OCR AS/A-level Year 1 Chemistry A exam practice answers

6 Basic concepts and hydrocarbons

**1 (a) (i)** (Free) radical substitution **✓**

 **(ii)** The bond breaks (i.e. fission) such that each atom in the bond retains one of the bonded electrons. **✓**

e.g. Cl−Cl → 2Cl•

 **(iii)** 1,2-dichloroethane **✓** and 1,1-dichloroethane **✓**

 **(b) (i)** It behaves as a nucleophile **✓** because it donates an electron pair to the Cδ+ **✓**

 **(ii)**



**✓✓**

**2 (a)** C : H : O

 83.93/12 : 11.92 : 4.15/16

 6.99 : 11.92 : 0.26 **✓**

 27 : 46 : 1

 empirical formula = C27H46O

 empirical mass = (12 × 27) + 46 + 16 = 386 **✓**

 Therefore, molecular formula also C27H46O **✓**

 **(b)** Secondary alcohol **✓** and alkene **✓**

 **(c) (i)** D **✓**

 **(ii)** E **✓**

 **(iii)** A **✓**

 **(iv)** B **✓**

 **(v)** C **✓**

**3 (a) (i)** Hydrocarbons are compounds that contain carbon and hydrogen *only*. **✓**

 **(ii)** Liquids with different boiling points can be separated by fractional distillation. **✓**

 **(b) (i)** C12H26 = 144 + 26 =170 **✓**

 % C = (144/170) × 100 = 84.7% **✓**

 **(ii)** C12H26 → C8H18 + 2C2H4 **✓**

 **(c) (i)** A = 2,4-dimethylhexane **✓**

 B = 2,3,3-trimethylpentane **✓**

 C = 4-methylheptane **✓**

**(ii)** BAC **✓**

 **(iii)** Branched chains prevent close packing **✓** and reduce the formation of van der Waals forces. The longer the carbon chain and the fewer the branches, the more van der Waals forces, hence the higher the boiling point. **✓**

 **(iv)** 2C8H18 + 25O2 → 16CO2 + 18H2O

 *or*

 C8H18 + 12½O2 → 8CO2 + 9H2O

 1 mark for correct formulae **✓**and1 mark for balancing **✓**

 **(v)** Any of: used as additives in petrol to increase the octane rating/burn more smoothly/reduce knocking/make less viscous/make more volatile. **✓**

**4** There are three processes — cracking, isomerisation and reforming — and each requires:

* an explanation
* an equation
* a statement as to their importance

 It is possible to write the answer out in prose but probably easier using either bullet points or a table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Explanation** | **Equation** | **Industrial importance** |
| **Cracking** | Cracking is used to break down long-chain hydrocarbons into shorter-chain hydrocarbons and alkenes. High temperature and a catalyst are used. **✓** | C10H22 → C8H18 + C2H4 **✓** | Shorter-chain hydrocarbons are more volatile, less viscous and are more efficient fuels. **✓**\*Alkenes are used in the petrochemical industry for producing polymers, alcohols and many other essential chemicals. **✓** |
| **Isomerisation** | Isomerisation is used to convert straight-chain hydrocarbons into branched-chain hydrocarbons. **✓** | Macintosh HD:Users:jenny.reynolds:Desktop:M.jpgor any other branched isomer **✓** | The branched-chain hydrocarbons are added to petrol and increase the octane rating because they are more volatile, less viscous and are more efficient fuels.**✓**\* |
| **Reforming** | Reforming is the conversion of chain hydrocarbons into ring hydrocarbons. **✓** | Macintosh HD:Users:jenny.reynolds:Desktop:JPG:N.jpgor a cyclic diene + 3H2or benzene + 4H2 **✓** | Ring compounds are also added to petrol because they are more volatile, less viscous and burn more efficiently. **✓**\* |

 **✓**\* mark awarded only once