

IB Chemistry HL - S3.2

Functional groups: Classification of organic compounds

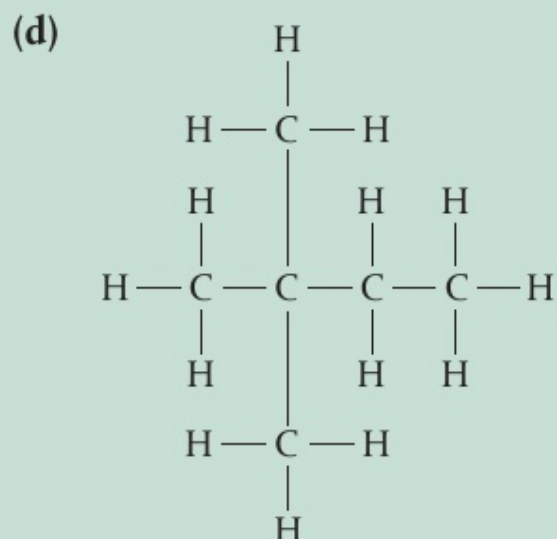
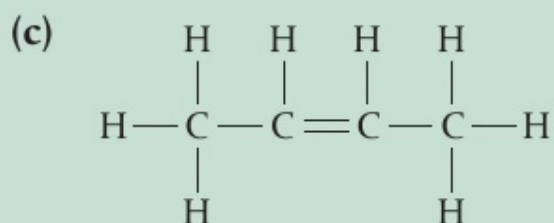
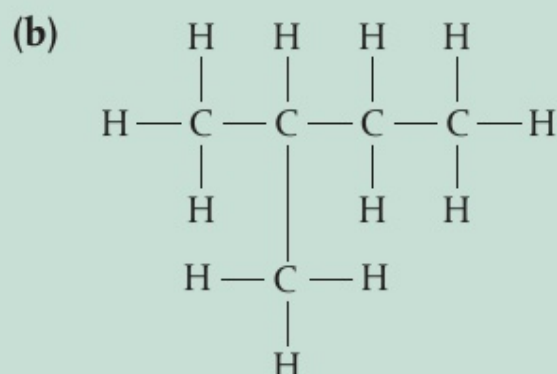
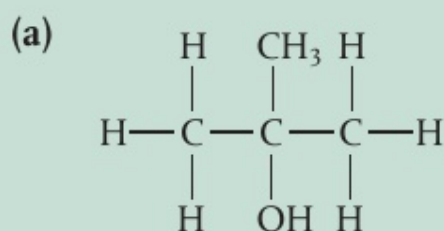
Exercises + Practice questions

Official answers appended at the end

further increases the molecular variety of organic compounds that are possible.

Exercise

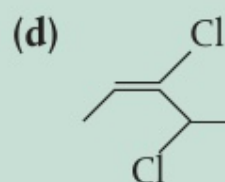
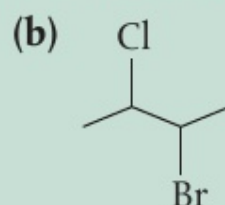
Q1. Convert the following full structural formulas to condensed structural formulas.



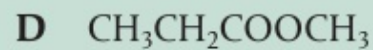
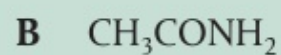
Q2. Convert the following condensed structural formulas to skeletal formulas.



Q3. Convert the following skeletal formulas to condensed structural formulas.



Q5. Which of the following is an amide?



Q6. Which of the following is an ester?



Exercise

- Q7.** Which of the following is a member of the same homologous series as butanoic acid, $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$?
- A** $\text{CH}_3\text{CH}_2\text{COOCH}_3$ **B** $\text{CH}_3\text{CH}_2\text{CH}_3$
C $\text{CH}_3\text{OCH}_2\text{CH}_3$ **D** CH_3COOH
- Q8.** Which of the following pairs of compounds belong to the same homologous series?
- I. $\text{CH}_3\text{CH}_2\text{Cl}$, $\text{CH}_2\text{ClCH}_2\text{CH}_2\text{CH}_3$
II. $\text{CH}_3\text{CH}_2\text{Br}$, $\text{CH}_2\text{ClCH}_2\text{CH}_3$
III. $\text{CH}_3\text{CH}_2\text{Br}$, $\text{CH}_2\text{BrCH}_2\text{Br}$
- A** I only **B** I and III **C** III only **D** I, II and III
- Q9.** Which option ranks the compounds in order of increasing boiling point?
- A** $\text{CH}_3\text{CH}_2\text{COOH} < \text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_2\text{F}$
B $\text{CH}_3\text{CH}_3 < \text{CH}_3\text{COOH} < \text{CH}_3\text{CH}_2\text{COOH}$
C $\text{CH}_3\text{COOH} < \text{CH}_3\text{COOCH}_3 < \text{CH}_3\text{COCH}_3$
- Q10.** Rank the following compounds in order of increasing volatility and provide an explanation for your answer.
- bromopropane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$); propanoic acid ($\text{CH}_3\text{CH}_2\text{COOH}$);
propane ($\text{CH}_3\text{CH}_2\text{CH}_3$)
- Q11.** Predict how the aqueous solubility of the alcohols changes with increasing chain length and provide a reason for your answer.

Q13. Give the structural formulas for the following molecules (condensed form is acceptable).

(a) methanoic acid

(b) hex-3-yne

(c) 3-ethylpentanal

(d) 3-methylbutan-2-one

(e) ethoxypropane

(f) 2-bromopropan-1-ol

Q14. A student draws the structure of what they believe is 2-ethylpentane. Draw the structure that is consistent with this name and then determine the correct IUPAC name for this compound.

Exercise

Q15. Which of the following pairs of compounds are structural isomers?

I. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$, $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_3$

II. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$, $\text{CH}_3\text{CH}_2\text{CH}_3$

III. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$, $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$,

A I only **B** I, II and III **C** III only **D** I and III

Q16. Pentyne, C_5H_8 , contains a triple bond.

(a) Draw two positional isomers of pentyne.

(b) Draw a third structural isomer of pentyne that is not a positional isomer of the two isomers you drew for part (a).

Q17. Which of the following compounds contains a secondary carbon.

A $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

B $\text{CH}_3\text{CHF}(\text{CH}_3)\text{CH}_2\text{CH}_3$

C $\text{CH}_2\text{BrCH}_2\text{CH}_2\text{CH}_2\text{OH}$

D $\text{CH}_3\text{CH}_2\text{CHClCH}_3$