DAY EIGHTEEN

Unit Test 4

(Organic and Environmental Chemistry I)

1 The IUPAC name of
$CH_2=CH-CH(CH_3CH_2)C(Br)=CH_2$ is

(a) 4-bromo-3-ethyl-1, 4-pentadiene
(b) 2-bromo-3-ethyl-1, 4-pentadiene
(c) 2-bromo-3-ethyl-1, 5-pentadiene
(d) None of the above

2 In the mechanism of Hofmann reaction, which intermediate rearranges to alkyl isocyanate?

(a) Bromamide (b) Nitrene
(c) Nitroso (d) Amide

3 What is the correct order of decreasing stability of the following cations?

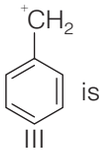
$CH_3-\overset{+}{C}H-CH_3$ (I), $CH_3-\overset{+}{C}H-OCH_3$ (II)

$CH_3-\overset{+}{C}H-CH_2-OCH_3$ (III)

(a) II > I > III (b) II > III > I (c) III > I > II (d) I > II > III

4 The order of stability of the following carbocations

$CH_2=CH-\overset{+}{C}H_2$ (I); $CH_3-CH_2-\overset{+}{C}H_2$ (II)



is (III)

(a) III > II > I (b) II > III > I
(c) I > II > III (d) III > I > II

5 Which of the following behave both as a nucleophile and as an electrophile?

(a) $H_3C-C\equiv N$ (b) H_3C-OH
(c) $H_2C=CH-CH_3$ (d) H_3C-NH_2

6 Electrophilic addition reactions proceed in two steps. The first step involves the addition of an electrophile. Name the type of intermediate formed in the first step of the following addition reaction.

$H_3C-CH=CH_2 + H^+$ → NCERT Exemplar

(a) 2° carbanion (b) 1° carbocation
(c) 2° carbocation (d) 1° carbanion

7 $C_3H_8 + Cl_2 \xrightarrow{\text{Light}} C_3H_7Cl + HCl$; is an example of

(a) substitution reaction (b) elimination reaction
(c) addition reaction (d) None of these

8 In which of the following, resonance will be possible?

(a) $CH_2=CH-CH_2-CHO$
(b) $CH_2=CH-CHO$
(c) CH_3COCH_3
(d) $CH_2=CH-CH_2-CH=CH_2$

9 *cis* and *trans*-isomers of but-2-ene are

(a) conformational isomers (b) optical isomers
(c) geometrical isomers (d) position isomers

10 Which one of the following conformations of cyclohexane is chiral?

(a) Twist boat (b) Rigid (c) Chair (d) Boat

11 Which of the following methods is/are used for the purification of solid impurities?

(a) Distillation (b) Sublimation
(c) Crystallisation (d) Both (b) and (c)

12 The fragnance of flowers is due to the presence of some steam volatile organic compounds called essential oils. These are generally insoluble in water at room temperature, but are miscible with water vapour in vapour phase. A suitable method for the extraction of these oils from the flowers is → NCERT Exemplar

(a) distillation
(b) crystallisation
(c) distillation under reduced pressure
(d) steam distillation

13 Distillation is used to separate liquids which differ in their boiling points by
(a) 5°C (b) 10°C (c) 30°- 80° C (d) 100°C

14 In a hydrocarbon, mass ratio of the hydrogen and carbon is 1 : 3, the empirical formula of hydrocarbon is
(a) CH_4 (b) CH (c) CH_3 (d) CH_2

15 A dibasic acid containing C, H and O was found to contain C = 26.7% and H = 2.2%. The vapour density of diethyl ester was found to be 73. What is the molecular formula of an acid?
(a) $C_4H_4O_4$ (b) $C_3H_4O_4$ (c) $C_2H_2O_4$ (d) CH_2O_2

16 A fuel has the same knocking property as a mixture of 70% *iso*-octane (2,2,4-trimethyl pentane) and 30% *n*-heptane by volume. The octane number of the fuel is
(a) 100 (b) 50 (c) 30 (d) 70

17 The major organic compound formed by the reaction of 1,1,1-trichloroethane with silver powder is
(a) acetylene (b) ethene (c) 2-butyne (d) 2-butene

18 Alkyl halide react with dialkyl copper reagents to give
(a) alkenyl halides (b) alkanes
(c) alkyl copper halides (d) alkenes

19 When a mixture of methane and oxygen is passed through heated molybdenum oxide, the main product formed is
(a) methanoic acid (b) ethanal
(c) methanal (d) methanol

20 The chemical added to leaded petrol to prevent the deposition of lead in the combustion chamber is
(a) *iso*-octane (b) *n*-heptane
(c) ethylene dibromide (d) All of these

21 Hydrolysis of ozonide of but-1-ene gives
(a) ethylene only
(b) acetaldehyde and formaldehyde
(c) propionaldehyde and formaldehyde
(d) acetaldehyde only

22 When 2-pentyne is treated with dil. H_2SO_4 and $HgSO_4$, the product formed is
(a) 1-pentanol (b) 2-pentanol
(c) 2-pentanone (d) 3-pentanone

23 In its reaction with silver nitrate, acetylene shows
(a) oxidising property (b) reducing property
(c) acidic property (d) basic property

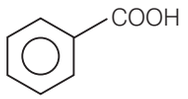
24 Lewisite is
(a) $CH_2{=}CAsCl_3$ (b) $AsCl_3$
(c) $CH_2{=}CHAsCl_2$ (d) $ClCH{=}CHAsCl_2$

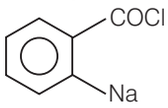
25 *n*-butylbenzene on oxidation will give
(a) benzoic acid (b) benzaldehyde
(c) 4-phenyl butanoic acid (d) benzyl alcohol

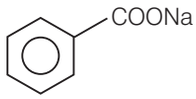
26 Heating a mixture of sodium benzoate and soda lime gives
(a) benzene (b) methane
(c) sodium benzoate (d) calcium benzoate

27 Which of the following species participate in sulphonation of benzene ring?
(a) H_2SO_4 (b) HSO_3^-
(c) SO_3 (d) SO_2^-

28 The most reactive among the following towards sulphonation is
(a) toluene (b) nitrobenzene
(c) chlorobenzene (d) *m*-xylene

29 Toluene reacts with excess of Cl_2 in the presence of sunlight to give a product which on hydrolysis followed by the reaction with NaOH give
(a) 

(b) 

(c) 

(d) None of these

30 Which of the following possesses highest melting point?
(a) *p*-dichlorobenzene (b) *m*-dichlorobenzene
(c) *o*-dichlorobenzene (d) Chlorobenzene

31 Ozone layer is depleted due to
(a) chlorofluorocarbons (b) oxides of nitrogen
(c) oxides of carbon (d) Both (a) and (b)

32 Main sources of water and soil pollution is
(a) agro industry
(b) thermal power plant
(c) mining
(d) All of the above

33 Biochemical oxygen demand is a measure of organic material present in water. BOD value less than 5 ppm indicates a water sample to be
(a) rich in dissolved oxygen
(b) poor in dissolved oxygen
(c) higher polluted
(d) not suitable for aquatic life

34 Which of the following practices will not come under green chemistry?
(a) If possible, making use of soap made of vegetable oils instead of using synthetic detergents
(b) Using H_2O_2 for bleaching purpose instead of using chlorine based bleaching agents
(c) Using bicycle for travelling small distance instead of using petrol/diesel based vehicles
(d) Using plastic cans for neatly storing substances

35 Which one of the following is not an application of green chemistry?

(a) Replacement of CFCs by CO_2 as blowing agent in the manufacture of polystyrene foam sheets

(b) Reacting methylamine and phosgene to produce methyl isocyanate

(c) Replacement of organotins by 'sea-nine' as anti-fouling compound in sea marines

(d) Catalytic dehydrogenation of the diethanol amine without using cyanide and formaldehyde

Direction (Q.Nos. 36-37) *In the following questions, more than one of the answers given may be correct. Select the correct answers and mark it according to the codes.*

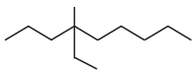
Codes

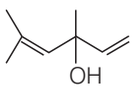
(a) 1, 2 and 3 are correct (b) 1, and 2 are correct

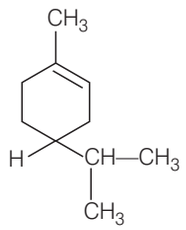
(c) 2 and 4 are correct (d) 1 and 3 are correct

36 Consider the following compounds

1. $CH_3—CH(O)—CH_2$

2. 

3. 

4. 

Select the compounds with chiral carbon atoms.

37 Major components of Los Angeles smog are

(1) SO_x (2) NO_x (3) soot (4) PBN

38 Match hydrocarbon (in Column I) with compounds (in Column II) from which they can obtained and choose the correct code.

Column I		Column II	
A.	CH_4	1.	C_2H_5OH
B.	C_2H_6	2.	CH_3I
C.	C_2H_2	3.	CH_4
D.	C_2H_4	4.	Be_2C

Codes

	A	B	C	D
(a)	3	1	2	4
(c)	4	2	3	1

	A	B	C	D
(b)	2	4	3	1
(d)	1	3	4	2

Direction (Q. Nos. 39-40) *Each of these questions contains two statements : Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.*

(a) Assertion is true, Reason is true; Reason is a correct explanation for Assertion

(b) Assertion is true, Reason is true; Reason is not a correct explanation for Assertion

(c) Assertion is true, Reason is false

(d) Assertion is false, Reason is false

39 **Assertion** Among isomeric pentanes, 2, 2-dimethyl propane has the highest boiling point.

Reason Branching does not affect the boiling point.

→ NCERT Exemplar

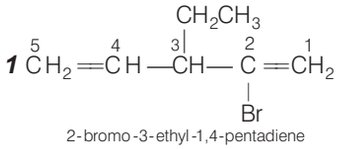
40 **Assertion** Iodination of alkanes is reversible.

Reason Iodination is carried out in the presence of iodic acid.

ANSWERS

1 (b)	**2** (b)	**3** (a)	**4** (d)	**5** (a)	**6** (c)	**7** (a)	**8** (b)	**9** (c)	**10** (a)
11 (d)	**12** (d)	**13** (c)	**14** (a)	**15** (c)	**16** (d)	**17** (c)	**18** (b)	**19** (c)	**20** (c)
21 (c)	**22** (c)	**23** (c)	**24** (d)	**25** (a)	**26** (a)	**27** (c)	**28** (d)	**29** (c)	**30** (a)
31 (d)	**32** (d)	**33** (a)	**34** (d)	**35** (b)	**36** (a)	**37** (c)	**38** (c)	**39** (d)	**40** (b)

Hints and Explanations

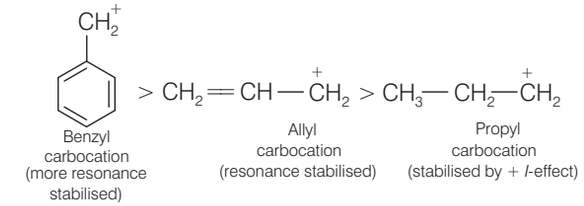
1 

2-bromo-3-ethyl-1,4-pentadiene

2 

3 $CH_3-\overset{+}{C}H-OCH_3$ (II) > $CH_3-\overset{+}{C}H-CH_3$ (I) > $CH_3-\overset{+}{C}H-CH_2-OCH_3$ (III)

4 The order of stability of carbocation will be



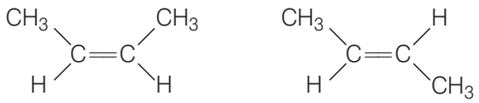
5 $H_3C-C\equiv\overset{\cdot\cdot}{N}$ can act both as an electrophile and a nucleophile. Compounds with a multiple bond between carbon and a more electronegative atom can act both as an electrophile and nucleophile.

6 $CH_3-CH=CH_2+H^+ \rightarrow CH_3-\overset{+}{C}H-CH_3$ (2° carbocation (more stable)); $\rightarrow CH_3-CH_2-\overset{+}{C}H_2$ (1° carbocation (less stable))

7 It is an example of free radical substitution.

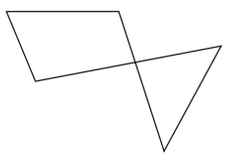
8 $CH_2=CH-CH=\ddot{O}: \longleftrightarrow \overset{+}{C}H_2-CH=CH-\ddot{O}:^-$

9 *cis* and *trans*-2-butene are geometrical isomers.


cis-but-2-ene

trans-but-2-ene

10 If a compound is symmetrical then it is not chiral. Hence, chair conformation and boat conformations both are achiral whereas twist boat (conformations) is chiral.



11 Distillation is the method to separate:

(i) Volatile liquids from non–volatile impurities.

(ii) The liquids having sufficient difference in their boiling points. Hence, it is not a method used for the purification of solid impurities.

Sublimation is the purification technique used to separate sublimable compounds from non–sublimable impurities i.e., separation for those solids which have the ability to convert directly into vapours on heating and the vapours upon cooling give back solid directly.

Crystallisation is used for purifying organic solids. This method is based on the differences in the solubility of the organic compound and its impurities in a suitable solvent.

12 Substances which are insoluble in water possess high vapour pressure at 373 K, therefore, such substances can be separated by steam distillation.

13 Distillation is used to separate liquids which differ in their boiling points by 30°C to 80°C.

14 The ratio between mass of H and C = 1 : 3

$$\text{Moles of H : moles of C} = \frac{1}{1} : \frac{3}{12} = 1 : \frac{1}{4} = 4 : 1$$

Hence, empirical formula is CH_4

15

Element	%	At. mass	$\frac{\%}{\text{At. mass}}$	Simplest ratio
C	26.7	12	2.2	1
H	2.2	1	2.2	1
O	71.1	16	4.44	2

Empirical formula = CHO_2

Empirical formula mass = 12 + 1 + 32 = 45

Vapour density of ester = 73

Molecular mass of ester = 2 × 73 = 146

Molecular mass of acid = molecular mass of ester − 2 × molecular mass of C_2H_5 + 2 × atomic mass of H

$$= 146 - 2\times 29 + 2 = 146 - 58 + 2 = 90$$

$$n = \frac{\text{molecular mass}}{\text{empirical formula mass}} \text{ or } n = \frac{90}{45} = 2$$

Molecular formula = $2\times CHO_2 = C_2H_2O_4$

16 Octane number of fuel is 70.

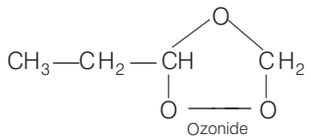
17 $2Cl-\underset{Cl}{\overset{Cl}{\underset{|}{\overset{|}{C}}}}-CH_3 \xrightarrow{Ag} CH_3-C\equiv C-CH_3 + AgCl$
1,1,1-trichloroethane; 2-butyne

18 $R_2CuLi + R'X \longrightarrow R-R' + R-Cu + LiX$
Dialkyl (copper lithium); (alkane)

19 $CH_4 + O_2 \xrightarrow{MoO,\ 550\ K} HCHO + H_2O$
Methanal

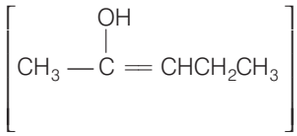
20 Ethylene dibromide converts lead into volatile lead bromide ($PbBr_2$).

21 $CH_3-CH_2-CH=CH_2 \xrightarrow{O_3}$ (But-1-ene)



Ozonide

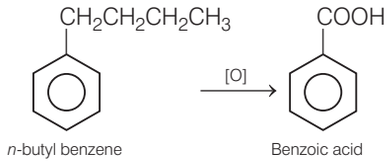
$\xrightarrow{Zn/HOH} CH_3CH_2CHO + HCHO$ (Propionaldehyde, Formaldehyde)

22 $CH_3C\equiv CCH_2CH_3 \xrightarrow[H_2O]{Hg^{2+}/H^+}$ 

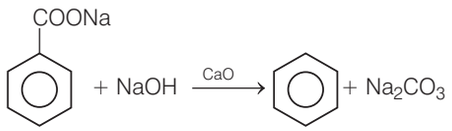
$\xrightarrow{\text{Tautomerises}} CH_3-CO-CH_2CH_2CH_3$ (2-pentanone)

23 $\underset{\text{Acetylene}}{CH\equiv CH} + 2AgNO_3 \longrightarrow \underset{\text{Silver acetylide}}{AgC\equiv CAg} + 2HNO_3$

24 Lewisite is $ClCH=CHAsCl_2$ (Prepared by addition of arsenic tri chloride to acetylene)

25 

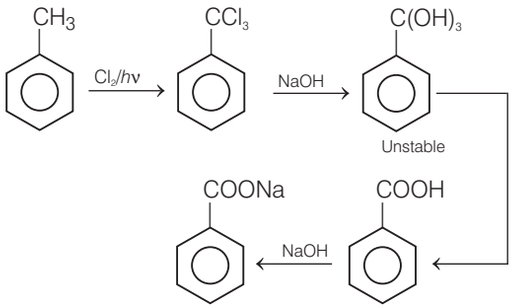
n-butyl benzene — Benzoic acid

26 

Benzene

27 SO_3 is an attacking species.

28 Among toluene, nitrobenzene, chlorobenzene and *m*-xylene. *m*- xylene is more reactive, because the reactive positions are activated by both methyls, rather than only one as in the toluene.

29 

Unstable

30 The melting point of the *p*-dichlorobenzene is always higher than that of the *o*- or the *m*-isomer. This is due to the reason that the *p*-isomer is symmetrical and hence, its molecules pack closely in the crystal lattice.

31 Oxides of nitrogen and chlorofluorocarbons are responsible for the depletion of ozone layer. The chlorofluoro carbons are stable is lower part of the atmosphere, float to the stratosphere and decompose releasing atomic chlorine radicals, which attack O_3.

$$CF_2Cl_2 \xrightarrow{UV} \dot{Cl} + CF_2\dot{Cl}\ (g)$$

The $\dot{Cl}$ radicals are continously generated and cause the breakdown of ozone.

Chemical reaction of O_3 with NO, diffusing through troposphere or produced by the action of ionising radiation on N_2.

32 Agro industries, thermal power plant and mining causes water and soil pollution.

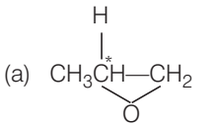
33 BOD less than 5 ppm shows that water contains larger amount of dissolved oxygen. i.e., BOD < 5PPM

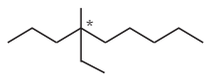
BOD > 17PPM for lightly polluted.

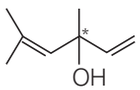
34 Using plastic cans for neatly storing substances will not come under green chemistry.

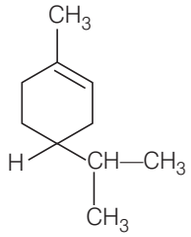
35 Reacting methylamine and phosgene to produce methyl isocyanates.

36 A carbon atom (C*) is chiral if it is joined with four different atoms/groups/species.

(a) 

(b) 

(c) 

(d) 

37 Los Angeles smog or photochemical smog has inorganic gases [NO_x, H_2O_2, CO] and organic hydroperoxides (PBN, PAN etc.) as major components whereas, London smog or classical smog has SO_x, particulates such as soot, humidity (from fog), $(NH_4)_2SO_4$ as major components.

38 (A) $Be_2C + 4H_2O \longrightarrow 2Be(OH)_2 + CH_4$

(B) $2CH_3I + 2Na \xrightarrow[\text{Wurtz reaction}]{\Delta} CH_3-CH_3 + 2NaI$

or $2CH_3I + Zn \xrightarrow[\text{Frankland reaction}]{} CH_3-CH_3 + ZnI_2$

(C) $2CH_4 \xrightarrow[\text{Electric arc}]{1200^\circ C} C_2H_2 + 3H_2$

or $6CH_4 + O_2 \xrightarrow{1500^\circ C} 2CH\equiv CH + 2CO + 1OH_2$

(D) $CH_3CH_2OH \xrightarrow[160^\circ C]{\text{Conc. } H_2SO_4} CH_2=CH_2 + H_2O$

39 Boiling points of isomeric compounds decreases with branching.

40 Iodination is reversible since, formed HI is a reducing agent and reduces the alkyl iodide back to alkane.