

JEE-Main-25-01-2023 (Memory Based) [Morning Shift]

Chemistry

Question: The number of lone pair of electrons present in oxygen in ozone.

Options:

- (a) 4
- (b) 6
- (c) 5
- (d) 12

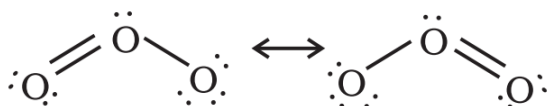
Answer: (b)

Solution:

Ozone \Rightarrow O_3

6 lone pairs

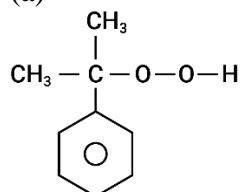
Non bonded electrons 12 electrons



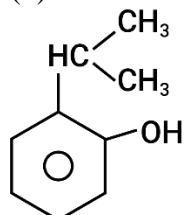
Question: Intermediate formed when phenol is prepared from cumene?

Options:

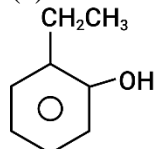
(a)



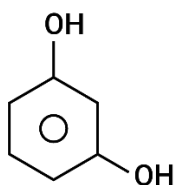
(b)



(c)

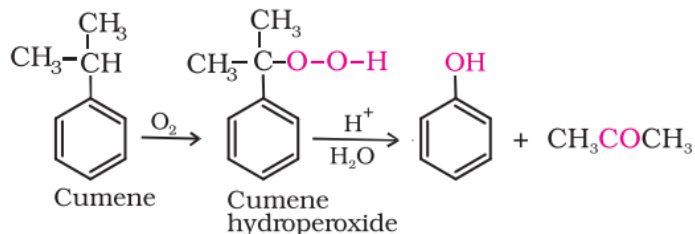


(d)



Answer: (a)

Solution:



Question: Which of the following will give flame test?

Options:

- (a) Ba
- (b) Sr
- (c) Ca
- (d) All of the above

Answer: (d)

Solution: The electropositive character increases down the group from Be to Ba. Calcium, strontium and barium impart characteristic brick red, crimson and apple green colours respectively to the flame.

Question: What is the correct order of electron gain enthalpy of noble gases?

Options:

- (a) $\text{Ne} > \text{Ar} = \text{Kr} > \text{Xe} > \text{He}$
- (b) $\text{Ne} < \text{Ar} = \text{Kr} > \text{Xe} > \text{He}$
- (c) $\text{Ne} < \text{Ar} = \text{Kr} < \text{Xe} < \text{He}$
- (d) $\text{Ne} = \text{Ar} = \text{Kr} > \text{Xe} < \text{He}$

Answer: (a)

Solution: $\text{Ne} > \text{Ar} = \text{Kr} > \text{Xe} > \text{He}$

Question: If X - atoms are present at alternate corners and at body centre of a cube and Y - atoms are present at $1/3^{\text{rd}}$ of face centres then what will be the empirical formula?

Options:

- (a) $\text{X}_{2.5}\text{Y}$
- (b) X_5Y_2
- (c) $\text{X}_{1.5}\text{Y}$
- (d) X_3Y_2

Answer: (d)

Solution:

$$X = 4 \times \frac{1}{8} + 1 = \frac{3}{2}$$

$$Y = \frac{1}{3} \times 6 \times \frac{1}{2} = 1$$

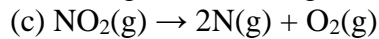
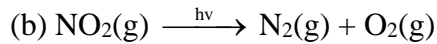
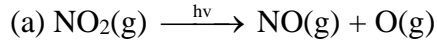
X : Y

$\frac{3}{2} : 1$

X_3Y_2

Question: Reactions of NO_2 in sunlight for photochemical smog

Options:



(d) None of the above

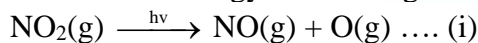
Answer: (a)

Solution: Formation of photochemical smog

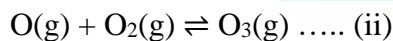
When fossil fuels are burnt, a variety of pollutants are emitted into the earth's troposphere.

Two of the pollutants that are emitted are hydrocarbons (unburnt fuels) and nitric oxide (NO).

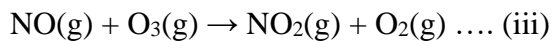
When these pollutants build up to sufficiently high levels, a chain reaction occurs from their interaction with sunlight in which NO is converted into nitrogen dioxide (NO_2). This NO_2 in turn absorbs energy from sunlight and breaks up into nitric oxide and free oxygen atom.



Oxygen atoms are very reactive and combine with the O_2 in air to produce ozone.



The ozone formed in the above reaction (ii) reacts rapidly with the $\text{NO}(\text{g})$ formed in the reaction (i) to regenerate NO_2 . NO_2 is a brown gas and at sufficiently high levels can contribute to haze.



Question: Volume of 1.2 kg/l solution of monobasic acid ($M = 24.2 \text{ g/mol}$) needed to neutralise 25 ml of 0.24 M NaOH.

Options:

(a) 149 ml

(b) 184 ml

(c) 121 ml

(d) 108 ml

Answer: (c)

Solution:

$$25 \times 0.24 = \frac{1.2 \times 1000 \times V}{24.2 \times 1000}$$

$$\frac{24.2 \times 6}{1.2} = V$$

$$V = 121 \text{ ml}$$

Question: Half life = 30 min. Find the time required for 75% completion of reaction.

Options:

(a) 15 min

(b) 5 min

(c) 20 min

(d) 60 min

Answer: (d)

Solution:

$$t_{1/2} = \frac{0.693}{K}$$

$$K = \frac{0.693}{30}$$

$$\frac{0.693}{30} = \frac{2.303}{t} \log \frac{100}{25}$$

$$t = \frac{2.303}{0.693} \times 30 \times 2 \times \log 2$$

$$t = 60 \text{ min}$$

Question: Which of the following are paramagnetic?

V^{3+} , Ti^{2+} , Cr^{3+} , Ni^{2+}

number of paramagnetic species?

Options:

(a) 2

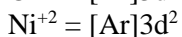
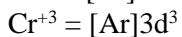
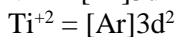
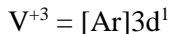
(b) 3

(c) 1

(d) 0

Answer: (b)

Solution:



Question: Radius of 2nd orbit of Li^{2+} is x, then radius of 3rd orbit of Be^{3+} will be?

Options:

(a) $\frac{27x}{16}$

(b) $\frac{16x}{27}$

(c) $\frac{4x}{3}$

(d) $\frac{3x}{4}$

Answer: (a)

Solution:

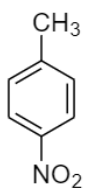
$$\frac{r_{\text{Li}^{+2}}}{r_{\text{Be}^{+3}}} = \frac{\frac{a_0 n_{\text{Li}}^2}{Z_{\text{Li}}}}{\frac{a_0 n_{\text{Be}}^2}{Z_{\text{Be}}}}$$

$$\frac{x}{r_{\text{Be}^{+3}}} = \frac{\frac{(4)}{9}}{\frac{4}{4}}$$

$$\Rightarrow \frac{x}{r_{\text{Be}^{+3}}} = \frac{4 \times 4}{9 \times 3} = \frac{16}{27}$$

$$r_{\text{Be}^{+3}} = \frac{27x}{16}$$

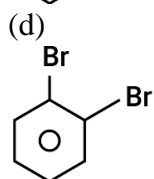
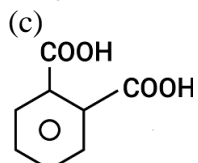
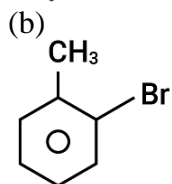
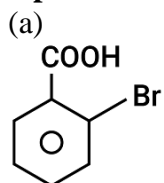
Question:



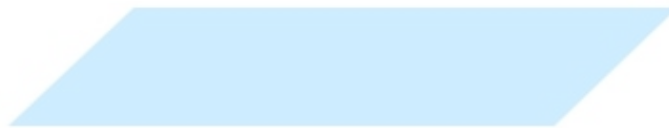
- (i) Bromination
- (ii) Reduction
- (iii) diazotisation
- (iv) KMnO_4



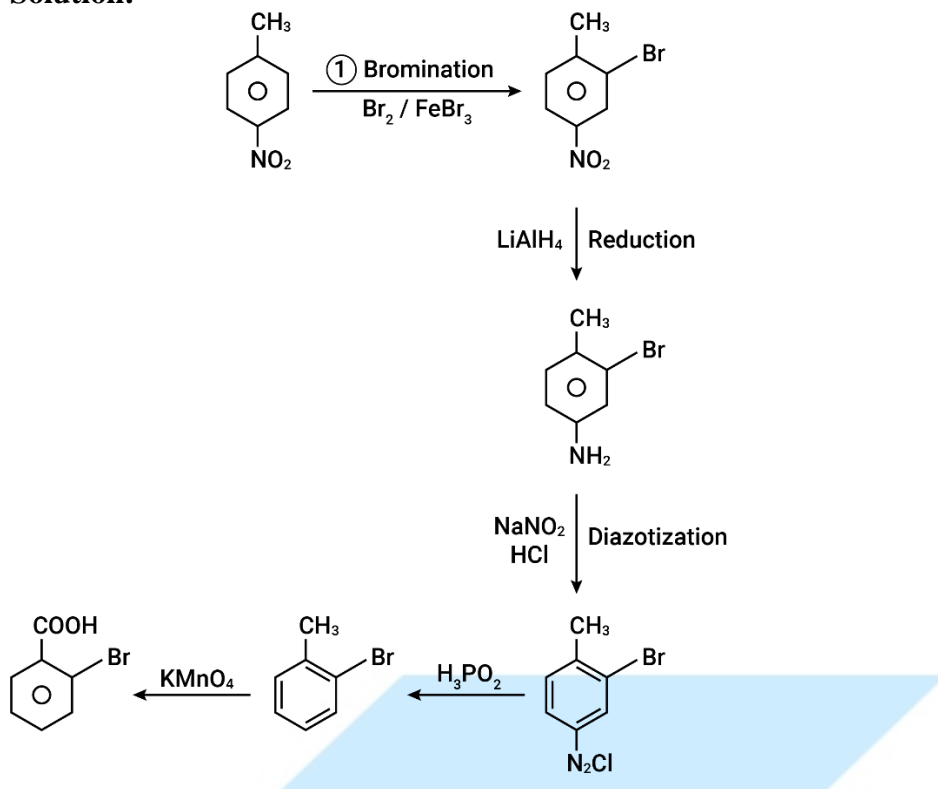
Options:



Answer: (a)



Solution:



Question: Thionyl chloride on reaction with white phosphorous gives compound A. A on hydrolysis give compound B which is dibasic. Identify A and B

Options:

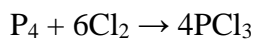
- (a) A- PCl_5 , B- H_3PO_4
- (b) A- P_4O_{10} , B- H_3PO_4
- (c) A- POCl_3 , B- H_3PO_4
- (d) A- PCl_3 , B- H_3PO_3

Answer: (d)

Solution:

Preparation

It is obtained by passing dry chlorine over heated white phosphorus.

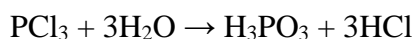


It is also obtained by the action of thionyl chloride with white phosphorus.



Properties

It is a colourless oily liquid and hydrolyses in the presence of moisture.



Question: Compare basic strength:

$(\text{CH}_3)_2\text{NH}$, CH_3NH_2 , $(\text{CH}_3)_3\text{N}$, NH_3

Options:

- (a) $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{NH}_3$
- (b) $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3 > (\text{CH}_3)_3\text{N}$
- (c) $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > \text{NH}_3 > (\text{CH}_3)_3\text{N}$
- (d) $\text{NH}_3 > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N}$

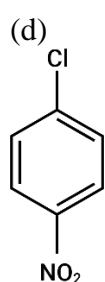
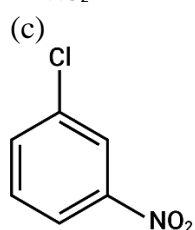
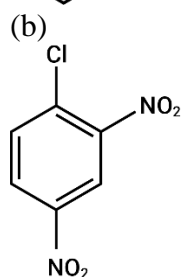
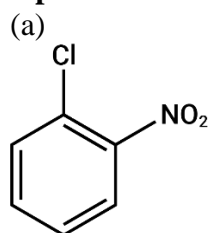
Answer: (a)

Solution: The order of basic strength in case of methyl substituted amines in aqueous solution is as follows:



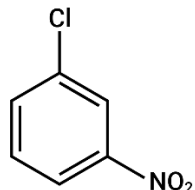
Question: Which of the following shows least reactivity towards nucleophilic substitution reaction?

Options:



Answer: (c)

Solution:



Question: Number of paramagnetic species in $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{NiCl}_4]^{2-}$, $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{CuCl}_4]^{2-}$, $[\text{Cu}(\text{CN})_4]^{3-}$, $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$

Options:

- (a) 4
- (b) 3
- (c) 5
- (d) 6

Answer: (a)

Solution: $[\text{NiCl}_4]^{2-}$, $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{CuCl}_4]^{2-}$, $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$

Question: $\text{Pt} | \text{H}_2 (1 \text{ atm}) | \text{H}^+ (1 \text{ M}) || \text{Fe}^{3+} | \text{Fe}^{2+}$

Find the ratio of concentration of Fe^{2+} to Fe^{3+}

$E_{\text{cell}} = 0.712$ and $E^\circ_{\text{cell}} = 0.771$

Options:

- (a) 2
- (b) 3
- (c) 4
- (d) 1

Answer: (a)

Solution:

$$E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{0.059}{2} \log \frac{\text{Product}}{\text{Reactant}}$$

$$0.712 = 0.771 - \frac{0.059}{2} \log \frac{[\text{P}]}{[\text{R}]}$$

$$-0.059 = -\frac{0.059}{2} \log \frac{[\text{P}]}{[\text{R}]}$$

$$2 = \log \frac{[\text{P}]}{[\text{R}]}$$

Question: Identify the correct sequence of reagents for the following sequence

n-Heptane \rightarrow A \rightarrow B \rightarrow PhCOOH + PhCH₂COOH

Options:

- (a) $\text{Al}_2\text{O}_3/\text{Cr}_2\text{O}_3$, $\text{CrO}_2\text{Cl}_2/\text{H}_3\text{O}^+$, conc NaOH, H_3O^+
- (b) $\text{Al}_2\text{O}_3/\text{Cr}_2\text{O}_3$, $\text{CrO}_2\text{Cl}_2/\text{H}_3\text{O}^+$, H_3O^+ , conc NaOH
- (c) CrO_2Cl_2 , Al_2O_3 , Conc. NaOH, H_3O^+
- (d) Sn/HCl, Conc. NaOH, CrO_2Cl_2 , HNO_3

Answer: (a)

Solution:

