M1. (a) *allow answers referring specifically to the naphtha fraction*

crude oil is <u>evaporated/vaporised</u> (by heating)

1

the vapours are <u>condensed</u> (by cooling)

1

(fractions condense) / boil at different temperatures

allow fractions have different boiling points

1

(b) any **four** from:

answer yes or no does not gain credit

ignore references to volume of milk held / number of bottles used / biodegradability / habitats / pollution / mining / dust

each marking point must be a comparison

milk bag points

- uses (75%) less **crude oil** to make (than a plastic milk bottle)

  allow eg uses 75% less

  poly(ethene) which is made from crude oil

- uses less **energy** / fuel to make (than a plastic / glass milk bottle)

- produces less **carbon dioxide** to manufacture (than a plastic / glass milk bottle)

  allow produces less greenhouse gases / causes less global warming

  allow produces less CO_2 on burning

- produces less **waste** (than a plastic / glass milk bottle)

  allow takes up less landfill (space)

  allow an argued case for more waste eg milk bags are discarded / cannot be reused

- less fuel used for **transport** than glass milk bottles

- (produces waste because) milk bags are only used once whereas glass bottles can be **re-used**

  allow milk bags are discarded but glass bottles can be reused (24 / many times)

  allow glass bottles can be reused but milk bags can't

poly(ethene) points

- uses a limited **raw material** / crude oil whereas the raw materials for glass are almost unlimited

- **less** (5%) poly(ethene) is **recycled** (compared to glass (35%))

  allow (35%) glass is recycled or (5%) poly(ethene) (bottles) recycled BUT milk bags aren't / are discarded

  or

  recycled poly(ethene) is not used to make new bags whereas recycled glass is used to make new bottles

4

[7]

M2. Reused

- saves raw materials / crude oil
    - *unable to reuse many times*
    - *bags easily split*
- saves energy / fuel / transport
- fewer bags needed / made
- reduces carbon / CO_2 emissions
- reduces use of landfill
- saves cost of a new bag
- no waste

1

Recycled

- saves raw materials / crude oil
    - *has to be collected / transported / washed / separated / melted*
- saves energy / use of fuel
- reduces carbon / CO_2 emissions
- reduces use of landfill
- can be used for new products

ignore uses energy

1

Burned

- heat / energy released can be used (for heating / generating electricity)
    - *has to be collected / transported*
- reduces use of landfill
    - *wastes the resource / plastic*
    - *releases harmful gases / toxic gases / CO_2*

1

Dumped

- collected / transported with household waste
    - *wastes the resource*
    - *plastic uses landfill*
- (slowly) biodegrades **or** produces methane which can be used as a fuel
    - *produces methane which is a greenhouse gas / could cause explosions*
- (not biodegradable so) does not release CO_2 / green house gas into the air
    - *not biodegradable / take years to decompose*

ignore cost / litter / waste / global warming / habitats unless mentioned above

1

[4]

M3. (a) any **two** from:

- naphtha has a different / low(er) boiling point
  accept different volatility
- condenses at a different temperature / height / place in the column / when it reaches it's boiling point
- different size of molecules

2

(b) (i) $C_{10}H_{22} \rightarrow C_6H_{14} + \mathbf{2}C_2H_4$
allow multiples

1

(ii) (hydrocarbon) heated / vapours

1

(passed over a) catalyst / alumina / porous pot
ignore other catalysts

1

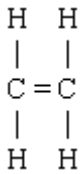
(iii) it / ethene is unsaturated **or** decane and hexane / they are saturated
accept decane and hexane are alkanes / C_nH_{2n+2}
***or** ethene is an alkene / C_nH_{2n}*
***or** different homologous series / general formula*

1

ethene has a double (carbon carbon) bond **or** decane and hexane have only single (carbon carbon) bonds
*accept ethene has a reactive double (carbon carbon) bond for **2** marks*

1

(c) <u>all</u> bonds drawn correctly



1

(d) **economic argument** against recycling

any **one** from:

- poly(ethene) / plastic must be collected / transported / sorted / washed
- this uses (fossil) fuels which are expensive

1

environmental argument against recycling

any **one** from:

- uses (fossil) fuels that are non-renewable / form CO_2 / CO / SO_2 / NO_x / particulates
  ignore pollution / harmful gases / etc
- washing uses / pollutes water

1

counter arguments

any **two** from:

- collect / transport alongside other waste
- use biofuels (instead of fossil)
- landfill is running out
- landfill destroys habitats
- incinerators are expensive to build
- saves raw materials / crude oil
- saves energy needed to make new plastic
- incinerators may produce harmful substances
- incinerator ash goes to landfill
- poly(ethene) is non-biodegradable
- poly(ethene) can be made into other useful items

- more jobs / employment for people

2

[12]