

Mock Test IV Mock Test_Haloalkanes, Haloarenes, basic concepts in chemistry and s-block

1. Which of the following statements is incorrect regarding benzyl chloride?

- (a) It gives white precipitate with alcoholic AgNO_3
 (b) It is an aromatic compound with substitution in the side chain
 (c) It undergoes nucleophilic substitution reaction
 (d) It is less reactive than vinyl chloride

2. Which one of the following forms propane nitrile as the major product?

- (a) Ethyl bromide + alcoholic KCN
 (b) Propyl bromide + alcoholic KCN
 (c) Propyl bromide + alcoholic AgCN
 (d) Ethyl bromide + alcoholic AgCN

3. The correct product obtained in the reaction



- (a)
- (b)
- (c)
- (d)

4. Which process does not occur during formation of CHCl_3 from $\text{C}_2\text{H}_5\text{OH}$ and bleaching powder?

- (a) Hydrolysis
 (b) Oxidation
 (c) Elimination
 (d) Chlorination

5. The reactivities of methyl chloride (A), propyl chloride (B) and chlorobenzene (C) are in the order :

- (a) $A > B > C$
 (b) $C > B > A$
 (c) $A > C > B$
 (d) $B > A > C$

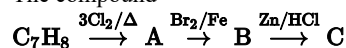
6. The product of 1-bromo-3-chloro cyclobutane with Na in presence of dioxane

- (a)
- (b)
- (c)
- (d) None of these

7. 9.65 C of electric current is passed through fused anhydrous magnesium chloride. The magnesium metal thus, obtained is completely converted into a Grignard reagent. The number of moles of the Grignard reagent obtained is

- (a) 5×10^{-4}
 (b) 1×10^{-4}
 (c) 5×10^{-5}
 (d) 1×10^{-5}

8. The compound



The compound C is

- (a) o-Bromotoluene
 (b) m-Bromotoluene
 (c) p-Bromotoluene
 (d) 3-Bromo-2,4,6-trichlorotoluene

9. 1,2-dibromoethane reacts with alcoholic KOH to yield a product X. The hybridisation state of the carbons present in X respectively, are

- (a) sp, sp
 (b) sp^3, sp^3
 (c) sp^3, sp^2
 (d) sp^3, sp^2

10. The reaction of toluene with chlorine in presence of ferric chloride gives predominantly:

- (a) benzoyl chloride
 (b) m-chlorotoluene
 (c) benzyl chloride
 (d) o- and p-chlorotoluene

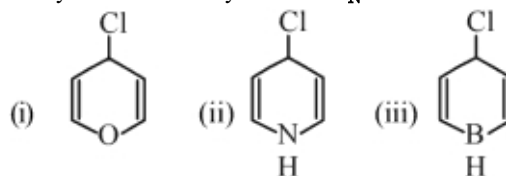
11. The reaction of toluene with Cl_2 in presence of FeCl_3 gives 'X' and reaction in presence of light gives 'Y'. Thus, 'X' and 'Y' are:

- (a) X = Benzyl chloride, Y = o-Chlorotoluene
 (b) X = m-Chlorotoluene, Y = p-Chlorotoluene
 (c) X = o- and p-Chlorotoluene Y = Trichloromethylbenzene
 (d) X = Benzyl chloride, Y = m-Chlorotoluene

12. Methyl chloride on treatment with potassium cyanide followed by hydrolysis yields:

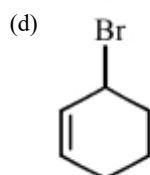
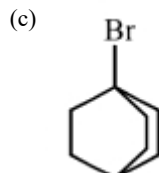
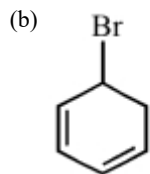
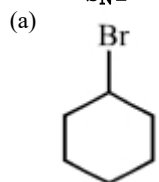
- (a) HCOOH
 (b) CH_3COOH
 (c) CH_3CN
 (d) CH_3COOK

13. Identify correct reactivity order for $\text{S}_{\text{N}}1$ reaction



- (a) $i > ii > iii$
 (b) $ii > iii > i$
 (c) $i > iii > ii$
 (d) $ii > i > iii$

14. Rate of S_N2 will be negligible in:



15. Ethyl chloride on heating with $AgCN$ forms a compound X . The functional isomer of X is

- (a) C_2H_5NC
 (b) $C_2H_5NH_2$
 (c) C_2H_5CN
 (d) None of these

16. 1 mole of methyl amine on reaction with nitrous acid gives at NTP

- (a) 1.0 L of nitrogen
 (b) 22.4 L of nitrogen
 (c) 11.2 L of nitrogen
 (d) 5.6 L of nitrogen

17. Choose the wrong statement.

- (a) 1 mole means 6.023×10^{23} particles
 (b) Molar mass is mass of one molecule
 (c) Molar mass is mass of one mole of a substance
 (d) Molar mass is molecular mass expressed in grams

18. The sample with largest number of atoms is

- (a) 1 g of $O_2(g)$
 (b) 1 g of Ni(S)
 (c) 1 g of B(S)
 (d) 1 g of $N_2(g)$

19. A metal oxide has the formula Z_2O_3 . It can be reduced by hydrogen to give free metal and water. 0.1596 g of the metal oxide required 6 mg of hydrogen for complete reduction. The atomic weight of the metal is:

- (a) 27.9
 (b) 159.6
 (c) 79.8
 (d) 55.8

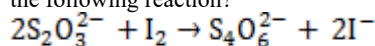
20. The equivalent weight of KIO_3 in the reaction,
 $2Cr(OH)_3 + OH^- + KIO_3 \rightarrow 2CrO_4^{2-} + 5H_2O + KI$

- is
 (a) Mol. wt.
 (b) Mol. wt./3
 (c) Mol. wt./6
 (d) Mol. wt./2

21. 100 mL of 20.8% $BaCl_2$ solution and 50 mL of 9.8% H_2SO_4 solution will form $BaSO_4$
 ($Ba = 137, Cl = 35.5, S = 32, H = 1, O = 16$)
 $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

- (a) 23.3 g
 (b) 11.65 g
 (c) 30.6 g
 (d) None of these

22. If the molecular weight of $Na_2S_2O_3$ and I_2 are M_1 and M_2 respectively, then what will be the equivalent weight of $Na_2S_2O_3$ and I_2 in the following reaction?



- (a) M_1, M_2
 (b) $M_1, M_2/2$
 (c) $2M_1, M_2$
 (d) $M_1, 2M_2$

23. The equivalent weight of a divalent metal is 31.82. The weight of single atom is:

- (a) $32.77 \times 6.02 \times 10^{23}$
 (b) $63.64 \times 6.02 \times 10^{23}$
 (c) 63.64
 (d) $63.64/6.02 \times 10^{23}$

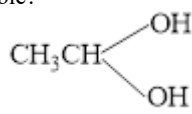
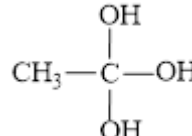
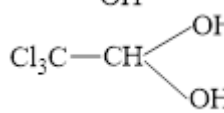
24. Equal weights of Zn metal and iodine are mixed together and I_2 is completely converted to ZnI_2 . What fraction by weight of original Zn remains unreacted? ($Zn = 65, I = 127$)

- (a) 0.34
 (b) 0.74
 (c) 0.84
 (d) Unable to predict

25. 0.0833 mole of carbohydrate of empirical formula CH_2O contain 1 g of hydrogen. The molecular formula of the carbohydrate is

- (a) $C_5H_{10}O_5$
 (b) $C_3H_4O_3$
 (c) $C_{12}H_{22}O_{11}$
 (d) $C_6H_{12}O_6$

26. Among the given statements, the incorrect one
 (a) **Be** differs much from other alkali metals than **Li** does from other alkali metals.
 (b) **Be** generally forms covalent compounds.
 (c) **Be** forms a very strong complex, $[Be(H_2O)_4]^{2+}$
 (d) **Be** usually has more than four water of crystallisation associated with it.

27. Metallic magnesium is prepared by
 (a) reduction of MgO by coke.
 (b) electrolysis of aqueous solution of $\text{Mg}(\text{NO}_3)_2$
 (c) displacement of Mg by iron from MgSO_4 solution.
 (d) electrolysis of molten MgCl_2
28. An unknown inorganic compound (**X**) loses its water of crystallization on heating and its aqueous solution gives the following reactions:
 (a) It gives a white turbidity with dilute HCl solution
 (b) It decolourises a solution of iodine in potassium iodide
 (c) It gives a precipitate with silver nitrate which turns black on standing. Identify the compound (**X**)
 (a) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
 (b) $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
 (c) $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
 (d) None of these
29. If NaOH is added to an aqueous solution of Zn^{2+} ions, a white precipitate appears and on adding excess '**X**', the precipitate dissolves. In this solution zinc exists in the:
 (a) both in cationic and anionic parts
 (b) there is no zinc left in the solution
 (c) cationic part
 (d) anionic part.
30. Among KO_2 , AlO_2^- , BaO_2 and NO_2^+ , unpaired electron is present in
 (a) NO_2^+ and BaO_2
 (b) KO_2 and AlO_2^-
 (c) KO_2 only
 (d) BaO_2 only
31. A compound (**A**) is used in preparation of washing soda to recover ammonia in Solvay's process. When CO_2 is bubbled through an aqueous solution of (**A**), the solution turns milky. It is used in white washing due to disinfectant nature. What is the chemical formula of (**A**)?
 (a) $\text{Ca}(\text{HCO}_3)_2$
 (b) CaO
 (c) $\text{Ca}(\text{OH})_2$
 (d) CaCO_3
32. Which of the following is/are true for oxygen.
 (a) $\text{KMnO}_4(\text{s})$ on strong heating gives oxygen gas
 (b) Oxygen mixed with helium is used for artificial respiration.
 (c) It has two unpaired electrons in bonding p molecular orbitals.
 (d) Brins process is used as an industrial method for the preparation of oxygen gas.
33. Borax bead test is given by:
 (a) An aluminium salt
 (b) A cobalt salt
 (c) A copper salt
 (d) A nickel salt
34. Amongst the following hydroxides, the one which has the lowest value of K_{sp} is:
 (a) $\text{Ca}(\text{OH})_2$
 (b) $\text{Mg}(\text{OH})_2$
 (c) $\text{Be}(\text{OH})_2$
 (d) $\text{Ba}(\text{OH})_2$
35. The alkali metals form salt-like hydrides by the direct synthesis at elevated temperature. The thermal stability of these hydrides decreases in which of the following orders?
 (a) $\text{CsH} > \text{RbH} > \text{KH} > \text{NaH} > \text{LiH}$
 (b) $\text{KH} > \text{NaH} > \text{LiH} > \text{CsH} > \text{RbH}$
 (c) $\text{NaH} > \text{LiH} > \text{KH} > \text{RbH} > \text{CsH}$
 (d) $\text{LiH} > \text{NaH} > \text{KH} > \text{RbH} > \text{CsH}$
36. Tertiary alkyl halides are practically inert to substitution by $\text{S}_{\text{N}}2$ mechanism because of
 (a) Steric hindrance
 (b) Inductive effect
 (c) Instability
 (d) Insolubility
37. In the preparation of chlorobenzene from aniline, the most suitable reagent is
 (a) Chlorine in the presence of ultraviolet light
 (b) Chlorine in the presence of AlCl_3
 (c) Nitrous acid followed by heating with Cu_2Cl_2
 (d) HCl and Cu_2Cl_2
38. Chloropicrin is obtained by the reaction of
 (a) Steam on carbon tetrachloride
 (b) Nitric acid on chlorobenzene
 (c) Chlorine on picric acid
 (d) Nitric acid on chloroform
39. A compound containing two OH groups attached with one carbon atom is unstable but which one of the following is stable?
 (a) 
 (b) 
 (c) 
 (d) None of these
40. The alkyl group of Grignard reagent acts as:
 (a) Free radical
 (b) Carbonium ion
 (c) Carbanion
 (d) None of these
41. Which of the following applies in the reaction,

$$\text{CH}_3\text{CHBrCH}_2\text{CH}_3 \xrightarrow{\text{Alc.KOH}} \text{CH}_3\text{CH}=\text{CHCH}_3$$
 (i) $\text{CH}_3\text{CH}=\text{CHCH}_3$ (major product)
 (ii) $\text{CH}_2=\text{CHCH}_2\text{CH}_3$ (minor product)
 (a) Markownikoffs rule
 (b) Saytzeff's rule
 (c) Kharasch effect
 (d) Hofmanns rule

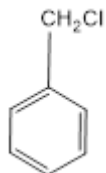
42. Grignard reagent shows addition on:
- (a) $>C=O$
 - (b) $C\equiv N$
 - (c) $>C=S$
 - (d) All of these
43. Among the following, the molecule with the highest dipole moment is:
- (a) CH_3Cl
 - (b) CH_2Cl_2
 - (c) $CHCl_3$
 - (d) CCl_4
44. Which one of the following compound reacts with chlorobenzene to produce DDT?
- (a) Acetaldehyde
 - (b) Nitrobenzene
 - (c) *m*-chloroacetaldehyde
 - (d) Trichloroacetaldehyde
45. Among the following the one that gives positive iodoform test upon reaction with I_2 and NaOH is
- (a) $CH_3CH_2CH(OH)CH_2CH_3$
 - (b) $C_6H_5CH_2CH_2OH$
 - (c) $H_3C-CH-CH_2OH$
 - (d) $PhCHOHCH_3$

Answer Key

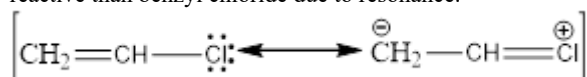
1. Answer: d

Solution

Benzyl chloride is very reactive. It readily gives white precipitate with alcoholic AgNO_3 at room temperature. It also readily undergoes nucleophilic substitution. Its structure is as follows



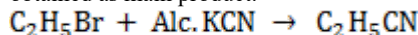
Vinyl chloride ($\text{CH}_2 = \text{CH} \cdot \text{Cl}$), on the other hand, is less reactive than benzyl chloride due to resonance.



2. Answer: a

Solution

When ethyl bromide reacts with alcoholic KCN, propane nitrile is obtained as main product.



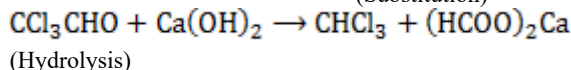
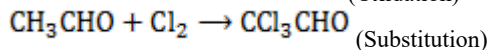
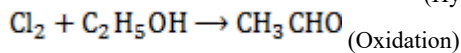
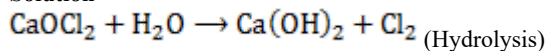
3. Answer: a

Solution

In 2° halides of this type the product formed has inverted configuration ($\text{S}_{\text{N}}2$ mechanism).

4. Answer: c

Solution



5. Answer: a

Solution

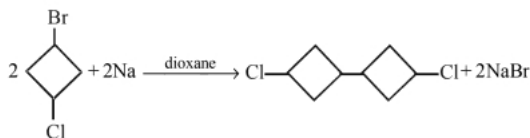
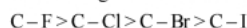
Among the primary halides reactivity order is

$\text{CH}_3\text{X} > \text{C}_2\text{H}_5\text{X} > \text{C}_3\text{H}_7\text{X}$, also chlorobenzene is less reactive due to resonance.

6. Answer: c

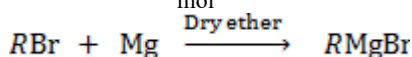
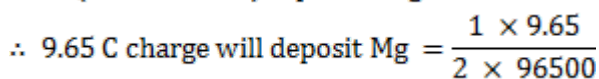
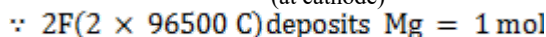
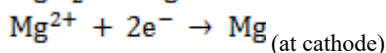
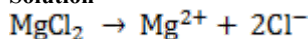
Solution

Bond strength follows the order



7. Answer: c

Solution



Grignard reagent

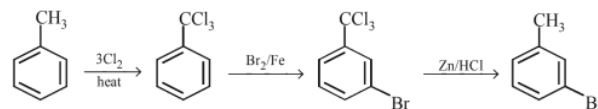
In order to prepare Grignard reagent, one mole of Mg is used per

mole of reagent obtained. Thus, by 5×10^{-5} mol mg,

5×10^{-5} mole of Grignard reagent is obtained.

8. Answer: b

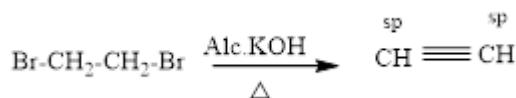
Solution



9. Answer: a

Solution

Alkyl halides give elimination reaction with alcoholic KOH and yield an alkene or alkyne (from dihalides) *e.g.*,



1,2-dibromo ethane acetylene

Hence, product has both sp -hybridised carbon.

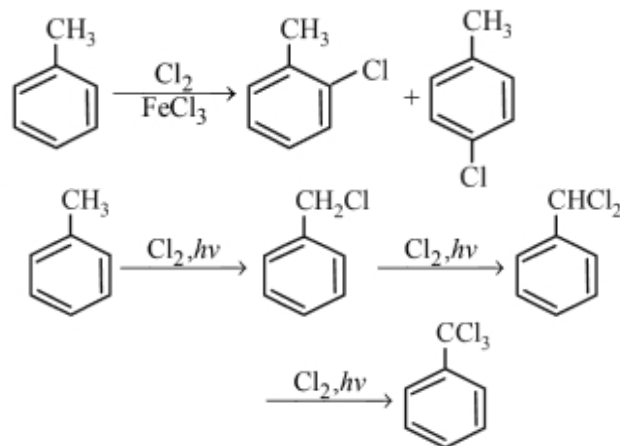
10. Answer: d

Solution

The given reaction is an example of electrophilic substitution. Further, CH_3 group in toluene is *o,p*-directing

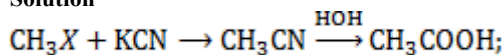
11. Answer: c

Solution



12. Answer: b

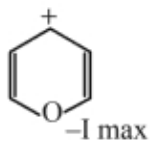
Solution



CN group hydrolyses to COOH.

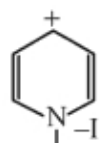
13. Answer: d

Solution



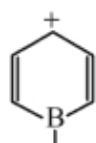
Aromatic

(i)



Aromatic

(ii)



Anti-aromatic

(iii)

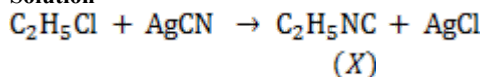
14. Answer: c

Solution

At bridge head position $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ do not take place.

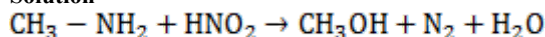
15. Answer: c

Solution

Functional isomer of X is $\text{C}_2\text{H}_5\text{CN}$.

16. Answer: b

Solution

1 mole of methyl amine gives 1 mole N_2

i.e., 22.4 L of nitrogen at NTP.

17. Answer: b

18. Answer: c

Solution

$$\text{No. of atoms in 1g of } \text{O}_2(\text{g}) = 2 \times \frac{1}{32} \times 6.023 \times 10^{23} = 0.38 \times 10^{23}$$

$$\text{No. of atoms in 1g of } \text{Ni}(\text{s}) = \frac{1}{58.2} \times 6.023 \times 10^{23} = 0.10 \times 10^{23}$$

$$\text{No. of atoms in 1g of } \text{B}(\text{s}) = \frac{1}{10.8} \times 6.023 \times 10^{23} = 0.58 \times 10^{23}$$

$$\text{No. of atoms in 1g of } \text{N}_2(\text{g}) = 2 \times \frac{1}{28} \times 6.023 \times 10^{23} = 0.43 \times 10^{23}$$

Alternative: Smaller the atomic mass, larger will be the no. of atoms in sample.

19. Answer: d

Solution

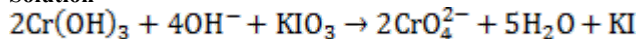
Meq. of oxide = Meq. of H;

$$\frac{0.1596}{E+8} = \frac{6 \times 10^{-3}}{1} \therefore E = 18.6$$

 \therefore atomic wt. = $18.6 \times 3 = 55.8$ (\therefore valence = 3)

20. Answer: c

Solution



Change in oxidation number of effective element (I) in

$$\text{KIO}_3 = (+5) - (-1) = 6$$

$$\text{Equivalent weight of oxidation} = \frac{\text{mol. wt}}{6}$$

21. Answer: b

Solution

$$100\text{ml of } 20.8\% \text{ BaCl}_2 \text{ solution} = 20.8\text{g BaCl}_2$$

$$50\text{ml of } 9.8\% \text{ H}_2\text{SO}_4 \text{ solution} = 4.9\text{g H}_2\text{SO}_4$$



$$208\text{gmol}^{-1} \quad 98\text{gmol}^{-1} \quad 233\text{gmol}^{-1}$$

$$\therefore 98\text{g H}_2\text{SO}_4 \text{ reacts with } 208\text{g BaCl}_2$$

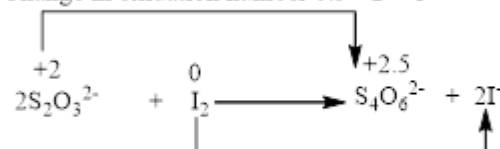
$$4.9\text{g H}_2\text{SO}_4 \text{ reacts with } \frac{208}{98} \times 4.9 = 10.4\text{g BaCl}_2$$

$$98\text{g H}_2\text{SO}_4 \text{ will produce } 233\text{g BaSO}_4$$

$$\therefore 4.9\text{g H}_2\text{SO}_4 \text{ will produce} = \frac{233}{98} \times 4.9 = 11.65\text{g BaSO}_4$$

22. Answer: b

Solution

Change in oxidation number $0.5 \times 2 = 1$ Change in oxidation number = $1 \times 2 = 2$

$$\text{Equivalent mass of } \text{Na}_2\text{S}_2\text{O}_3 = \frac{M_1}{1} = M_1$$

$$\text{Equivalent mass of } \text{I}_2 = \frac{M_2}{2}$$

23. Answer: d

Solution

$$\text{Equivalent weight} = \frac{\text{Molecular weight}}{\text{Valency}}$$

$$\text{Thus, molecular weight} = 31.82 \times 2 = 63.64$$

63.64 g of metal contains 6.023×10^{23} atoms of it.

$$\therefore 1 \text{ atom weighs } \frac{63.64}{6.02 \times 10^{23}} \text{ g.}$$

38. Answer: d

42. Answer: d

39. Answer: c

43. Answer: a

40. Answer: c

44. Answer: d

41. Answer: b

45. Answer: d