| Question | Answers | Extra information | Mark | AO /  Spec ref. |
| --- | --- | --- | --- | --- |
| **01** | alkanes  general  methane |  | 1  1  1 | AO1  C7.1.1  WS1.2 |
| **02.1** | cracking |  | 1 | AO1  C7.1.4  WS1.2 |
| **02.2** | a catalyst  steam |  | 1  1 | AO1  C7.1.4 |
| **02.3** | C10H22  C5H12 |  | 1  1 | AO2  C7.1.1  WS1.2 |
| **02.4** | Any **two** from:   * large molecules less useful * large molecules in less demand * small molecules are feedstocks/ make polymers * small molecules are better fuels/ burn cleaner/burn more easily. | Allow converse i.e. small molecules are more useful;  allow converse;  allow converse. | 2 | AO2  C7.1.4  WS1.2 |
| **03** | gases at room temperature ─ small molecules  high boiling point ─ large molecules  low viscosity ─ small molecules  very flammable ─ small molecules | 4 correct  **3** marks;  3 correct  **2** marks;  2 correct  **1** mark. | 3 | AO1  C7.1.3  WS1.2, 4.1 |
| **04.1** | thermometer | Accept temperature probe/ temperature sensor. | 1 | AO3  WS1.2 |
| **04.2** | butane |  | 1 | AO1  C7.1.1 |
| **04.3** | C8H18 |  | 1 | AO2  C7.1.1 |
| **04.4** | *Layout Disk 1:01_Q2A Media:OUP:GCSE Kerboodle Worksheets:Design HO 02/07:z_Source:830885 AQA GCSE Science Kerboodle HO 6 Jan 2017:06 02 17:Priority 1:Priority 1 PNGs:AQA Chemistry Exam-style questions:oxo_AQA16_C9ss_xm01_awfg01.png* |  | 1 | AO2  C7.1.1 |
| **04.5** | 98 (°C) | ±1 °C | 1 | AO3  C7.1.3  WS1.2, 4.1  MS4a |
| **04.6** | range −35 to −50 (°C) |  | 1 | AO3  C7.1.3  WS1.2, 4.1  MS4a |
| **04.7** | As the number of carbon atoms increases, the boiling point increases/positive correlation;  larger/longer molecules are harder/ more difficult to separate. | No mark for molecules ‘breaking down’. | 1  1 | AO3  C7.1.3  WS1.2, 4.1  MS4a |
| **05.1** | exothermic | Accept combustion; allow burning;  **or** oxidation **or** redox. | 1 | AO1  C7.1.3  WS1.2, 4.1 |
| **05.2** | Carbon monoxide/CO (is produced);  because there is incomplete/partial combustion (of the fuel). | Allow monoxide (is produced) but ignore carbon oxide;  accept because there is insufficient oxygen/air (to burn the fuel). | 1  1 | AO1  C7.1.3  WS1.2, 4.1 |
| **05.3** | **Level 3:** There is a reasonable explanation of how petrol is, or fractions are, separated from crude oil using evaporating **and** condensing. | | 5–6 | AO2  C7.1.2  WS1.2 |
| **Level 2:** There is some description of heating/evaporating crude oil **and either** fractions have different boiling points **or** there is an indication of a temperature difference in the column. | | 3–4 |
| **Level 1:** There is a statement that crude oil is heated **or** that substances are cooled. However there is little detail and any description may be confused or inaccurate. | | 1–2 |
| **Level 0:** No relevant content. | | 0 |
| **Indicative content:**   * some/most of the hydrocarbons (or petrol) evaporate/form vapours or gases * when some of/a fraction of the hydrocarbons (or petrol) cool to their boiling point, they condense * hydrocarbons (or petrol) that have (relatively) low boiling points are collected near the top of the fractionating column or hydrocarbons with (relatively) high boiling points are collected near the bottom of the fractionating column * the process is fractional distillation * heat the crude oil/mixture of hydrocarbons or crude oil/ mixture is heated to about 350 °C * some of the hydrocarbons remain as liquids * liquids flow to the bottom of the fractionating column * vapours/gases rise up the fractionating column * vapours/gases cool as they rise up the fractionating column * the condensed fraction (or petrol) separates from the vapours/ gases and flows out through a pipe * some of the hydrocarbons remain as vapours/gases * some vapours/gases rise out of the top of the fractionating column * there is a temperature gradient in the fractionating column/ the fractionating column is cool at the top and hot at the bottom.   This indicative content is not exhaustive, other creditworthy responses should be awarded marks as appropriate. | | |