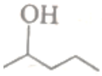
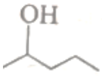
Solution

ALCOHOLS PHENOLS AND ETHERS WS

Class 12 - Chemistry

1.
   (d) IV > III > I > II
   Explanation: IV > III > I > II
2.
   (c) 
   Explanation: 
3.
   (c) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
   Explanation: (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
4.
   (c) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
   Explanation: (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
5.
   (d) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
   Explanation: (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
6.
   (d) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
   Explanation: (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
7. **(a)** (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
   Explanation: (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
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   (c) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
   Explanation: (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
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   Explanation: (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
10.
   (b) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
   Explanation: (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
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   Explanation: (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
12. **(a)** (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
   Explanation: (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
13. **(a)** Alcohols
   Explanation: Lucas Test is a test that is used to distinguish between primary, secondary, and tertiary alcohols. This test is carried out with the help of Lucas reagent, which is a solution of anhydrous Zinc Chloride and concentrated hydrochloric acid ($ZnCl_2$ + HCl). It is based on the difference between the reactivity of primary, secondary, and tertiary alcohols with hydrogen halides.
14. **(a)** Neutral $FeCl_3$
   Explanation: Phenol and ethanol can be easily distinguished by the ferric chloride test.
   When to a solution of phenol, a few drops of ferric chloride is added, a purple colouration is observed due to the formation of the following complex.

$3C_6H_5OH + FeCl_3 \rightarrow Fe(OC_6H_5)_3 + 3HCl$

Ethanol, on the other hand, gives no such test, (Alcohols do not form colored complexes with iron ion) as the corresponding complex in case of ethanol is not formed.

15.

(d) secondary alcohols

Explanation: Carboxylic acids, esters, and acid halides can be reduced to either aldehydes or a step further to primary alcohols, depending on the strength of the reducing agent, aldehydes, and ketones can be reduced respectively to primary and secondary alcohols.

16.

(b) propene

Explanation: Alkenes can be prepared from alkyl halides by treatment with alcoholic solution of caustic potash (KOH) at about 353-363 K. This reaction is known as dehydrohalogenation of alkyl halides.

$$\underset{n-Propyl\ bromide}{CH_3CH_2CH_2Br} + KOH \xrightarrow[353-363K]{C_2H_5OH} \underset{Propene}{CH_3CH = CH_2} + KBr + H_2O$$

17.

(d) both ortho and paranitroanisole

Explanation: With a mixture of conc.HNO3 and conc. H2SO4 (nitrating mixture), anisole gives ortho and para nitro anisole.

18.

(d) treatment with pyridinium chlorochromate

Explanation: Alcohols are oxidized to aldehydes and finally to acids.

$CH_3CH_2CH \xrightarrow{[O]} CH_3CHO \xrightarrow{[O]} CH_3COOH$

$CH_3CH_2OH \xrightarrow{PCC} CH_3CHO$

The advantage of PCC over other common oxidizing agent is that it also doesn't attack the double bond and PCC is formed by adding a complex of Chromium trioxide with pyridine and HCl.

19.

(c) decrease

Explanation: As the length of the carbon chain increases, the surface area of the compound will also increase. Van der Waals dispersion force is proportional to the surface area. So the increase of surface increases the ability of individual molecules to attract each other. Branching in molecules decreases the surface area thereby decreasing the attractive force between individual molecules. As a result, the boiling point decreases.

20.

(d) o – nitrophenol

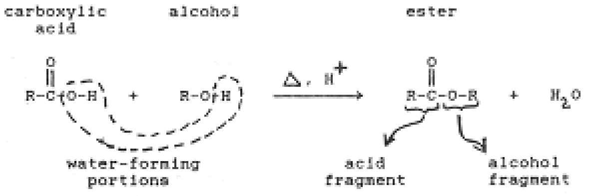
Explanation: The nitro-group is an electron-withdrawing group. The presence of this group in the ortho or para position decreases the electron density in the OH bond. As a result, it is easier to lose a proton. Also, the o-nitrophenoxide or p-nitrophenoxide ion formed after the loss of protons is stabilized by resonance. Hence, ortho and para nitrophenols are stronger acids than phenol.

21. **(a)** substitution reaction

Explanation: Alkyl halides are converted into alcohols by substitution reaction. When alkyl halides are treated with aqueous KOH, alcohols are formed. This is a nucleophilic substitution reaction.

22. **(a)** Esterification process

Explanation: Esterification is the reaction in which a Carboxylic acid combines with an alcohol in the presence of little concentrated sulphuric acid to form an ester. The esters so formed are pleasant smelling.



23.

(c) primary alcohols

Explanation: $RCHO + H_2 \rightarrow RCH_2OH$

- Aldehydes and ketones are most readily reduced with hydride reagents.
- The reducing agents $LiAlH_4$ and $NaBH_4$ act as a source of 4 x H^- (hydride ion)
- Overall 2 H atoms are added across the C=O to give H-C-O-H
- Hydride reacts with the carbonyl group, C=O, in aldehydes or ketones to give alcohols.
- The substituents on the carbonyl dictate the nature of the product alcohol.
- Reduction of methanal (formaldehyde) gives methanol.
- Reduction of other aldehydes gives primary alcohol.
- Reduction of ketones gives secondary alcohol.

24.

(c) Methanol, ethanol, propan – 1 – ol, butan – 2 – ol, butan – 1 – ol, pentan – 1 – ol.

Explanation: Boiling point is α the Van der Waal forces α Molecular weight.

When the molecular weight is the same as in the case of butan-1-ol and butan -2- ol, then the boiling point increases as branching decreases. This is so because, with an increase in branching, a molecule occupies a spherical shape, and surface area of contact decreases, and hence boiling point decreases.

So, butan-2-ol will have a lower boiling point than butan-1-ol.

25.

(b) b > d > a > c > e

Explanation: The correct order of decreasing acid strength is b > d > a > c > e. As p-nitrophenol is most acidic and p-methoxy phenol is least acidic. When an electron-withdrawing group is para to the OH group, the acidity is maximum. When an electron releasing group is para to OH group, the acidity is minimum.

26.

(c) Aspirin

Explanation: Aspirin

27.

(b) Propan – 1 – ol, 4 – methylphenol, phenol, 3 – nitrophenol, 3,5 – dinitrophenol,2,4, 6 – trinitrophenol.

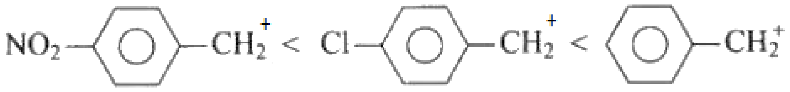
Explanation: Phenols are more acidic than alcohols Also in phenols if –M groups like $–NO_2$ are arranged then acidity increases. And –M operates only at o/p position. At m only –I operate.

28.

(c) b < c < a

Explanation:

All three benzyl alcohols react with HBr/HCl through the formation of an intermediate carbocation. The more stable the carbocation, the more reactive is the alcohol. The electron releasing groups i.e. NO_2, Cl decreases the stability of the carbocation. Since $-NO_2$ group is stronger electron-withdrawing than -Cl group, therefore, the stability of carbocation increases in the order:



The stability of the first Carbonium ion formed is also decreased by - M effect showing by a nitro group which develops positive charge on the carbon of the ring on which CH_2OH is attached .

29.

(d) 3° > 2° > 1°

Explanation: The mixture of HCl and $ZnCl_2$ is called the Lucas Reagent. Secondary and tertiary alcohols react via the S_N^1 mechanism with the Lucas reagent. The $ZnCl_2$ coordinates to the hydroxyl oxygen and this generates a far superior leaving group.

When alcohols react with a hydrogen halide, a substitution occurs, producing an alkyl halide and water:

Scope of Reaction: The order of reactivity of alcohols is 3° > 2° > 1°

30.

(b) b>d>c>a>e

Explanation: The acidity of phenols depends on the group attached to the benzene ring. Groups showing electron withdrawing nature i.e. -I and -R effect will increase the acidity while group showing electron donating nature like +I and +R effect will decrease acidity. Resonance effect of group (-R or +R) attached to benzene system is operative only ortho and para position of the benzene system, while at meta position only inductive effect is operative.

Clearly, b will be most acidic because $-NO_2$ group attached will show strong -R effect. In d, $-NO_2$ is present at meta position where only -I is effective. -I effect of $-NO_2$ is more than $-OCH_3$ group so, d will be more acidic than c, e will be least acidic as $-OCH_3$ group is attached at para position and shows +R effect.

31.

(d) Propan-1-ol, butan-2-ol, butan-1-ol, pentan-1-ol

Explanation: Boiling point increases with increase in molecular mass of the alcohols. Among isomeric alcohols 1^o alcohols have higher boiling point than 2^o alcohols. Thus, correct order is:

Propan-1-ol < Butan-2-ol < Butan-1-ol < pentan-1-ol

32.

(b) (iii) < (ii) < (i)

Explanation: The nitro-group is an electron-withdrawing group. The presence of this group in the para position decreases the electron density on the benzene ring. which in turn decreases the electron density on the oxygen of O-H bond. As a result, it is easier to lose a proton. Also, the p-nitrophenoxide ion formed after the loss of protons is stabilized by resonance. Hence, ortho nitrophenol is a stronger acid. On the other hand, methoxy group is an electron-releasing group. Thus, it increases the electron density on the oxygen of the O-H bond and hence, the proton cannot be given out easily. For this reason, para-nitrophenol is more acidic than para-methoxyphenol.

33.

(d) Statement B is true; Statement A is false.

Explanation:

- **The solubility** of alcohols in water **decreases** with increasing molecular weight. The first three alcohols (methanol, ethanol, and propanol) are completely miscible. Each alcohol consists of a carbon chain (always non-polar) and an OH group (which is polar). The solubility of alcohol starts to decrease with **butanol**. Alcohols are considered immiscible after **heptanol**.
- **The boiling point** of alcohol **increases** with increasing molecular weight. The **boiling point** of alcohol increases as the length of the hydrocarbon chain increases.