CHEMISTRY

BOOKS - CENGAGE CHEMISTRY

HYDROCARBONS

Mandatory Exercise Exercise Set I

1. Cylindrical shape of an alkyne is due to

A. three σ carbon-carbon bonds

B. three π carbon-carbon bonds

C. two σ carbon-carbon and one π carbon-carbon bond

D. one σ carbon-carbon and two π carbon-carbon bond

Answer: D

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2. What are the hybridisations of carbon 1 and carbon 2 in the hydrocarbon $\overset{1}{C}H_3 - \overset{2}{C}H = CH_2$?

A. sp^3, sp

B. sp^3, sp^2

C. sp^2, sp^2

D. sp, sp^2

Answer: B

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3. In the given compound, identify the type of hybrid orbitals used by the carbon atoms labelled $1, 2$ and 3.

$$H_3\overset{1}{C} - \overset{\langle O \rangle}{\overset{|}{\underset{|_2}{C}}} - \overset{3}{C} \equiv N:$$

A. so^3, sp, sp

B. sp^2, sp^2, sp

C. sp^3, sp^2, sp

D. sp^3, sp^2, sp

Answer: C

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4. On cracking of petrol, we get:

A. CH_4, C_2H_6

B. C_3H_6, CH_4

C. Both of the above

D. $CH_3 + CH_4 + C_2H_6 +$ alcohols

Answer: C

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5. Photochemical chlorination of alkane is initiated by a process of:

A. Pyrolysis

B. Substitution

C. Hemolysis

D. Peroxidation

Answer: C

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6. Lead tetraethyl is used as:

A. Fire extinguisher

B. Pain killer

C. Petroleum additive

D. Mosquito repellant

Answer: C

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7. The following reaction is an example of:

$$C_3H_8 + 2CI_2 \xrightarrow{\text{light}} C_3H_8CI_2 + 2HCI$$

A. An addition reaction

B. A substitution reaction

C. An oxidation reaction

D. Elimination reaction

Answer: B

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8. Petroleum consists mainly of:

A. Aliphatic hydrocarbons

B. Aromatic hydrocarbons

C. Aliphatic alcohols

D. None of the above

Answer: A

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9. By coal-tar distillation which of the following is not obtained:

A. Light oil

B. Middle oil

C. Heavy oil

D. Mobile oil

Answer: D

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10. Highest boiling point is expected for:

A. Isooctane

B. n-octane

C. $2, 2, 3, 3$-tetra methyl butane

D. n-Butane

Answer: B

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11. The order of reactivity of halogens in substitution reaction in polar protic solvent is:

A. $F > CI > Br > I$

B. $I > Br > CI > F$

C. $F > Br > CI > I$

D. $F > CI = Br > I$

Answer: A

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12. $2CH_4 + O_2 \xrightarrow[200^\circ C, 100 \text{ atm}]{\text{copper-tube}}$ Product is:

A. Formaldehyde and H_2

B. Acetic acid

C. Carbon dioxide

D. Methanol

Answer: D

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13. Which of the following compounds should undergo chlorination faster than the remaining three?

A. n-Pentane

B. Neopentane

C. Isopentane

D. n-Butane

Answer: C

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14. Which of the following reagents cannot be used for preparing an alkane from a ketone?

(i) $Zn/Hg +$ conc. HCI

(ii) Red $P + I_2$

(iii) H_2NNH_2 and C_2H_5 Ona

(iv) $NaBH_4$

A. A and B

B. A and C

C. B and D

D. C and D

Answer: C

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15. The main constituents of LPG gas are:

A. Methane + Ethane

B. Isobutane + $n-$ Butane

C. Propane + $n-$ Butane

D. Methane + Ethane + Propane

Answer: C

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16. Which of the following gases is present as chief constituent in fire damp?

A. CO

B. CH_4

C. C_2H_2

D. H_2S

Answer: B

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17. Methane reacts with excess chlorine in direct sunlight to form:

A. $C + HCI$

B. $\mathrm{CCI}_4 + HCI$

C. $CHCI_3 + HCI$

D. $CH_3CI + HCI$

Answer: B

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18. Which of the following process is suitable for converting methanoic acid to a paraffin?

A. Electrolysis of sodium salt

B. Reduction with red $P + HI$

C. Decarboxylation

D. Reduction with $LiAIH_4$

Answer: B

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19. How much air should be required for complete combustion of 44 grams of propane at normal temperature and pressure?

A. 25L

B. 15L

C. 5 moles

D. 10 moles

Answer: C

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20. The catalyst used to convert alkanes containing 6 to 10 carbon atoms into benzene and its homologous at nearly 600°C are

A. Cr_2O_3 and AI_2O_3

B. Cr_2O_3 and $AICI_3$

C. H_2SO_4 and HF

D. BF_3

Answer: A

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21. Which sodium salt will be heated soda lime to obtain propane?

A. $CH_3 - CH_2 - \underset{\underset{O}{||}}{C} - \overset{\Theta}{O}\overset{\oplus}{Na}$

B. $CH_3 - CH_2 - CH_2 - \underset{\underset{O}{||}}{C} - \overset{\Theta}{O}\overset{\oplus}{Na}$

C. $(CH_3)_2 - CH - \underset{\underset{O}{||}}{C} - \overset{\Theta}{O}\overset{\oplus}{Na}$

D. Both (B) and (C)

Answer: D

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22. Which sodium salt will be heated soda lime to obtain propane?

A. Alkanes

B. Alkenes

C. Alkynes

D. Cyclic compounds

Answer: A

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23. Which sodium salt will be heated soda lime to obtain propane?

A. n-pentane

B. Isopentane

C. Neopentane

D. n-hexane

Answer: C

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24. Which sodium salt will be heated soda lime to obtain propane?

A. Hydrocarbons

B. CO_2

C. Both

D. None

Answer: C

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25. Which sodium salt will be heated soda lime to obtain propane?

A. Ethene

B. Propyne

C. Propene

D. Propane

Answer: D

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Mandatory Exercise Exercise Set Ii

1. How can alkanes be prepared from an alkene

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2. How can alkanes be prepared from an alkyl halide?

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3. How can ethane be prepared from ethanol

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4. How can ethane be prepared from ethyl iodide?

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5. Compare the melting point/boiling point of alkynes with other hydrocarbons and give

reasons for the behavior r.

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6. What is the effect of branching on the melting point of an alkane?

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7. $C_2H_4 + H_4 + H_2 \xrightarrow{Ni} CH_3 - CH_3$. The reaction is called as

A. Wurtz reaction

B. synthesis

C. Sabetier-Senderen's reaction

D. laboratory preparation

Answer: C

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8. Dehydrohalogenation of bromoethane results in the formation of

A. ethyne

B. ethene

C. propene

D. ethane

Answer: B

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9. Which one of the following conversions involves partial hydrogenation?

A. $C_2H_4 \rightarrow C_2H_6$

B. $C_2H_2 \rightarrow C_2H_4$

C. $X_2HH_2 \rightarrow C_2H_6$

D. $C_2H_6 \rightarrow C_2H_4$

Answer: B

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10. Methane is prepared by the ___ of sodium acetate with soda lime.

A. substitution

B. carboxylation

C. addition

D. decarboxylation

Answer: D

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11. Which formula represents au alkyne? (Assume all are non-cyclic).

A. C_2H_6

B. C_2H_4

C. C_5H_{10}

D. C_8H_8

Answer: D

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12. Conversion of CH_4 to CH_3CI is an example of ..... Reaction

A. Free radical substitution

B. Free radical addition

C. Electrophilic substitution

D. Nudeophilic substitution

Answer: A

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13. The complete combustion of CH_4 gives

A. $CO_2 + H_2O$

B. $CO_2 + H_2$

C. $CO_2 + COCI_2$

D. $CO + H_2O$

Answer: A

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14. Which hydrocarbon are not formed by the wurtz reaction of ethyl iodide and $n-$ propyl iodide

A. $n-$ Butane

B. $n-$ Heptane

C. $n-$ pentane

D. $n-$ Hexane

Answer: B

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15. $CH_2=CH_2$ reacts with HCI to form:

A. $CICH=CH-CI$

B. $\underset{\underset{CI}{|}}{CH_2} - CH_3$

C. $CH_2CI - CH_2CI$

D. CH_3CHCI_2

Answer: B

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16. Hydrocarbon containing following bond is most reactive towards electrophile?

A. $C \equiv C$

B. $C = C$

C. $C - C$

D. All

Answer: B

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17. When Propene reacts with hydrogen bromide in the presence of peroxide, the product formed is:

A. $n-$ Propyl alcohol

B. Propylene peroxide

C. $n-$ Propyl bromide

D. $1,3-$ dibromo propane

Answer: C

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18. Ethylene from ethyl bromide is obtained by treating it with

A. Hydrogen

B. Alcoholic caustic potash

C. Aqueous caustic potash

D. Aqueous caustic soda

Answer: B

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19. Ethylene can be prepared by electrolysis of an aqueous solution of:

A. Sodium acetate

B. Sodium succinate

C. Sodium propionate

D. None of these

Answer: B

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20. Ethyl alcohol is heated with cone. H_2SO_4.

The product formed is:

A. $H_3C - \underset{\underset{O}{||}}{C} - OC_2H_6$

B. C_2H_6

C. C_2H_4

D. C_2H_2

Answer: C

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21. Conjugated double bond is present in:

A. Propylene

B. Isobutylene

C. 1, 3-Butadiene

D. Butylene

Answer: C

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22. A compound "X" on ozonolysis forms two molecules of HCHO. "X" is:

A. C_2H_4

B. C_2H_2

C. C_2H_6

D. C_6H_6.

Answer: A

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23. The products of oxidative ozonolysis of an unsymmetrical alkene are:

A. alcohol and/or acids

B. aldehydes and/or acids

C. ketones and/or acids

D. aldehydes and/or ketones

Answer: C

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24. In the presence of peroxide, hydrogen chloride and hydrogen iodide don't give anti Markovnikov's addition to alkene because:

A. both are highly ionic

B. one is oxidising and other is reducing

C. one of the steps is endothermic in both the case

D. all the steps are exothermic in both the case

Answer: C

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25. The acetylene molecule contains:

A. 5 sigma bonds

B. 4 sigma and 1 pi bonds

C. 3 sigma and 2 pi bonds

D. 2-sigma and 3 pi bonds

Answer: C

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26. Polymerization of acetylene leads to the formation of:

A. Benzene

B. Butane

C. Naphthalene

D. Octane

Answer: A

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27. Acidic hydrogen is present in:

A. Ethyne

B. Ethene

C. Benzene

D. Ethane

Answer: A

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28. Acetylene reacts with 42% H_2SO_4 containing 1% $HgSO_4$ to give:

A. $C_2H_3HSO_4$

B. CH_3CHO

C. $HCHO$

D. $CH_2 = CH_2$

Answer: B

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29. Propyne and Propene can be distinguished by:

A. Conc. H_2SO_4

B. Br_2 in $\mathrm{CCI_4}$

C. Dilute $KMnO_4$

D. $AgNO_3$ in Ammonia

Answer: D

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30. $CH \equiv CH \xrightarrow{O_3 / \text{NaOH}} X \xrightarrow{Zn / CH_3COOH} Y$

compound Y is:

A. C_2H_5OH

B. CH_3COOH

C. $\begin{matrix} CHO \\ | \\ CHO \end{matrix}$

D. $\begin{matrix} CH_2OH \\ | \\ CH_2OH \end{matrix}$

Answer: D

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31. Propyne can react with two moles of HCl to form:

A. propylidene dichloride

B. iso propylidene dichloride

C. ethylidene dichloride

D. butylidene dichloride

Answer: B

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32. Which of the following reagents should be suitable for converting propyne to propanone?

A. Ozone

B. Dilute $H_2SO_4 + HgSO_4$

C. Acidified $KMnO_4$

D. Di alkylborane followed by alkaline H_2O_2

Answer: B

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33. The ascending order of solubility in water is:

A. Ethane lt Ethyne lt Ethene

B. Ethene lt Ethane lt Ethyne

C. Ethyne lt Ethene lt Ethane

D. Ethane lt Ethene lt Ethyne

Answer: D

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34. Acetylene can be prepared from

A. Potassium fumarate

B. Calcium carbide

C. Ethylene bromide

D. All

Answer: D

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35. A compound is treated with $NaNH_2$ to give sodium salt. Identify the compound

A. C_2H_2

B. C_6H_6

C. C_2H_6

D. C_2H_4

Answer: A

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Mandatory Exercise Exercise Set Iii

1. Which one of the following compounds on dehydration gives ethene?

A. Acetylene

B. Ethanol

C. Ethyl bromide

D. Calcium carbide

Answer: B

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2. Methane is converted to formaldehyde by

A. complete combustion

B. incomplete combustion

C. catalytic oxidation

D. partial oxidation

Answer: D

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3. Which one of the following compounds undergoes electrophilic as well as nucleophilic addition?

A. C_3H_8

B. C_4H_8

C. C_2H_6

D. C_4H_6

Answer: D

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4. During the complete combustion of methane, CH_4, what change in hybridisatiqn does the carbon atom undergo?

A. sp^3 to sp

B. sp^3 to sp^2

C. sp^2 to sp

D. sp^2 to sp^3

Answer: A

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5. Acetylene, C_2H_2, reacts with oxygen according to the unbalanced equation

$C_2H_2 + O_2(g) \rightarrow CO_2 + H_2O(g)$

What is the ratio of O_2 / C_2H_2 in the balanced equation?

A. $2/1$

B. $3/1$

C. $4/1$

D. $5/2$

Answer: D

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Consolidated Exercise

1. Answer the following questions.

A hydrocarbon· containing two double bonds on reductive ozonolysis gave glyoxal, ethanal and propanone. Elucidate the structure of the hydrocarbon along with its IUPAC name.

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2. Answer the following questions.

An alkene gives propanone and butanal on ozonolysis. What is its structural formula?

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3. Answer the following questions.

The reductive ozonolysis of an alkene gave butanone and ethanal. Compute the structure and IUPAC name of the alkene.

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4. Answer the following questions.

Match the following:

Column A	Column B
(i) $CH_2=CH-CH=CH_2$	(p) Addition Reaction
(ii) CH_2-Br / CH_2-Br + Zn $\xrightarrow[-ZnBr_2]{\Delta/CH_3OH}$ $CH_2=CH_2$	(q) Markownikoff's rule
(iii) $CH_2-CH-CH_2 + HCl \rightarrow CH_3-CH(Cl)-CH_3$	(r) Baeyer's reagent
(iv) Cold dilute alkaline $KMnO_4$	(s) Elimination reaction
	(t) Substitution reaction
	(u) Resonance
	(v) $sp^2 - sp^2 - sp^2 - sp^2$

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Consolidated Exercise Multiple Choice Questions With One Or More Than One Correct Answer

1. Which of the following have only one type of hybrid carbon?

A. $CH_2 = CH - CH = CH_2$

B. $CH_3 = CH_2 - CH_2 = CH_3$

C. $CH_3 - C = C - CH_3$

D. $HC = C - C = CH$

Answer: (A), (B), and (D)

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2. Ethane may be obtained by

A. elimination reaction

B. Wurtz reaction

C. decarboxylation

D. hydrogenation

Answer: (B), (C), and (D)

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Challenging Exercise

1. Predict the major products for the reaction of 2,3-dimethylbut-2-ene with the following reagents:

A. cold alkaline potassium permanganate

B. aqueous bromine

C. hydrogen in the presence of a nickel catalyst

D. hydrogen bromide

Answer:

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2. How do you convert acetylene to

but-I-yne

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3. How do you convert acetylene to

but-2-yne?

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4. Predict the major product of the following compounds with excess of hydrogen chloride:

$CH_3CH = CH$

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5. Predict the major product of the following compounds with excess of hydrogen chloride:

$(CH_3)_2C = CH - CH_3$

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6. Predict the major product of the following compounds with excess of hydrogen chloride:

$CH_3 - C = CH$

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7. How will you separate a mixture of ethane, ethylene, and acetylene?

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Olympiad And Ntse Level Exercises

1. Which of the following statements is not true for ethane?

A. It can be chlorinated with chlorine

B. It can be catalytically hydrogenated

C. When oxidized produces O_2 and H_2O

D. It is a homologue of iso-butane

Answer: B

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2. Ethene when treated with Br_2 in the presence of CCI_4 which compound is formed

A. 1, 2-dibromoethane

B. 1-bromo-2-chloroethane

C. Both (A) and (B)

D. 1, 1, 1-tribromoethane

Answer: A

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3. In which of the following, addition of HBr does not take place against Markownikoffs rule or Anti-Markownikoff addition of HBr is not observed for

A. Propene

B. But-1-ene

C. But-2-ene

D. Pent-2-ene

Answer: C

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4. When ethyl iodide and propyl iodide react with Na in the presence of ether, they form

A. One alkane

B. Two alkanes

C. Four alkanes

D. Three alkanes

Answer: D

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5. Acetylene can be obtained by the reaction

A. $HCOOK \xrightarrow{\text{electrolysis}}$

B. $CHI_3 + 6Ag + CHI \xrightarrow{\Delta}$

C. $CH_3CH_2OH \xrightarrow{\text{Conc. } H_2SO_4}$

D. $Be_2C + H_2O \rightarrow$

Answer: B

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6. Order of reactivity of C_2H_6, C_2H_4 and C_2H_2 is

A. $C_2H_6 > C_2H_4 > C_2H_2$

B. $C_2H_2 > C_2H_6 > C_2H_4$

C. $C_2H_2 > C_2H_6$

D. All are equally reactive

Answer: C

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7. A mixture of 1-chloropropane and 2-chloropropane when treated with alcoholic KOH gives

A. 1-propene

B. 2-propene

C. Isopropylene

D. All of the above

Answer: A

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8. What is the chief product obtained when n-butane is treated with bromine in the presence of light at 130°C

A. $CH_3 - CH_2 - \underset{CH_3}{\underset{|}{CH}} - Br$

B. $CH_3 - \underset{CH_3}{\underset{|}{CH}} - CH_2 - Br$

C. $CH_3 - \underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}} - Br$

D. $CH_3 - CH_2 - CH_2 - CH_2 - Br$

Answer: A

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9. Which of the following does not give white precipitate with ammoniacal $AgNO_3$

A. $CH \equiv CH$

B. $CH_3 - C \equiv CH$

C. $CH_3 - C \equiv C - CH_3$

D. $\underset{\underset{CI}{|}}{CH_2} - C \equiv CH$

Answer: C

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10. 2-chlorobutane is heated with alcoholic NaOH, the product formed in larger amount is

A. I-Butene

B. 1-Butyne

C. 2-Butene

D. All of these

Answer: C

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