DPP - Daily Practice Problems

Name : Date :

Start Time : End Time :

CHEMISTRY 27

SYLLABUS : Hydrocarbons-3-(Alkynes)

Max. Marks : 120 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE choice is correct.

Q.1 The product formed by the addition of HBr to propyne in the presence of H_2O_2 is –

(a) $CH_3CH_2CH(Br)$ (b) $CH_2(Br)-CH_2-CH_2(Br)$

(c) $CH_3-CH(CH_2Br)-Br$ (d) All of these

Q.2 On passing vinyl acetylene into conc. HCl in the presence of cuprous and ammonium chlorides, the following is produced-

(a) Neoprene (b) Isoprene

(c) Chloroprene (d) None of these

Q.3 Chloroform is heated with Ag powder in laboratory what will be the product ?

(a) Acetylene (b) Ag_2O

(c) CH_2Cl_2 (d) CH_4

Q.4 What happens when 2- butyne reacts with H_2 in presence of $LiAlH_4$?

(a) $CH_3-C(H)=C(H)-CH_3$

(b) $CH_3-C(H)=C(H)-CH_3$

(c) $CH_3-CH_2-CH_2-CH_3$

(d) $CH_2=CH-CH=CH_2$

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ

Space for Rough Work

Q.5 What happens when 2- butyne reacts with Na+ Liq. NH_3 ?

(a) CH_3-C-H / CH_3-C-H (with double bond) (b) CH_3-C-H / $H-C-CH_3$ (with double bond)

(c) $CH_3-CH_2-CH_2-CH_3$ (d) $CH_2=CH$ / $CH=CH_2$

Q.6 What happens when 2- butyne reacts with H_2 in presence of Nickle boride or Lindlar's catalyst (Pd/$CaCO_3$–PbO) ?

(a) CH_3-C-H / CH_3-C-H (with double bond) (b) CH_3-C-H / $H-C-CH_3$ (with double bond)

(c) $CH_3-CH_2-CH_2-CH_3$ (d) $CH_2=CH$ / $CH=CH_2$

Q.7 What will be the product of chlorine water and acetylene ?

(a) Dichloropropanol (b) Dichloroethanal

(c) Propanol (d) 2-Chloroethanol

Q.8 $CH_3-C\equiv CH$ + dil. $H_2SO_4 + Hg^{+2} \rightarrow X$, what is the 'X' ?

(a) Acetal

(b) Acetone

(c) Butanone

(d) Propylidine hydrogen sulphate

Q.9 Product formed by the oxidation of acetylene in the presence of alkaline $KMnO_4$ is

(a) Glyoxal (b) Oxyrane

(c) $CO_2 + H_2O$ (d) Oxalic acid

Q.10 When acetylene and sulphur react in the presence of hot iron pyrite, product formed is

(a) Pyrrole (b) Benzene

(c) Toluene (d) Thiophene

Q.11 The product of reaction between one mole of acetylene and two moles of HCHO in the presence of Cu is -

(a) $HOCH_2-C\equiv C-CH_2OH$

(b) $H_2C=CH-C\equiv C-CH_2OH$

(c) $HC\equiv C-CH_2OH$

(d) None of these

Q.12 $CH \equiv CH$ reacts with acetic acid in presence of Hg^{2+} to give :

(a) CH_3 / $CH(CH_3COO)_2$ (b) $CH(CH_3COO)_2$ / $CH(CH_3COO)_2$

(c) CH_3 / $CH_2(CH_3COO)$ (d) none of the above

Q.13 What is the chief product of reaction between β-butylene chloride and alc. KOH/$NaNH_2$?

(a) 1,2-butadiene (b) 1,3-butadiene

(c) 2-butyne (d) 1-butyne

Q.14 Acetylene magnesium chloride reacts with ethyl bromide, what will be the product ?

(a) 1-butyne (b) 2-butyne

(c) 1,2-butadiene (d) 1,3-butadiene

Q.15 When sodium fumarate is electrolysed, which alkyne is formed at anode?

(a) Propyne (b) Butyne (c) Ethyne (d) None

Q.16 Order of acidity of H_2O, NH_3 and acetylene is–

(a) $NH_3 > CH\equiv CH > H_2O$

(b) $H_2O > NH_3 > HC\equiv CH$

(c) $H_2O > HC\equiv CH > NH_3$

(d) $NH_3 > H_2O > HC\equiv CH$

Q.17 Westrosol has the following formula

(a) $CHCl_2$ / $CHCl_2$ (b) $CHCl_2$ / CH_2Cl

(c) $CHCl$ / $CHCl$ (with double bond) (d) $CHCl$ / CCl_2 (with double bond)

Q.18 $CH\equiv CCOOH \xrightarrow{H_2O}$ Product is

(a) $CH_2=C-COOH$ / OH (b) $CH_3-C-COOH$ / O (with double bond)

(c) $OHC-CH_2-COOH$ (d) $OH-CH=CH-COOH$

RESPONSE GRID					
	5. ⓐⓑⓒⓓ	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ
	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ
	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	

Space for Rough Work

Q.19 When acetylene is passed into methanol at 160-200°C in the presence of a small amount of potassium methoxide under pressure, the following is formed–

(a) Polyvinyl alcohol (b) Divinyl ether

(c) Dimethyl ether (d) Methyl vinyl ether

Q.20 Acetylene and ethylene react with alk $KMnO_4$ to give respectively

(a) Oxalic acid and formic acid

(b) Acetic acid and ethylene glycol

(c) Ethyl alcohol and ethylene glycol

(d) None

Q.21 Which is the most suitable reagent among the following to distinguish compound (3) from the rest of the compounds?

(1) $CH_3C \equiv CCH_3$ (2) $CH_3CH_2-CH_2CH_3$

(3) $CH_3CH_2C \equiv CH$ (4) $CH_3CH = CH_2$

(a) Br_2 in CCl_4 (b) Br_2 in CH_3COOH

(c) Alkaline $KMnO_4$ (d) Tollen's reagent

DIRECTIONS (Q.22-Q.24) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :

(a) 1, 2 and 3 are correct **(b)** 1 and 2 are correct

(c) 2 and 4 are correct **(d)** 1 and 3 are correct

Q.22 The triply bonded carbon atoms –

(1) Are *sp* hybridised

(2) Are sp^3 hybridised

(3) Have two pi bonds and one sigma bonds

(4) Have three sigma bonds and one pi bond

Q.23 Acetylene can be prepared from –

(1) Potassium fumarate (2) Calcium carbide

(3) Ethylene bromide (4) Aluminium carbide

Q.24 In the given reaction

$$CH \equiv CH + H_2O \xrightarrow[60°C]{H_2SO_4/HgSO_4} A \xrightarrow{[O]} B$$

Which are correct ?

(1) A = Acetaldehyde (2) B = acetic acid

(3) A = Acetone (4) B = ethyl alcohol

DIRECTIONS (Q.25-Q.27) : Read the passage given below and answer the questions that follows :

Acetylene and other terminal alkynes (1-alkynes) are weakly acidic in character. The acetylenic hydrogen of such alkynes can be replaced by copper (I) and silver (I) ions. They react with ammonical solutions of cuprous chloride and silver nitrate to form the corresponding copper and silver alkynides.

$$CH \equiv CH + 2([Cu(NH_3)_2]Cl \rightarrow \underset{\text{Dicopper acetylide (Red ppt)}}{Cu-C \equiv C-Cu} + 2NH_4Cl + 2NH_3$$

$$CH \equiv CH + 2[Ag(NH_3)_2]NO_3 \rightarrow \underset{\text{Disilver acetylide (white ppt)}}{Ag-C \equiv C-Ag} + 2NH_4NO_3$$

This reaction can be used to distinguish between 2-alkynes and 1-alkynes. 1-Alkynes will give this test while 2-alkynes, will not give this test.

Q.25 Which of the following acid is dibasic ?

(a) $CH_3-CH = CH-CH_3$ (b) $(CH_3)_2C = CH_2$

(c) $CH_3-C \equiv CH$ (d) $CH \equiv CH$

Q.26 Acetylenic hydrocarbons are acidic because–

(a) Sigma electron density of C — H bond in acetylene is nearer a carbon which has 50% s-character

(b) Acetylene has only one hydrogen atom at each carbon atom

(c) Acetylene contains least number of hydrogen atoms among the possible acetylenic hydrocarbons

(d) Acetylene belongs to the class of alkynes with formula $C_n H_{2n-2}$

RESPONSE GRID					
	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ
	24. ⓐⓑⓒⓓ	25. ⓐⓑⓒⓓ	26. ⓐⓑⓒⓓ		

Space for Rough Work

Q.27 Acetylene gives –

(a) White ppt with $AgNO_3$ and red ppt with Cu_2Cl_2

(b) White ppt with Cu_2Cl_2 and red ppt with $AgNO_3$

(c) White ppt with both

(d) Red ppt with both

DIRECTIONS (Q. 28-Q.30) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

(c) Statement-1 is False, Statement-2 is True.

(d) Statement-1 is True, Statement-2 is False.

28. **Statement 1 :** Acetylene reacts with sodamide to evolve H_2 gas.

Statement-2 : Acetylene is a weaker acid than ammonia.

29. **Statement-1 :** The reaction rates of alkynes with electrophiles are slower than those of alkenes.

Statement-2 : The steric and electronic factors play their part in diminishing the reactivity of alkynes towards electrophiles.

30. **Statement-1 :** 1-Alkynes are considered as weak acids.

Statement-1 : Hydrogen atom attached to the triply bonded carbon atom can be easily removed by strong base.

RESPONSE GRID	27.ⓐⓑⓒⓓ	28.ⓐⓑⓒⓓ	29.ⓐⓑⓒⓓ	30.ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 27 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	32	Qualifying Score	56
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS

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(1) **(c)** The product formed by the addition of HBr to propyne in the presence of H_2O_2 is $CH_3CH(Br)CH_2Br$, contrary to Markownikoff's rule.

$$CH_3-C\equiv CH \xrightarrow[\text{Peroxide}]{HBr} CH_3-CH=CHBr$$

$$\xrightarrow[\text{Peroxide}]{HBr} CH_3-\underset{\displaystyle CH_2Br}{\overset{\displaystyle |}{\underset{\displaystyle |}{CHBr}}}$$

(2) **(c)** On passing vinyl acetylene into conc. HCl in the presence of cuprous and ammounium chlorides, chloroprene is formed and the reaction proceeds by 1, 4-addition followed by rearrangement under the influence of the catalyst.

$$CH_2=CH-C\equiv CH+HCl\rightarrow[CH_2Cl-CH=C=CH_2]$$

$$\rightarrow CH_2=\underset{\displaystyle Cl}{\overset{\displaystyle |}{\underset{\displaystyle |}{C}}}-CH=CH_2$$

Chloroprene (2-chlorobuta-1, 3-diene)

(3) **(a)** $HCCl_3+6Ag+Cl_3HC \xrightarrow[-6AgCl]{} HC\equiv CH$

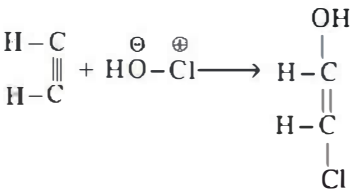
acetylene

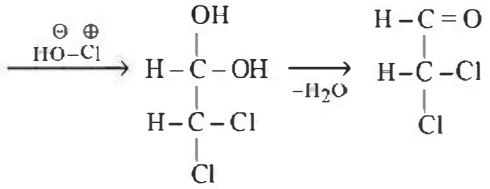
(4) **(b)** 2-Butyne mainly forms trans-2-butene on hydrogenation with $LiAlH_4$.

(5) **(b)** Reaction is called as 'Birch reduction'.

(6) **(a)** 2-Butyne forms cis-2-butene with Lindlar's catalyst.

(7) **(b)** Chlorine water $(HO^{\ominus}-Cl^{\oplus})$ reacts with acetylene and gives dichloroethanal





(8) **(b)** In dil H_2SO_4 alkyne is hydrolysed to form ketone, here acetone will be the main product.

(9) **(d)** This is the exceptional case of oxidation in which triple bonded carbon is not separated. The product is oxalic acid.

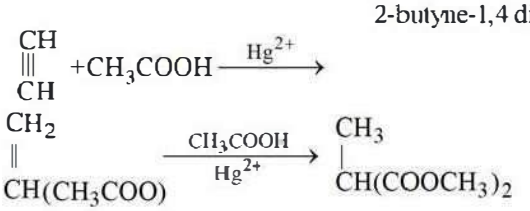
(10) **(d)** In the presence of hot iron pyrite, thiophene is formed as a product, when NH_3 is taken in place of sulphur, pyrrole is formed.

(11) **(a)** $CH_2=O+H-C\equiv C-H+CH_2=O \xrightarrow{Cu}$

$HOCH_2-C\equiv C-CH_2OH$

2-butyne-1,4 diol.

(12) **(a)**



(13) **(c)** 2-Butyne is the chief product according to Saytzeff's rule.

$CH_3CH(Cl)CH(Cl)CH_3 \longrightarrow CH_3C\equiv CCH_3$

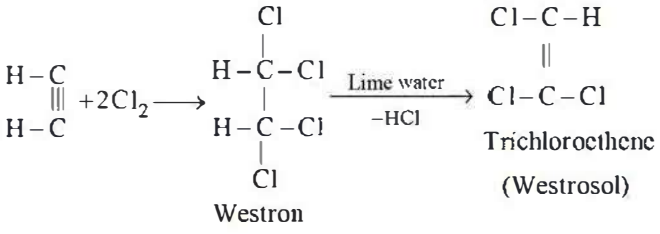
(14) **(a)** $HC\equiv C-MgCl+C_2H_5Br \longrightarrow$

$HC\equiv C-C_2H_5+Mg(Cl)Br$

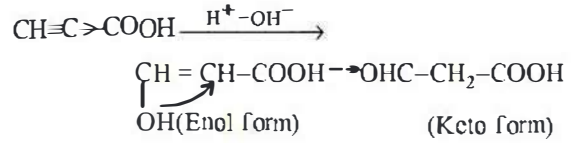
(15) **(c)** In Kolbe's synthesis, sodium or potassium salt of malcic acid or fumaric acid on electrolysis gives acetylene or ethyne at anode.

(16) **(c)** The order of acidity of H_2O, NH_3 and acetylene depends upon the relative basicity of OH^-, NH_2^- and $HC\equiv C^=$. The decreasing nature of basic character is $NH_2^->HC\equiv C^->OH^-$, hence the decreasing order of acidity is $H_2O>HC\equiv CH>NH_3$.

(17) **(d)** Acetylene adds up two molecules of chlorine to give tertachloroethane, known as westron industrially. This on dehydrochlorination with lime water gives trichloroethene, commerically called westrosol



(18) **(c)**



(19) **(d)** When acetylene is passed into methanol at 160-200°C in the presence of a small amount (1-2%) of potassium methoxide and under pressure just high enough to prevent boiling, methyl vinyl ether is formed.

The mechanism is believed to involve nucleophilic attack in the first step.

$HC\equiv CH+CH_3O^-\rightarrow C^-H=CHOCH_3$

$\xrightarrow{CH_3OH} CH_2=CHOCH_3+CH_3O^-$

Methyl vinyl ether

(20) **(a)** Acetylene and ethylene react with alk. $KMnO_4$ to give oxalic acid and formic acid respectively.

$$\underset{\text{acetylene}}{\overset{CH}{\overset{\|}{CH}}} + 4[O] \xrightarrow{\text{alk. } KMnO_4} \underset{\text{oxalic acid}}{\overset{COOH}{\overset{|}{COOH}}}$$

$$\underset{\text{ethylene}}{\overset{CH_2}{\overset{\|}{CH_2}}} + 4[O] \xrightarrow{\text{alk. } KMnO_4} \underset{\text{formic acid}}{2HCOOH}$$

(21) **(d)** Terminal alkynes ($\equiv C-H$) give white precipitate with Tollen's reagent (ammoniacal $AgNO_3$)

(22) **(d)** Each triply bonded carbon is *sp* hybridised & has 2π & 1σ bonds.

(23) **(a)** Potassium fumarate on electrolysis, CaC_2 on hydrolysis and ethylene bromide on elimination give acetylene. Aluminium carbide on hydrolysis produces methane.

(24) **(b)** $$CH\equiv CH \xrightarrow[60^\circ C]{H_2SO_4, HgSO_4} \underset{A}{CH_3CHO} \xrightarrow{[O]} \underset{B}{CH_3COOH}$$

(25) **(d)** Acetylene contains two acidic hydrogen atoms.

(26) **(a)**

(27) **(a)** $AgC \equiv CAg$ is white and $CuC \equiv CCu$ is red.

(28) **(d)**

(29) **(a)** The low reactivity of alkynes towards electrophilic addition reactions is believed to be due to following two factors.

(1) The bridged intermediate cation formed by the initial attack of electrophile on the triple bond is less stable because it is a highly strained system.

(2) In acetylenic carbon atoms, the π electrons are more tightly held by the carbon nuclei and hence they are less easily available for reaction with electrophiles.

Thus both the above factors, steric and eletronic, play their part in diminishing the reactivity of alkynes towards electrophiles.

(30) **(a)**