

Name of the Student: \_\_\_\_\_

Max. Marks : 21 Marks

Time : 21 Minutes

## Mark Schemes

Q1.

- (a) (i) (free-)radical substitution  
(both words required for the mark) 1
- (ii) uv light OR sunlight OR high temperature OR 150 °C to 500 °C 1
- (iii) Propagation  
(ignore "chain", "first", "second" in front of the word propagation) 1
- (iv) Termination 1
- $\bullet\text{CH}_2\text{CH}_3 + \text{Br}\bullet \longrightarrow \text{CH}_3\text{CH}_2\text{Br}$   
 OR  $2\bullet\text{CH}_2\text{CH}_3 \longrightarrow \text{C}_4\text{H}_{10}$   
 (penalise if radical dot is obviously on  $\text{CH}_3$ , but not otherwise)  
 (penalise  $\text{C}_2\text{H}_5\bullet$ )  
 (credit  $2\text{Br}\bullet \longrightarrow \text{Br}_2$ )  
 (ignore "chain" in front of the word termination) 1
- (b) (i) Fractional distillation OR fractionation  
(credit gas-liquid chromatography, GLC) 1
- (ii)  $\text{CH}_3\text{CH}_3 + 6\text{Br}_2 \longrightarrow \text{C}_2\text{Br}_6 + 6\text{HBr}$   
(credit  $\text{C}_2\text{H}_6$  for ethane) 1
- (c) Correct structure for  $\text{CF}_2\text{BrCF}_2\text{Br}$  drawn out  
(penalise "Fl" for fluorine) 1
- (d) (i) 2-bromo-2-chloro-1,1,1-trifluoroethane  
 OR 1-bromo-1-chloro-2,2,2-trifluoroethane  
 (insist on all numbers, but do not penalise failure to use alphabet)  
 (accept "flourine" and "cloro" in this instance) 1
- (ii) 197.4 only  
(ignore units) 1

(iii)  $(57/197.4 \times 100) = 28.9\%$  OR  $28.88\%$

*(credit the correct answer independently in part (d)(iii), even if (d)(ii) is blank or incorrectly calculated, but mark consequential on part (d)(ii), if part (d)(ii) is incorrectly calculated, accepting answers to 3sf or 4sf only)*

*(penalise 29% if it appears alone, but not if it follows a correct answer)*

*(do not insist on the % sign being given)*

*(the percentage sign is not essential here, but penalise the use of units e.g. grams)*

1

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Q2.

- (a) (i) any two from:  
show a gradation/trend/gradual change in physical properties/  
a specified property  
differ by  $\text{CH}_2$   
chemically similar or react in the same way  
have the same functional group  
(penalise 'same molecular formula')  
(penalise 'same empirical formula')
- 2
- (ii) fractional distillation or fractionation
- 1
- (iii) contains only single bonds or has no double bonds  
(credit 'every carbon is bonded to four other atoms' provided it does not contradict by suggesting that this will always be H)
- 1
- (b) (i) the molecular formula gives the actual number of atoms of each element/type in a molecule/hydrocarbon/compound/formula  
(penalise 'amount of atoms')  
(penalise 'ratio of atoms')
- 1
- (ii)  $\text{C}_{14}\text{H}_{30}$  only  
(penalise as a contradiction if correct answer is accompanied by other structural formulae)
- 1
- (iii)  $\text{C}_{10}\text{H}_{22} + 5\frac{1}{2}\text{O}_2 \rightarrow 10\text{C} + 11\text{H}_2\text{O}$   
(or double this equation)
- 1
- (c) (i)  $\frac{1}{2}\text{N}_2 + \frac{1}{2}\text{O}_2 \rightarrow \text{NO}$   
(or double this equation)
- 1
- (ii) Platinum or palladium or rhodium
- 1
- (iii)  $2\text{CO} + 2\text{NO} \rightarrow 2\text{CO}_2 + \text{N}_2$  or  
 $2\text{NO} \rightarrow \text{N}_2 + \text{O}_2$  or  
(ignore extra  $\text{O}_2$  molecules provided the equation balances)  
 $\text{C} + 2\text{NO} \rightarrow \text{CO}_2 + \text{N}_2$   
(or half of each of these equations)  
 $\text{C}_8\text{H}_{18} + 25\text{NO} \rightarrow 8\text{CO}_2 + 12\frac{1}{2}\text{N}_2 + 9\text{H}_2\text{O}$   
(or double this equation)
- 1

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