

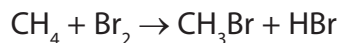
1 Which of the following types of radiation can directly result in bond breaking?

- A Infrared
- B Microwave
- C Radio wave
- D Ultraviolet

(Total for Question = 1 mark)

2 This question is about the reaction of methane with bromine in sunlight.

(1)

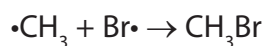


(a) This reaction is best described as

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

(b) One of the steps in the mechanism of this reaction is

(1)



This step is

- A initiation.
- B propagation.
- C termination.
- D reduction.

(c) This reaction produces a mixture of products.

Which of the following is most likely to form, as well as bromomethane?

(1)

- A ethane
- B propane
- C butane
- D pentane

(d) When human skin is overexposed to sunlight, it is likely to lead to skin cancer.

What is the radiation in sunlight that leads to skin cancer?

(1)

- A microwaves
- B infrared
- C visible light
- D ultraviolet

(Total for Question = 4 marks)

3 Cracking crude oil

- A** separates the mixture into pure compounds.
- B** separates the mixture into a number of fractions.
- C** separates saturated compounds from unsaturated ones.
- D** decreases the average number of carbon atoms per molecule.

(Total for Question = 1 mark)

4 The meaning of homolytic fission is

- A** bond-breaking to form two free radicals.
- B** bond-making to form two free radicals.
- C** bond-breaking to form a cation and an anion.
- D** bond-making to form a cation and an anion.

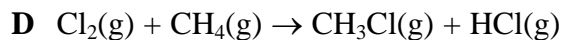
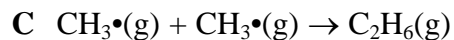
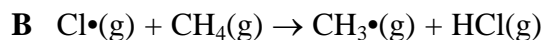
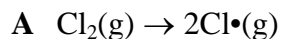
(Total for Question = 1 mark)

5 When methane reacts with chlorine, a mixture of products forms. Which product provides the strongest evidence for a free radical mechanism?

- A** C_2H_6
- B** CH_3Cl
- C** HCl
- D** $CHCl_3$

(Total for Question = 1 mark)

6 The equations below show some of the processes that occur when methane and chlorine react.



(a) Which equation shows a propagation step?

(1)

A

B

C

D

(b) Which equation shows an initiation step?

(1)

A

B

C

D

(c) Which equation shows a termination step?

(1)

A

B

C

D

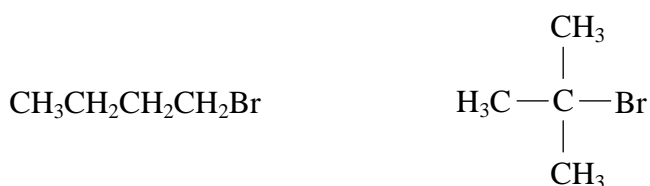
(Total for Question = 3 marks)

7 Consider the following compounds, **P**, **Q**, **R** and **S**.



Compound P

Compound Q



Compound R

Compound S

The boiling temperatures of compounds P, Q, R and S **increase** in the order

- A** P Q R S
- B** R S P Q
- C** Q S P R
- D** Q P S R

(Total for Question = 1 mark)

8 Which of the following substances, obtained from the fractional distillation of crude oil, has the lowest boiling temperature?

- A** refinery gas
- B** kerosene
- C** diesel oil
- D** lubricating oil

(Total for Question = 1 mark)

9 Which of the following is the correct order for the processes used to obtain petrol from petroleum (crude oil)?

- A Petroleum → fractional distillation → reforming → cracking → petrol.
- B Petroleum → reforming → fractional distillation → cracking → petrol.
- C Petroleum → cracking → reforming → fractional distillation → petrol.
- D Petroleum → fractional distillation → cracking → reforming → petrol.

(Total for Question 1 mark)

10 An organic compound reacts with chlorine in the presence of ultraviolet light. The relative molecular mass of the product has increased by 34.5 compared with the original compound. What is the reaction mechanism?

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

(Total for Question 1 mark)

11 UV light is useful in initiating some reactions because it

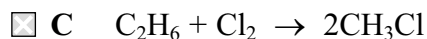
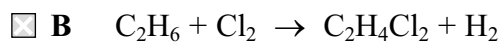
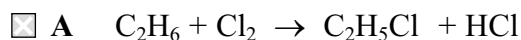
- A lowers the activation energy of the reaction.
- B causes bonds in molecules to stretch and bend.
- C causes molecules to form ions.
- D causes molecules to form free radicals.

(Total for Question 1 mark)

12 Ethane reacts with chlorine when the substances are exposed to UV radiation.

(a) The equation for this reaction is

(1)



(b) The role of the UV radiation in the reaction is to

(1)

A break the Cl—Cl bond forming Cl• free radicals.

B break the Cl—Cl bond forming Cl⁺ and Cl⁻ ions.

C break the C—C bond in ethane forming CH₃• free radicals.

D break a C—H bond in ethane forming C₂H₅• free radicals.

(c) The overall reaction between ethane and chlorine is best described as

(1)

A addition.

B homolytic fission.

C heterolytic fission.

D substitution.

(Total for Question 3 marks)

13 A hazard that is particularly associated with alkanes is that they are

- A corrosive.
- B flammable.
- C toxic by inhalation.
- D toxic by skin absorption.

(Total for Question 1 mark)

14 Which of the following mixtures could **not** form when octane, C_8H_{18} , is cracked?

- A propane + pentene
- B butane + butene
- C pentane + propene
- D heptane + ethene

(Total for Question = 1 mark)