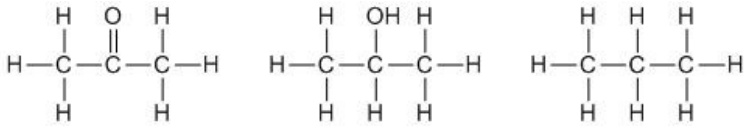
Test Bank

Type: multiple choice question
Title: Chapter 02 Question 01
1) Which of the following full structural formulae depictions has the condensed structure $CH_3CH(OH)CH_3$?



a. A
Feedback: Incorrect. The central carbon in A contains a carbonyl group.

Molecule **A** is propanone, which contains a carbonyl on the central carbon with two CH_3 groups attached. The central carbon is bonded to oxygen but is *sp*^{2} hybridized. Please reconsider your answer.

Section reference: 2.2
***b.** B
Feedback: Correct. The central carbon in **B** is directly connected to oxygen and is *sp*^{3} hybridized.

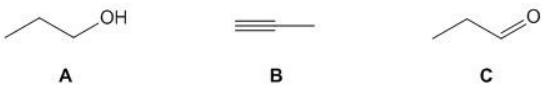
Molecule **B** is propan-2-ol and contains a central sp^3 hybridized carbon directly attached to an oxygen. The central carbon is also directly attached to two CH_3 groups.

Section reference: 2.2
c. C
Feedback: Incorrect. The central carbon in C is *sp*^{3} hybridized and but is not directly attached to an oxygen.

Molecule **C** is propane. The central carbon is *sp*^{3} hybridized but not connected to oxygen. Please reconsider your answer.

Section reference: 2.2

Type: multiple choice question
Title: Chapter 02 Question 02
2) Which of the following skeletal structures represents the condensed structure $CH_3CH_2CH_2OH$?



***a.** A
Feedback: Correct.

Molecule **A** is propan-1-ol, which contains three *sp*^{3} hybridized carbons linearly joined, with the terminal carbon bonded directly to oxygen.

Section reference: 2.2
b. B

Feedback: Incorrect. None of the carbons within **B** are connected to oxygen.

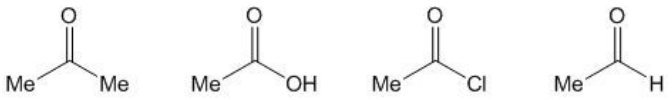
Molecule **B** is prop-1-yne and contains two sp hybridized carbons and one sp^3 hybridized carbon linearly connected. Please reconsider your answer

Section reference: 2.2
c. C
Feedback: Incorrect. The carbon connected to oxygen is sp^2 hybridized.

Molecule **C** is propionaldehyde. The carbon connected to oxygen is sp^2 hybridized. Please reconsider your answer.

Section reference: 2.2

Type: multiple choice question
Title: Chapter 02 Question 03
3) Which of the following compounds is a carboxylic acid?



a. A
Feedback: Incorrect. For a molecule to be classed as a carboxylic acid, the sp^2- hybridized carbon of the carbonyl must be bonded to OH and a carbon-based substituent (CH_3).

Molecule **A** is ketone (acetone, aka propanone) because the sp^2 hybridized carbon atom of the carbonyl forms a single bond to two carbon-based substituents. Please reconsider your answer.

Section reference: 2.3
***b.** B
Feedback: Correct. Molecule **B** is a carboxylic acid (acetic acid, aka ethanoic acid) because the sp^2-hybridized carbon of the carbonyl is bonded to OH and carbon-based substituents (CH_3).

Section reference: 2.3
c. C
Feedback: Incorrect. For a molecule to be classed as a carboxylic acid, the sp^2hybridized carbon of the carbonyl must be bonded to OH and carbon-based substituents.

Molecule **C** is an acyl halide (acetyl chloride) because the sp^2 hybridized carbon atom of the carbonyl forms a single bond to a halogen (Cl) and a carbon-based substituent (CH_3). Please reconsider your answer.

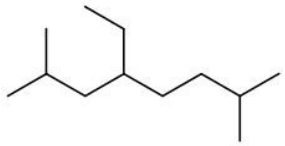
Section reference: 2.3
d. D
Feedback: Incorrect. For a molecule to be classed as a carboxylic acid, the sp^2-hybridized carbon of the carbonyl must be bonded to OH and a carbon-based substituent.

Molecule **D** is an aldehyde (acetaldehyde) because the sp^2 hybridized carbon atom of the carbonyl forms a single bond to a halogen and a hydrogen. Please reconsider your answer.

Section reference: 2.3

Type: multiple choice question
Title: Chapter 02 Question 04

4) What is the IUPAC name for:



a. 2-methyl-5-isobutylheptane
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkane names end with -ane and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **eight** carbon atoms. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order.

This is incorrect because the longest carbon chain is octane, not heptane. Please reconsider your answer.

Section reference: 2.5
***b.** 2,7-dimethyl-4-ethyloctane
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkane names end with -ane and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

Well done! This answer is correct. The IUPAC name is 2,7-dimethyl-4-ethyloctane, **not** 2,7-dimethyl-5-ethyloctane because the carbon chain is numbered so that the lowest possible numbers are used.

Section reference: 2.5
c. 2,7-dimethyl-5-ethyloctane
Feedback: Incorrect. The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkane names end with -ane and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

This answer is incorrect. The carbon chain is numbered so that the lowest possible numbers are used. Please reconsider your answer.

Section reference: 2.5
d. 2-methyl-5-(2-methylpropyl)heptane
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkane names end with -ane and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

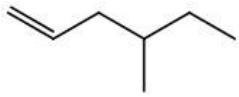
This answer is incorrect because the longest carbon chain is octane, not heptane. Please reconsider your answer.

Section reference: 2.5
e. 2,7,7-trimethyl-4-ethylheptane
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkane names end with -ane and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

This answer is incorrect because the longest carbon chain is octane, not heptane. Please reconsider your answer.

Section reference: 2.5

Type: multiple choice question
Title: Chapter 02 Question 05
5) What is the IUPAC name for:



***a.** 4-methylhex-1-ene
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkene names end with -ene and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **six** carbon atoms. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order. Numbering begins at the alkene end of the hydrocarbon.

Section reference: 2.5
b. 4-ethylpent-1-ene
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkene names end with -ene and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

This answer is incorrect. The IUPAC name 4-methylhex-1-ene, **not** 5-ethylpent-1-ene because the carbon chain is numbered so that the lowest possible numbers are used. Please reconsider your answer.

Section reference: Section 2.5
c. 3-methylhex-5-ene
Feedback: Incorrect. The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkene names end with -ene and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

This answer is incorrect. The carbon chain is numbered so that the lowest possible numbers are used. Please reconsider your answer.

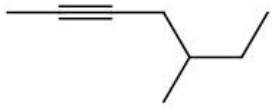
Section reference: 2.5
d. 2-ethylpent-4-ene
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkene names end with -ene and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

This answer is incorrect because the longest carbon chain is hexane not pentene. Also, numbering begins at the alkene end of the hydrocarbon. The carbon chain is numbered so that the lowest possible numbers are used. Please reconsider your answer.

Section reference: 2.5

Type: multiple choice question
Title: Chapter 02 Question 06

6) What is the IUPAC name for:



a. 5-ethylhex-2-yne
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkyne names end with -yne and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

This answer is incorrect because the carbon chain is named using the longest continuous carbon chain. Also, numbering begins at the alkyne end of the hydrocarbon. Please reconsider your answer.

Section reference: Section 2.5
b. 2-ethylhex-4-yne
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkene names end with -yne and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

This answer is incorrect because the carbon chain is named using the longest continuous carbon chain. Please reconsider your answer.

Section reference: Section 2.5
c. 3-methylhept-5-yne
Feedback: Incorrect. The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkyne names end with -yne and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

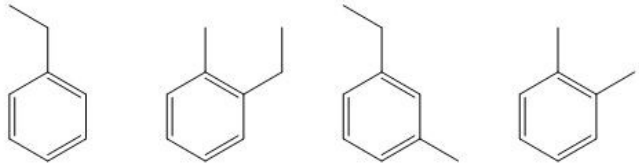
This answer is incorrect. The carbon chain is numbered so that the lowest possible numbers are used. Numbering begins at the alkyne end of the hydrocarbon. Please reconsider your answer.

Section reference: 2.5
*__d.__ 5-methylhept-2-yne
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. All alkyne names end with -yne and this ending is the suffix used for all saturated hydrocarbons. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **seven** carbon atoms. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order. Numbering begins at from the alkyne end of the hydrocarbon.

Section reference: 2.5

Type: multiple choice question
Title: Chapter 02 Question 07
7) Which of the following compounds is named 1-ethyl-2-methylbenzene?



A B C D

a. A
Feedback: Incorrect. For benzene rings containing two alkyl substituents, three isomers are possible (the numbers *1,2*-, *1,3*- and *1,4*- are used to designate the positions of the groups). If the two substituents are different, the names are listed in alphabetic order before ending in 'benzene'.

Molecule **A** is ethylbenzene and is *mono*-substituted. Please reconsider your answer.

Section reference: 2.5
***b.** B
Feedback: Correct. For benzene rings containing two alkyl substituents, three isomers are possible (the numbers *1,2*-, *1,3*- and *1,4*- are used to designate the positions of the groups). If the two substituents are different, the names are listed in alphabetic order before ending in 'benzene'.

Section reference: 2.5
c. C
Feedback: Incorrect. For benzene rings containing two alkyl substituents, three isomers are possible (the numbers *1,2*-, *1,3*- and *1,4*- are used to designate the positions of the groups). If the two substituents are different, the names are listed in alphabetic order before ending in 'benzene'.

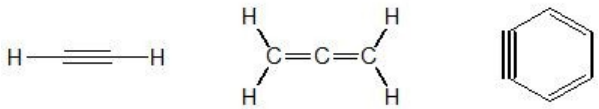
Molecule **C** is 1-ethyl-3-methylbenzene. This molecule is *1,3*- disubstituted, not *1,2*-disubstituted. Please reconsider your answer.

Section reference: 2.5
d. D
Feedback: Incorrect. For benzene rings containing two alkyl substituents, three isomers are possible (the numbers *1,2*-, *1,3*- and *1,4*- are used to designate the positions of the groups). If the two substituents are different, the names are listed in alphabetic order before ending in 'benzene'.

Molecule **D** is *1,2*-dimethylbenzene (*o*-xylene). This molecule is *1,2*- disubstituted, but the two groups are the same (CH_3). Please reconsider your answer.

Section reference: 2.5

Type: multiple choice question
Title: Chapter 02 Question 08
8) Which of the following molecules contain *sp* hybridized carbon atoms?



A B C

a. A

Feedback: Incorrect. *sp* hybridized carbon atoms contain **two** perpendicular 2*p* orbitals. Normally, these 2*p* orbitals overlap to form either cumulated double bonds (adjacent to each other) or a triple bond.

Molecule **A** is ethyne (acetylene), which contains a triple carbon-carbon bond. This triple bond is made up of two equivalent *sp* hybridized carbon atoms with two *p* orbitals. So, molecule **A** does contain *sp* hybridized carbon atoms. Have you considered whether the other molecules also contain sp hybridised carbons? Please reconsider your answer.

Section reference: 2.5
b. B
Feedback: Incorrect. *sp*-hybridized carbon atoms contain **two** perpendicular 2*p* orbitals. Normally, these 2*p* orbitals overlap to form either cumulated double bonds (adjacent to each other) or a triple bond.

Molecule **B** is allene (propadiene) and contains **only** one *sp* hybridized carbon atom. The central carbon atom is *sp* hybridized and forms two double bonds with adjacent sp^2 hybridized carbon atoms. So, molecule **B** does contain an *sp* hybridized carbon atom. Have you considered whether the other molecules also contain sp hybridised carbons? Please reconsider your answer.

Section reference: 2.5
***c.** A and B
Feedback: Correct. *sp* hybridized carbon atoms contain **two** perpendicular 2*p* orbitals. Normally, these 2*p* orbitals overlap to form either cumulated double bonds (adjacent to each other) or a triple bond.

Well done! Both molecules **A** and **B** contain *sp* hybridized carbon atoms. Molecule **A** has two equivalent *sp* hybridized carbon atoms, whereas, molecule **B** has only one. Molecule **C** (benzyne) does not contain these hybrids as all the carbon atoms are sp^2-hybridized. Two sp^2 hybridized carbon atoms, which contain a single electron in each hybrid, can overlap weakly to form a weak second pi-type bond.

Section reference: 2.5
d. A and **C**
Feedback: Incorrect. *sp* hybridized carbon atoms contain **two** perpendicular 2*p* orbitals. Normally, these 2*p* orbitals overlap to form either cumulated double bonds (adjacent to each other) or a triple bond.

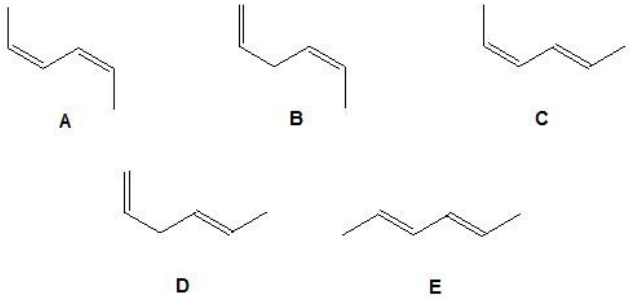
Molecule **A** is ethyne (acetylene) and contains a triple carbon-carbon bond. This triple bond is made up from two equivalent *sp* hybridized carbon atoms with two *p* orbitals. Molecule **C** (benzyne) does not contain these hybrids as all the carbon atoms are sp^2 hybridized. Two sp^2 hybridized carbon atoms, which contain a single electron in each hybrid, can overlap weakly to form a weak second pi-type bond.

Section reference: 2.5
e. A, B and C
Feedback: *sp* hybridized carbon atoms contain **two** perpendicular 2*p* orbitals. Normally, these 2*p* orbitals overlap to form either cumulated double bonds (adjacent to each other) or a triple bond.

The hybridisation of all six carbon atoms in molecule **C** (benzyne) are the same as those in benzene (sp^2 hybridized). Please reconsider your answer.

Section reference: 2.5

Type: multiple choice question
Title: Chapter 02 Question 09
9) Pick out the diene which has one *cis* C=C bond and one *trans* C=C bond:



a. A
Feedback: Incorrect. Simple 1,2-disubstituted alkenes can have two isomers, namely *cis*- and *trans*-. A *cis*-isomer is where both substituents are on the *same side* of the double bond, whereas, for a *trans*-isomer the substituents are on *opposite sides* of the double bond. A diene contains two C=C bonds. Assuming the diene contains two internal disubstituted C=C bonds, then each C=C bond can be *cis*- or *trans*-.

Diene **A** is an example of a 1,3-diene, which contains two internal disubstituted C=C bonds. The carbon-linked substituents on both C=C bonds are on the same side of the double bonds, so both C=C bonds in diene **A** are *cis*-. Please reconsider your answer.

Section reference: 2.5
b. B
Feedback: Incorrect. Simple 1,2-disubstituted alkenes can have two isomers, namely *cis*- and *trans*-. A *cis*-isomer is where both substituents are on the *same side* of the double bond, whereas, for a *trans*-isomer the substituents are on *opposite sides* of the double bond. A diene contains two C=C bonds. Assuming the diene contains two internal disubstituted C=C bonds, then each C=C bond can be *cis*- or *trans*-.

Diene **B** is a 1,4-diene and only one C=C bond is an internal disubstituted C=C bond. The carbon-linked substituents on the C=C bond are on the same side of the double bond, so diene **B** is the *cis*-isomer. Please reconsider your answer.

Section reference: 2.5
***c.** C
Feedback: Correct. Simple 1,2-disubstituted alkenes can have two isomers, namely *cis*- and *trans*-. A *cis*-isomer is where both substituents are on the *same side* of the double bond, whereas, for a *trans*-isomer the substituents are on *opposite sides* of the double bond. A diene contains two C=C bonds. Assuming the diene contains two internal disubstituted C=C bonds, then each C=C bond can be *cis*- or *trans*-.

Well done! Diene **C** is an example of a 1,3-diene, which contains two internal disubstituted C=C bonds. One C=C bond has both carbon-linked substituents on the same sides of the double bond, so it is *cis*-, whereas the other C=C bond has both carbon-linked substituents on the opposite sides of the double bond, so it is *trans*-. For diene **A** both C=C bonds are *cis*-, for diene **E** both C=C bonds are *trans*-. In comparison, for dienes **B** and **D** only one of the C=C bonds is an internal disubstituted C=C bond.

Section reference: 2.5
d. D
Feedback: Incorrect. Simple 1,2-disubstituted alkenes can have two isomers, namely *cis*- and *trans*-. A *cis*-isomer is where both substituents are on the *same side* of the double bond, whereas, for a *trans*-isomer the substituents are on *opposite sides* of the double bond. A diene contains two C=C bonds. Assuming the diene contains two internal disubstituted C=C bonds, then each C=C bond can be *cis*- or *trans*-.

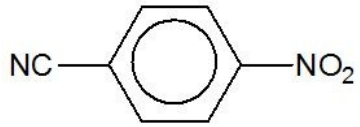
Diene **D** is a 1,4-diene and only one of the C=C bonds is an internal disubstituted C=C bond. The carbon-linked substituents on the C=C bond are on the opposite side of the double bond, so diene **D** is the *trans*-isomer. Please reconsider your answer.

Section reference: 2.5
e. E
Feedback: Incorrect. Simple 1,2-disubstituted alkenes can have two isomers, namely *cis*- and *trans*-. A *cis*-isomer is where both substituents are on the **same side** of the double bond, whereas, for a *trans*-isomer the substituents are on **opposite sides** of the double bond. A diene contains two C=C bonds. Assuming the diene contains two internal disubstituted C=C bonds, then each C=C bond can be *cis*- or *trans*-.

Diene **E** is an example of a 1,3-diene, which contains two internal disubstituted C=C bonds. The carbon-linked substituents on both C=C bonds are on the opposite sides of the double bonds, so both C=C bonds in diene **E** are *trans*-. Please reconsider your answer.

Section reference: 2.5

Type: multiple choice question
Title: Chapter 02 Question 10
10) How many pi (π-) electrons are there in molecule **A**?



A

a. 6
Feedback: Incorrect. It can sometimes be difficult to count the number of electrons present in chemical structures. For ease, it is better to re-draw the molecule in a skeletal structure and to include all of the bonds in the functional groups. Multiple bonds are made up of one sigma (σ-) bond plus one pi (π-) bond (for a double bond) and two pi bonds (for a triple bond). Each pi (π-) bond, in the main, contains two pi (π-) electrons.

It appears that you have simply counted the number of pi (π-) electrons present in the aromatic ring. An NO_2 group is a nitro group, and a CN group is a nitrile group. Please reconsider your answer.

Section reference: 2.5
b. 10
Feedback: Incorrect. It can sometimes be difficult to count the number of electrons present in chemical structures. For ease, it is better to re-draw the molecule in a skeletal structure and to include all of the bonds in the functional groups. Multiple bonds are made up of one sigma (σ-) bond plus one pi (π-) bond (for a double bond) and two pi bonds (for a triple bond). Each pi (π-) bond, in the main, contains two pi (π-) electrons.

There are a number of possible options that can lead to this particular number of pi (π-) electrons. The most probable reason is that you have considered that both the nitro (NO_2) and nitrile (CN) groups contain a single pi-bond. The nitro group does indeed contain a single double (N=O) bond, but the nitrile group does not. Please reconsider your answer.

Section reference: 2.5
***c.** 12
Feedback: Correct. It can sometimes be difficult to count the number of electrons present in chemical structures. For ease, it is better to re-draw the molecule in a skeletal structure and to include all of the bonds in the functional groups. Multiple bonds are made up of one sigma

(σ-) bond plus one pi (π-) bond (for a double bond) and two pi bonds (for a triple bond). Each pi (π-) bond, in the main, contains two pi (π-) electrons.

Well done! The substituted aryl ring has six delocalised pi (π-) electrons. The remaining nitro and nitrile groups contain one and two pi-bonds, respectively. The total number of pi (π-) electrons is twelve.

Section reference: 2.5
d. 14
Feedback: Incorrect. It can sometimes be difficult to count the number of electrons present in chemical structures. For ease, it is better to re-draw the molecule in a skeletal structure and to include all of the bonds in the functional groups. Multiple bonds are made up of one sigma (σ-) bond plus one pi (π-) bond (for a double bond) and two pi (π-) bonds (for a triple bond). Each pi (π-) bond, in the main, contains two pi (π-) electrons.

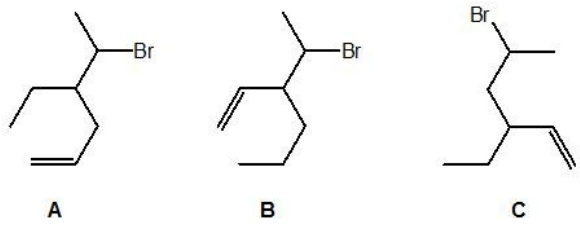
It appears from your answer that you have suggested a nitro (NO_2) group contains two pi-bonds. This is in fact incorrect, as the valency of the nitrogen atom would exceed eight electrons (and four bonds). A nitro group **only** contains one double bond. Please reconsider your answer.

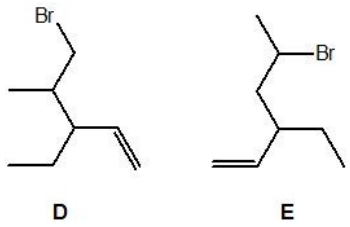
Section reference: 2.5
e. None of the other options
Feedback: Incorrect. It can sometimes be difficult to count the number of electrons present in chemical structures. For ease, it is better to re-draw the molecule in a skeletal structure and to include all of the bonds in the functional groups. Multiple bonds are made up of one sigma (σ-) bond plus one pi (π-) bond (for a double bond) and two pi bonds (for a triple bond). Each pi (π-) bond, in the main, contains two pi (π-) electrons.

As a starting point, the aryl ring has six delocalised pi (π-) electrons. Please reconsider your answer.

Section reference: 2.5

Type: multiple choice question
Title: Chapter 02 Question 11
11) Which of the following molecules is 5-bromo-4-ethylhex-1-ene?





***a.** A
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **six** carbon atoms and the major functional group is C=C. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order.

Well done! This is correct because the substituents have the lowest possible numbers and are listed in alphabetical order.

Section reference: 2.6
b. B
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **six** carbon atoms and the major functional group is C=C. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order.

This is incorrect because this molecule has a substituent at the *C*3 position. This molecule is 3-(1-bromoethyl)hex-1-ene. Please reconsider your answer.

Section reference: 2.6
c. C
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **six** carbon atoms and the major functional group is C=C. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order.

This is incorrect because this molecule has substituents at the C3 and C5 positions. This molecule is 5-bromo-3-ethylhex-1-ene and is identical to molecule **E**. Please reconsider your answer.

Section reference: Section 2.6
d. D
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **six** carbon atoms and the major functional group is C=C. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order.

This is incorrect because the longest carbon chain is pentene, not hexene. This molecule is 5-bromo-3-ethyl-4-methyl-pent-1-ene. Please reconsider your answer.

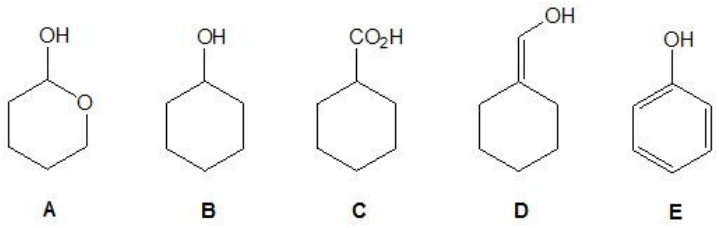
Section reference: Section 2.6
e. E
Feedback: The IUPAC name of a compound is made up of three parts: the suffix, the parent chain and the prefix. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix.

For this molecule, the longest continuous carbon chain has **six** carbon atoms and the major functional group is C=C. The carbon chain is numbered so that the lowest possible numbers are used and the substituents are listed in alphabetical order.

This is incorrect because this molecule has substituents at the C3 and C5 positions. This molecule is 5-bromo-3-ethylhex-1-ene, and is identical to molecule **C**. Please reconsider your answer.

Section reference: 2.6

Type: multiple choice question
Title: Chapter 02 Question 12
12) Which of the following compounds are alcohols?



a. A and D
Feedback: Incorrect. For a molecule to be classed as an alcohol, the sp^3 hybridized carbon atom of the C–OH group must be bonded to hydrogen and/or carbon-based substituents. This gives rise to four classes of alcohols; a tertiary alcohol (R_3COH), a secondary alcohol (R_2CHOH), a primary alcohol (RCH_2OH) and methanol (CH_3OH), where R is a carbon-based substituent.

Molecule **A** is **not** an alcohol because the carbon atom in the C–OH group forms a single bond to another O atom. This molecule is a hemiacetal. Molecule **D** is **not** an alcohol as the carbon atom bonded to the OH group is sp^2 hybridized. This molecule is an enol. Please reconsider your answer.

Section reference: 2.6
b. A and B
Feedback: Incorrect. For a molecule to be classed as an alcohol, the sp^3 hybridized carbon atom of the C–OH group must be bonded to hydrogen and/or carbon-based substituents. This gives rise to four classes of alcohols; a tertiary alcohol (R_3COH), a secondary alcohol (R_2CHOH), a primary alcohol (RCH_2OH) and methanol (CH_3OH), where R is a carbon-based substituent.

Molecule **A** is **not** an alcohol because the carbon atom in the C–OH group forms a single bond to another O atom. This molecule is a hemiacetal. However, molecule **B** is an alcohol. It is a secondary alcohol (R_2CHOH) because the carbon atom in the C–OH group is bonded to two carbon-based substituents and one hydrogen atom. Please reconsider your answer.

Section reference: 2.6
c. C and E
Feedback: Incorrect. For a molecule to be classed as an alcohol, the sp^3 hybridized carbon atom of the C–OH group must be bonded to hydrogen and/or carbon-based substituents. This gives rise to four classes of alcohols; a tertiary alcohol (R_3COH), a secondary alcohol (R_2CHOH), a primary alcohol (RCH_2OH) and methanol (CH_3OH), where R is a carbon-based substituent.

Molecule **C** is **not** an alcohol because the carbon atom of the C–OH group forms a double bond with a second oxygen atom. This molecule is a carboxylic acid. Molecule **E** is also **not** an alcohol because the carbon atom bonded to the OH group is sp^2 hybridized. This molecule is called phenol. Please reconsider your answer.

Section reference: 2.6
***d.** B
Feedback: Correct. For a molecule to be classed as an alcohol, the sp^3 hybridized carbon atom of the C–OH group must be bonded to hydrogen and/or carbon-based substituents. This gives rise to four classes of alcohols; a tertiary alcohol (R_3COH), a secondary alcohol (R_2CHOH), a primary alcohol (RCH_2OH) and methanol (CH_3OH), where R is a carbon-based substituent.

Well done! Molecule **B** is an alcohol. It is a secondary alcohol (R_2CHOH) because the sp^3 hybridized carbon atom of the C–OH group is bonded to two carbon-linked substituents and one hydrogen atom.

Section reference: 2.6
e. D
Feedback: Incorrect. For a molecule to be classed as an alcohol, the sp^3 hybridized carbon atom of the C–OH group must be bonded to hydrogen and/or carbon-based substituents. This gives rise to four classes of alcohols; a tertiary alcohol (R_3COH), a secondary alcohol (R_2CHOH), a primary alcohol (RCH_2OH) and methanol (CH_3OH), where R is a carbon-based substituent.

Molecule **D** is **not** an alcohol because the carbon atom bonded to the OH group is sp^2 hybridized. This molecule is an enol. Please reconsider your answer.

Section reference: 2.6

Type: multiple choice question
Title: Chapter 02 Question 13
13) Which of the following classes of compounds **A**-**D** are capable of forming hydrogen bonds (in the presence of suitable H-donors/acceptors)?

A: Phenols

B: Carboxylic acids

C: Ethers

D: Alcohols

a. A and B
Feedback: Incorrect. For a molecule to form a hydrogen bond it must contain a group that acts as a hydrogen-bond donor (a hydrogen atom attached to an electronegative atom), and/or a hydrogen-bond acceptor (an electronegative atom with one or more lone pairs of electrons). Molecules, such as H_2O, contain both components and so intermolecular hydrogen bonds can occur between different water molecules.

Yes, both phenols (ArOH) and carboxylic acids (RCO_2H) contain hydrogen-bond donors (the hydrogen atom in the O-H bonds) and also hydrogen-bond acceptors (the oxygen atoms, which each have two lone pairs of electrons). Have you considered ethers and alcohols? Please reconsider your answer.

Section reference: 2.6
b. A and C
Feedback: Incorrect. For a molecule to form a hydrogen bond it must contain a group that acts as a hydrogen-bond donor (a hydrogen atom attached to an electronegative atom), and/or a hydrogen-bond acceptor (an electronegative atom with one or more lone pairs of electrons). Molecules, such as H_2O, contain both components and so intermolecular hydrogen bonds can occur between different water molecules.

Yes, both phenols (ArOH) and ethers (ROR) contain hydrogen-bond acceptors (the oxygen atoms, which each have two lone pairs of electrons). Phenols (ArOH) also contain a hydrogen-bond donor (the hydrogen atom in the O-H bond). Have you considered carboxylic acids and alcohols? Please reconsider your answer.

Section reference: 2.6
c. B and D
Feedback: Incorrect. For a molecule to form a hydrogen bond it must contain a group that acts as a hydrogen-bond donor (a hydrogen atom attached to an electronegative atom), and/or a hydrogen-bond acceptor (an electronegative atom with one or more lone pairs of electrons). Molecules, such as H_2O, contain both components and so intermolecular hydrogen bonds can occur between different water molecules.

Carboxylic acids (RCO_2H) and alcohols (ROH) contain both hydrogen-bond donors (the hydrogen atom in the O-H bond) and hydrogen-bond acceptors (the oxygen atoms, which each have two lone pairs of electrons). Have you considered ethers and alcohols? Please reconsider your answer.

Section reference: 2.6
d. A, B and D
Feedback: Incorrect. For a molecule to form a hydrogen bond it must contain a group that acts as a hydrogen-bond donor (a hydrogen atom attached to an electronegative atom), and/or a hydrogen-bond acceptor (an electronegative atom with one or more lone pairs of electrons). Molecules, such as H_2O, contain both components and so intermolecular hydrogen bonds can occur between different water molecules.

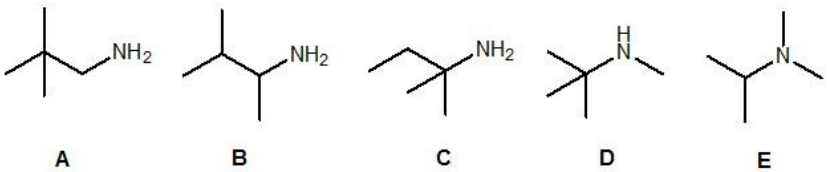
From your answer, it appears that you have correctly picked out the functionalities that are Brønsted acids which are capable of being good hydrogen-bond donors. However, have you considered the complementary aspect of this hydrogen-bond formation, those functional groups that can act as hydrogen-bond acceptors? For a molecule to be a hydrogen-bond acceptor it needs an electronegative atom with one or more lone pairs of electrons. Please reconsider your answer.

Section reference: 2.6
***e.** All of them
Feedback: Correct. For a molecule to form a hydrogen bond it must contain a group that acts as a hydrogen-bond donor (a hydrogen atom attached to an electronegative atom), and/or a hydrogen-bond acceptor (an electronegative atom with one or more lone pairs of electrons). Molecules, such as H_2O, contain both components and so intermolecular hydrogen bonds can occur between different water molecules.

Well done! Neat phenols (ArOH), carboxylic acids (RCO_2H) and alcohols (ROH) can form hydrogen bonds on their own as they can act as hydrogen-bond acceptors (they have at least one electronegative atom with one or more lone pairs of electrons) and also hydrogen-bond donors (they all have OH groups). Whereas, ethers (ROR) can only act as hydrogen-bond acceptors. Ethers can form hydrogen bonds in the presence of a suitable hydrogen-bond donor.

Section reference: 2.6

Type: multiple choice question
Title: Chapter 02 Question 14
14) Which of the following compounds contain a primary amine?



A B C D E

a. A
Feedback: Incorrect. For a molecule to be classed as a primary amine it must have an sp^3 hybridized carbon atom attached to an NH_2 group.

You are correct in your assumption that molecule **A** is a primary amine as it contains an sp^3 hybridized carbon atom attached to an NH_2 group. Are there any other primary amines present? Please reconsider your answer.

[It is important to note that an amine can only be tertiary if it contains an R_3N motif (see molecule **E**) and not because it contains a *tert*-butyl group!]

Section reference: 2.6
b. C and D
Feedback: Incorrect. For a molecule to be classed as a primary amine it must have an sp^3 hybridized carbon atom attached to an NH_2 group.

You are correct in your assumption that molecule **C** is a primary amine as it contains an sp^3 hybridized carbon atom attached to an NH_2 group. However, molecule **D** is a secondary amine because of its R_2NH functionality.

[It is important to note, an amine can only be tertiary if it contains an R_3N motif (see molecule **E**) and not because it contains a *tert*-butyl group!]

Section reference: 2.6
c. D
Feedback: Incorrect. For a molecule to be classed as a primary amine it must have an sp^3 hybridized carbon atom attached to an NH_2 group.

Molecule **D** is a secondary amine because of its R_2NH functionality. (Do not think that because it has a neighbouring *tert*-butyl group it is a tertiary amine). Please reconsider your answer.

Section reference: 2.6
d. E
Feedback: Incorrect. For a molecule to be classed as a primary amine it must have an sp^3 hybridized carbon atom attached to an NH_2 group.

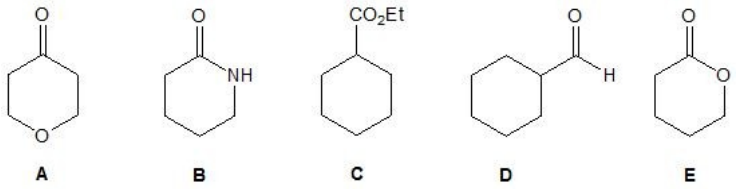
Molecule **E** is a tertiary amine because of its R_3N functionality. Please reconsider your answer.

Section reference: 2.6
***e.** A, B and C
Feedback: Correct. For a molecule to be classed as a primary amine it must have an sp^3 hybridized carbon atom attached to an NH_2 group.

Well done! Molecules **A**, **B** and **C** are all primary amines because they contain sp^3 hybridized carbon atoms attached to NH_2 groups.
Molecule **D** is a secondary amine (R_2NH) and molecule **E** is a tertiary (R_3N) amine.

Section reference: 2.6

Type: multiple choice question
Title: Chapter 02 Question 15
15) Which of the following compounds **A**-**E** is a lactone?



a. A
Feedback: Incorrect. A lactone is a cyclic ester, which contains the –C(=O)O– motif within a ring.

Molecule **A** contains a cyclic ketone and a cyclic ether. In order to be an ester, the molecule must contain a R(C=O)OR motif. Please reconsider your answer.

Section reference: 2.7
b. B
Feedback: Incorrect. A lactone is a cyclic ester, which contains the –C(=O)O– motif within a ring.

Molecule **B** is a cyclic amide (commonly known as a lactam). In order to be an ester, the molecule must contain a R(C=O)OR motif. Please reconsider your answer.

Section reference: 2.7
c. C
Feedback: Incorrect. A lactone is a cyclic ester, which contains the –C(=O)O– motif within a ring.

Molecule **C** is an ester, but the $–CO_2–$ motif is not present within a ring and so it is not a lactone.

Section reference: 2.7
d. D
Feedback: Incorrect. A lactone is a cyclic ester, which contains the –C(=O)O– motif within a ring.

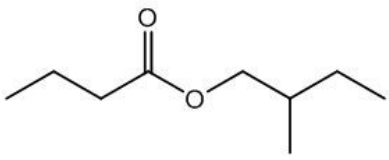
Molecule **D** is an aldehyde (RCHO). In order to be an ester, the molecule must contain a R(C=O)OR motif. Please reconsider your answer.

Section reference: 2.7
***e.** E
Feedback: Correct. A lactone is a cyclic ester, which contains the –C(=O)O– motif within a ring.

Well done! Molecule **E** is a lactone. It is a cyclic ester because the $–CO_2–$ motif is within the 6-membered ring.

Section reference: 2.7

Type: multiple choice question
Title: Chapter 02 Question 16
16) The correct IUPAC name for the following molecule is:



*__a.__ 2-methylbutyl butanoate
Feedback: The name of the alkyl or aryl group bonded to the oxygen is given first, followed by the names of the acid (as a separate word) with the ending '*ic acid*' replace with '*ate'*.

This is correct. The alkyl group is named 2-methylbutyl using the IUPAC system.

Section reference: 2.7 and 2.6
b. 2-methylbutyl propanoate
Feedback: The name of the alkyl or aryl group bonded to the oxygen is given first, followed by the names of the acid (as a separate word) with the ending '*ic acid*' replace with '*ate'*.

This is incorrect. Is appears that you have forgotten to include the carbonyl carbon in acid when determining the longest chain. Please reconsider your answer.

Section reference: 2.7 and 2.6
c. 2-ethylpropyl butanoate
Feedback: The name of the alkyl or aryl group bonded to the oxygen is given first, followed by the names of the acid (as a separate word) with the ending '*ic acid*' replace with '*ate'*.

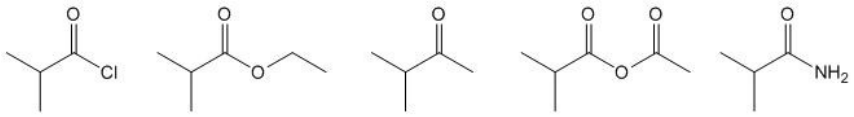
This is incorrect. Remember that naming the alkyl group bonded directly to the oxygen follows the same IUPAC rules for naming alcohols. Please reconsider your answer.

Section reference: 2.7 and 2.6
d. butyl butanoate
Feedback: The name of the alkyl or aryl group bonded to the oxygen is given first, followed by the names of the acid (as a separate word) with the ending '*ic acid*' replace with '*ate'*.

This is incorrect. It would appear that you have missed the methyl group on the butyl side chain. Remember that naming the alkyl group bonded directly to the oxygen follows the same IUPAC rules for naming alcohols. Please reconsider your answer.

Section reference: 2.7 and 2.6

Type: multiple choice question
Title: Chapter 02 Question 17
17) Which of the following compounds **A**-**E** is an anhydride?



A B C D E

a. A
Feedback: Incorrect. For anhydrides, the OH of a carboxylic acid is replaced by OCOR (two acyl groups (RCO) are linked together by a single oxygen atom). If the two carboxylic acids are the same, a symmetric anhydride results. Mixed anhydrides result from two different carboxylic acids.

Molecule **A** is an acyl halide. In order to be an anhydride, the molecule must contain a two RCO motifs linked by oxygen. Please reconsider your answer.

Section reference: 2.7
b. B
Feedback: Incorrect. For anhydrides, the OH of a carboxylic acid is replaced by OCOR (two acyl groups (RCO) are linked together by a single oxygen atom). If the two carboxylic acids are the same, a symmetric anhydride results. Mixed anhydrides result from two different carboxylic acids.

Molecule **B** is an ester. In order to be an anhydride, the molecule must contain a two RCO motifs linked by oxygen. Please reconsider your answer.

Section reference: 2.7
c. C
Feedback: Incorrect. For anhydrides, the OH of a carboxylic acid is replaced by OCOR (two acyl groups (RCO) are linked together by a single oxygen atom). If the two carboxylic acids are the same, a symmetric anhydride results. Mixed anhydrides result from two different carboxylic acids.

Molecule **C** is a ketone. In order to be an anhydride, the molecule must contain a two RCO motifs linked by oxygen. Please reconsider your answer.

Section reference: 2.7
***d.** D
Feedback: Correct.

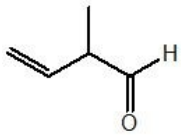
Molecule **D** is a mixed anhydride. Mixed anhydrides are prepared from two different carboxylic acids.

Section reference: 2.7
e. E
Feedback: Incorrect. For anhydrides, the OH of a carboxylic acid is replaced by OCOR (two acyl groups (RCO) are linked together by a single oxygen atom). If the two carboxylic acids are the same, a symmetric anhydride results. Mixed anhydrides result from two different carboxylic acids.

Molecule **E** is an amide. In order to be an anhydride, the molecule must contain a two RCO motifs linked by oxygen. Please reconsider your answer.

Section reference: 2.7

Type: multiple choice question
Title: Chapter 02 Question 18
18) Which of the following is the correct IUPAC name for this molecule:



a. 3-formyl-but-1-ene
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **four** carbon atoms. The major functional group is the RCHO group and the numbering of the chain starts from the carbonyl carbon.

This is incorrect. The CHO group has a higher priority than the C=C group. Please reconsider your answer.

(Formyl and vinyl are the trivial names for aldehyde and ethenyl groups, respectively. Although commonly used, they are not part of the IUPAC system.)

Section reference: 2.8
b. 3-methylbut-2-enal
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in

the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **four** carbon atoms. The major functional group is the RCHO group and the numbering of the chain starts from the carbonyl carbon.

This is incorrect because the numbering of the carbon chain is wrong – the methyl substituent and the C=C bond (C2-C3) are in the wrong positions. Please reconsider your answer.

Section reference: 2.8
***c.** 2-methylbut-3-enal
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **four** carbon atoms. The major functional group is the RCHO group and the numbering of the chain starts from the carbonyl carbon.

Well done! This is correct because the carbon chain is numbered so that the lowest possible numbers are used, and the substituents are listed in alphabetical order.

(Formyl and vinyl are the trivial names for aldehyde and ethenyl groups, respectively. Although commonly used, they are not part of the IUPAC system.)

Section reference: 2.8
d. 2-vinylpropanal
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **four** carbon atoms. The major functional group is the RCHO group and the numbering of the chain starts from the carbonyl carbon.

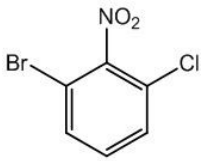
This is incorrect because the longest continuous carbon chain must have four atoms. Please reconsider your answer.

Section reference: 2.8
e. None of these
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **four** carbon atoms. The major functional group is the RCHO group and the numbering of the chain starts from the carbonyl carbon.

This is incorrect. Please reconsider your answer.

Section reference: 2.8

Type: multiple choice question
Title: Chapter 02 Question 19
19) The correct IUPAC name for the following molecule is:



a. 1-bromo-2-nitro-3-chlorobenzene
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this

molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring. The substituents are then numbered in alphabetical order.

This is incorrect. Remember that the substituents are listed in alphabetical order and not numerical order. Please reconsider your answer.

Section reference: 2.8
*__b.__ 1-bromo-3-chloro-2-nitrobenzene
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring. The substituents are then numbered in alphabetical order.

This correct. The bromine takes preference and is therefore numbered 1. Chlorine follows followed by the nitro group.

Section reference: 2.8
c. 1-chloro-2-nitro-3-bromobenzene
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring.

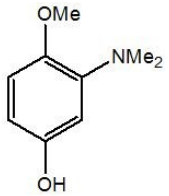
This is incorrect. Remember that the substituents are listed in alphabetical order and not numerical order. Please reconsider your answer.

Section reference: 2.8
d. 1-nitro-2-bromo-6-chlorobenzene
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring.

This is incorrect. Remember that the substituents are listed in alphabetical order and not numerical order. Please reconsider your answer.

Section reference: 2.8

Type: multiple choice question
Title: Chapter 02 Question 20
20) The correct IUPAC name for the following molecule is:



a. 1-Dimethylamino-2-methoxy-5-hydroxybenzene
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring.

The principal functional group is the OH group, and the numbering of the remaining substituents start from this position.

This is incorrect because this molecule is a phenol. Please reconsider your answer.

Section reference: 2.8
b. *N*,*N*-dimethyl-2-methoxy-5-hydroxylphenylamine
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring.

The principal functional group is the OH group, and the numbering of the remaining substituents start from this position.

This is incorrect because this molecule is a phenol. Please reconsider your answer.

Section reference: 2.8
c. *N*,*N*-dimethyl-2-methoxy-5-hydroxylaniline
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring.

This is incorrect. Aniline is a common name and is not part of IUPAC nomenclature. The preferred name for aniline is phenylamine. Please reconsider your answer.

Section reference: 2.8
***d.** 3-Dimethylamino-4-methoxyphenol
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring.

The principal functional group is the OH group, and the numbering of the remaining substituents start from this position.

Well done! This is correct because the substituents have the lowest possible numbers and are listed in alphabetical order.

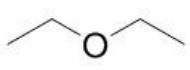
Section reference: 2.8
e. *O*-Methyl 2-dimethylamino-4-hydroxyphenol.
Feedback: The IUPAC name of a compound is made up of three parts. The longest continuous carbon chain is called the parent chain. The major functional group is identified in the suffix. Any substituents or minor functional groups are listed in the prefix. For this molecule, the longest continuous carbon chain has **six** carbon atoms and is a benzene ring.

The principal functional group is the OH group and **not** the OMe group, and the numbering of the remaining substituents start from this position.

This is incorrect because ethers are **not** named like esters. *O*-Methyl phenol is simply methoxybenzene. Please reconsider your answer.

Section reference: 2.8

Type: multiple choice question
Title: Chapter 02 Question 21
21) Identify the functional group in the following molecule:



a. ester
Feedback: This molecule is diethyl ether as the oxygen atom is bonded to two sp^3 carbon atoms.

This answer is incorrect. An ester group contains a carbonyl group (C=O) adjacent to an oxygen atom with a sp^3-hybridised carbon atoms bonded to either side of the group. The overall atom arrangement is –C(=O)O–.

Please reconsider your answer.

Section reference: 2.6.
***b.** ether
Feedback: This molecule is diethyl ether as the oxygen atom is bonded to two sp^3 carbon atoms.

This answer is correct. Well done!

Section reference: 2.6.
c. aldehyde
Feedback: This molecule is diethyl ether as the oxygen atom is bonded to two sp^3 carbon atoms.

This answer is incorrect. An aldehyde contains a carbonyl group (C=O) in which the carbon atom is bonded to one sp^3-hybridised carbon and one hydrogen atom.

Please reconsider your answer.

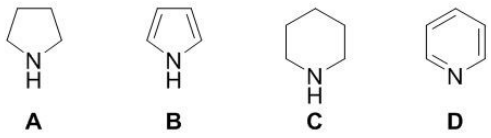
Section reference: 2.6.
d. acetal
Feedback: This molecule is diethyl ether as the oxygen atom is bonded to two sp^3 carbon atoms.

This answer is incorrect. An acetal group contains a central carbon atom bonded to two oxygen atoms, each of which is also bonded to an sp^3-hybridised carbon. The overall atom arrangement is $–ROCX_2OR$, where X = alkyl group or H.

Please reconsider your answer.

Section reference: 2.6.

Type: multiple choice question
Title: Chapter 02 Question 22
22) Which of these cyclic nitrogen-containing molecules is pyrrole?



A **B** **C** **D**

a. A
Feedback: Pyrrole is a 5-membered heterocyclic aromatic secondary amine.

This answer is incorrect. This aliphatic analogue **A** is pyrrolidine and is not aromatic.

Please reconsider your answer.

Section reference: 2.6.
***b.** B
Feedback: Pyrrole is a 5-membered heterocyclic aromatic secondary amine.

This answer is correct. Well done!

Section reference: 2.6.
c. C
Feedback: Pyrrole is a 5-membered heterocyclic aromatic secondary amine.

This answer is incorrect. This aliphatic 6-ring **C** is piperidine and is not aromatic.

Please reconsider your answer.

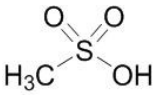
Section reference: 2.6.
d. D
Feedback: Pyrrole is a 5-membered heterocyclic aromatic secondary amine.

This answer is incorrect. This 6-membered analogue **D** is pyridine.

Please reconsider your answer.

Section reference: 2.6.

Type: multiple choice question
Title: Chapter 02 Question 23
23) Identify the sulfur-containing functional group in the following molecule:



a. sulfoxide
Feedback: This molecule is methanesulfonic acid and contains sulfur in +4 oxidation state.

This answer is incorrect. Sulfoxides are the sulfur-containing analogues of ketones, with the atom arrangement –RS(=O)R–.

Please reconsider your answer.

Section reference: 2.3.
b. sulfone
Feedback: This molecule is methanesulfonic acid and contains sulfur in +4 oxidation state.

This answer is incorrect. Sulfones have the atom arrangement $–RS(=O)_2R–$.

Please reconsider your answer.

Section reference: 2.3.
***c.** sulfonic acid
Feedback: This molecule is methanesulfonic acid and contains sulfur in +4 oxidation state.

This answer is correct. Well done! Methanesulfonic acid is sometimes used as an acid catalyst during synthesis as sulfonic acids are easily deprotonated to form salts.

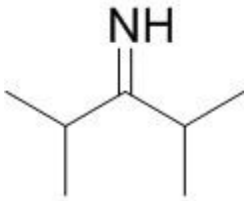
Section reference: 2.3.
d. sulfonate ester
Feedback: This molecule is methanesulfonic acid and contains sulfur in +4 oxidation state.

This answer is incorrect. Sulfonate esters have the atom arrangement $–RS(=O)_2OR–$.

Please reconsider your answer.

Section reference: 2.3.

Type: multiple choice question
Title: Chapter 02 Question 24
24) What is the IUPAC name for this structure?



a. *N*-methylpentan-3-imine
Feedback: This answer is incorrect. There are two methyl groups present within this molecules, so the prefix would be expected to be 'dimethyl'. The abbreviation '*N*-' in this name infers that the methyl substituent is bonded to the nitrogen atom.

Please reconsider your answer.

Section reference: Section 2.6.
b. 2,4-dimethylpentan-3-amine
Feedback: This answer is incorrect. The nitrogen-containing functional group is an imine (C=NH), not an amine ($C–NX_2$, X = R or H).

Please reconsider your answer.

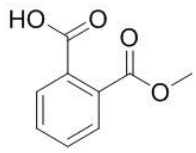
Section reference: 2.6.
c. *N,N*-dimethylpentan-3-amine
Feedback: This answer is incorrect. The nitrogen-containing functional group is an imine (C=NH), not an amine ($C–NX_2$, X = R or H). The abbreviation '*N,N*-' in this name infers that the methyl substituents are bonded to the nitrogen atom.

Please reconsider your answer.

Section reference: 2.6.
***d.** 2,4-dimethylpentan-3-imine
Feedback: This answer is correct. Well done! The parent chain contains five carbons (i.e. 'penta'), the positions of the two methyl substituents are listed appropriately and the nitrogen-containing functional group is an imine.

Section reference: 2.6.

Type: multiple choice question
Title: Chapter 02 Question 25
25) Below is the structure of aspirin. What is the IUPAC name for aspirin?



***a.** 2-acetoxybenzoic acid
Feedback: This answer is correct. Well done! The prefix 'acetoxy' is indicative of an $CH_3OC(O)–$ substituent, and this name has it correctly position on the carbon adjacent to the carboxylic acid group.

Section reference: 2.7 and 2.8.
b. methyl 5-carboxybenzoate
Feedback: This answer is incorrect. The structure generated would be the same as that from the name 5-acetoxybenzoic acid. This name generates a structure with the two functional groups located in the 1,3-poisitions relative to each other.

Please reconsider your answer.

Section reference: 2.7 and 2.8.
c. 2-methoxybenzoic acid
Feedback: This answer is incorrect. The prefix ‘methoxy’ is indicative of a CH_3O– substituent, so this name would generate an incorrect structure.

Please reconsider your answer.

Section reference: 2.7 and 2.8.
d. 5-acetoxybenzoic acid
Feedback: This answer is incorrect. The structure generated would be the same as that from the name methyl 5-carboxybenzoate. Here, the prefix ‘acetoxy’ is indicative of an $CH_3OC(O)$– substituent, although this name would generate a structure with the two functional groups located in the 1,3-poisitions relative to each other.

Please reconsider your answer.

Section reference: 2.7 and 2.8.