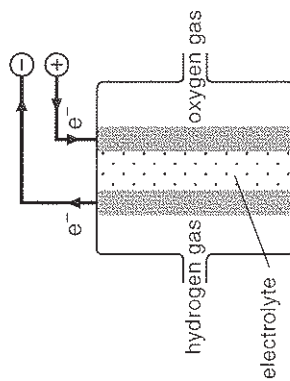


HOME PRACTICE

5.7

1. Unlike petrol, ethanol is a **renewable** fuel that, like petrol, can be used in car engines.
 - (a) From what renewable resource can ethanol be made? (1)
 - (b) Apart from being renewable, give an advantage that ethanol has over petrol as a fuel. (1)
2. Hydrogen is another possible renewable fuel for the future.
 - (a) From what natural resource can hydrogen be made in a non-polluting way? (1)
 - (b) How can this be achieved? (2)

3. The diagram illustrates a hydrogen fuel cell.



- (a) Write an ion-electron equation for the production of electrons from hydrogen gas. (1)
- (b) What ion is made at the oxygen electrode? (1)
- (c) Which compound is produced when the ions from the two electrodes meet and react? (1)
- (d) What are **two** advantages that hydrogen fuel cells have compared to an internal combustion engine using hydrogen as a fuel? (2)

TOTAL (10)

Mark your answers by using the Answer Check.

CHALLENGE CHEMISTRY

- Higher -

SECTION 5

HYDROCARBONS & FUELS

HOME PRACTICE

The "Home Practice" problems are for doing at home. They follow exactly the lesson topics of the section.

It is good practice to look again at a lesson topic just a short time afterwards, for example - the evening of the same day.

The "Home Practice" problems are designed to help you do that. As each lesson topic is covered in school, then the corresponding "Home Practice" should be done within two days at home.

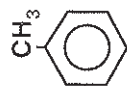
By doing this consistently, you help to build yourself a memory bridge for the future.



HOME PRACTICE

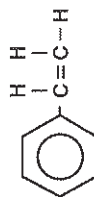
5.5

1. Toluene is an example of an aromatic hydrocarbon. The diagram shows one way to represent its structural formula.



- What is the systematic name for toluene? (1)
- What is its **molecular** formula? (1)
- What does the circle in the structural formula stand for? (1)
- Is toluene a **saturated** or an **unsaturated** hydrocarbon? (1)
- Does toluene undergo an addition reaction with bromine? (1)
- From which fraction in crude oil is toluene extracted? (1)

2. The diagram shows the full structural formula of styrene.



- Write the shortened structural formula for this hydrocarbon. (1)
- Draw a dotted line around the phenyl group in the shortened structural formula. (1)
- Give the systematic name for styrene. (1)
- Will styrene decolourise bromine water or not? (1)

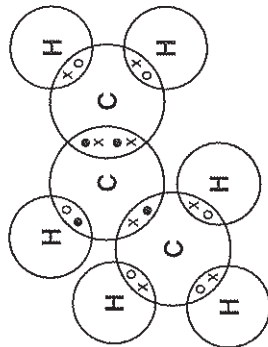
TOTAL (10)

Mark your answers by using the Answer Check.

HOME PRACTICE

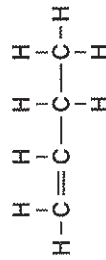
5.2

1. The diagram shows how the electrons are shared in a hydrocarbon molecule that contains a double bond.



- How many electrons are involved in the double bond? (1)
- Draw the full structural formula for this molecule. (1)
- Draw a dotted line around the functional group in the structural formula. (1)
- Using shortened structural formulae, write an equation for the hydrogenation of this molecule. (2)

2. The following molecule reacts rapidly with bromine.



- Draw the full structural formula of the molecule produced. (1)
 - Give the systematic name for the product molecule. (1)
 - Name the type of reaction by which the bromination takes place. (1)
3. Using shortened structural formulae, write an equation for the reaction of hex-3-ene with hydrogen bromide. (2)

TOTAL (10)

Mark your answers by using the Answer Check.

HOME PRACTICE

5.3

1. A propyne molecule contains a triple bond.
- Draw the full structural formula for propyne. (1)
 - Draw a dotted line around the functional group in the structural formula. (1)
 - How many electrons are shared in a triple bond? (1)
 - Is propyne a **saturated** or an **unsaturated** hydrocarbon? (1)
 - Draw the full structural formula of the molecule produced when one propyne molecule reacts with one bromine molecule. (1)
 - Give the systematic name for this product molecule. (1)
2. Draw the full structural formula for:
- 3-methylpent-1-yne. (1)
 - 4-ethylhex-2-yne. (1)
3. Give the systematic name for each of the following hydrocarbons.
- $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CCH}_2\text{CH}_2\text{CH}_3$ (1)
 - $$\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CHC}\equiv\text{CCH}_3 \end{array}$$
 (1)

TOTAL (10)

Mark your answers by using the Answer Check.

HOME PRACTICE

5.4

1. Draw the full structural formula for:
- chloroethene. (1)
 - trichloromethane. (1)
 - tetrafluoroethene. (1)
 - 1,2-dichloro-1,1,2,2-tetrafluoroethane. (1)
2. Of the compounds listed in question 1, which one is:
- used as a feedstock for manufacturing PVC? (1)
 - an example of a CFC? (1)
3. The use of CFC gases as refrigerants and propellants is now banned internationally.
- What problem do CFC gases cause in the atmosphere? (1)
 - Why does rain not wash CFC gases out of the atmosphere? (1)
 - What causes CFC molecules to split up in the uppermost atmosphere? (1)
 - What atom from the CFC molecule causes the damage in the uppermost atmosphere? (1)

TOTAL (10)

Mark your answers by using the Answer Check.

ANSWER CHECK

5.7

1. (a) Any one from:
 - sugar
 - sugar cane
 - sugar beet
 - grapes
 - grains (1)
- (b) It burns more cleanly. OR It produces less pollution. (1)
2. (a) Water (1)
- (b) By electrolysis (1)
 using electricity from a renewable source (1) (2)
3. (a) $H_2 \rightarrow 2H^+ + 2e^-$ (1)
- (b) Hydroxide ion OR OH^- (1)
- (c) Water OR H_2O (1)
- (d) More energy efficient (1)
 Completely pollution free
 OR No oxides of nitrogen from sparking (1) (2)

TOTAL (10)

Learn from any mistakes by checking over all wrong answers.
 Ask your teacher about anything you still do not understand.

CHALLENGE CHEMISTRY

- Higher -

SECTION 5

HYDROCARBONS & FUELS

ANSWER CHECK

FOR
 HOME PRACTICE
 QUESTIONS

Checking your answers is an important part of the learning process.

You should check out every mistake, even if it is just one mark.

If you still do not understand a question, even after studying this answer check, then ask your teacher.



ANSWER CHECK

5.1

1. (a) (i)
$$\begin{array}{c} \text{H} & & \text{H} & & \text{H} \\ | & & | & & | \\ \text{H}-\text{C}-\text{H} & & \text{H}-\text{C}-\text{H} & & \text{H}-\text{C}-\text{H} \\ | & & | & & | \\ \text{H} & & \text{H} & & \text{H} \\ | & & | & & | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ | & | & | \\ \text{H} & \text{H} & \text{H} \end{array}$$
 [OR drawn back to front or upside down] (1)
- (ii)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CH}_2\text{CHCH}_3 \end{array}$$
 [OR back to front or upside down] (1)
- (b) (i)
$$\begin{array}{c} \text{H} & & \text{H} & & \text{H} \\ | & & | & & | \\ \text{H}-\text{C}-\text{H} & & \text{H}-\text{C}-\text{H} & & \text{H}-\text{C}-\text{H} \\ | & & | & & | \\ \text{H} & & \text{H} & & \text{H} \\ | & & | & & | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ | & | & | & | \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$$
 [OR back to front or upside down] (1)
- (ii)
$$\begin{array}{c} \text{CH}_3 & & \text{CH}_3 \\ | & & | \\ \text{CH}_3\text{CH}_2\text{CHCH}_2\text{CH}_2\text{CHCH}_3 \end{array}$$
 [OR back to front or upside down] (1)
- (c) (i)
$$\begin{array}{c} \text{H} & & \text{H} & & \text{H} \\ | & & | & & | \\ \text{H}-\text{C}-\text{H} & & \text{H}-\text{C}-\text{H} & & \text{H}-\text{C}-\text{H} \\ | & & | & & | \\ \text{H} & & \text{H} & & \text{H} \\ | & & | & & | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}=\text{C}-\text{H} \\ | & | & | & | \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$$
 [OR back to front or upside down] (1)
- (ii)
$$\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CH}_2\text{CHCH}=\text{CH}_2 \end{array}$$
 [OR back to front or upside down] (1)
2. (a) 2,2-Dimethylbutane (1)
- (b) 2-Methylpent-2-ene (1)
- (c) 4-Methylpent-2-ene (1)
3. They both have molecular formulae C_6H_{12} (1/2) but their structures are different (1/2). (1)

TOTAL (10)

Learn from any mistakes by checking over all wrong answers.
Ask your teacher about anything you still do not understand.

ANSWER CHECK

5.6

1. (a) By a spark OR By a sparking plug (1)
- (b) Limited air intake for complete combustion OR Incomplete combustion of the fuel (1)
- (c) The sparking causes some nitrogen and oxygen in the air mixture to combine. (1)
2. (a) 2,4-Dimethylhexane (1)
It has a more branched structure. (1) (2)
- (b) 2,4-Dimethylhexane (1)
- (c) Knocking OR Pre-ignition (1)
- (d) Reforming (1)
3. (a) Hydrocracking (OR Cracking) (1)
- (b) To ensure that the petrol vaporises sufficiently in the lower temperatures of winter. (1)

TOTAL (10)

Learn from any mistakes by checking over all wrong answers.
Ask your teacher about anything you still do not understand.

ANSWER CHECK

5.5

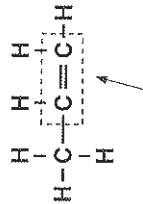
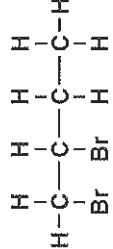
1. (a) Methylbenzene (1)
 (b) C_7H_8 (1)
 (c) Delocalised electrons OR Aromatic bond (1)
 (d) Unsaturated (1)
 (e) No (1)
 (f) Naphtha (1)
2. (a) $C_6H_5CH=CH_2$ (1)
 (b) [Dotted line around C_6H_5] (1)
 (c) Phenylethene [All one word] (1)
 (d) Yes (1)

TOTAL (10)

Learn from any mistakes by checking over all wrong answers.
 Ask your teacher about anything you still do not understand.

ANSWER CHECK

5.2

1. (a) 4 (1)
 (b)  (1)
 (c) [Dotted line around $C=C$] (1)
 (d) $CH_3CH=CH_2 + H_2 \rightarrow CH_3CH_2CH_3$ (1)
 (1/2)
2. (a)  (1)
 (b) 1,2-Dibromobutane (1/2)
 (1/2)
 (c) Addition (1)
3. $CH_3CH_2CH=CHCH_2CH_3 + HBr \rightarrow CH_3CH_2CH_2CHBrCH_2CH_3$ (1)
 (1/2)
 [OR Back to front for product structure] (2)

TOTAL (10)

Learn from any mistakes by checking over all wrong answers.
 Ask your teacher about anything you still do not understand.

ANSWER CHECK

5.3

1. (a)
$$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{C}\equiv\text{C}-\text{H} \\ | \\ \text{H} \end{array}$$
 (1)
- (b) [Dotted line around $\text{C}\equiv\text{C}$] (1)
- (c) 6 (1)
- (d) Unsaturated (1)
- (e)
$$\begin{array}{c} \text{H} \quad \text{Br} \quad \text{Br} \\ | \quad | \quad | \\ \text{H}-\text{C}-\text{C}=\text{C}-\text{H} \\ | \\ \text{H} \end{array}$$
 (1)
- (f)
$$\underbrace{\text{1,2-Dibromopropene}}_{(1/2)} \quad (1/2)$$
 (1)
2. (a)
$$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{H} \\ | \\ \text{H} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{C}-\text{C}\equiv\text{C}-\text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$
 (1)
- (b)
$$\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{C}-\text{C}\equiv\text{C}-\text{H} \\ | \quad | \\ \text{H} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$
 (1)
3. (a) Oct-3-yne (1)
- (b) 4-Ethylhex-2-yne (1)
- TOTAL (10)

Learn from any mistakes by checking over all wrong answers.
Ask your teacher about anything you still do not understand.

ANSWER CHECK

5.4

1. (a)
$$\begin{array}{c} \text{H} \quad \text{Cl} \\ | \quad | \\ \text{H}-\text{C}=\text{C}-\text{H} \end{array}$$
 [OR Any version of an ethene structure with one H replaced by a Cl] (1)
- (b)
$$\begin{array}{c} \text{Cl} \\ | \\ \text{H}-\text{C}-\text{Cl} \\ | \\ \text{Cl} \end{array}$$
 (1)
- (c)
$$\begin{array}{c} \text{F} \quad \text{F} \\ | \quad | \\ \text{F}-\text{C}=\text{C}-\text{F} \end{array}$$
 OR
$$\begin{array}{c} \text{F} \quad \text{F} \\ | \quad | \\ \text{C}=\text{C} \\ | \quad | \\ \text{F} \quad \text{F} \end{array}$$
 (1)
- (d)
$$\begin{array}{c} \text{Cl} \quad \text{Cl} \\ | \quad | \\ \text{F}-\text{C}-\text{C}-\text{F} \\ | \quad | \\ \text{F} \quad \text{F} \end{array}$$
 [Must have one Cl and two F atoms on each C] (1)
2. (a) Tetrafluoroethene (1)
- (b) 1,2-Dichloro-1,1,2,2-tetrafluoroethane (1)
3. (a) They destroy the ozone layer. (1)
- (b) They are **insoluble** in water. (1)
- (c) Ultraviolet rays OR u. v. radiation (1)
- (d) Chlorine OR Cl (1)
- TOTAL (10)

Learn from any mistakes by checking over all wrong answers.
Ask your teacher about anything you still do not understand.