

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

- (a) (mixture of) compounds/substances with similar boiling points

Allow similar number of carbon atoms / chain length / M_r / size

Ignore same boiling point / number of C atoms / chain length / M_r / size

Ignore reference to similar melting points

Ignore reference to similar chemical properties

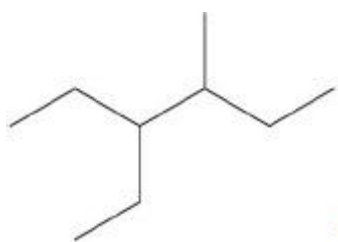
1

- (b) zeolites / aluminosilicates

Ignore aluminium oxide

1

- (c)



1

Must be skeletal formula

Ignore working, including other forms of structure of this compound.

1

- (d) **M1** C_9H_{20}

M2 $C_9H_{20} + 14 O_2 \rightarrow 9 CO_2 + 10 H_2O$

*For **M2** allow ECF from their molecular formula, providing it is an attempt at the molecular formula of a hydrocarbon*

*Penalise **M1** only for not using molecular formula*

Allow multiples and fractions

2

- (e) (C=O) bonds vibrate (at IR frequency) / (IR/it makes) bonds vibrate **or**

net change in dipole moment of molecule during (asymmetric) vibration **or**

(C=O) bonds are polar

Do not allow that CO_2 is a polar molecule / has a dipole

1

- (f) **M1** acid rain / respiratory problems

M1 Allow direct consequences of acid rain; allow smog; allow production of ground level ozone

M2 catalytic converters

M2 allow description of process that occurs in catalytic converter but must include reference to a (named) catalyst

2

(g) no net emissions of carbon dioxide/CO₂ to the atmosphere

Allow explanation showing that same amount of CO₂ taken in and released to the atmosphere

Answer needs to refer to carbon dioxide (not just carbon)

1

[9]

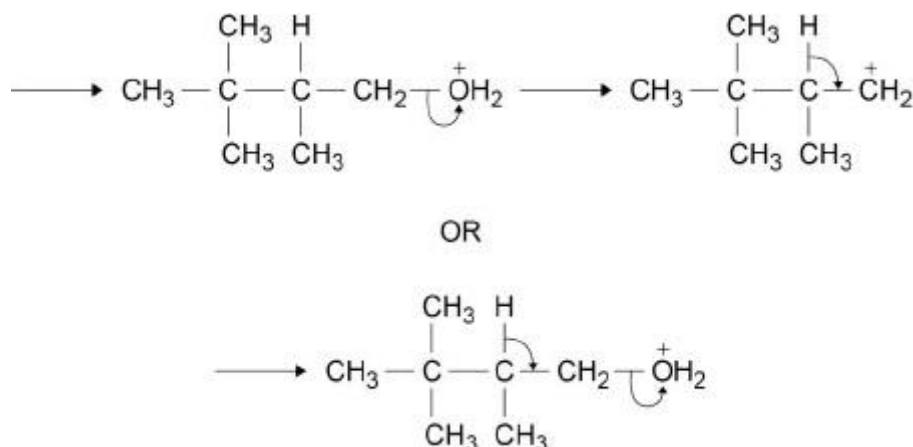
Q2.

(a) **M1** idea of ensuring condenser fills with water

M2 idea that condenser is cool(er) **or**
ensuring (more) vapour condenses

2

(b) **M1** elimination



M1 ignore dehydration; ignore reference to acid-catalysed

M2 correct protonated intermediate with OH_2^+

M3 loss of H_2O : correct arrow from middle of C-O bond to the O

M4 loss of H^+ : correct arrow from middle of correct C-H bond to correct C-C bond

M2 + charge anywhere on OH_2 group

M3 and **M4** can be two separate steps or all in one step - if two steps shown then the correct carbocation is part of **M4**

Ignore structure of product

For **M3/4**, penalise extra arrows on the original structure (or elsewhere) that contradict "correct" ones

4

(c) Correct answer scores 5

M1 mass of alcohol = 12×0.818 (= 9.816 g)

M2 amount of alcohol = $\frac{\text{M1}}{116(.0)}$ (= 0.0846 mol)

M3 M_r of alkene = 98(.0)

M4 mass of alkene expected = **M2** $\times$ **M3** (= 8.29 g)

M5 % yield = $\frac{6.12}{\text{M4}} \times 100$ = 73.8% (at least 2sf)

Alternative

M4 mol of alkene formed = $\frac{6.12}{\text{M3}}$ (= 0.0624 mol)

M5 % yield = $\frac{\text{M4}}{\text{M2}} \times 100$ = 73.8% (at least 2sf)

Allow ECF at each stage

M5 should be an attempt at (their) mass (or moles) of alkene achieved divided by their mass (or moles) of alkene expected $\times 100$

5

[11]