Answer all the questions below then check your answers

1. True or False?

a. T/F: Complete combustion of alkanes requires a limited supply of oxygen.

b. T/F: Incomplete combustion produces carbon monoxide and/or carbon

c. T/F: Water is a product of both complete and incomplete combustion.

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

The two main products of complete combustion are _____ and _____.

A yellow, smoky flame is indicative of _____ combustion.

Carbon monoxide is a _____ gas produced during incomplete combustion.

3. Match the type of combustion with its corresponding flame colour:

Complete combustion	A. Yellow/Orange
Incomplete combustion	B. Blue

4. Match the substance with its environmental impact:

Carbon dioxide	A. Poisonous to humans
Carbon monoxide	B. Contributes to global warming
Soot (carbon)	C. Respiratory problems and visual pollution

5. A Bunsen burner flame is yellow when the air hole is closed. Explain why and how you would adjust the flame to ensure complete combustion.

6. What are the two main products of the complete combustion of an alkane?

7. What type of flame indicates incomplete combustion?

8. Name a chemical used to test for the presence of water.

9. Name a chemical used to test for carbon dioxide.

10. Write the balanced chemical equation for the complete combustion of methane (CH_4).

b. Write the balanced chemical equation for the complete combustion of propane (C_3H_8).

c. Write balanced chemical equations for the incomplete combustion of propane (C_3H_8), producing:

a) Carbon monoxide

b) Carbon (soot)

11. Explain why incomplete combustion is less efficient than complete combustion.

12. A student burns the hydrocarbon ethane (C_2H_6) and observes a yellow flame. Explain what this observation indicates and write a possible chemical equation for the reaction.

13. Compare and contrast complete and incomplete combustion in terms of their products, flame appearance, and energy release.

14. Discuss the environmental and health impacts of incomplete combustion. Suggest measures that can be taken to minimise these impacts.

Answers

1a. T/F: Complete combustion of alkanes requires a limited supply of oxygen.

False, the incomplete combustion requires a limited supply of air/oxygen.

b. T/F: Incomplete combustion produces carbon monoxide and/or carbon (soot).

True

c. T/F: Water is a product of both complete and incomplete combustion.

True

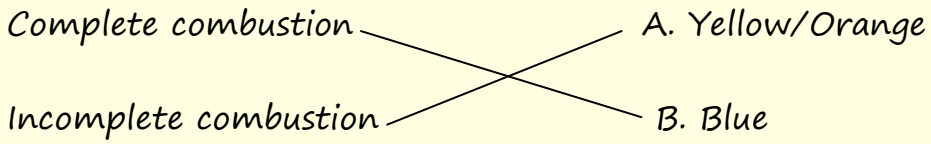
2. Fill in the gaps to complete the sentences below:

The two main products of complete combustion are water and carbon dioxide.

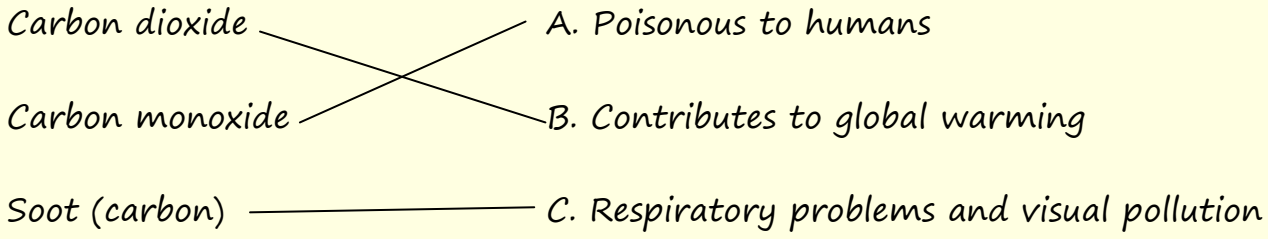
A yellow, smoky flame is indicative of incomplete combustion.

Carbon monoxide is a toxic or poisonous gas produced during incomplete combustion.

3. Match the type of combustion with its corresponding flame colour:



4. Match the substance with its environmental impact:



5. A Bunsen burner flame is yellow when the air hole is closed. Explain why and how you would adjust the flame to ensure complete combustion.

   The yellow flame is due to incomplete combustion caused by a lack of oxygen. Opening the air hole allows more oxygen in, resulting in a blue flame and complete combustion.

6. What are the two main products of the complete combustion of an alkane?

   Carbon dioxide and water

7. What type of flame indicates incomplete combustion?

   Yellow/orange, sooty flame

8. Name a chemical used to test for the presence of water.

   Colourless anhydrous copper (II) sulfate turns blue on addition of water or blue cobalt chloride paper turns pink on addition of water.

9. Name a chemical used to test for carbon dioxide.

   Limewater (calcium hydroxide solution) turns cloudy/milky

10. Write the balanced chemical equation for the complete combustion of methane (CH_4).

    $$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

b. Write the balanced chemical equation for the complete combustion of propane (C_3H_8).

   $$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O.$$

c. Write balanced chemical equations for the incomplete combustion of propane (C_3H_8), producing:

a) Carbon monoxide

b) Carbon (soot)

a. $C_3H_8 + 3.5O_2 \rightarrow 3CO + 4H_2O$

b. $C_3H_8 + 2O_2 \rightarrow 3C + 4H_2O$

11. Explain why incomplete combustion is less efficient than complete combustion.

Incomplete combustion releases less energy and produces potentially harmful products like carbon monoxide and soot.

12. A student burns the hydrocarbon ethane (C_2H_6) and observes a yellow flame. Explain what this observation indicates and write a possible chemical equation for the reaction.

The yellow flame indicates incomplete combustion. A possible equation for the incomplete combustion of ethane (C_2H_6) is:

$$2C_2H_6 + 5O_2 \rightarrow 4CO + 6H_2O$$

13. Compare and contrast complete and incomplete combustion in terms of their products, flame appearance, and energy release.

Products: Complete combustion produces carbon dioxide and water, while incomplete combustion produces carbon monoxide, carbon (soot), and water.

Flame Appearance: Complete combustion has a clean, blue flame. Incomplete combustion has a yellow/orange, sooty flame.

Energy Release: Complete combustion releases more energy than incomplete combustion.

14. Discuss the environmental and health impacts of incomplete combustion. Suggest measures that can be taken to minimise these impacts.

Environmental Impacts: Soot contributes to air pollution and global warming. Carbon monoxide is a greenhouse gas.

Health Impacts: Carbon monoxide is poisonous, reducing oxygen delivery in the body. Soot particles can cause respiratory problems.

Mitigation Measures: Ensure sufficient air supply for complete combustion. Use cleaner fuels. Regularly maintain appliances and engines.