1.

(a) formulation

1

(b) $\frac{23.3}{265.5 + 23.3 + 3.0 + 1.5} (\times 100)$

allow $\frac{23.3}{293.3} (\times 100)$

1

= 7.9 (%)

allow 7.944084555 (%) rounded correctly

1

*an answer of 7.9 (%) scores **2** marks*

(c) to deter consumption / drinking (by people)

1

(d) any **one** from:

1

- fuel
- solvent
- antiseptic

allow specific uses e.g.
- *fuel additive*
- *cleaning products*
- *hand-sanitisers*

1

*do **not** accept as an alcoholic drink*

(e) ferment(ation)

ignore distillation

1

add yeast

1

anaerobic (conditions)

allow in the absence of oxygen

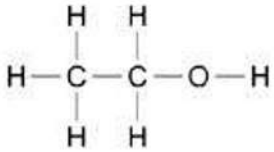
or

warm

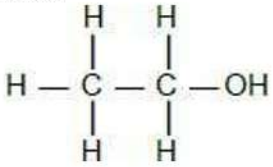
allow a temperature value in range 5 − 45 °C inclusive
allow room temperature

ignore hot / heat
ignore high temperature

1

(f) 

allow



1

(g) hydrogen

allow H_2

1

(h) oxidising (agent).

allow permanganate / dichromate ions
allow [O]
ignore oxygen

1

[11]

2. (a) fermentation

1

(b) (i) turns cloudy / milky / white

ignore bubbles

1

because carbon dioxide is produced

allow CO_2 produced

1

(ii) filter paper

1

[4]

3. (a) (i) fizz / effervescence / bubbles

allow calcium carbonate decreases in size or dissolves

1

because carbon dioxide produced / released

allow because gas produced / released

1

limewater turns cloudy / milky / white

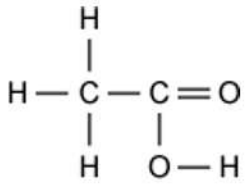
1

because (a precipitate of or solid) calcium carbonate forms

allow because of carbon dioxide if not already credited

1

(ii)



allow -OH
do not allow lower case 'h'

1

(iii) acid

must be in this order
ignore any name of an acid

1

ester(s)

1

(b) white (precipitate) no change

no change no change

all four correct 2 marks
any two correct 1 mark

2

(c) (i) lilac

allow purple

1

red

1

must be in this order

(ii) colours are masked / changed by each flame colour

1

[12]

4. (a) (i) 25 °C

1

(ii) (fractional) distillation

1

(b) (i) (fertile) land is used to grow fuel crops **or** crops are grown for fuel **or** farmers get a better price for crops for fuel **or** crops for biofuels take up space

ignore biofuels are made from food or plants

1

less food grown **or** food prices rise **or** less (fertile) land to grow food

1

(ii) (crops / plants) take in carbon dioxide (while growing / during photosynthesis)

1

so the CO_2 given out was previously taken in

*do **not** accept burning biofuels does not release CO_2 or releases less CO_2 unqualified*

*if no other mark awarded, a statement of "carbon neutral" scores **1** mark*

1

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best–fit' approach to the marking.

0 marks
No relevant content

Level 1 (1−2 marks)
At least one statement about the effect of a condition on either rate **or** yield.

Level 2 (3−4 marks)
Correct statements about the effect of at least one condition on rate **and** yield.

Level 3 (5−6 marks)
Correct statements about the effect of at least one condition on rate and yield **and** at least one correct statement about compromise conditions.

Examples of the points made in the response

Temperature
- a higher temperature gives a lower yield
- a higher temperature gives a faster rate

Pressure
- a higher pressure gives a higher yield
- increase in yield gets less as pressure increases
- a higher pressure gives a faster rate
- increase in rate increases as pressure increases

Catalyst
- using a catalyst speeds up reaction
- catalysts allow a lower temperature to be used and so save energy / reduce energy costs

Compromise
- a higher pressure gives a greater yield but increases costs / (safety) risks
- a high pressure gives a faster rate but increases costs / risks
- a high temperature makes reaction faster but reduces yield
- a catalyst makes reaction faster so a lower temperature can be used which will increase the yield

6

[12]

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

- fuel

  allow source of energy
- solvent

  allow perfume / aftershave
- antiseptic

  allow antibacterial

2

(b) Hydrogen **1**

(c) (i) oxidation

*do **not** allow redox*

1

(ii) correct structure

1

(iii) ethanoic acid is a weak / weaker acid

it = ethanoic acid

1

because it does not completely ionise.

allow because it does not completely dissociate

allow it has a lower concentration of hydrogen ions

allow converse for hydrochloric acid

*do **not** allow ionising*

1

(d) (i) ethyl ethanoate

1

(ii) acid

allow any strong acid

allow correct formulae

1

(iii) evaporates easily / quickly

allow low boiling point

*do **not** allow flammable*

1

[10]

6. (a) CO_2 (+) H_2O

correct products

1

3 (O_2) **2** (CO_2) **3** (H_2O)

correct balancing

1

(b) (i) add bromine water

allow iodine

1

changes (from orange) to colourless / decolourised

ignore clear

1

(ii) octane vapours

ignore any references to butane ($C_4 H_{10}$) **1**

are passed over a catalyst (to produce ethene)

ignore incorrect names of catalysts

1

OR

octane mixed with steam (1)

at a (very) high temperature (1)

for steam cracking, second mark is conditional on 'steam'

steam is added (to ethene)

ignore the formula $H_2 O$ / water

1

in the presence of a catalyst (to produce ethanol)

*if no other marks awarded then allow **1** mark for cracking of octane **or** hydration of ethene*

1

[8]