GCSE Chemistry

Alcohols, Carboxylic Acids and Esters

Mark Scheme

Time available: 64 minutes
Marks available: 62 marks

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1. (a) (i) ethanol

1

(ii) oxidised

1

(iii) **Test**

add any named carbonate or hydrogen carbonate

the first mark is for the test; the second is for the result

if the test is incorrect award 0 marks.

1

Result

A will effervesce (carbon dioxide) **or B** will not effervesce.

if the result is incorrect, award the first mark only

1

or

candidates do not have to name a gas but penalise an incorrect gas.

Test

add a named (magnesium, aluminium, zinc, iron or tin) metal

give credit to any test that will work.

Result

A will effervesce (hydrogen), **B** will not

*allow a test that would identify **B**.*

or

Test

add an acid-base indicator

Result

credit any acid colour for that indicator eg for universal indicator allow red, yellow or orange

give credit for the neutral colour for **B**

or

Test

add an alcohol (+ acid catalyst)

Result

sweet or fruity smell of esters.

(b) (i) H_2O

1

(ii) ethyl ethanoate

1

(iii) any **one** from:

- flavourings
- perfumes
- solvents
- plasticisers

allow any correct use of esters

1

[7]

2.

(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

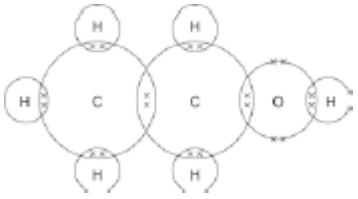
1

(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]

3. (a) HCOOH

allow HCO_2H

1

propanoic acid

1

(b) incomplete / partial ionisation

allow incomplete / partial dissociation

1

(because) reaction is reversible

allow (because) reaction is in equilibrium

1

(c) mass (of flask and contents) decreases

1

(because) carbon dioxide is produced

1

(and) carbon dioxide escapes (from the flask)

*allow **1** mark for the gas produced escapes (from the flask)*

1

(d) (0.01 mol/dm^3) methanoic acid has a lower pH

allow converse argument for ethanoic acid

allow (0.01 mol/dm^3) methanoic acid is a stronger acid

1

(so 0.01 mol/dm^3) methanoic acid has a higher concentration of hydrogen ions

1

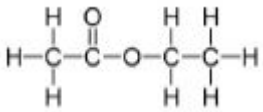
(therefore) more collisions per unit time

1

(e) ethyl ethanoate

1

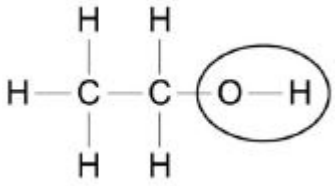
(f)



1

[12]

4. (a)



1

(b)

Name of element	Symbol for element	Number of atoms in one molecule of ethanol
carbon	C	**2**
hydrogen	**H**	6
oxygen	O	1

ignore O2

1
1
1

(c) a solvent

1

(d) sugar

allow named sugar
allow saccharide

1

(e) yeast

1

(f) ethyl ethanoate

1

(g) water

ignore H_2O

1

(h) 400 cm^3 = 0.40 dm^3

1

$\frac{1.00}{0.40}$ × 20

allow correct use of incorrectly converted or unconverted volume

1

= 50 (g)

1

alternative approach:

1.0 dm^3 = 1000 cm^3 (1)

$\frac{1000}{400}$ × 20 (1)

allow correct use of incorrectly converted or unconverted volume

= 50 (g) (1)

[12]

5. (a) oxygen

allow correct answer shown in box if answer line blank

1

(b) vinegar

allow correct answer shown in box if answer line blank

1

(c) C

1

(d) Ester

1

(e) pleasant smell

1

volatile

allow low boiling point / evaporates

1

[6]

6. (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]