CHEMISTRY

BOOKS - MTG IIT JEE FOUNDATION

CARBON AND ITS COMPOUNDS

Illustrations

1. Give one example each of the following :

A molecule containing double bond.

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2. Give one example each of the following :

A molecule in which central atom is linked to three other atoms by covalent bonds.

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3. Give one example each of the following :

A molecule in which central atom has ten electrons after sharing.

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4. Write the electron dot structure of NH_3 and PCl_5.

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5. Why are diamonds so hard?

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6. Write some physical properties of graphite.

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7. Draw carbon ring structure and structural formula of cyclopentane

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8. Draw carbon ring structure and structural formula of cyclohexane.

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9. Give condensed formula and bond line notation for cyclohexane and

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10. Give condensed formula and bond line notation for benzene.

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11. What are saturated hydrocarbons? Explain with examples.

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12. Give IUPAC names for the following hydrocarbons :

$$CH_3 - \underset{\underset{C_2H_5}{|}}{CH} - \underset{\underset{C_2H_5}{|}}{CH} - CH_3$$

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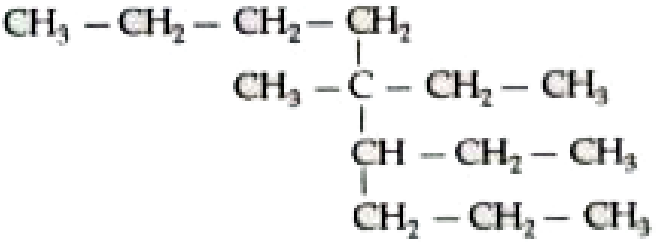
13. Give IUPAC names for the following hydrocarbons :



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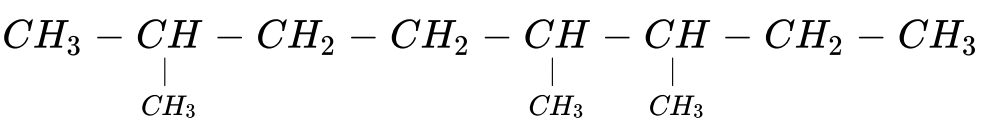

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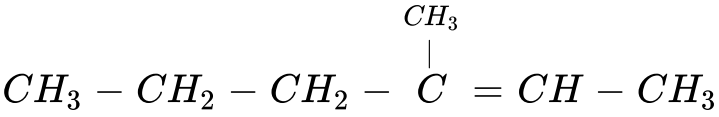
15. Give IUPAC names for the following hydrocarbons :



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16. Starting from the hydrocarbon butane, write the structures and IUPAC names of

chloro derivative

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17. Starting from the hydrocarbon butane, write the structures and IUPAC names of

alcohol

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18. Starting from the hydrocarbon butane, write the structures and IUPAC names of

aldehyde

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19. Starting from the hydrocarbon butane, write the structures and IUPAC names of

carboxylic acid

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20. Starting from the hydrocarbon butane, write the structures and IUPAC names of

amine

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21. Starting from the hydrocarbon butane, write the structures and IUPAC names of

ketone.

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22. Write IUPAC names of the following compounds :

$$CH_3 - \overset{Br}{\underset{|}{C}}H - \overset{Cl}{\underset{|}{C}}H - CH_3$$

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23. Write IUPAC names of the following compounds :

$$CH_3 - \underset{\underset{CHO}{|}}{CH} - CH_2 - CH_3$$

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24. CHO group cannot be present in the middle of a chain. Justify.

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25. Draw the structures of the following compounds:

Ethanoic acid

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26. Draw the structures of the following compounds:

Butanone

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27. Draw the structures of the following compounds:

Hexanal

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28. An organic compound 'X' is a constituent of wine. On heating with acidified potassium dichromate it gives a compound 'Y' which gives brisk effervescence with sodium bicarbonate. Identify 'X' and 'Y'. Give the chemical equations involved in the reactions.

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29. How will you obtain

sodium ethoxide

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30. How will you obtain

ethyl ethanoate and

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31. How will you obtain

ethene from ethanol?

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32. Give chemical tests to detect the presence of ethanoic acid.

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33. Complete the following chemical equations:

$C_2H_5OH + O_2 \rightarrow$

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34. Complete the following chemical equations:

$CH_3COOH + NaHCO_3 \rightarrow$

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35. Show an activity to prove detergents are more effective in hard water than soaps.

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36. Write main properties of synthetic detergents.

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37. Explain cleansing action of soap with the help of the structure of soap.

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38. Why is cleansing action of detergents considered more effective than soaps?

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Solved Examples

1. What is combustion? Give some reactions to show that carbon in all its forms and in the form of compounds undergo combustion.

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2. Taking a suitable example show the formation of a molecule bonded by triple covalent bond.

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3. A compound X has molecular formula C_3H_6. One mole of X reacts with one mole of bromine to yield a compound Y. Deduce the structures of X and Y.

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4. Define isomerism. Write down the structures and names of isomers of butane.

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5. Answer the following :

Why are some of the carbon compounds called saturated while other unsaturated compounds?

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6. Answer the following :

Which of these two are more reactive?

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7. What is meant ny 'word root' in IUPAC name. Give word roots for compounds containing upto ten carbon atoms.

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8. Explain the reaction of ethene and ethyne with bromine water. How is this reaction used as test for unsaturation?

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9. What would be observed on adding 5% solution of alkaline potassium permanganate drop by drop to some warm ethanol taken in a test tube?

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10. Write the name of the compound formed during the chemical reaction.

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11. How would you distinguish experimentally between an alcohol and a carboxylic acid on the basic of a chemical property?

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12. Explain the significance of term preflix in IUPAC nomenclature.

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13. Compare the following properties of ethanol and ethanoic acid :

Litmus test

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14. Compare the following properties of ethanol and ethanoic acid :

Sodium metal test

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15. Compare the following properties of ethanol and ethanoic acid :

Sodium bicarbonate test.

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16. Name the functional groups present in the following compounds :

$CH_3CH_2CH_2OH$

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17. Name the functional groups present in the following compounds :

$CH_3COCH_2CH_3$

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18. Name the functional groups present in the following compounds :

CH_3CH_2CHO

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19. Name the functional groups present in the following compounds :

$CH_3CH_2CH_2COOH$

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20. Name the functional groups present in the following compounds :

$CH_3COOC_2H_5$

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21. What happens when vegetable oil (like groungnut oil) is hydrogenated? Explain your answer with an equation.

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22. An organic compound A having molecular formula $C_2H_4O_2$ reacts witgh sodium metal and evolves a gas B which readily catches fire. A also reacts with ethanol in t he presence of concentrated sulphuric acid to form sweet smelling substance C used in making perfumes.

Identity the compounds A, B and C.

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23. An organic compound A having molecular formula $C_2H_4O_2$ reacts witgh sodium metal and evolves a gas B which readily catches fire. A also reacts with ethanol in t he presence of concentrated sulphuric acid to form sweet smelling substance C used in making perfumes.

Write balanced chemical equations to represent

the evolution of B from compound A

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presence of concentrated sulphuric acid to form sweet smelling substance C used in making perfumes.

Write balanced chemical equations to represent the conversion of compound A into compound C.

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25. Give the structures and IUPAC names of straight chain alkanes with molecular formula

C_4H_{10}

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26. Give the structures and IUPAC names of straight chain alkanes with molecular formula

C_5H_{12}

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27. Give the structures and IUPAC names of straight chain alkanes with molecular formula

C_6H_{14}

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28. Write chemical equations for the reactions of ethanoic acid with

sodium carbonate

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29. Write chemical equations for the reactions of ethanoic acid with

potassium

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30. Write chemical equations for the reactions of ethanoic acid with

soda lime

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31. Write chemical equations for the three reactions of ethanoic acid with

ethanol in the presence of conc. H_2SO_4.

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Ncert Section

1. What would be the electron dot structure of carbon dioxide which has the formula CO_2?

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2. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (Hint : The eight atoms of sulphur are joined together in the form of a ring).

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3. How many structural isomers can you draw for pentane?

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4. What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

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5. What will be the formula and electron dot structure of cyclopentane?

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6. Draw the structures of the following compounds:

(i) Ethanoic acid (ii) Bromopentane

(iii) Butanone (iv) Hexanal

Are structural isomers possible for bromopentane?

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7. How would you name the following compounds?

$CH_3 - CH_2 - Br$

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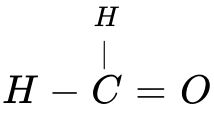
8. How would you name the following compounds?



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9. How would you name the following compounds?

$CH_3 - CH_2 - CH_2 - CH_2 - C \equiv C - H$

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10. Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

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11. A mixture of ethyne and oxygen is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

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12. How would distinguish experimentally between an alcohol and a carboxylic acid?

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13. What are oxidising agents?

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14. Would you be able to check if water is hard by using a detergent?

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15. People use a variety of methods to wash clothes. Usually after adding the soap, they beat the clothes on a stone or beat them with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is this agitation necessary to get clean clothes?

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16. Ethane, with the molecular formula C_2H_6 has

A. 6 covalent bonds

B. 7 covalent bonds

C. 8 covalent bonds

D. 9 covalent bonds

Answer: B

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17. Butanone is a four carbon compound with the functional group

A. carboxylic acid

B. aldehyde

C. ketone

D. alcohol

Answer: C

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18. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that

A. the food is not cooked completely

B. the food is not burning completely

C. the fuel is wet

D. the food is burning completely

Answer: B

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19. Explain the nature of the covalent bond using the bond formation in CH_3Cl.

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20. Draw the electron dot structures for

Ethanoic acid

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21. Draw the electron dot structures for

H_2S

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22. Draw the electron dot structures for

Propanone

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23. Draw the electron dot structures for

F_2

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24. What is a homologous series? Explain with an example.

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25. How can ethanol and ethanoic acid be differentiated in the basic of their physical and chemical properties?

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26. Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

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27. Why are carbon and its compounds used as fuels for most applicants?

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28. Explain the formation of scum when hard water is treated with soap.

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29. What change will youn observed if you test soap with itmus paper (blue or red)?

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30. What is hydrogenation? What is its industrial application?

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31. Which of the following hydrocarbons undergo addition reactions : $C_2H_6, C_3H_8, C_3H_6, C_2H_2$ and CH_4?

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32. Give a test that can be used to differentiate chemically between butter and cooking oil?

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33. Explain the mechanism of cleansing action of soaps.

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Exercise Multiple Choice Questions Level 1

1. A phenomenon by which an element occurs in different physical modification in same physical state is called

A. isomerism

B. allotropy

C. amorphous

D. crystalline

Answer: B

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2. Number of free electron(s) in each carbon atom in graphite is/are

A. two

B. four

C. one

D. three

Answer: C

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3. In fullerene carbon atoms are arranged in mixed

A. tetragons and pentagons

B. pentagons and hexagons

C. pentagons and heptagons

D. all are correct

Answer: B

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4. Which of the following does not contain a double bond?

A. CO_2

B. C_2H_4

C. HCl

D. O_2

Answer: C

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5. Diamond is not a good conductor of electricity because

A. it is very hard

B. its structure is very compact

C. it is not water soluble

D. it has no free electron

Answer: D

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6. The difference in molecular weight of two consecutive members of a homologous series is

A. 15

B. 14

C. 8

D. 9

Answer: B

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7. The general formula of an ester where R represents alkyl group is

A. ROH

B. RCOOH

C. RCOOR

D. RH

Answer: C

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8. The IUPAC name of CH_3CHO is

A. acetaldehyde

B. methanal

C. ethanal

D. formaldehyde

Answer: C

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9. Which of the following have a triple bond?

A. C_2H_4

B. C_3H_4

C. CV_3H_8

D. C_2H_6

Answer: B

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10. All the members of homologous series of alkynes have the general formula

A. $C_N H_{2N}$

B. $C_n H_{2n+2}$

C. $C_n H_{2n-2}$

D. $C_n H_{2n-4}$

Answer: C

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11. Alcohols can be prepared by hydration of

A. alkenes

B. alkanes

C. alkynes

D. acids

Answer: A

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12. The reaction $CH_4 + Cl_2 \xrightarrow[\text{light}]{\text{hv}} CH_3Cl + HCl$ is an example of

A. additional reaction

B. substitution reaction

C. elimination reaction

D. oxidation reaction

Answer: B

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13. When ethanoic acid is heated with $NaHCO_3$ the gas evolved is

A. H_2

B. CO_2

C. CH_4

D. CO

Answer: B

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14. Methane, ethane and propane are said to form a homologous series because all are

A. hydrocarbons

B. saturated hydrocarbons

C. aliphatic hydrocarbons

D. differ from each other by $-CH_2$ group

Answer: D

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15. Which of the following belong to the same homologous series?

A. Ethane, ethene, ethyne

B. Propanol, propanone, propanal

C. Methanol, ethanol, propaol

D. Ethane, ethanol, ethanoic acid

Answer: C

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16. Ethane can be prepared by reaction of ethanol with

A. hot conc. H_2SO_4

B. alkaline $KMnO_4$

C. sodium metal

D. $NAHCO_3$

Answer: A

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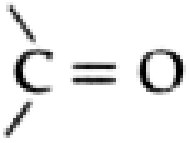
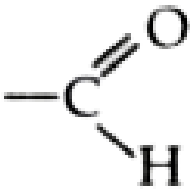
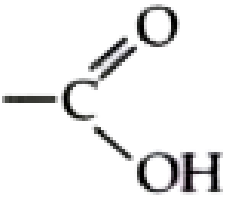
17. Which of the following is the functional group for carboxylic acid?

A. 

B. 

C. $-OH$

D. 

Answer: D

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18. The structural formula of ethyl ethanoate is

A. $CH_3 - \overset{\overset{O}{||}}{C} - OCH_3$

B. $CH_3 - \overset{\overset{O}{||}}{C} - OCH_2CH_3$

C. $CH_3CH_2 - \overset{\overset{O}{||}}{C} - OCH_2CH_3$

D. $CH_3CH_2 - \overset{\overset{O}{||}}{C} - OCH_3$

Answer: B

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19. Conversion of ethanol to ethanoic acid is a/an

A. substitution reaction

B. oxidation reaction

C. addition reaction

D. rearrangement reaction

Answer: B

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20. In the reaction, $CH_3COONa + NaOH \rightarrow$ the gas obtained is

A. C_2H_6

B. C_2H_2

C. CH_4

D. C_3H_8

Answer: C

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21. Ethanol on complete oxidation gives

A. carbon dioxide and water

B. acetaldehyde

C. acetic acid

D. acetone

Answer: C

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22. When the stopper of a bottle containing a colourless liquid was removed, it gave out smell like that of venegar. The liquid in the bottle could be

A. hydrochloric acid

B. sodium hydroxide solution

C. acetic acid solution

D. sodium carbonate solution

Answer: C

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23. C_2H_4 reacts with hydrogen in presence og Ni to give

A. CH_4

B. C_2H_6

C. $HCOOH$

D. $HCHO$

Answer: B

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24. Vegetable oils which are liquid at room temperature, can be converted to solid ghee by the presence of

A. dehydrogenation

B. hydrogenation

C. halogenation

D. dehydration

Answer: B

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25. The following reaction is an example of

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{heat} + \text{light}$$

A. addition reaction

B. substitution reaction

C. combustion reaction

D. displacement reaction

Answer: C

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26. Complete the following reaction :

A. CH_3COOH

B. $HCOOH$

C. CH_3COCH_3

D. CH_3OH

Answer: A

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27. IUPAC name of $(C_2H_5)_2CHCH_2OH$ is

A. 2-ethylbutane-1-ol

B. 2-methylpentan-1-ol

C. 2-ethylpentan-1-ol

D. 3-ethylbutane-1-ol

Answer: A

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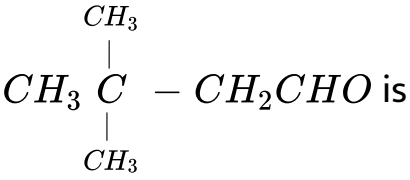
28. IUPAC name of the compound



A. 3,3,3-trimethylpropanal

B. 2,2-dimethylbutanal

C. 3,3-dimethylbutanal

D. 1,1-dimethylbutanal

Answer: C

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29. IUPAC name of the compound

$CH_2 = C(CH_3)_2$ is

A. 1,1-dimethylprop-2-ene

B. 2-methylprop-1-ene

C. 2-ethyl-3,3-dimethylbutane

D. 2,3-dimethylhexane

Answer: B

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30. In the presence of concentrated sulphuric acid, acetic acid reacts with ethyl alcohol to produce

A. aldehyde

B. alcohol

C. ester

D. carboxylic acid

Answer: C

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Exercise Multiple Choice Questions Level 2

1. Number of electrons shared between carbon-carbon atons in ethene is

A. 2

B. 4

C. 6

D. 8

Answer: B

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2. How many unshared pair of electrons are present in water molecule?

A. One

B. Zero

C. Two

D. Three

Answer: C

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3. The number of isomers of pentane is

A. 2

B. 3

C. 4

D. 5

Answer: B

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4. Unsaturation in the organic compound can be tested by the help of

A. Baeyer's test

B. Fehling test

C. chlorination reaction

D. dehydration reaction

Answer: A

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5. The reaction,

$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$ suggests that ethanol is

A. acidic in nature

B. basic in nature

C. amphoteric in nature

D. neutral in nature

Answer: A

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6. Which compound gives effervescence with sodium metal but not with sodium bicarbonate?

A. Ethanol

B. Ethanoic acid

C. Ethanal

D. Ester

Answer: A

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7. Among the following the one having longest chain is

A. neo-pentane

B. iso-pentane

C. 2-methylpentane

D. 2,2-dimethylbutane

Answer: C

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8. The IUPAC name of the compound

$$CH_2 - \underset{\underset{CH(CH_3)_2}{|}}{CH} - CH_3$$ is

A. 2-isopropylpropane

B. iso-butane

C. 2,3-dimethylbutane

D. 2,3-dimethylpentane

Answer: C

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9. An organic compound X with molecular formula $C_2H_4O_2$ turns litmus red and gives brisk effervescence with sodium bicarbonate. Identify the compound.

A. Ethanol

B. Ethanoic acid

C. Ethanal

D. Ethyl ethanoate

Answer: B

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10. C_6H_{14} the number of possible isomers is

A. 3

B. 6

C. 4

D. 5

Answer: D

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11. Which of the following set of compounds have same molecular formula?

A. Butane and iso-butane

B. Cyclohexane and hexene

C. Propanal and propanone

D. All of these

Answer: D

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12. Which of the following is an isomeric pair?

A. Ethane and propane

B. Ethane and ethene

C. Propane and butane

D. Butane and 2-methylpropane

Answer: D

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13. Which of the following hydrocarbons does not decolourise bromine water?

A. $C_{10}H_{22}$

B. C_6H_{12}

C. $C_{10}H_{18}$

D. $C_{10}H_{20}$

Answer: A

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14. What is observed when acetic acid and sodium bicarbonate solution are mixed?

A. A colourless odourless gas is liberated.

B. A colourless gas that turns blue litmus red.

C. A colourless gas which burns with a soap sound.

D. Both (a) and (b).

Answer: D

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15. 2 mL of ethanoic acid was taken in each of the three test tubes A, B and C. To these test tubes 2 mL, 4 mL and 8 mL of water wad added respectively. Which test tube will give a clear solution?

A. Test tube A only

B. Test tube B only

C. Test tube A and B only

D. All the test tubes

Answer: D

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16. Which of the following statements is not correct?

A. A common functional group is present in different members of a homologous series.

B. Two consecutive members of a homologous series differ by a $-CH_3$ group.

C. The members of a homologous series can be represented by one general formula.

D. Different members of a homologous series have similar chemical properties.

Answer: B

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17. Compound X has the molecular formula C_2H_6O.

1. X can be made by fermentation process.

2. X can be oxidised to Y.

3. X can react with Y to form Z and water.

To which homologous series do X, Y and Z belong?

A. X Alcohol Y Carboxylic acid Z Ester

B. X Alcohol Y Ester Z Carboxylic acid

C. X Carboxylic acid Y Alcohol Z Ester

D. X Carboxylic acid Y Ester Z Alcohol

Answer: A

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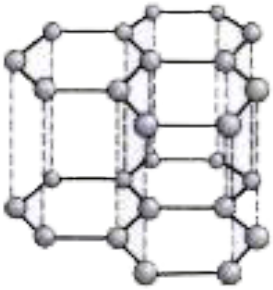
18. Structures of two different form of carbon are given below.



Identify the two forms and how are they related to each other?

A. Diamond, Graphite, Isotopes

B. Graphite, Diamond, Allotropes

C. C^{12}, C^{14}, Allotropes

D. C^{14}, C^{12}, Isotopes

Answer: B

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19. Which of the following pairs of compounds of carbon will undergo combustion as well as addition reactions?

A. CH_4 and C_2H_6

B. C_2H_6O and C_3H_8O

C. $C_2H_4O_2$ and C_3H_6O

D. C_2H_2 and C_3H_6

Answer: D

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20. The IUPAC name of $CH_3 - CH_2 - \underset{\underset{CH_3}{|}}{CH} - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3$ is

A. 2,2,3-trimethylpentane

B. 3,4,4-trimethylpentane

C. 2-ethyl-3,3-dimethylbutane

D. 2,3-dimethylhexane

Answer: A

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Match The Following

1. Match the following columns

List-I		List-II	
(P)	$-COOH$	1.	Ester
(Q)	$-C\equiv C-$	2.	Carboxylic acid
(R)	$-\overset{\overset{O}{\|}}{C}-O-$	3.	Ketone
(S)	$-CO-$	4.	Alkyne

A. P-2, Q-4, R-1, S-3

B. P-1, Q-2, R-3, S-4

C. P-4, Q-3, R-2, S-1

D. P-4, Q-2, R-3, S-1

Answer: A

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2. Match the following columns

List-I (Family)	List-II (General formula)
(P) Alkyne	1. $C_nH_{2n+1}X$
(Q) Alcohol	2. C_nH_{2n-2}
(R) Alkyl halide	3. C_nH_{2n}
(S) Alkene	4. $C_nH_{2n+2}O$

A. P-1, Q-2, R-3, S-4

B. P-2, Q-4, R-1, S-3

C. P-4, Q-2, R-1, S-3

D. P-2, Q-1, R-3, S-4

Answer: B

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3. Match the following columns

List-I	List-II
(P) Molecules having different physical properties but same chemical properties	1. Isomers
(Q) Substances having same molecular formula but different structures	2. Allotropes
(R) Substances having same functional group but different molecular formula	3. Functional group
(S) Group of atoms in a molecule which determines its chemical properties	4. Homologous

A. P-1, Q-2, R-3, S-4

B. P-3, Q-2, R-1, S-4

C. P-4, Q-3, R-1, S-2

D. P-2, Q-1, R-4, S-3

Answer: D

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4.

List-I	List-II
(P) Chlorination in presence of sunlight	1. Alcohols
(Q) Addition of H_2 to give saturated compounds	2. Carboxylic acids
(R) Formation of alkene by heating with conc. H_2SO_4	3. Alkenes
(S) Reaction with alcohols to give esters	4. Alkanes

A. P-4, Q-1, R-2, S-3

B. P-4, Q-3, R-1, S-2

C. P-3, Q-1, R-2, S-4

D. P-3, Q-2, R-1, S-4

Answer: B

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5. Match the following columns

List-I	List-II
(P) Alkanol	1. $-\overset{\overset{O}{\|}}{C}-OH$
(Q) Alkanal	2. $-\overset{\overset{O}{\|}}{C}-$
(R) Alkanone	3. $-\overset{\overset{O}{\|}}{C}-H$
(S) Alkanoic acid	4. $-OH$

A. P-1, Q-2, R-4, S-3

B. P-4, Q-3, R-2, S-1

C. P-4, Q-2, R-3, S-1

D. P-1, Q-2, R-3, S-4

Answer: B

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Assertion Reaction Type

1. Assertion : Saturated hydrocarbons are chemically less reactive.

Reason : All the valencies of carbon atom are satisfied by single covalent bonds.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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2. Assertion : Alkenes usually show addition reactions.

Reason : Alkenes are unsaturated hydrocarbons having double bonds.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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3. Assertion : Reaction with $NaHCO_3$ can be used as a test to distinguish between alcohols and acids.

Reaction : Both alcohols and acids give brisk effervescence with $NaHCO_3$.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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4. Assertion : Both aldehydes and ketones contain carbonyl group.

Reaction : In aldehydes, the functional group is attached to atleast one hydrogen atom.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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5. Assertion : In alkanes, alkenes and alkynes the valency of carbon is always four.

Reaction : All hydrocarbons except alkanes contain double bonds.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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6. Assertion : Graphite is a good conductor of electricity.

Reason : Ih has one free valence electron.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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7. Assertion : Dehydration of ethanol with conc. H_2SO_4 yields ethene.

Reason : The reaction of ethanol with conc. H_2SO_4 is known as dehydration.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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8. Assertion : By hydrogenation, vegetable oils are converted into vanaspati ghee.

Reason : Vegetable oils contain at least one double bond inb their constituents.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

9. Assertion : The functional group present in alcohols is -OH.

Reaction : It is the same group as present in water, hence water and alcohol have similar properties.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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10. Assertion : Soaps are sodium salts of fatty acids.

Reason : Soaps react with Mg^{2+} and Ca^{2+} of hard water to give insoluble precipitates.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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Comprehension Type

1. PASSAGE-I : Diamond and graphite are two allotropic forms of carbon which are crystalline in nature. They differ physically but chemically they are similar. Diamond is the hardest crystalline form of carbon. In diamond each carbon atom is linked to four other carbon atoms by covalent bonds. In graphite, each carbon atom is linked to three other carbon atoms by covalent bond. Graphite is relatively soft and greasy. It is a good conductor or electricity.

Which of the following is a goos conductor of heat and electricity?

A. Coal

B. Diamond

C. Charcoal

D. Graphite

Answer: D

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2. PASSAGE-I : Diamond and graphite are two allotropic forms of carbon which are crystalline in nature. They differ physically but chemically they are similar. Diamond is the hardest crystalline form of carbon. In diamond each carbon atom is linked to four other carbon atoms by covalent bonds. In graphite, each carbon atom is linked to three other carbon atoms by covalent bond. Graphite is relatively

soft and greasy. It is a good conductor or electricity.

Which of the folowing types of forces bind together the carbon atoms in diamond?

A. Ionic

B. Covalent

C. Polar

D. van der Waals'

Answer: B

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3. PASSAGE-I : Diamond and graphite are two allotropic forms of carbon which are crystalline in nature. They differ

physically but chemically they are similar. Diamond is the hardest crystalline form of carbon. In diamond each carbon atom is linked to four other carbon atoms by covalent bonds. In graphite, each carbon atom is linked to three other carbon atoms by covalent bond. Graphite is relatively soft and greasy. It is a good conductor or electricity.

Graphite is a good conductor of electricity because

A. it has free electrons

B. it has free atoms

C. it is crystalline

D. it is soft and greasy

Answer: A

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4. PASSAGE-I : Diamond and graphite are two allotropic forms of carbon which are crystalline in nature. They differ physically but chemically they are similar. Diamond is the hardest crystalline form of carbon. In diamond each carbon atom is linked to four other carbon atoms by covalent bonds. In graphite, each carbon atom is linked to three other carbon atoms by covalent bond. Graphite is relatively soft and greasy. It is a good conductor or electricity.

Which allotrope gives carbon dioxide on heating?

A. Graphite

B. Diamond

C. Coal

D. All of these

Answer: D

5. PASSAGE-II : In all the organic compounds, the four valencies of carbon atom must be satisfied, either by single, double or triple bonds. It is not possible to get a compound in which the carbon atom has valencies either less or more than four. In these compounds carbon atoms can be linked together in the form of straight chains, branched chains or even ring chains.

In order to form branching, an organic compound must have a minimum of

A. four carbon atoms

B. three carbon atoms

C. five carbon atoms

D. any number of carbon atoms

Answer: A

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6. PASSAGE-II : In all the organic compounds, the four valencies of carbon atom must be satisfied, either by single, double or triple bonds. It is not possible to get a compound in which the carbon atom has valencies either less or more than four. In these compounds carbon atoms can be linked together in the form of straight chains, branched chains or

even ring chains.

The number of $C-H$ bonds in ethene (C_2H_4) is

A. four

B. six

C. two

D. ten

Answer: A

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7. PASSAGE-II : In all the organic compounds, the four valencies of carbon atom must be satisfied, either by single, double or triple bonds. It is not possible to get a compound

in which the carbon atom has valencies either less or more than four. In these compounds carbon atoms can be linked together in the form of straight chains, branched chains or even ring chains.

The compound in which a double bond is present between two carbon atoms is

A. ethane

B. ehtene

C. ethyne

D. ethanol

Answer: B

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8. PASSAGE-II : In all the organic compounds, the four valencies of carbon atom must be satisfied, either by single, double or triple bonds. It is not possible to get a compound in which the carbon atom has valencies either less or more than four. In these compounds carbon atoms can be linked together in the form of straight chains, branched chains or even ring chains.

Identify the unsaturated hydrocarbon.

A. C_4H_{10}

B. C_4H_8

C. C_5H_{12}

D. CH_4

Answer: B

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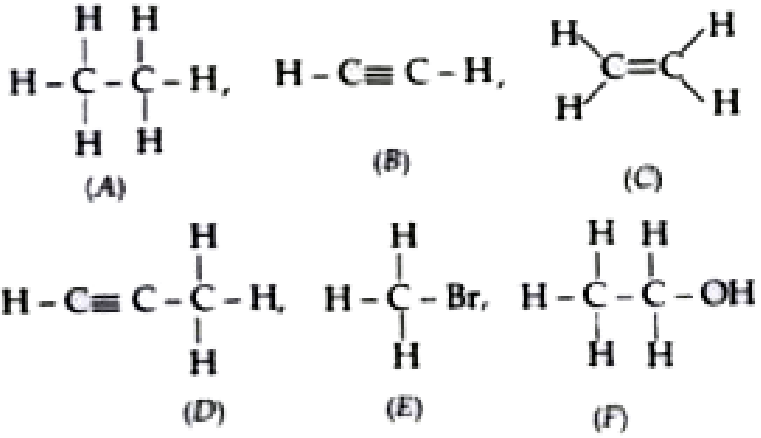
Watch Video Solution

9. PASSAGE-III : Structural formmulae of some organic compounds are given :



The compound belonging to same homologous series are

A. A and B

B. B and C

C. B and D

D. E and F

Answer: C

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10. PASSAGE-III : Structural formmulae of some organic compounds are given :

Thwe structures which do not belong to hydrocarbons are

A. A and C

B. A, B and C

C. E and F

D. C and D

Answer: C

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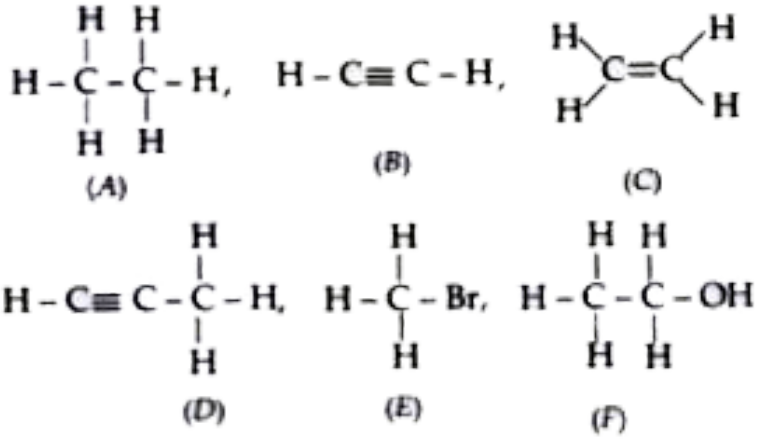
11. PASSAGE-III : Structural formmulae of some organic compounds are given :



How can F be converted to C?

A. By heating with conc. H_2SO_4

B. By heating with Ni

C. By heating with carboxylic acid

D. By heating with Na metal

Answer: A

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12. PASSAGE-III : Structural formmulae of some organic compounds are given :

The compounds which can undergo addition reactions are

A. A, B and C

B. B, C and D

C. E, F and C

D. B, D and F

Answer: B

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13. PASSAGE-IV : A neutral organic compound A of molecular formula C_2H_6O, on oxidation with potassium dichromate and sulphuric acid gives an acidic compound B. The compound A reacts with B on warming in presence of conc. H_2SO_4 to give a sweet smelling substance C. C on heating with D gives back A.

In the given reaction A is

A. CH_3CH_2OH

B. CH_3COOH

C. $CH_3COOC_2H_5$

D. CH_3OH

Answer: A

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14. PASSAGE-IV : A neutral organic compound A of molecular formula C_2H_6O, on oxidation with potassium dichromate and sulphuric acid gives an acidic compound B. The compound A reacts with B on warming in presence of conc. H_2SO_4 to give a sweet smelling substance C. C on heating with D gives back A.

In the above sequence of reactions compound B is

A. ethanol

B. ethanoic acid

C. ethyl ethanoate

D. water

Answer: B

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15. A neutral organic compound A of molecular formula C_2H_6O, on oxidation with potassium dichromate and sulphuric acid gives an acidic compound B. The compound A reacts with B on warming in presence of conc. H_2SO_4 to give a sweet smelling substance C. C on heating with D gives back A.

Compound C in the above reaction is

A. an alcohol

B. an ester

C. a hydrocarbon

D. hydrogen

Answer: B

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16. PASSAGE-IV : A neutral organic compound A of molecular formula C_2H_6O, on oxidation with potassium dichromate and sulphuric acid gives an acidic compound B. The compound A reacts with B on warming in presence of conc. H_2SO_4 to give a sweet smelling substance C. C on heating with D gives back A.

Identify the reagent D.

A. H_2O

B. $NaOH$

C. Conc. H_2SO_4

D. $K_2Cr_2O_7$

Answer: B

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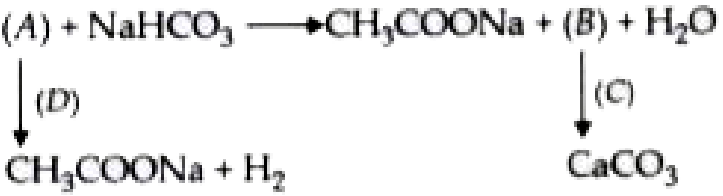
17. PASSAGE-V :



In the above sequences of reaction A is

A. CH_3OH

B. CH_3COOH

C. CH_3CHO

D. CH_3COCH_3

Answer: B

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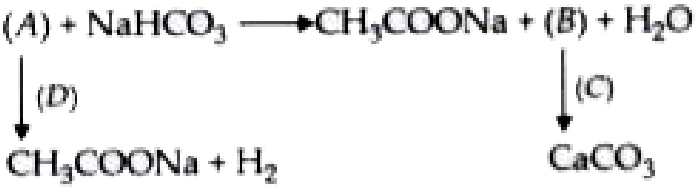
18. PASSAGE-V :



The compound B is

A. hydrogen

B. sodium hydroxide

C. carbon dioxide

D. ethanol

Answer: C

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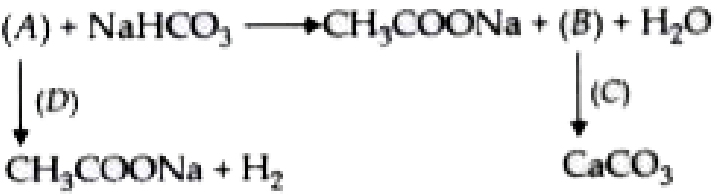
19. PASSAGE-V :



In the sequence of reaction C is

A. $Ca(OH)_2$

B. CaC_2

C. $CaCO_3$

D. $CaSO_4$

Answer: A

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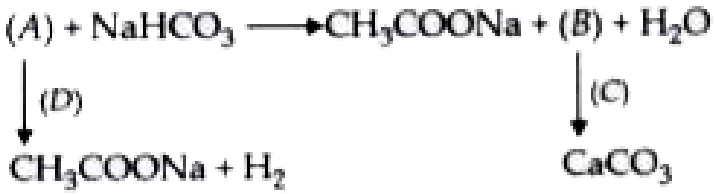
20. PASSAGE-V :



The reagent D is

A. $NaOH$

B. Na_2CO_3

C. Na

D. $NaHCO_3$

Answer: C

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Subjective Problems Very Short Answer Type

1. How is the conductivity shown by carbon compounds?

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2. Why does carbon not form the ionic compounds?

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3. What happens when a small piece of sodium is dropped into ethanol?

Watch Video Solution

4. How does the conductivity vary in diamond and graphite?

Watch Video Solution

5. What are saturated and unsaturated compounds? Give examples also.

Watch Video Solution

6. What is the role of a functional group in an organic compound?

Watch Video Solution

7. What is the common name of simplest acid and why?

Watch Video Solution

8. Write the name and formula of the 2^{nd} member of homologous series having general formula C_nH_{2n}.

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9. Which two of the following compounds belong to same homologous series?

$C_2H_6O_2, C_2H_6O, C_2H_6, CH_4O$

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10. What is the valency of carbon in its compounds?

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11. Out of kitonic and aldehydic group, which is the terminal functional group?

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12. The formula of a hydrocarbon is C_nH_{2n}. Name the family to which it belongs and also predict its nature.

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13. An unknown compound has the smell of vineger. Identiy

Watch Video Solution

14. What do we get when ethanoic acid reats with athanol in the presence of concentrated sulphuric acid?

View Text Solution

15. Vapours of a hydrocarbon were passed through bromine dissolved in carbon tetrachloride. The yellow colour of bromine got discharged? Predict the nature of the hydrocarbon.

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Subjective Problems Short Answer Type

1. Why are covalent compounds generally poor conductors of electricity?

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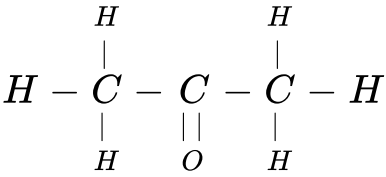
2. Name the following compound :



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3. Name the gas evolved when ethanoic acid is added to sodium carbonate. How would you prove the presence of this gas?

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4. Give reasons for the following observations :

Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.

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5. Give reasons for the following observations :

Use of synthetic detergents causes pollution of water.

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6. An organic compound 'X' with molecular formula C_2H_6O, on oxidation with acidified potassium dichromate gives

ethanoic acid. What is the compound X? Write equation also.

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7. What is a 'homologous series' of substance?

Watch Video Solution

8. In an organic compound, which parts largely determine its physical and chemical properties?

Watch Video Solution

9. Write a chemical equation to represent the reaction of ethanol with acidified solution of potaasium dichromate.

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10. 1000 cm^3 of propane is burnt completely in oxygen. What is the full structural formula of propane?

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11. 1000 cm^3 of propane is burnt completely in oxygen. Draw the electronic structure of propane.

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12. 1000 cm^3 of propane is burnt completely in oxygen. Write the balanced chemical equation for the complete combustion of propane.

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13. An organic compound 'X' which is sometimes used as antifreeze has the molecular formula C_2H_6O. 'X' on oxidation gives a compound 'Y' which gives effervescence with baking soda solution. What can 'X' and 'Y' be? Write the structural formulae.

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14. What are the reactive sites for addition reactions in unsaturated hydrocarbons? Give one example.

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15. Three hydrocarbons A, B and C have melting points $-183^{\circ}C$, $-138^{\circ}C$, and $-95.3^{\circ}C$ respectively. Which one has minimum number of carbon atoms in molecule?

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16. What is meant by saponification? Give an example.

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17. What is esterification? Or What happens when ethyl and acetic acid react with each other in the presence of conc. H_2SO_4 ?

View Text Solution

18. What is scum? How is it formed?

Watch Video Solution

19. What are the advantages of synthetic detergents over soaps?

Watch Video Solution

20. Write a chemical test to distinguish between ethanol ad ethanoic acid.

Watch Video Solution

21. What is meant by decarboxylation? Explain with example.

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22. Two carbon compounds A and B have the molecular formulae C_3H_8 and C_3H_6, respectively. Which one of the two is most likely to show addition reaction? Justify your answer. Explain with the help of a chemical equation, how an addition reaction is useful in vegetable ghee industry.

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Subjective Problems Long Answer Type

1. Explain the formation of (i) oxygen molecule and (ii) ethylene molecule with the help of Lewis dot structure.

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2. What are the main properties of covalent compounds with respect to melting and boiling points, solubility and conductivity?

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3. Elements forming ionic compounds attain noble gas electronic configuration by either gaining or losing electrons from their valence shells. Explain giving reason why carbon cannot attain such a configuration in this manner to form its compounds. Name the type of bonds formed in ionic compounds and in the compounds formed by carbon. Also explain with reason why carbon compounds are generally poor conductors of electricity.

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4. Define the term 'isomers'.

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5. Draw two possible isomers of the compound with molecular formula C_3H_6O and write their names.

Watch Video Solution

6. Give the electron dot structures of the above two compounds.

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7. Write the structural formulae for

2-methyl-2-butane

Watch Video Solution

8. Write the structural formulae for

2-methylpropene.

Watch Video Solution

9. Write the structural formulae for

Methyl propyl ether

Watch Video Solution

10. Write the structural formulae for

2,2-dimethyl propane

Watch Video Solution

11. Write the structural formulae for

4,6-dimethyl hept-2-ene

Watch Video Solution

12. Write IUPAC names of the following compounds :

CH_3CH_2COOH

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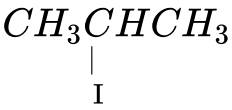
13. Write IUPAC names of the following compounds :

CH_3CHO

Watch Video Solution

14. Write IUPAC names of the following compounds :



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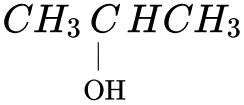
15. Write IUPAC names of the following compounds :

$CH_3CH_2CH_2OH$

Watch Video Solution

16. Write IUPAC names of the following compounds :



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17. A hydrocarbon has three carbon atoms. Write down its molecular formulae as

alkane

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18. A hydrocarbon has three carbon atoms. Write down its molecular formulae as

alkene

Watch Video Solution

19. A hydrocarbon has three carbon atoms. Write down its molecular formulae as

alkyne

Watch Video Solution

20. A hydrocarbon has three carbon atoms. Write down its molecular formulae as

alcohol derivative

Watch Video Solution

21. A hydrocarbon has three carbon atoms. Write down its molecular formulae as

aldehyde derivative

Watch Video Solution

22. A hydrocarbon has three carbon atoms. Write down its molecular formulae as

ketone derivative

Watch Video Solution

23. A hydrocarbon has three carbon atoms. Write down its molecular formulae as

acid derivative

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24. What is the difference between combustion and oxidation? Under what conditions an oxidation reaction

becomes combustion?

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25. List in tabular form three physical and two chemical properties on the basic of which ethanol and ethanoic acid can be differentiated.

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26. What happens when ethanoic acid reacts with magnesium

Write chemical equation in each case.

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27. What happens when ethanoic acid reacts with sodium carbonate

Write chemical equation in each case.

Watch Video Solution

28. What happens when ethanoic acid reacts with sodium hydroxide?

Write chemical equation in each case.

Watch Video Solution

Integer Numerical Value Type

1. Maximum number of structural isomers for a pentane with molecular formula C_5H_{12} is

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2. The number of compounds in the following compounds belong to same homologous series is

$CH_2O_2, C_3H_8O, C_2H_4O_2, C_2H_6, C_3H_6O_2, C_5H_{10}O_2, C_3H_8$

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3. Number of carbon atoms in alkane having molecular mass 58 is

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4. The number of alkanes in the following compounds is

$C_3H_8, C_3H_6, C_4H_8, C_4H_6$ and C_5H_{12}.

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5. The difference in the molecular mass for CH_3OH and C_2H_5OH is

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Olympaid Hots Corner

1. An organic compound 'A' on heating with concentrated H_2SO_4 forms a compound 'B' which on addition of one mole of hydrogen in presence of Ni forms a compound 'C'. One mole of compound 'C' on combustion forms two moles of CO_2 and three moles of H_2O.

Which of the following represents the compound 'C' ?

A. C_2H_6, a saturated hydrocarbon

B. C_2H_4, an unsaturated hydrocarbon

C. HCOOH, an unsaturated acid

D. C_2H_5OH, a saturated alcohol

Answer: A

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2. An organic compound 'A' on heating with concentrated H_2SO_4 forms a compound 'B' which on addition of one mole of hydrogen in presence of Ni forms a compound 'C'. One mole of compound 'C' on combustion forms two moles of CO_2 and three moles of H_2O.

When 'B' and 'C' are added separately to the test tubes conrtaining orange-brown liquid 'X', the colour disappears in case of 'B' but remains same in case of 'C'. The name of the liquid 'X' and the substance responsible for colour change are respectively

A. alkaline $KMnO_4$ solution and ethanoic acid

B. alkaline $KMnO_4$ and ethanol

C. bromine water and 1, 2-dibromoethane

D. bromine water and 1, 1, 2, 2-tetrabromoethane.

Answer: C

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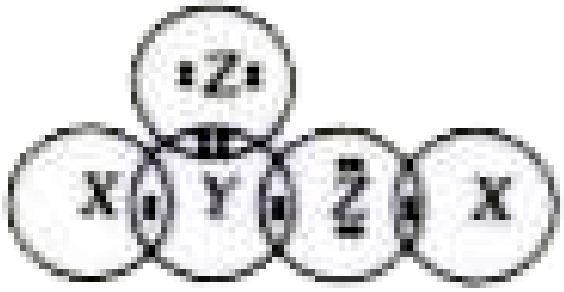
3. The given diagrams shows the arrangement of valence electrons in organic compound Q, having molecular formula X_2YZ_2.



What could be the compound Q?

A. Methanol

B. Ethanol

C. Methanoic acid

D. Ethanoic acid

Answer: C

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4. Match column I with column II and select the correct option from the given codes.

Column I	Column II
(A) $C_2H_5OH \rightarrow CH_3COOH$	(i) Conc. H_2SO_4, 170 °C
(B) $C_2H_5OH \rightarrow CH_2=CH_2$	(ii) H_2, Ni
(C) $CH_4 \rightarrow CH_3Cl$	(iii) Alk. $KMnO_4$
(D) $CH_2=CH_2 \rightarrow CH_3CH_3$	(iv) Cl_2, sunlight

A. (A) - (i), (B) - (iii), (c) - (ii), (D) - (iv)

B. (A) - (iv), (B) - (iii), (c) - (ii), (D) - (i)

C. (A) - (i), (B) - (iv), (c) - (iii), (D) - (ii)

D. (A) - (iii), (B) - (i), (c) - (iv), (D) - (ii)

Answer: D

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5. When alcohols react with carboxylix acids in the presence of concentrated sulphuric acid, compounds with fruity smell called edters are formed. Also, alcohols on oxidation in the presence of acidified $K_2Cr_2O_7$ form carboxylic acids.

If third member of alcohol family (homologous series) undergoes esterification reaction with second member of

carboxylic acid family then, the name of ester formed and its formed and its formula will be respectively

A. ethyl propanoate, $CH_3CH_2COOCH_2CH_3$

B. propyl propanoate, $CH_3COOCH_2CH_2CH_3$

C. ethyl butanoate, $CH_3CH_2CH_2COOCH_2CH_3$

D. ethyl ethanoate, $CH_3COOCH_2CH_3$

Answer: B

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6. When alcohols react with carboxylix acids in the presence of concentrated sulphuric acid, compounds with fruity smell called edters are formed. Also, alcohols on oxidation in the

presence of acidified $K_2Cr_2O_7$ form carboxylic acids.

C_2H_5OH on oxidation with acidified $K_2Cr_2O_7$ gives CH_3COOH.

Which of the following statements is/are correct regarding these two compounds?

I. Ther both react with sodium metal to evolve a combustible gas.

II. They both react with $NaHCO_3$ to evolve a gas which turns lime water milky.

III. They both turn blue litmus red.

A. I and II only

B. II only

C. I only

D. I, II and II

Answer: C

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7. An organic compound 'A' on treating with acidified potassium dichromated solution gives 'B' with molecular mass 60 g/mol. 'A' on heating with conc. H_2SO_4 at 443 K produces a gas that decolourise bromine water. The compound 'A' is

A. n-propyl alcohol

B. iso-propyl alcohol

C. ehtyl alcohol

D. acetaldehyde

Answer: C

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8. Ethanol is made unfit for drinking by adding

A. propanol

B. methanal

C. methanol

D. ethanal

Answer: C

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9. Dilute solution of alkaline potassium permanganate is known as

A. Baeyer's reagent

B. Tollen's reagent

C. Fehling solution

D. Benedict solution

Answer: A

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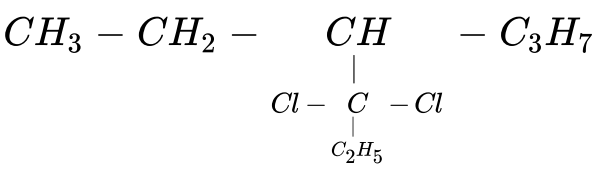
10. What is the IUPAC name of the following compound?



A. 3,3-Dichloro-4-ethylheptane

B. 4-Ethyl-3, 3-dichlorohexane

C. 4-Ethyl-3-chlorohexane

D. 3, 3-Dichloro-4-butylheptane

Answer: A

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11. The allotrope of carbon in amorphous from among the following is

A. diamond

B. graphite

C. buckminster fullerence

D. coal

Answer: D

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12. The IUPAC name of $PhCH = CH - COOH$ is

A. 3-phenylprop-2-enoic acid

B. cinnamic acid

C. 1-carboxy-2-phenylethene

D. 1-phenylpropenoic acid

Answer: A

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13. Read the statements about carbon and choose correct option.

A. It has small atomic size.

B. Its melting and boiling points are low as compared to other members of group.

C. It shows electropositive character.

D. It shows maximum tendency of catenation.

A. A and B are correct.

B. B and D are correct.

C. A, C and D are correct.

D. A and D are correct.

Answer: D

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14. The highly significant isomers among the following compounds are

A. Methane B. Propane

C. Butane D. Hexane

A. A and B

B. A and D

C. B and C

D. C and D

Answer: D

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15. Ajay got stung by red ant, it causes itching and irritation. The sting consists of which of the following acid>

A. Acetic acid

B. Butyric acid

C. Carbonic acid

D. Formic acid

Answer: D

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16. Which of the following has shortest carbon-carbon bond length?

A. C_2H_2

B. C_2H_4

C. C_2H_6

D. C_6H_6

Answer: A

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17. Which of the following represent saponification reaction?

A. $CH_3COONa + NaOH \xrightarrow{CaO} + Na_2CO_3$

B.

$$CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$$

C. $2CH_3COOH + 2Na \rightarrow 2CH_3COONa + H_2$

D.

$$CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$$

Answer: D

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18. Hard water does not easily produce lather with soap because it contains

A. Only Mg^{2+} ions

B. Only Ca^{2+} ions

C. both Mg^{2+} and Ca^{2+} ions

D. both Na^{+} and K^{+} ions

Answer: C

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19. Which of the following organic compounds does not have the same chemical properties as methanol?

A. C_2H_6O

B. $C_5H_{10}O$

C. $C_4H_{10}O$

D. $C_7H_{16}O$

Answer: B

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20. Write the IUPAC name of $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - CH_3$

A. neo-Pentane

B. 2, 2-Dimnethylpropane

C. 2-methylpentane

D. 2, 3-Dimethylpropane

Answer: B

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21. Which type of bond is present between carbon-carbon atoms in acetylene?

A. Single covalent bond

B. Double covalent bond

C. Triple covalent bond

D. Electrovalent bond

Answer: C

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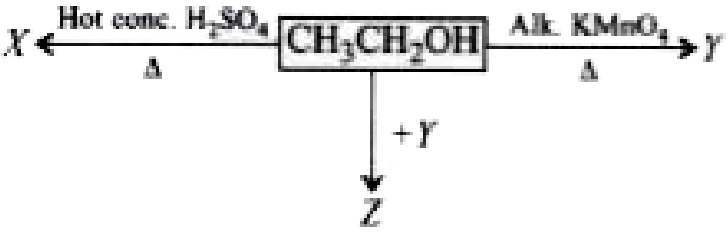
22.



Identify X, Y and Z respectively.

A. $CH_3COOH, CH_2 = CH_2, CH_3COOCH_3$

B. $CH_2 = CH_2, CH_3COOH, CH_3COOCH_2CH_3$

C. $HCHO, CH_3CH_3, CH_3CH_2COOH$

D. $CH_3CH_3, HCHO, CH_3COOH$

Answer: B

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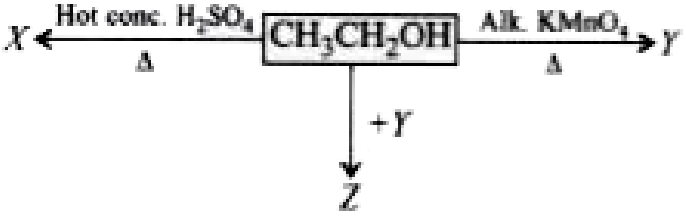
23.



What are the types of reactinos occurring in the formation of X, Y and Z respectively ?

A. Oxidation, Reduction, Substitution

B. Substitution, Esterification, Dehydration

C. Reduction, Substitution, Oxidation

D. Dehydration, Oxidation, Esterification

Answer: D

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24. Compound X decolourises acidified potassium dechromate to produce an acid with a pH value of 4.5. Which of the following could be the structure of X?

A. CH_3CH_2COOH

B. $CH_3CH_2CH_2OH$

C. $CH_2 = CH - CH_3$

D. $CH_3CH_2CH_3$

Answer: B

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25. Three hydrocarbons X, Y and Z are shown below:

$X: CH_3CH_2CH_2CH_2CH_3, Y: CH_3 - C \equiv C - CH_2CH_3$

$Z: CH_3CH_2 - CH = CH - CH_3$

Identify the incorrect statements about these three hydrocarbons.

I. X and Y both differ by a $-CH_2$ unit.

II. X and Z have the same boiling point.

III. All have different general formulae.

IV. Y and Z have different molecular masses.

A. I and II

B. II and III

C. I and IV

D. All the statements are incorrect

Answer: A

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