Kirkcaldy High School

Chemistry

National 5

Unit 2 – Nature's Chemistry

TUTORIAL ANSWERS

(a) Homologous series

(i) Systematic Carbon Chemistry

1.

(a) A substance that **only** contains hydrogen and carbon.

(b) A family of compounds with similar chemical properties that share a chemical formula.

2. **Hydrogen:** A lit wooden splint makes a popping sound.
Oxygen: A glowing wooden splint relights in a test tube of oxygen.
Carbon dioxide: Add limewater and it will turn cloudy white.

3.

(a) Carbon and hydrogen

(b) Oxygen

4.

(a) Water and carbon dioxide

(b) Carbon and hydrogen

(c) Hydrocarbon

5.

(a) Sulfur

(b) SO_2

(c) Acid rain.

6.

(a)

(i) E

(ii) A

(iii) E

(b)

(i) Increased size of the molecule decreases flammability.

(ii) Increased size of the molecule increases viscosity.

7.

(a) There is a larger percentage of petrol and diesel.

(b) Fractional distillation.

(ii) Alkanes, Alkenes, and Cycloalkanes

1.

(a)A molecule that contains no carbon-carbon multiple bonds.

(b) A molecule that contains at least one carbon-carbon multiple bond.

(c) Molecules that have the same molecular formulae but different structural formlae

2.

(a) Ethane

(b) Butane

(c) Heptane

(d) 2-methylpentane

3.

(a) Methane

(b) Propane

(c) Hexane

(d) Octane

4.

(a) C_nH_{2n+2}

(b)

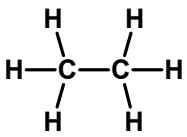
(i) C_4H_{10}

(ii) CH_4

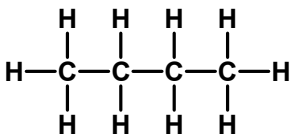
(iii) C_8H_{18}

5.

(a)



(b)



(other isomers are possible!)

6.

(a) Cyclopropane

(b) Cyclopentane

(c) Cyclohexane

(d) Methycyclohexane

7.

(a) Cyclobutane

(b) Cycloheptane

(c) Cyclooctane

8.

(a) C_nH_{2n}

(b)

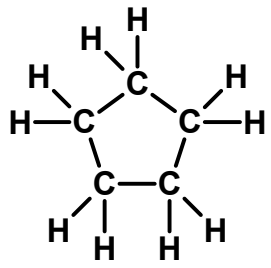
(i) C_4H_8

(ii) C_3H_6

(iii) C_8H_{16}

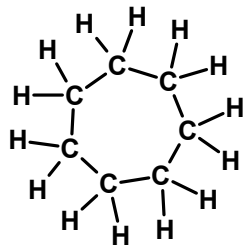
9.

(a)



(other isomers are possible!)

(b)



(other isomers are possible!)

10.

(a) Propene

(b) Pent-2-ene

(c) Pent-1-ene

(d) 4-methyl-pent-1-ene

11.

(a) ethene

(b) but-1-ene (other isomers are possible)

(c) hept-1-ene (other isomers are possible)

(d) oct-1-ene (other isomers are possible)

12.

(a) C_nH_{2n}

(b)

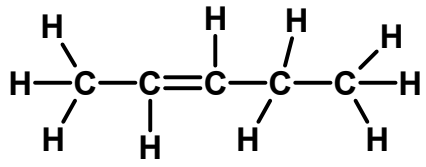
(i) C_4H_8

(ii) C_3H_6

(iii) C_8H_{16}

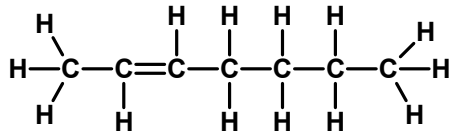
13.

(a)



(other isomers are possible!)

(b)



(other isomers are possible!)

14.

(a) C_6H_{14}

(b) C_5H_{10}

(c) C_4H_8

(d) C_9H_{18}

15.

(a) -162 °C

(b) -188 °C

(c) -12 °C

(d) increases

(e) The forces between the molecules in pentane are stronger than those between the molecules of propane.

16.

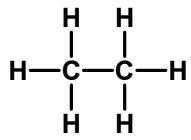
(a) -Alkenes and cycloalkanes

(b) -Alkanes change bromine water from orange/brown to colourless.

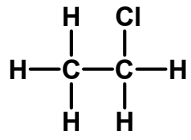
(c) -Addition reaction

(d)

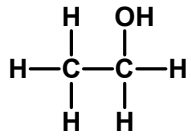
(i)



(ii)



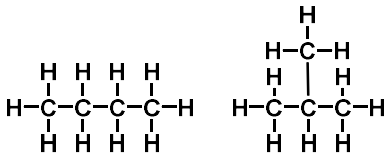
(iii)



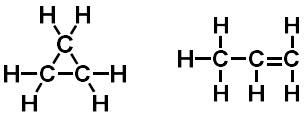
17.

(a) **Isomer:** Same molecular formula, different structural formula.

b)



c)

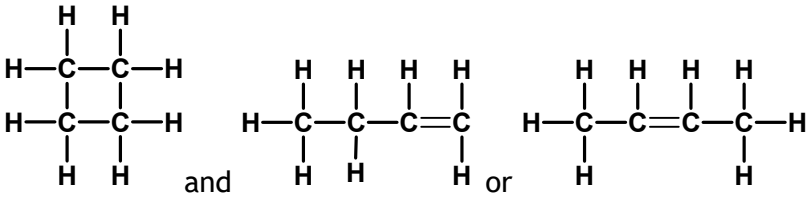


(b)

Saturated: a saturated compound is a chemical compound that has a chain of carbon atoms linked together by single bonds, *e.g.* alkanes.

Unsaturated: an unsaturated compound is a chemical compound that has at least one carbon to carbon double bond, *e.g.* alkenes.

18. Cycloalkanes and alkenes.



19.

(a) As the numbers of chlorine atoms are increased in the compound the anaesthetic effect gets stronger.

(b) $CH_4 + 3Cl_2 \rightarrow CHCl_3 + 3HCl$

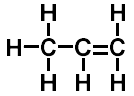
20.

(a) C + D

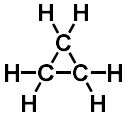
(b) A

21.

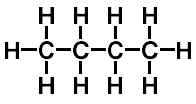
a)



b)



c)



d)

22.

(a) Hex-3-ene

(b) Pent-1-ene

23.

(a) C_4H_{10} (b) C_7H_{16} (c) C_5H_{10}

24.

(a) D + E

(b) A + B

(c) F

25.

(a) F

(b) C + D

(c) A + C

26.

(a) B + D

(b) C

(b) Everyday Consumer Products

1.

(a) Methanol

(b) Propan-1-ol

(c) Propan-2-ol

(d) 4-methyl-pentan-2-ol

2.

(a) ethanol

(b) butan-1-ol (other isomers are possible)

(c) heptan-1-ol (other isomers are possible)

(d) octan-1-ol (other isomers are possible)

3.

(a) $C_nH_{2n+1}OH$ OR $C_nH_{2n+2}O$

(b)

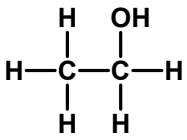
(i) C_4H_7OH OR C_4H_8O

(ii) C_3H_5OH OR C_3H_6O

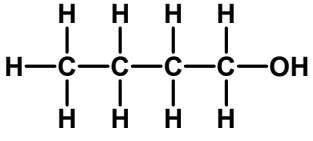
(iii) $C_8H_{15}OH$ OR $C_8H_{16}O$

4.

(a)



(b)



(other isomers are possible!)

5.

(a) Methanoic acid

(b) Propanoic acid

(c) Pentanoic acid

(d) 3-methyl-pentanoic acid

6.

(a) ethanoic acid

(b) butanoic acid (other isomers are possible)

(c) heptanoic acid (other isomers are possible)

(d) octanoic acid (other isomers are possible)

7.

(a) $C_nH_{2n+1}COOH$ OR $C_nH_{2n}O_2$

(b)

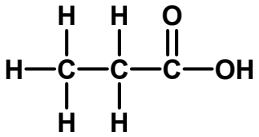
(i) C_3H_7COOH OR $C_4H_8O_2$

(ii) $CHCOOH$ OR CH_2O_2

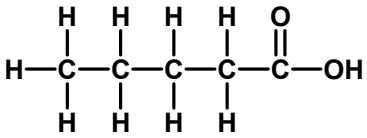
(iii) $C_7H_{15}COOH$ OR $C_8H_{16}O_2$

8.

(a)



(b)



(other isomers are possible!)

9.

(a) Salt and Water

(b)

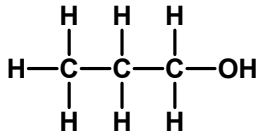
(i) Sodium ethanoate

Potassium propanoate

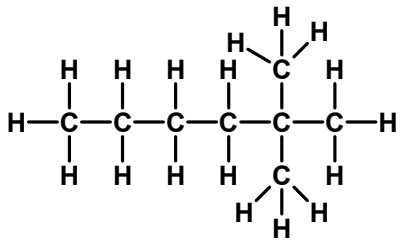
Lithium butanoate

10.

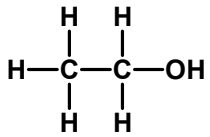
(a)



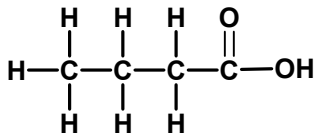
(b)



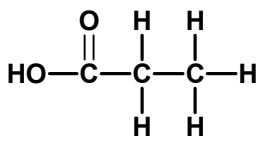
(c)



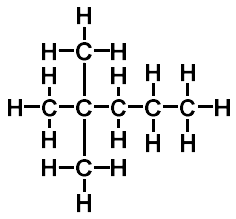
(d)

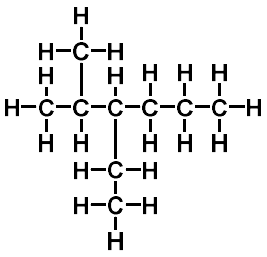


(e)



11.

a) 

b) 

12.

(a) 4-methylhept-3-ene

(b) 2,2,5-trimethyloctane

13. A

14.

(a) Pentan-2-ol

(b) Ethanoic acid

(c) Energy from Fuels

1. 29.09 kJ
2. 2.84 kJ
3. 4.18 kJ
4. 2.42 kJ
5. 26.7 °C
6.

    (a) 33.44 kJ

    (b) Insulate the beaker (there are other suggestons)