

$$\therefore x = 3$$

25.

26.

27.

28.

29.

30.