


Common Functional Groups

Subject & topics		
Chemistry Organic Functional Groups		
Status	Stage & difficulty	
Not started	A Level Practice 1	

Familiarity with different functional groups is important in organic chemistry. Name the following common functional groups.

Part A

Functional group A

What is the name of the functional group present in the following compound?



Figure 1: A common functional group

Need some help?

Part B

Homologous series B

What is the name of the class of compounds that have a general formula of C_nH_{2n} and include a $C=C$ double bond?

Need some help?

Part C

Homologous series C

What is the name of the class of compounds that have a general formula of C_nH_{2n} and include a ring?

Need some help?

Part D

Functional group D

What is the name of the following functional group?

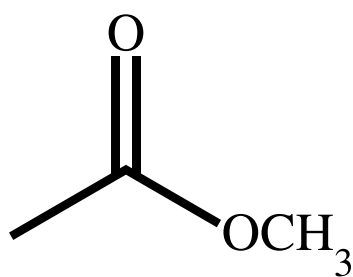


Figure 2: A common functional group

Need some help?

Part E

Functional group E

What is the name of the following functional group?

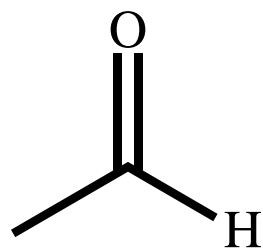


Figure 3: A common functional group

Need some help?

Part F

Functional group F

What is the name of the following functional group?

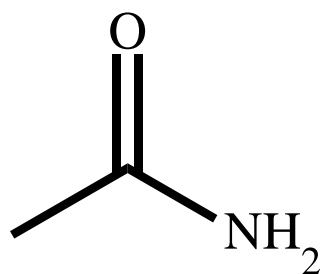


Figure 4: A common functional group

Need some help?

Part G

Functional group G

What is the name of the following functional group?

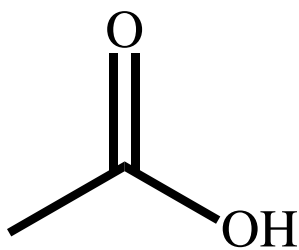


Figure 5: A common functional group

Need some help?

Part H

Functional group H

What is the name of the following functional group?

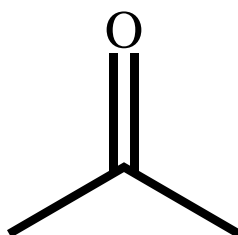


Figure 6: A common functional group

Need some help?

Part I

Functional group I

What is the name of the following functional group?

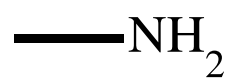


Figure 7: A common functional group

Need some help?

Fructose Functional Groups

Subject & topics

Chemistry | Organic | Functional Groups

Status

Not started

Stage & difficulty

A Level Practice 1



The structure of the monosaccharide fructose is shown below.

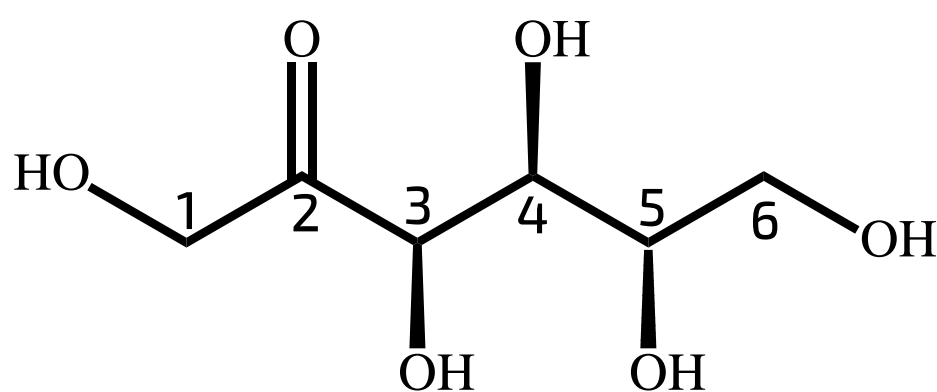


Figure 1: Fructose structure

Part A

Carbon 2

Name the functional group at the position labelled 2.

Need some help?

Part B

Carbon 6

Name the functional group at the position labelled 6.

Need some help?

Adapted with permission from OCSEB, A Level, Structured Science Scheme, Jun 1997, Unit C9 Biochemistry, Question 1

Question deck:

STEM SMART Chemistry Week 23

Hops

Subject & topics

[Chemistry](#) | [Organic](#) | [Functional Groups](#)

Status

Not started

Stage & difficulty

A Level Practice 1



Hops are used to give beers their bitter flavour. Traditionally the hop flavours are extracted by heating with water. The bitterness develops during this process when humulone in the hops is converted into a bitter-tasting isomer, iso-humulone.

Part A

Functional groups

The structures of humulone and iso-humulone are shown below.

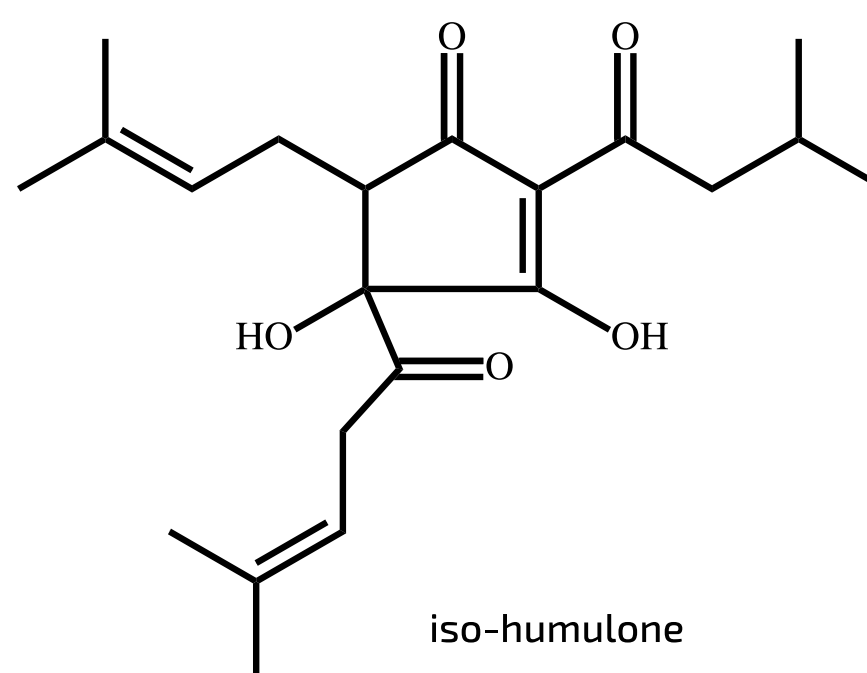
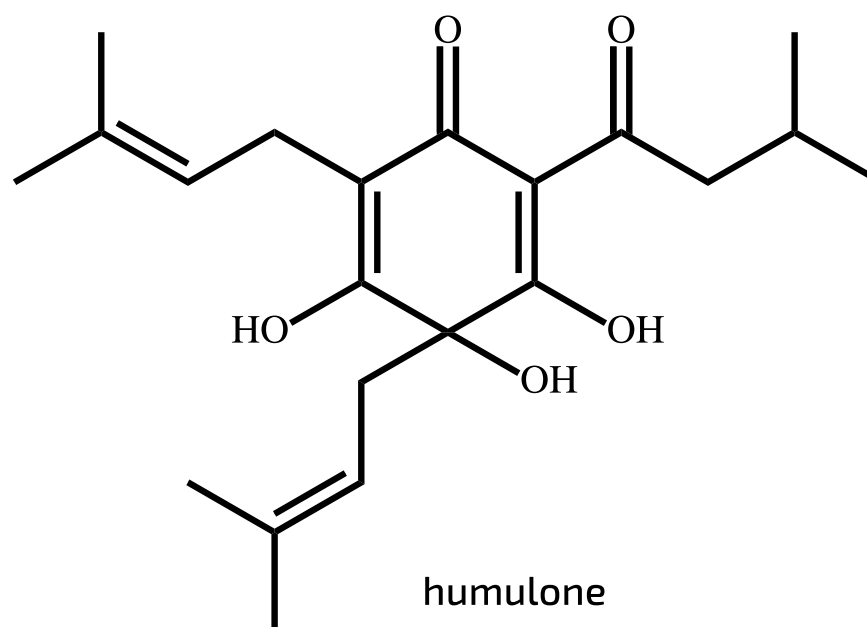


Figure 1: Humulone and iso-humulone

Name three functional groups (excluding alkyl groups) which are present in both humulone and iso-humulone. Give your answer in the format "A, B, C"

Need some help?

Part B

Isomers

Why are humulone and iso-humulone considered to be isomers?

They share the same formula, but have different arrangements of within their , resulting in different properties.

Items:

structural

molecular

skeletal

molecules

atoms

isotopes

Part A adapted with permission from OCSEB, Structured Science Scheme, January 1997, Unit C3 Essential Organic Chemistry, Question 5; Part B created for isaacphysics.org by Andrea Chlebkova

Question deck:

STEM SMART Chemistry Week 23

Methyl Ester

Subject & topics

Chemistry | Organic | Functional Groups

Status

Not started

Stage & difficulty

A Level Practice 1



Combine the components below to create the condensed formula of methyl ethanoate.

Items:

CO

H₂CO

CH₂

CH₃


O

Created for isaacphysics.org by Andrea Chlebkova

Question deck:

STEM SMART Chemistry Week 23

Glucose to Lactic Acid

Subject & topics		
Chemistry Organic Functional Groups		
Status	Stage & difficulty	
Not started	A Level Practice 1	

When oxygen is in short supply, human muscle cells can break down glucose by a process which involves the following molecules among others:

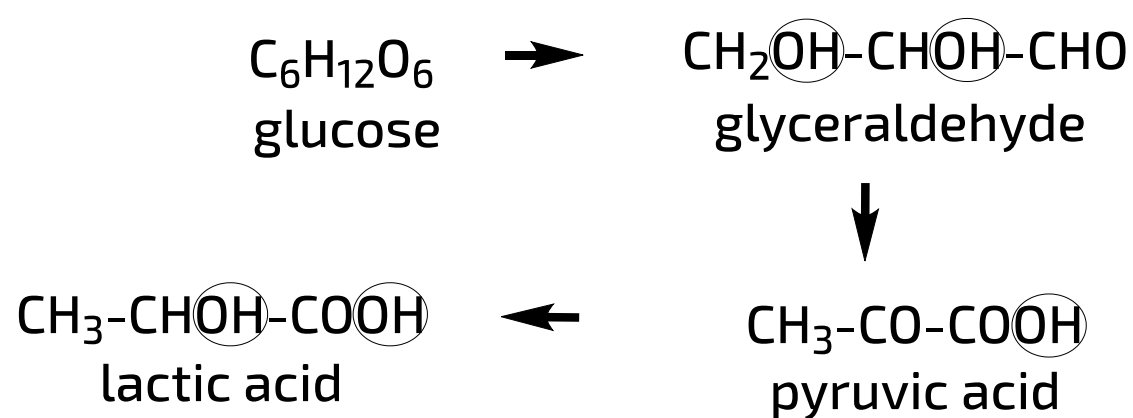


Figure 1: The metabolic pathway from glucose to lactic acid.

This process enables energy to be released from glucose without overall oxidation being necessary.

Part A

Secondary alcohol

Which of these circled groups contains a secondary alcohol?

- ☐ Left group circled in glyceraldehyde.
- ☐ Right group circled in glyceraldehyde.
- ☐ Group circled in pyruvic acid.
- ☐ None of the above

Need some help?

Part B

Pyruvic acid

State the type of functional group present on the middle carbon of pyruvic acid.

Need some help?

Part C

Lactic acid

Give the systematic name for lactic acid.

Need some help?

Part D

Glyceraldehyde


Draw a full structural formula for glyceraldehyde.

Adapted with permission from OCSEB, A Level Chemistry (Salters), Jun 1996, Paper 1, Question 2

Question deck:

STEM SMART Chemistry Week 23

Nitrogen-containing Compounds

Subject & topics		
Chemistry Organic Functional Groups		
Status	Stage & difficulty	
Not started	A Level Practice 1 	

Consider the three compounds **P** and **Q** and **R**.

CH_3CONH_2	$\text{CH}_3\text{CH}_2\text{NH}_2$	CH_3CN
P	Q	R

Part A

P

To what class of organic compounds does compound **P** belong?

Need some help?

Part B

Q

To what class of organic compounds does compound **Q** belong?

Need some help?

Part C

R

To what class of organic compounds does compound **R** belong?

Need some help?

Part D

Structure of P

Draw the structure of **P** in the [structure editor](#) and enter your answer as a SMILES string.

Need some help?

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

[Using the structure editor](#)

Part E

Structure of R

Draw the structure of **R** in the [structure editor](#) and enter your answer as a SMILES string.

Need some help?

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

[Using the structure editor](#)

Adapted with permission from OCSEB, Structured Science Scheme, January 1997, Unit C3 Essential Organic Chemistry, Question 5

Question deck:

Change of Colour

Subject & topics

[Chemistry](#) | [Organic](#) | [Functional Groups](#)

Status

Not started

Stage & difficulty

A Level Practice 1



Part A

Jasmone

Jasmone is the active ingredient of jasmine. It is extracted from jasmine flowers for perfume.

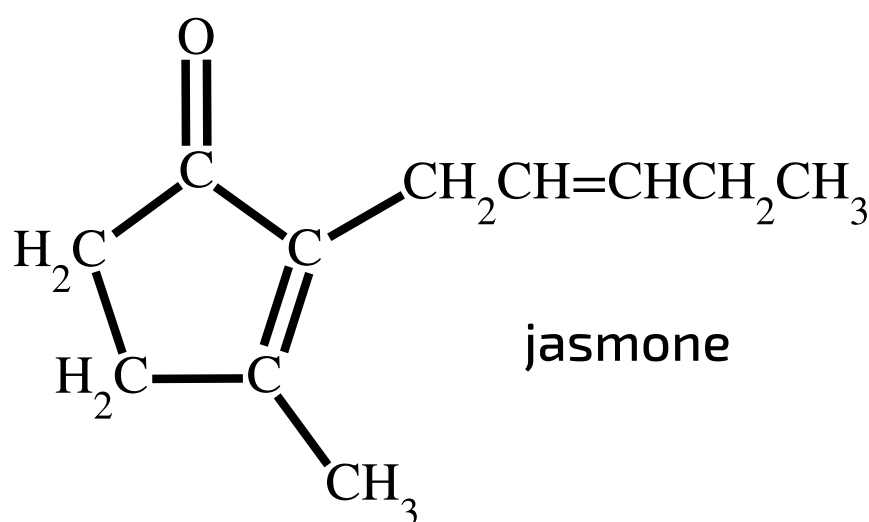


Figure 1: Structure of jasmone

Which of the following reagents, when added to jasmone, would show a change of colour?

1. Potassium dichromate (VI)
2. Tollens' reagent
3. Bromine

- ☐ 1, 2 and 3 are correct
- ☐ 1 and 2 only are correct
- ☐ 1 and 3 only are correct
- ☐ 2 and 3 only are correct
- ☐ 1 only is correct
- ☐ 2 only is correct
- ☐ 3 only is correct

Need some help?

Part B

Aq. bromine test

When aqueous bromine is added to an organic compound, **Y**, the colour of bromine is discharged.

To which classes of compound could **Y** belong?

1 Alkenes

2 Carboxylic acids

3 Alcohols

- ☐ **1, 2 and 3** are correct
- ☐ **1 and 2** only are correct
- ☐ **1 and 3** only are correct
- ☐ **2 and 3** only are correct
- ☐ **1** only is correct
- ☐ **2** only is correct
- ☐ **3** only is correct

Need some help?

Part A adapted with permission from UCLES, A-Level Chemistry, June 1995, Paper 4, Question 38;

Part B adapted with permission from UCLES, A-Level Chemistry, November 1992, Paper 4, Question 40

Question deck:

STEM SMART Chemistry Week 23

Successive Tests

Subject & topics

Chemistry | Organic | Functional Groups

Status

Not started

Stage & difficulty

A Level Practice 2



Compound **A** forms a yellow/orange precipitate when reacted with 2,4-DNP(H) (Brady's reagent). **A** reacts with acidified dichromate to form compound **B** which fizzes upon reaction with sodium carbonate.

Part A

Functional group

What functional group is **A** likely to contain?

Part B

Additional test

What reagent would you use to verify the presence of this functional group in **A**?

Created for isaacphysics.org by Andrea Chlebkova

Question deck:

STEM SMART Chemistry Week 23

Antibiotics

Subject & topics

Chemistry | Organic | Functional Groups

Status

Not started

Stage & difficulty

A Level Practice 1



The structure of Lankacidin C is shown below

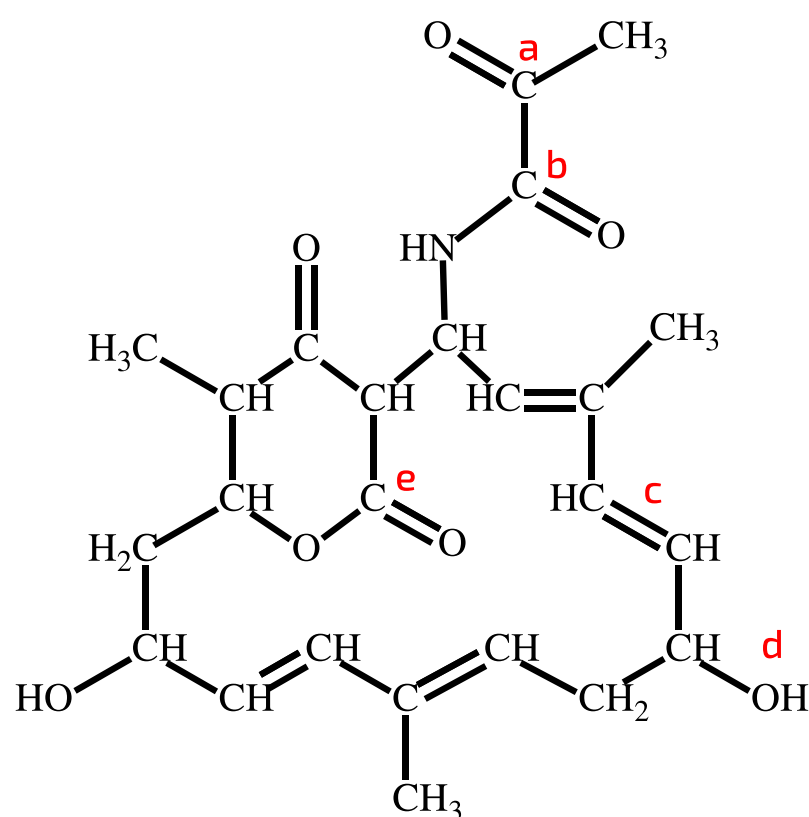


Figure 1: Structure of Lankacidin C

Identify the functional groups **a-e** present in Lankacidin C.

Part A

a

Functional group **a**

Need some help?

Part B

b

Functional group **b**

Need some help?

Part C

c

Functional group **c**

Need some help?

Part D

d

Functional group **d**

Need some help?

Part E

e

Functional group **e**

Need some help?

Part F

Chemical tests 1

Which of the functional groups **a-e** will react with acidified potassium dichromate (VI)?

- ☐ **a**
- ☐ **b**
- ☐ **c**
- ☐ **d**
- ☐ **e**
- ☐ None of the above

Need some help?

Part G

Chemical tests 2

Which of the functional groups **a-e** will give a silver mirror on addition of Tollens' reagent?

- ☐ **a**
- ☐ **b**
- ☐ **c**
- ☐ **d**
- ☐ **e**
- ☐ None of the above

Need some help?

Double Bond Equivalents

Subject & topics

Chemistry | Organic | Isomerism

Status

Not started

Stage & difficulty

A Level Challenge 1



While the molecular formula does not contain a lot of structural information about a compound, it is possible to extract the number of double bond equivalents (DBEs), a measure of degree of unsaturation of an organic compound.

Part A

Alkanes

How many hydrogen atoms does an alkane with n carbon atoms contain?

The following symbols may be useful: n

Part B

Reducing the hydrogen count

Which of the following, if present in the structure, will reduce the number of hydrogens a hydrocarbon with a given number of carbon atoms contains?

- ☐ a branch
- ☐ a ring
- ☐ a double bond
- ☐ a triple bond
- ☐ a chiral centre

Part C

Unsaturated hydrocarbon

A hydrocarbon with n carbons contains one ring, one double bond **and** one triple bond. How many hydrogens does it contain?

Need some help?

Part D

DBEs in hydrocarbons

Bearing in mind that each double bond equivalent removes two hydrogens compared to the alkane, how many double bond equivalents does a compound with the molecular formula C_xH_y contain?

The following symbols may be useful: x , y

Need some help?

Part E

Other elements

The presence of other elements can also modify the number of hydrogens a compound contains. Halogens will the number of hydrogens present, as they take their place in structures and only form one bond. Oxygens will the number of hydrogens present, as they form two bonds. Meanwhile, nitrogens will the number of hydrogens present, as they form three bonds. Introducing an extra carbon will the number of hydrogens present, as expected from the general formulae of homologous series, and consistent with the trend, as they form four bonds.

Items:

increase by two

increase by one

not change

decrease by one

decrease by two

Part F

DBEs more generally

By first accounting for the impact of the non-carbon elements on the hydrogen count, and then using the formula previously derived (or by other means), calculate the number of double bond equivalents present in a compound with the molecular formula $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$.

Need some help?