



# Fractional distillation of crude oil

Answer all the questions then check your answers

1. True or False?

- a. T/F: Crude oil is a pure substance.
- b. T/F: Fractional distillation separates crude oil based on differences in boiling points.
- c. T/F: The fractions with the lowest boiling points are collected at the bottom of the fractionating column.

2. Fill in the gaps to complete the sentences below:

- a. Crude oil is a mixture of \_\_\_\_\_.
- b. The process of separating crude oil into fractions is called \_\_\_\_\_.
- c. The fractions with the \_\_\_\_\_ boiling points condense at the top of the column.

3. Match the fraction with its main use:

Refinery gas

A. Fuel for ships and power stations

Gasoline

B. Road surfacing and roofing

Kerosene

C. Jet fuel and paraffin for heating

Diesel oil

D. Fuel for cars

Bitumen

E. Bottled gas for heating and cooking

4. Why is it necessary to separate crude oil into fractions?

5. Explain why different fractions of crude oil have different boiling points.

6. Describe the process of fractional distillation, including how the temperature changes within the fractionating column.

7. List four fractions obtained from crude oil and state a use for each.

8. Explain how the properties of hydrocarbons change as you move from the top to the bottom of the fractionating column.

9. Which of the following fractions has the highest boiling point?

a) Refinery gas

b) Gasoline

c) Kerosene

d) Bitumen

## Answers

1. True or False?

- a. T/F: Crude oil is a pure substance. *False, crude oil is a mixture of thousands of different compounds, mainly hydrocarbons*
- b. T/F: Fractional distillation separates crude oil based on differences in boiling points.

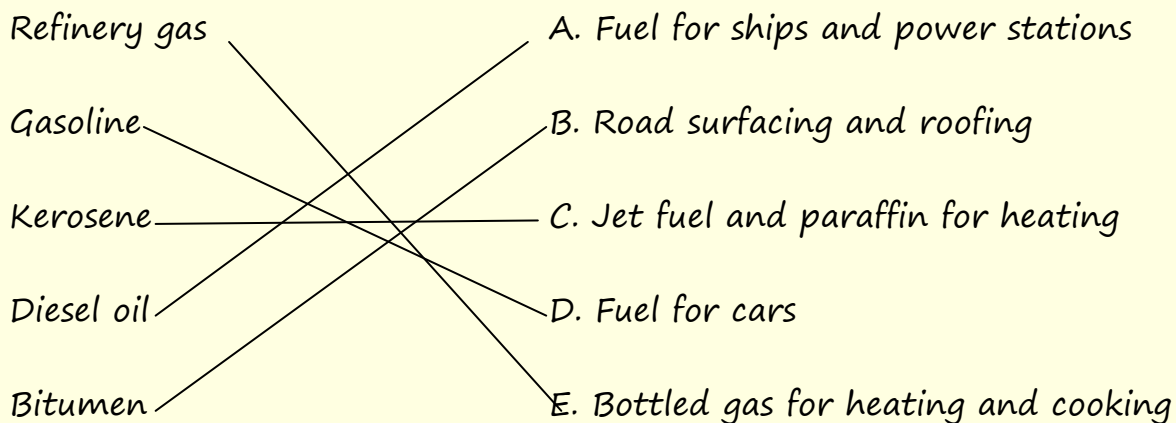
*True*

- c. T/F: The fractions with the lowest boiling points are collected at the bottom of the fractionating column. *False, the most volatile fractions are collected at the top of the fractionating column. The boiling points of the fractions decrease as you ascend the fractionating column.*

2. Fill in the gaps to complete the sentences below:

- a. Crude oil is a mixture of *hydrocarbons*.
- b. The process of separating crude oil into fractions is called *fractional distillation*.
- c. The fractions with the lowest boiling points condense at the top of the column.

3. Match the fraction with its main use:



4. Why is it necessary to separate crude oil into fractions?

Crude oil is a mixture of hydrocarbons which have different uses. Separation allows us to obtain useful products tailored to specific needs.

5. Explain why different fractions of crude oil have different boiling points.

Different fractions contain hydrocarbons with varying chain lengths. Longer chains have stronger intermolecular forces, leading to higher boiling points.

6. Describe the process of fractional distillation, including how the temperature changes within the fractionating column.

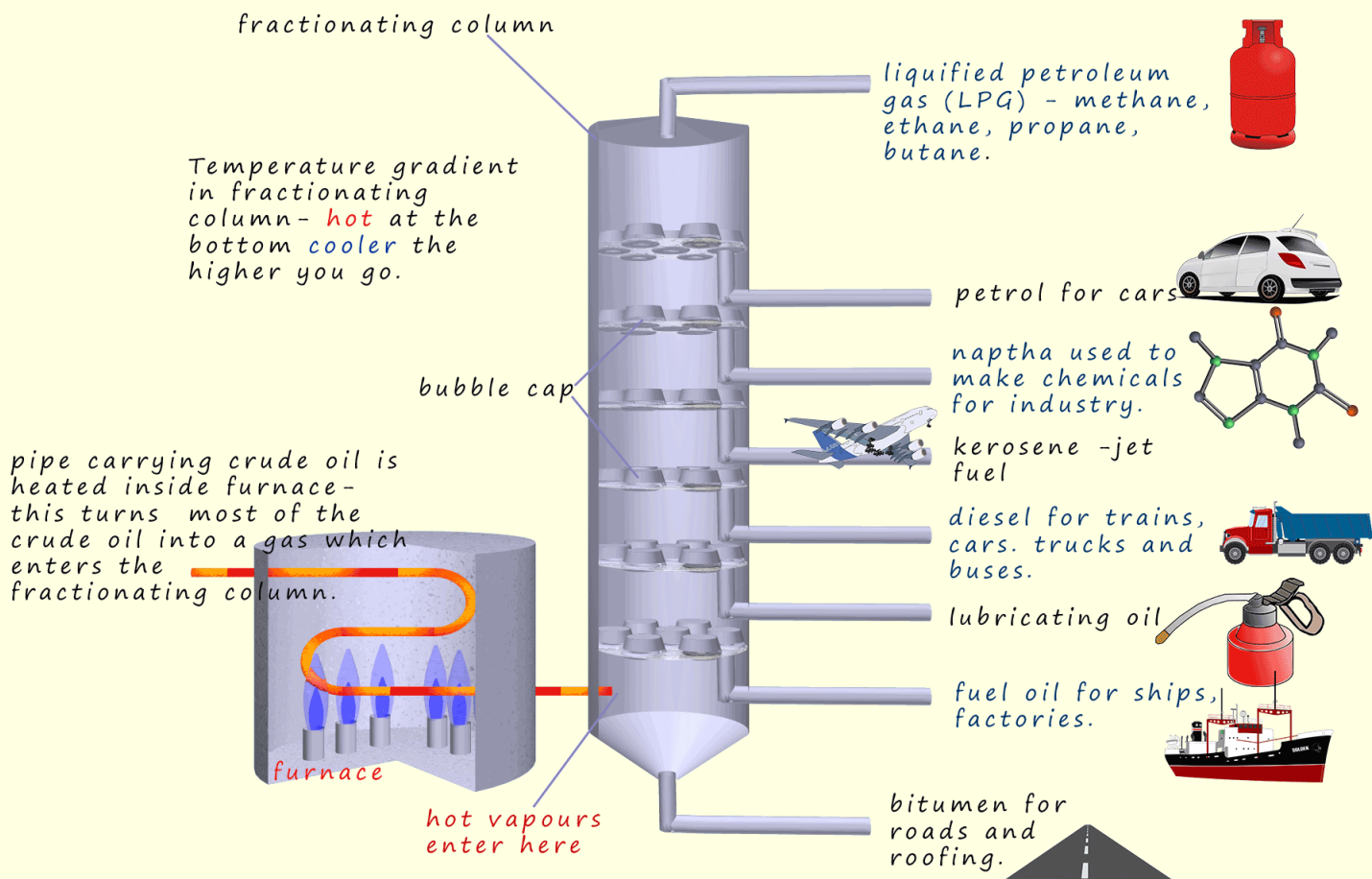
The crude oil passes through a hot pipe in a furnace, this vaporises most of the hydrocarbon molecules present in the crude oil.

The hot vapours then enter the fractionating column. This is a tall narrow cylinder with a temperature gradient; it gets cooler the higher you go up the column.

The hot vapours rise up inside the fractionating column. When the hot vapours meet a bubble cap cooler than its boiling point then they will condense and are collected

7. List four fractions obtained from crude oil and state a use for each.

The image show the various fractions and gives uses for these fractions.



8. Explain how the properties of hydrocarbons change as you move from the top to the bottom of the fractionating column.

As you move down the column:

- Boiling point increases
- Viscosity increases
- Flammability decreases
- Colour darkens

9. Which of the following fractions has the highest boiling point?

a) Refinery gas

b) Gasoline

c) Kerosene

d) Bitumen