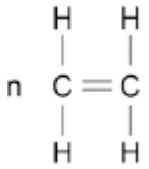
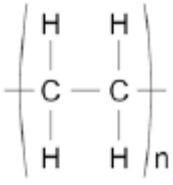
M1.(a) *(ethene)*



1

(polyethene)



1

(b) any **four** from:

- poly(ethene) produced by addition polymerisation whereas polyester by condensation polymerisation
- poly(ethene) produced from one monomer wheareas polyester produced from two different monomers
- poly(ethene) produced from ethene / alkene whereas polyester from a (di)carboxylic acid and a diol / alcohol
- poly(ethene) is the only product formed whereas polyester water also produced
- poly(ethene) repeating unit is a hydrocarbon whereas polyester has an ester linkage

4

[6]

M2.(a) water level above the start line

and

start line drawn in ink

allow water level too high

1

water level

food colours would dissolve into water

or

start line

the ink would 'run' on the paper

1

(b) (distance moved by **A**) 2.8cm **and** 8.2 cm (distance moved by solvent)

allow values in range 2.7 – 2.9 cm and 8.1 – 8.3 cm

1

$\frac{2.8}{8.2}$

1

0.34

allow 0.33 or 0.35

*allow ecf from incorrect measurement to final answer for **2** marks if given to 2 significant figures*

*accept 0.34 without working shown for **3** marks*

1

(c) 6.6 cm

allow values between 6.48 and 6.64 cm

1

(d) solvent moves through paper

1

different dyes have different solubilities in solvent

1

and different attractions for the paper

1

and so are carried different distances

1

(e) calcium ions

allow Ca^{2+}

1

sodium ions

allow Na^{+}

1

(f) two different colours

or

Ca^{2+} / one is orange-red and Na^{+} / the other is yellow

allow brick red for Ca^{2+} and / or orange for Na^{+}

*allow incorrect colours if consistent with answer to **7.5***

1

(so) colours mix

or

(so) one colour masks the other

1

(g) (Student **A** was incorrect)

because sodium compounds are white not green

or

because sodium carbonate is soluble

1

so can't contain sodium ions

1

(Student **B** was incorrect)

because adding acid to carbonate produces carbon dioxide

1

so must contain carbonate not chloride ions

1

[18]

M3.(a) both water <u>vapour</u> and ethanol will condense

allow steam for water vapour
allow they both become liquids
allow ethane condenses at a lower temperature
allow some of the steam hasn't reacted
allow it is a reversible reaction / equilibrium

1

(b) amount will decrease

1

because the equilibrium will move to the left

1

(c) more ethanol will be produced

1

because system moves to least / fewer molecules

1

[5]

M4.(a) (i) the products are at a lower energy level than the reactants

accept products have less energy / less energy at the end than the beginning

1

(ii) because a catalyst provides an alternative / different pathway / mechanism / reaction route

accept adsorption or 'increases concentration at the surface'

ignore absorption

1

(that has) <u>lower activation energy</u>

allow weakens bonds

allow idea of increased successful collisions.

DO NOT ALLOW answers stating catalysts provide energy for M1 and M2

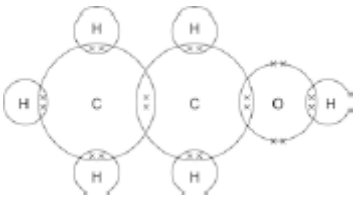
1

(b) one pair of electrons in each overlap (8 pairs in total)

allow any combination of dots, crosses or other symbols

1

the rest of the diagram correct with four non-bonding electrons on the oxygen giving a total of eight electrons in oxygen outer energy level.



*gains **2** marks*

1

(c) (i) ±3024 (J)

*correct answer with or without working gains **3** marks*

*if the answer is incorrect, award up to **2** marks for the following steps:*

- *ΔT = 14.4(°C)*
- *50 x 4.2 x 14.4*

allow ecf for incorrect ΔT

3

(ii) 0.015(2173913)

*correct answer with or without working gains **3** marks*

if answer is incorrect, allow 1 mark each for any of the following steps up to a max of 2.

- *0.70g*
- *M_r of ethanol = 46*
- *0.70 / 46*

allow ecf in final answer for arithmetical errors

3

(iii) ±198 720(J / mole)

c(i) ÷ c(ii)

*allow ecf from **(c)(i)** and **(c)(ii)***

0.015 gives 201600

0.0152 gives 198947

0.01522 gives 198686

1

(d) (as the molecules get bigger **or** the number of carbon atoms increases) the intermolecular forces

allow intermolecular bonds

1

(intermolecular forces) increase

allow more / stronger (intermolecular forces)

1

and therefore require more (heat) energy to overcome

*breaking covalent bonds or unspecified bonds max **1** mark (M3)*

1

[15]

M5.(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]