



A-Level Chemistry

Alkanes

(Multiple Choice)

Question Paper

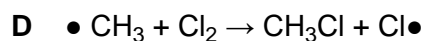
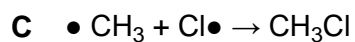
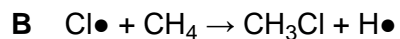
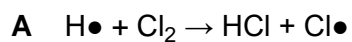
Time available: 31 minutes

Marks available: 27 marks

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1.

Which is a propagation step in the chlorination of methane?



(Total 1 mark)

2.

Which statement is **not** correct about the pollutant sulfur dioxide?

A It can be removed from car exhaust gases by a catalytic converter.

B It can be removed from power station flue gases by reaction with calcium oxide.

C It can cause respiratory problems.

D It can cause acid rain.

(Total 1 mark)

3.

Which statement is correct about thermal cracking?

A A pressure between 100 and 200 kPa is used.

B Aromatic hydrocarbons are the major products.

C C–C bonds are broken.

D Zeolite catalysts are used.

(Total 1 mark)

4. An excess of methane reacts with chlorine in the presence of ultraviolet radiation.

What are the main products of this reaction?

- A CCl_4 and H_2
- B CCl_4 and HCl
- C CH_3Cl and H_2
- D CH_3Cl and HCl

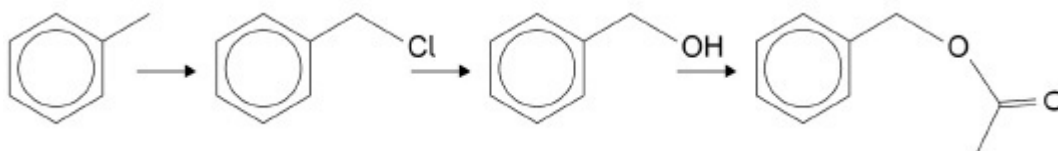
(Total 1 mark)

5. Which equation represents a propagation step?

- A $\bullet\text{CH}_2\text{Cl} + \text{Cl}\bullet \rightarrow \text{CH}_2\text{Cl}_2$
- B $\bullet\text{CH}_3 + \bullet\text{CH}_3 \rightarrow \text{C}_2\text{H}_6$
- C $\text{Cl}_2 \rightarrow \text{Cl}\bullet + \text{Cl}\bullet$
- D $\text{CH}_3\text{Cl} + \text{Cl}\bullet \rightarrow \bullet\text{CH}_2\text{Cl} + \text{HCl}$

(Total 1 mark)

6. A possible synthesis of a compound found in jasmine flower oil is shown.



Which mechanism is not used in this synthesis?

- A Electrophilic substitution
- B Nucleophilic substitution
- C Free-radical substitution
- D Nucleophilic addition-elimination

(Total 1 mark)

7.

Which statement is correct about the fractional distillation of crude oil?

A A zeolite catalyst is used.

B Each fraction contains a mixture of hydrocarbons.

C Gaseous fractions are formed by breaking covalent bonds.

D The fractionating column is hottest at the top.

(Total 1 mark)

8.

Which equation represents a termination step?

A $\text{CH}_3\text{CH}_2\text{CH}_3 + \text{Br}\cdot \rightarrow \text{CH}_3\dot{\text{C}}\text{HCH}_3 + \text{HBr}$ B $\text{ClO}\cdot + \text{O}_3 \rightarrow \text{Cl}\cdot + 2\text{O}_2$ C $\text{RO}\cdot + \text{CH}_2=\text{CH}_2 \rightarrow \text{ROCH}_2\dot{\text{C}}\text{H}_2$ D $\text{CH}_3\dot{\text{C}}\text{FCl} + \text{Cl}\cdot \rightarrow \text{CH}_3\text{CFCl}_2$

(Total 1 mark)

9.

Which equation is a propagation step in the conversion of trichloromethane into tetrachloromethane by reaction with chlorine in the presence of ultraviolet light?

A $\text{CHCl}_3 + \text{Cl}_2 \rightarrow \text{CCl}_4 + \text{HCl}$ B $\bullet\text{CCl}_3 + \bullet\text{Cl} \rightarrow \text{CCl}_4$ C $\text{CHCl}_3 + \bullet\text{Cl} \rightarrow \text{CCl}_4 + \bullet\text{H}$ D $\bullet\text{CCl}_3 + \text{Cl}_2 \rightarrow \text{CCl}_4 + \bullet\text{Cl}$

(Total 1 mark)

10.

The table shows possible conditions and products for the cracking of alkanes.

Which row is correct?

	Type of cracking	Conditions	Products	
A	Thermal	High pressure High temperature	Mainly alkanes	<input type="checkbox"/>
B	Thermal	Slight pressure High temperature	Mainly alkenes	<input type="checkbox"/>
C	Catalytic	Slight pressure High temperature	Mainly branched alkanes and aromatics	<input type="checkbox"/>
D	Catalytic	High pressure High temperature	Mainly branched alkanes and aromatics	<input type="checkbox"/>

(Total 1 mark)

11.

Which of the following mechanisms does **not** occur in reactions of bromoethane?

- A** Electrophilic addition
- B** Elimination
- C** Nucleophilic substitution
- D** Radical substitution

(Total 1 mark)

12.

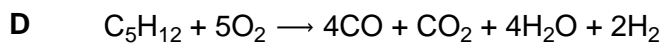
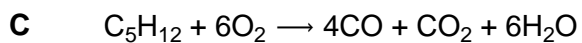
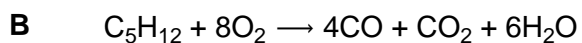
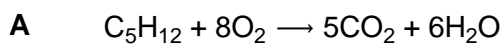
Which catalyst is used in the catalytic cracking of alkanes?

- A** Concentrated phosphoric acid
- B** Iron
- C** Nickel
- D** Zeolite

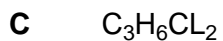
(Total 1 mark)

13.

Which correctly represents an incomplete combustion of pentane?

**(Total 1 mark)****14.**

Which species is produced in a propagation step during the reaction of propane with an excess of chlorine in the presence of UV light?

**(Total 1 mark)****15.**Which of these substances does **not** contribute to the greenhouse effect?**A** Unburned hydrocarbons.**B** Carbon dioxide.**C** Water vapour.**D** Nitrogen.**(Total 1 mark)**

16. Which molecule is **not** produced when ethane reacts with bromine in the presence of ultraviolet light?

A $C_2H_4Br_2$

B HBr

C H_2

D C_4H_{10}

(Total 1 mark)

17. Sulfur dioxide (SO_2) is produced when some fossil fuels are burned.

Which of the following statements is true?

A Sulfur dioxide can be removed from waste gases in a power station by an acid-base reaction with calcium oxide.

B Sulfur dioxide is insoluble in water.

C Sulfur dioxide is a basic oxide.

D Sulfur dioxide is an ionic compound.

(Total 1 mark)

18. Tetradecane ($C_{14}H_{30}$) is an alkane found in crude oil. When tetradecane is heated to a high temperature, one molecule of tetradecane decomposes to form one molecule of hexane and three more molecules.

Which of the following could represent this reaction?

A $C_{14}H_{30} \rightarrow C_6H_{14} + C_4H_8 + 2C_2H_4$

B $C_{14}H_{30} \rightarrow C_6H_{14} + C_6H_{12} + C_2H_4$

C $C_{14}H_{30} \rightarrow C_5H_{12} + 3C_3H_6$

D $C_{14}H_{30} \rightarrow C_6H_{14} + C_2H_6 + 2C_3H_6$

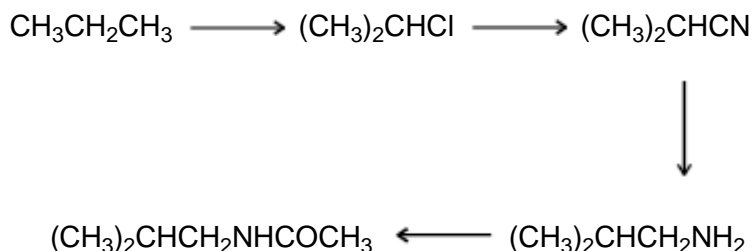
(Total 1 mark)

19. The percentage by mass of carbon is 83.3% in

- A propane.
- B butane.
- C pentane.
- D hexane.

(Total 1 mark)

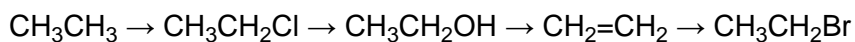
20. Which one of the following types of reaction mechanism is **not** involved in the above sequence?



- A free-radical substitution
- B nucleophilic substitution
- C elimination
- D nucleophilic addition-elimination

(Total 1 mark)

21. Which one of the following mechanisms is **not** involved in the reaction sequence below?



- A electrophilic addition
- B electrophilic substitution
- C nucleophilic substitution
- D free-radical substitution

(Total 1 mark)

22. An alkane contains 30 hydrogen atoms per molecule. Its empirical formula is

- A C_6H_{15}
- B C_7H_{15}
- C $\text{C}_{14}\text{H}_{30}$
- D $\text{C}_{15}\text{H}_{30}$

(Total 1 mark)

23.

Which one of the following is least likely to occur in the reaction between methane and chlorine?

- A $\text{CH}_4 + \text{Cl}\cdot \rightarrow \text{CH}_3\cdot + \text{HCl}$
B $\text{CH}_3\cdot + \text{HCl} \rightarrow \text{CH}_3\text{Cl} + \text{H}\cdot$
C $\text{CH}_3\cdot + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{Cl}\cdot$
D $\text{CH}_3\text{Cl} + \text{Cl}\cdot \rightarrow \text{CH}_2\text{Cl}\cdot + \text{HCl}$

(Total 1 mark)

24.

Which one of the following reactions involves nucleophilic addition?

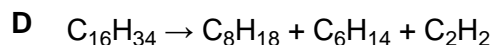
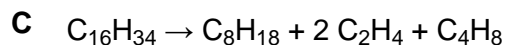
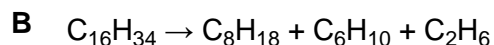
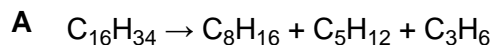
- A $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HBr} \rightarrow \text{CH}_3\text{CHBrCH}_3$
B $\text{CH}_3\text{CH}_2\text{CH}_3 + \text{Cl}_2 \rightarrow \text{CH}_3\text{CHClCH}_3 + \text{HCl}$
C $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{NaOH} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{NaBr}$
D $\text{CH}_3\text{CH}_2\text{CHO} + \text{HCN} \rightarrow \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CN}$

(Total 1 mark)

25.

When hexadecane ($\text{C}_{16}\text{H}_{34}$) is heated to a high temperature, one molecule of hexadecane decomposes to form an alkane containing eight carbon atoms and two different unsaturated compounds.

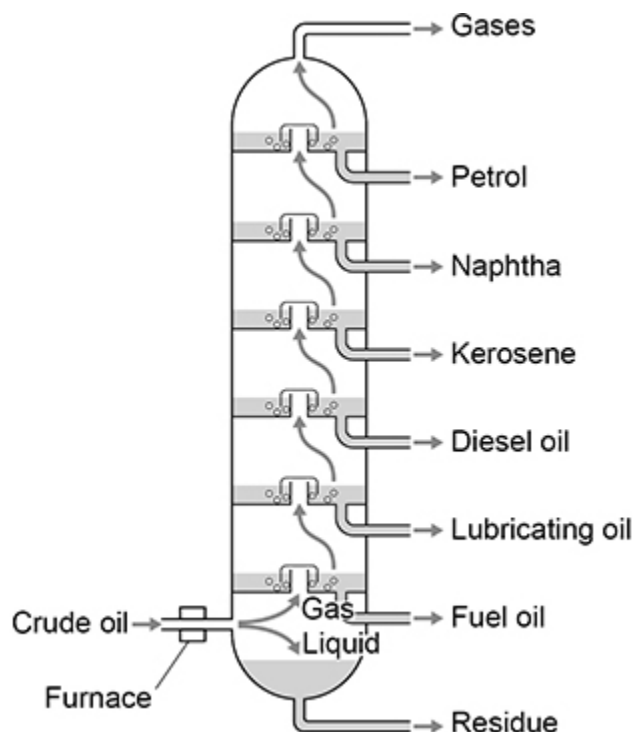
Which equation could represent this reaction?



(Total 1 mark)

26.

The diagram shows a fractionating column used in the industrial fractional distillation of crude oil.



Which statement is correct?

- A The most viscous product is fuel oil.
- B The boiling point of naphtha is higher than diesel oil.
- C Molecules in diesel oil are held together by hydrogen bonds.
- D Kerosene is a mixture of compounds.

(Total 1 mark)

27.

2-Bromopropane reacts with bromine to form 2,2-dibromopropane.

What is the name of the mechanism of this reaction?

- A Electrophilic addition
- B Elimination
- C Free-radical substitution
- D Nucleophilic substitution

(Total 1 mark)