Chemistry · Organic Chemistry

Introduction to Organic Chemistry

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Multiple choice questions — 37 questions

1 All of the following are true about the first organic compound prepared in the laboratory, except that it .....

(A) contains the element nitrogen.
(B) can be prepared from an inorganic compound.
(C) is formed naturally in the bodies of animals.
(D) does not dissolve in water.

---

2 The vital force theory failed because of the compound .....

(A) NH_4CNO (B) $(NH_2)_2CO$ (C) NH_4SCN (D) $(NH_4)_2CO$

---

3 Organic chemistry is concerned with the study of the compounds of .....

(A) hydrogen. (B) sulphur. (C) oxygen. (D) carbon.

---

4 After urea was prepared, organic compounds were classified according to .....

(A) their source.
(B) their structure.
(C) their physical state.
(D) the number of carbon atoms in them.

---

5 Paraffin wax and acetone can be distinguished by .....

(A) electrical conductivity.
(B) the products of combustion.
(C) dissolving in benzene.
(D) the physical state.

---

6 All of the following are properties of organic compounds, except that .....

(A) most of them are weakly ionized.
(B) their reactions are slow.
(C) all of them can be polymerized.
(D) all of them contain covalent bonds.

---

7 The complete combustion of dimethyl ether gives .....

(A) C_2H_5OH (B) $H_2O + CO_2$ (C) C_2H_4 (D) C_2H_2

---

8 Ethyl alcohol is similar to sodium chloride salt in .....

(A) the physical state.
(B) the reaction with sodium metal.
(C) the type of bonds in the molecule.
(D) dissolving in water.

9 Most organic compounds are characterized by .....

(A) a low melting point.

(B) a high boiling point.

(C) solubility in water.

(D) their aqueous solutions conducting electricity.

10 The following table shows some points of comparison between the two compounds (A) and (B), which have close molar masses:

(A): covalent, gas, insoluble in water, flammable.

(B): ionic, solid, soluble in water, non-flammable.

What is the name of each of the compounds (A) and (B)?

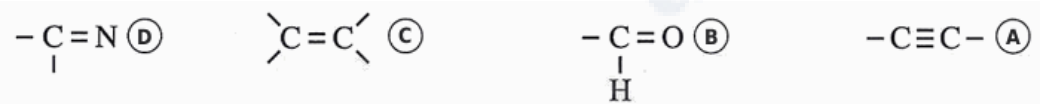
(A) (A): naphthalene, (B): sodium chloride.

(B) (A): butane, (B): sodium chloride.

(C) (A): carbon dioxide, (B): paraffin wax.

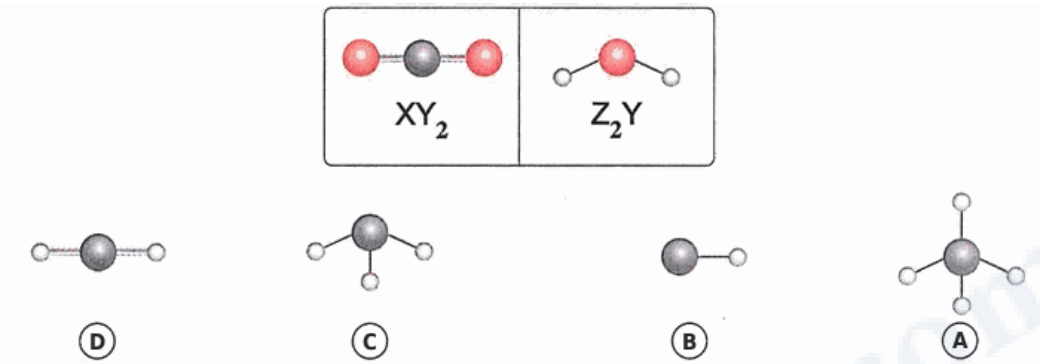
(D) (A): ethyl alcohol, (B): paraffin wax.

11 All of the following are correct, except .....

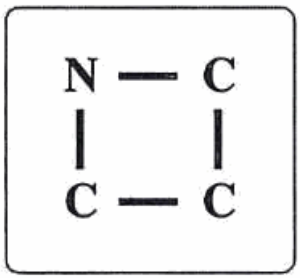


12 The two opposite models represent the molecule XY_2 and the molecule Z_2Y

Which model represents the molecule formed by the combination of the two elements (X) and (Z)?



13 The hydrogen atoms are not shown in the molecule of the opposite organic compound. What is the number of hydrogen atoms in this molecule, and what is the type of this compound?



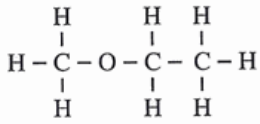
(A) 7 / saturated homocyclic.
(B) 8 / saturated heterocyclic.
(C) 8 / saturated homocyclic.
(D) 7 / saturated heterocyclic.

14 Which of the following pairs of compounds are isomers?

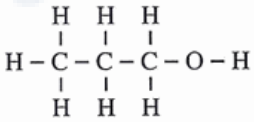
(A) C_6H_6 , C_2H_2
(B) C_3H_8 , C_2H_6
(C) C_2H_5OH , CH_3OH
(D) CH_3COOH , $HCOOCH_3$

15 The following compounds are isomers of one molecular formula, except .....

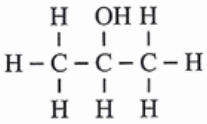
(B)



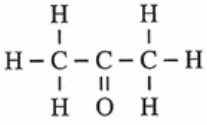
(A)



(D)



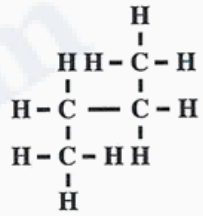
(C)



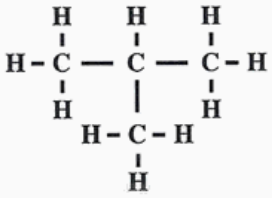
16 From the following structural formulas:

Which of the following are isomers of each other?

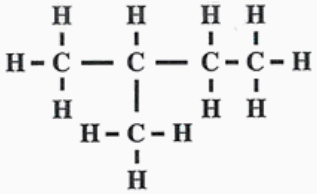
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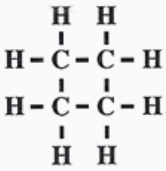
(1)



(4)



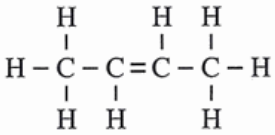
(3)



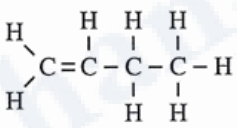
(A) (1) , (2). (B) (3) , (4). (C) (1) , (2) , (3). (D) (1) , (2) , (4).

17 Each of the following is an isomer of one molecular formula, except .....

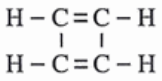
(B)



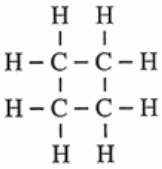
(A)



(D)

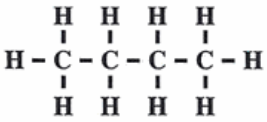


(C)

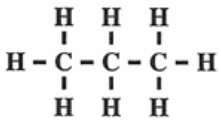


18 Which pair of the following hydrocarbons are isomers of each other?

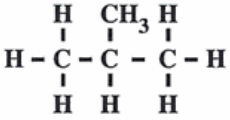
(2)



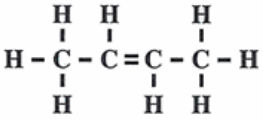
(1)



(4)

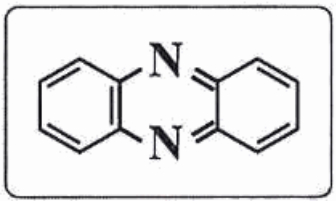


(3)



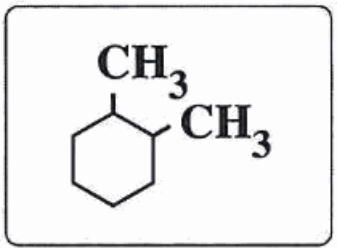
(A) (1) , (2). (B) (1) , (4). (C) (2) , (3). (D) (2) , (4).

19 What is the molecular formula of the opposite compound?



(A) C_6H_4N (B) C_6H_6N (C) $C_{12}H_8N_2$ (D) $C_{12}H_{12}N_2$

20 What is the molecular formula of the opposite compound?



(A) C_8H_{10} (B) C_8H_{12} (C) C_8H_{14} (D) C_8H_{16}

21 Two isomers with the molecular formula C_2H_6O can be distinguished by using .....

(A) anhydrous copper sulphate. (B) sodium bicarbonate.
(C) potassium metal. (D) calcium hydroxide solution.

22 Water and pure ethyl alcohol can be distinguished by using .....

(A) anhydrous $CuSO_4(s)$. (B) $CuSO_4(aq)$
(C) $Ca(OH)_2(aq)$ (D) $CaCO_3(s)$

23 When steam is passed over iron filings heated to redness, and then the gas produced is passed over copper(II) oxide powder heated to redness, all of the following substances are formed, except .....

(A) copper. (B) magnetic iron oxide.
(C) oxygen. (D) water vapour.

24 The compound XSO_4 is used as a fungicide in the purification of drinking water.
What is the role of the compound XO in the experiment for detecting the elements of aromatic benzene?

(A) detecting $H_2O(v)$ only.
(B) detecting $CO_2(g)$ only.
(C) a reducing agent.
(D) an oxidizing agent.

25 The element produced in the experiment for detecting the elements of a hydrocarbon compound can be identified by using .....

(A) $Ca(OH)_2(aq)$ (B) $CuSO_4(s)$ (C) $HNO_3(l)$ (D) $(NH_4)_2CO_3(aq)$

26 Which of the following may describe the arrangement of carbon atoms in the compounds whose chemical formula is C_5H_{12}?

(A) continuous chain ✗ , branched chain ✗ , cyclic ✓
(B) continuous chain ✓ , branched chain ✗ , cyclic ✓
(C) continuous chain ✗ , branched chain ✓ , cyclic ✗
(D) continuous chain ✓ , branched chain ✓ , cyclic ✗

27 Which of the following formulas represents an alkane?

(A) C_6H_{12} (B) C_4H_{10} (C) C_4H_6 (D) C_6H_6

28 The structural formula of the compound C_3H_4 includes ..... covalent bonds.

(A) single only.
(B) triple only.
(C) double and triple.
(D) single and triple.

29 The molecular formula C_5H_{10} represents a(n) ..... compound.

(A) aliphatic
(B) aromatic
(C) unsaturated cyclic
(D) acetylene (alkyne)

30 The molecular formula C_4H_8 has two open-chain isomers which include ..... covalent bonds.

(A) single only.
(B) double only.
(C) single and double.
(D) single and triple.

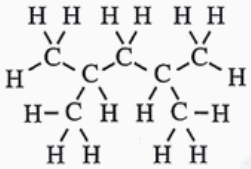
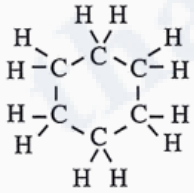
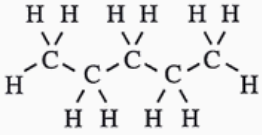
31 Each of the following describes a compound whose molecular formula is C_3H_4, except .....

(A) it belongs to the alkyne series.
(B) its molecule contains two pi bonds.
(C) it is called propyne.
(D) it follows the general formula C_nH_{2n}

32 Each of the following describes the molecular formula C_3H_6, except .....

(A) it follows the general formula C_nH_{2n}
(B) it is a saturated cyclic compound.
(C) it contains the bond (=).
(D) it is an aromatic cyclic compound.

33 The classifications of the following compounds are all correct, except .....

Classification	Compound	Choices
Homocyclic		(A)
Branched alkane		(B)
Saturated cyclic		(C)
Straight-chain alkane		(D)

34 Which of the following chemical formulas represents a saturated heterocyclic compound?

(A) C_5H_5N (B) $C_5H_{11}N$ (C) C_5H_9N (D) C_5H_7N

35 Cyclohexane differs from aromatic benzene in .....

(A) the number of carbon atoms only.
(B) the number of hydrogen atoms only.
(C) the number of carbon atoms and the molecular formula.
(D) the number of hydrogen atoms and the molecular formula.

36 Naphthalene is one of the ..... compounds.

(A) saturated aliphatic
(B) unsaturated aliphatic
(C) saturated cyclic
(D) unsaturated cyclic

37 Each of the following describes the compound whose molecular formula is C_6H_6, except that it is .....

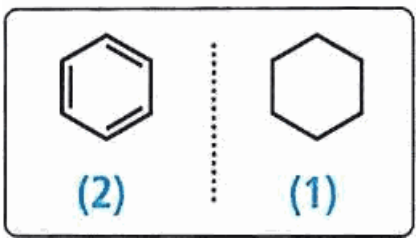
(A) aromatic.
(B) homocyclic.
(C) unsaturated.
(D) odourless.

Essay questions — 9 questions

1 The two opposite compounds are hydrocarbons. Compare them in terms of:

(1) the type of compound.

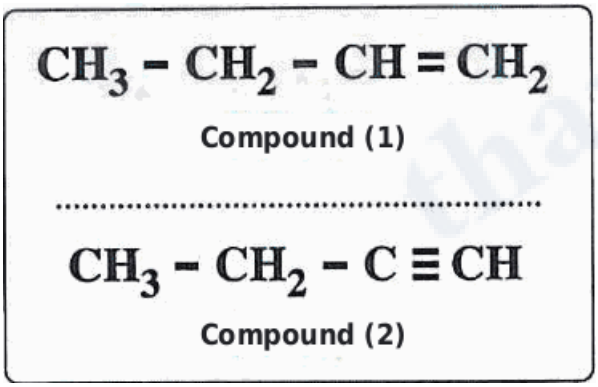
(2) the molecular formula.



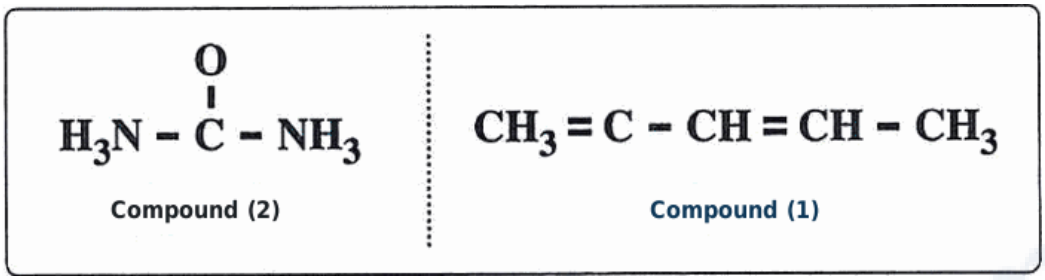
2 The two opposite compounds are hydrocarbons. Compare them in terms of:

(1) the general formula.

(2) the type of hydrocarbon.



3 Rewrite the structural formula of each of the following two compounds correctly, without changing their molecular formulas.



4 The compound $CO(NH_2)_2$ is known as carbamide:

(1) What is the other name of this compound?

(2) Is this compound organic or inorganic? Write the equation of its preparation.

5 Write the structural formula and the molecular formula of each of:

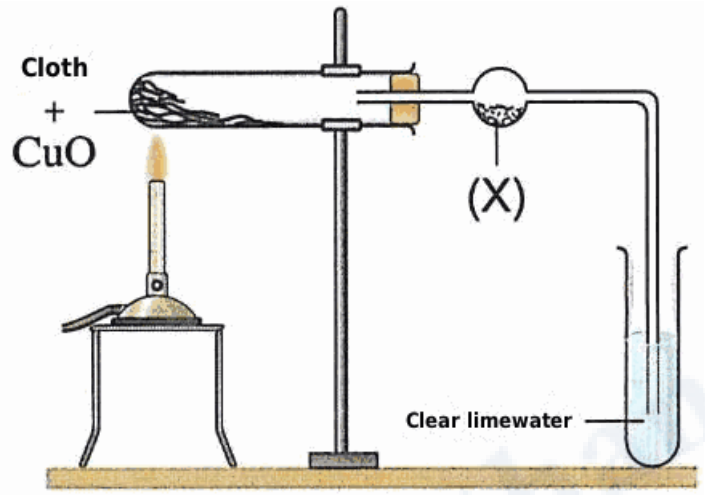
(1) the saturated aliphatic hydrocarbon whose continuous chain is made of 3 carbon atoms.

(2) the saturated aliphatic hydrocarbon whose ring is made of 3 carbon atoms.

6 The opposite figure shows an experiment carried out on a piece of cloth:

(1) Why was a piece of cloth used in this experiment?

(2) What change takes place in the colour of substance (X) at the end of the experiment? Write the electron configuration of the cation in it.



7 Deduce the molecular formula and one structural formula of an alkyne whose molar mass is 54 g/mol

[C = 12 , H = 1]

8 An alkane has a molar mass of 72 g/mol:

(1) Deduce the molecular formula of this alkane.

(2) Draw three different isomers that have the same molecular formula as this alkane.

[C = 12 , H = 1]

9 Do the two isomers $CH_3OC_2H_5$ and C_3H_7OH have the same boiling point? Explain.

Past exam questions — 1 questions

1 Which of the following is the number of open-chain aliphatic isomers of the formula $C_4H_{10}O$ that do not react with sodium metal? (Sample exam 2026)

(A) 3 (B) 4 (C) 5 (D) 7

Answer key and solutions

Multiple choice questions

1 D	2 B	3 D	4 B	5 D	6 C	7 B	8 D	9 A	10 B
11 D	12 A	13 D	14 D	15 C	16 A	17 D	18 D	19 C	20 D
21 C	22 A	23 C	24 D	25 C	26 D	27 B	28 D	29 A	30 C
31 D	32 D	33 A	34 B	35 D	36 D	37 D			

1 **Answer (D)**

The first organic compound prepared in the laboratory is urea (Wöhler).

Urea dissolves in water, so statement (D) is wrong.

2 **Answer (B)**

Wöhler prepared urea $(NH_2)_2CO$ from an inorganic substance, so the vital force theory collapsed.

3 **Answer (D)**

Organic chemistry is the chemistry of carbon compounds.

4 **Answer (B)**

After urea was prepared, compounds were classified according to their structure, not their source.

5 **Answer (D)**

Both do not conduct electricity, both give CO_2 and H_2O on burning, and both dissolve in benzene.

But the wax is solid and acetone is liquid, so the difference is in the physical state.

6 **Answer (C)**

Not all organic compounds can be polymerized.

7 **Answer (B)**

Dimethyl ether is an organic compound (C, H, O), so its complete combustion gives CO_2 and H_2O

8 **Answer (D)**

Ethyl alcohol and sodium chloride both dissolve in water.

9 **Answer (A)**

Most organic compounds have low melting and boiling points.

10 **Answer (B)**

(A) is a covalent, flammable gas: butane (naphthalene is a solid and alcohol is a liquid).

(B) is an ionic solid that dissolves in water: sodium chloride.

11 **Answer (D)**

In (D) the nitrogen atom is bonded by two bonds only, while nitrogen is trivalent.

So the bond is written wrongly.

12 **Answer (A)**

XY_2 is CO_2 and Z_2Y is H_2O, so element X is carbon and Z is hydrogen.

They combine to give CH_4 (a central atom bonded to four atoms).

13 **Answer (D)**

The ring has a nitrogen atom, so it is heterocyclic, and all its bonds are single, so it is saturated.

Each carbon atom carries 2 H (6 in total) and the nitrogen carries 1 H, so the total is 7

14 **Answer (D)**

CH_3COOH and $HCOOCH_3$ have the same molecular formula $C_2H_4O_2$, so they are isomers.

15 **Answer (C)**

(A), (B) and (D) have the formula C_3H_8O

(C) has the formula C_3H_6O, so it is not an isomer of them.

16 **Answer (A)**

(1) and (2) have the formula C_4H_{10}

(3) has the formula C_4H_8 and (4) has the formula C_5H_{12}

17 **Answer (D)**

(A), (B) and (C) have the formula C_4H_8

(D) has the formula C_4H_4

18 **Answer (D)**

(1) C_3H_8 , (2) C_4H_{10} , (3) C_4H_8 , (4) C_4H_{10}

So compounds (2) and (4) are isomers.

19 **Answer (C)**

The molecule has 12 carbon atoms, two nitrogen atoms and 8 hydrogen atoms: $C_{12}H_8N_2$

20 **Answer (D)**

A saturated six-membered ring (C_6H_{10}) carrying two methyl groups: C_8H_{16}

21 **Answer (C)**

The two isomers of C_2H_6O are ethyl alcohol and dimethyl ether.

The alcohol reacts with potassium metal and hydrogen is given off, while the ether does not react.

22 **Answer (A)**

White anhydrous copper sulphate turns blue with water and is not affected by pure alcohol.

23 **Answer (C)**

$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

$H_2 + CuO \rightarrow Cu + H_2O$

Oxygen is not formed.

24 **Answer (D)**

XSO_4 is $CuSO_4$, so the compound XO is CuO

CuO oxidizes carbon to CO_2 and hydrogen to H_2O, so it is an oxidizing agent.

25 **Answer (C)**

The element produced is copper, from the reduction of CuO

Copper reacts with nitric acid, so it can be identified with it.

26 **Answer (D)**

C_5H_{12} is an alkane (C_nH_{2n+2}), so its chain is continuous or branched, not cyclic.

27 **Answer (B)**

An alkane follows C_nH_{2n+2}, and for n = 4: C_4H_{10}

28 **Answer (D)**

C_3H_4 is propyne $HC{\equiv}C{-}CH_3$, which has single and triple bonds.

29 **Answer (A)**

C_5H_{10} follows C_nH_{2n}, like pentene, which is an aliphatic compound.

30 **Answer (C)**

The two open-chain isomers of C_4H_8 are 1-butene and 2-butene, which have single and double bonds.

31 **Answer (D)**

C_3H_4 follows C_nH_{2n-2}, not C_nH_{2n}

32 **Answer (D)**

C_3H_6 may be propene (which has a double bond) or cyclopropane (saturated).

Aromatic compounds contain a benzene ring, so it is not aromatic.

33 **Answer (A)**

The ring of compound (A) has a nitrogen atom, so it is heterocyclic, not homocyclic.

34 **Answer (B)**

A saturated heterocyclic compound has single bonds only and an atom other than carbon in its ring.

$C_5H_{11}N$ (piperidine) is the saturated one; the others have double bonds.

35 **Answer (D)**

Cyclohexane is C_6H_{12} and benzene is C_6H_6

They have the same number of carbon atoms but differ in the number of hydrogen atoms and the molecular formula.

36 **Answer (D)**

Naphthalene is two fused benzene rings, so it is an unsaturated cyclic (aromatic) compound.

37 **Answer (D)**

Benzene C_6H_6 has a characteristic smell, so it is not odourless.

Essay questions

1 **Model answer**

(1) Compound (1): cycloalkane (cyclohexane), compound (2): aromatic (benzene).

(2) Compound (1): C_6H_{12} , compound (2): C_6H_6

2 **Model answer**

(1) Compound (1): C_nH_{2n} , compound (2): C_nH_{2n-2}

(2) Compound (1): alkene, compound (2): alkyne.

3 **Model answer**

Compound (1): $CH_2=CH-CH=CH-CH_3$

Compound (2): $H_2N-CH(OH)-NH_2$

4 **Model answer**

(1) Urea.

(2) An organic compound, prepared by heating ammonium cyanate solution:

$NH_4CNO(aq) \rightarrow NH_2CONH_2(s)$

5 **Model answer**

(1) Propane $CH_3-CH_2-CH_3$, molecular formula C_3H_8

(2) Cyclopropane (a ring of 3 CH_2 groups), molecular formula C_3H_6

6 **Model answer**

(1) Because it is an organic material that contains the elements carbon and hydrogen.

(2) Substance (X) (anhydrous copper sulphate) turns blue.

Cu^{2+} : [Ar] $3d^9$

7 **Model answer**

General formula of alkynes C_nH_{2n-2}

$12n + 2n - 2 = 54$

$14n = 56$, $n = 4$

Molecular formula: C_4H_6

Structural formula: $CH_3-CH_2-C\equiv CH$

8 **Model answer**

(1) General formula of alkanes C_nH_{2n+2}

$12n + 2n + 2 = 72$

$14n = 70$, $n = 5$

Molecular formula: C_5H_{12}

(2) $CH_3-CH_2-CH_2-CH_2-CH_3$ (normal pentane)

$CH_3-CH(CH_3)-CH_2-CH_3$ (2-methylbutane)

$C(CH_3)_4$ (2,2-dimethylpropane)

9 **Model answer**

No, their boiling points are different, because isomers have different physical properties.

Past exam questions

1
A

1 **Answer (A)**

The isomers that do not react with sodium are the ethers:

$CH_3–O–CH_2CH_2CH_3$, $CH_3–O–CH(CH_3)_2$, $C_2H_5–O–C_2H_5$

There are 3