

## Whitehaven High – Grade Improvement Assignment – Advanced Placement Chemistry

Please send completed assignment to [lucasjn@scsk12.org](mailto:lucasjn@scsk12.org) by 11:59 pm on May 11, 2020.

Student Name: \_\_\_\_\_ Date: \_\_\_\_\_

Petroleum, or crude oil, is refined by separating it into different by-products. This process is called fractional distillation, whereby the crude oil is heated and each different product is distilled, or drawn off, at different stages. Each product is distilled at certain temperature ranges and collected in separate receivers. Petroleum refining is carried out in a boiler and a fractionating tower. The crude oil is super-heated in the boiler to about  $600^{\circ}\text{C}$ , which vaporizes the crude oil. The vapors then rise in the tower to certain levels where they cool and condense, according to their chemical structure. When the vapor reaches a height in the tower where the temperature in the column is equal to the boiling point of the substance, the vapor turns into liquid (condenses), collects in troughs, and flows into various tanks for storage, as shown in Figure 1. Table 1 below summarizes the characteristics of the by-products obtained from the fractional distillation of petroleum.

| Table 1                |   |
|------------------------|---|
| Petroleum by-product   | Condensation temperature ( $^{\circ}\text{C}$ ) |
| Petroleum gas          | 20–40   |
| Gasoline               | 40–70   |
| Kerosene               | 100–120   |
| Gas oil                | 120–200   |
| Lubricating oil stocks | 200–300   |
| Residue                | 600   |

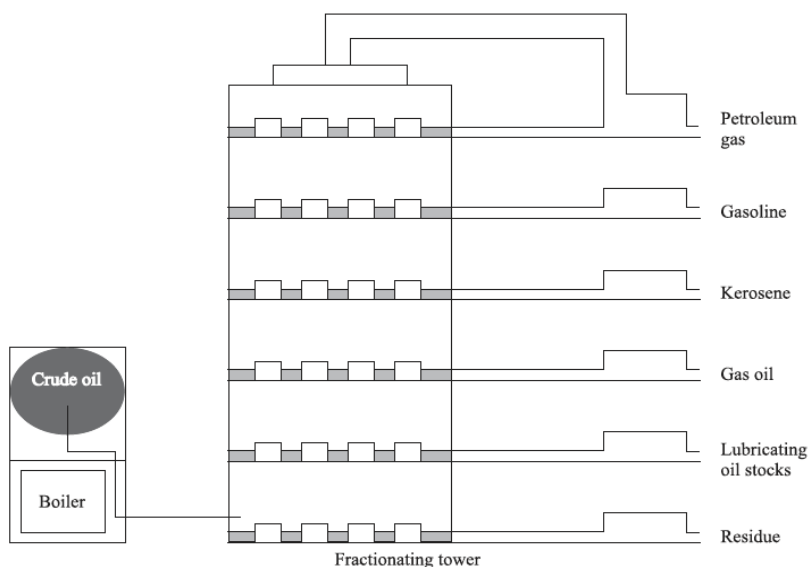


Figure 1

1. According to the passage, the temperature at which gasoline condenses is most likely:
  - A. less than  $0^{\circ}\text{C}$ .
  - B. less than  $40^{\circ}\text{C}$ .
  - C. greater than  $20^{\circ}\text{C}$ .
  - D. greater than  $70^{\circ}\text{C}$ .
2. According to the passage, which by-product formed in the fractionating tower condenses first?
  - A. Petroleum gas
  - B. Kerosene
  - C. Gas oil
  - D. Residue

## Whitehaven High – Grade Improvement Assignment – Advanced Placement Chemistry

Please send completed assignment to [lucasjn@scsk12.org](mailto:lucasjn@scsk12.org) by 11:59 pm on May 11, 2020.

Student Name: \_\_\_\_\_ Date: \_\_\_\_\_

3. According to Figure 1, fractional distillation uses which of the following as a raw material?

- A. Gasoline
- B. Residue
- C. Crude oil
- D. Gas oil

4. Given that naptha, another by-product of petroleum distillation, has a condensation point of approximately 90°C, between which two petroleum by-products would this substance be found in a fractionating tower?

- A. Gasoline and kerosene
- B. Lubricating oil stocks and gas oil
- C. Kerosene and gas oil
- D. Residue and lubricating oil stocks

5. According to the passage, at what temperature is most of the crude oil vaporized?

- A. 600°C
- B. 300°C
- C. 100°C
- D. 20°C