Science Mastery

Section A

1. Explain why crude oil is described as a mixture.

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2. Choose the fraction of crude oil that has the lowest boiling point.

   Tick (✓) **one** box.

   A. Bitumen ☐

   B. Petrol ☐

   C. Liquefied petroleum gases ☐

3. Choose the option that correctly describes the pattern of viscosity in the fractions of crude oil.

   Tick (✓) **one** box.

   A. Viscosity increases as the size of molecules in a fraction increase ☐

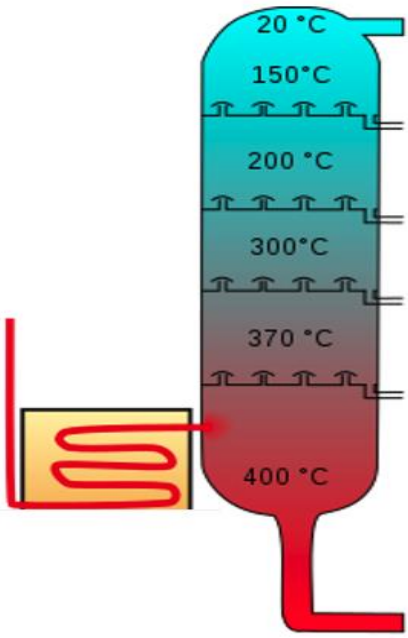
   B. Viscosity decreases as the size of molecules in a fraction increase ☐

   C. Viscosity increases as the size of molecules in a fraction decrease ☐

4. The image below shows a fractionating column.

   a. Add labels to the fractionating column to show where it is hottest and coolest.

   b. Add labels to the fractionating column to name each of the fractions collected at each condenser.



Section B

5. Fractional distillation is used to separate crude oil.
   a. Describe how fractional distillation separates crude oil.

   b. Describe the relationship between the size of molecules in a fraction and boiling point.

   c. Explain the relationship between the size of molecules in a fraction and boiling point.

6. The table below shows the boiling points of three alkanes.

Alkane	**Boiling point (°C)**
Pentane (C_5H_{12})	36
Decane ($C_{10}H_{22}$)	174
Pentadecane ($C_{15}H_{22}$)	271

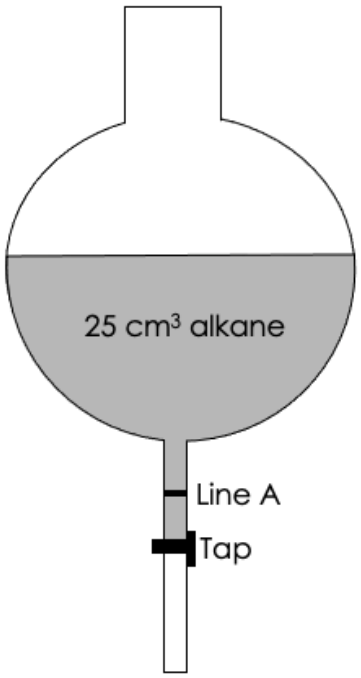
a. What is an alkane?

b. What is the general formula for alkanes?

c. Determine which state of matter pentane would be at room temperature (22 °C).

A student used the following experiment to investigate a property of these alkanes:

- Add 25 cm^3 of pentane to a separating flask (as shown)
- Start the timer as the tap is opened
- Record the time taken for the level of pentane to reach line A
- Repeat for decane and pentadecane



d. What property is the student investigating with this experiment?

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e. The student measured 5.2 seconds for pentane to reach line A.

Predict how the time taken for decane and pentadecane would compare.

Explain your answer.

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Section C

7. Fractional distillation is used to separate crude oil into fractions, but there are many other uses of distillation.

   a. Describe how distillation is used in desalination.
   b. Give a disadvantage of using distillation for desalination.
   c. Give the name for water that is safe to drink.
   d. Explain the difference between water that is safe to drink and distilled water.
   e. Explain whether distilled water would conduct electricity.
   f. Draw a dot and cross diagram to show the bonding in water.
   g. Calculate the percentage by mass of oxygen in water.