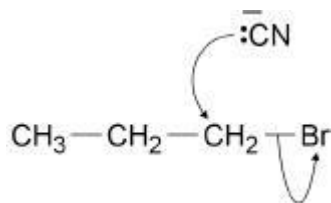


Mark schemes

Q1.

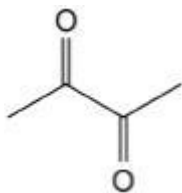
B



[1]

Q2.

A



[1]

Q3.

(a)



1

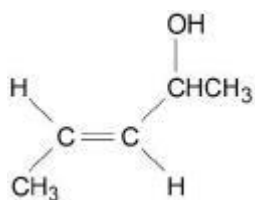
(b) Use Plane polarised light

M1

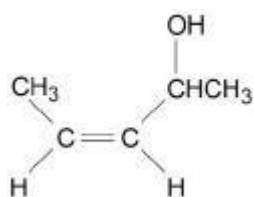
rotates (the plane of) in opposite directions

M2

(c)

*Must be E isomer*

M1

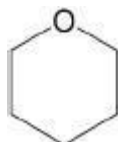


Must be Z isomer

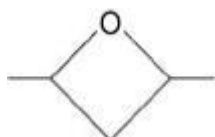
Allow 1 mark out of 2 for 2 correct structures but shown in the wrong boxes

M2

(d)



M1

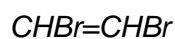


M2

[7]

Q4.

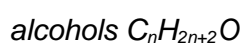
C



[1]

Q5.

A



[1]

Q6.

| | |
|--|---|
| This question is marked using levels of response. Refer to the Mark Scheme Instructions for Examiners for guidance on how to mark this question. | |
| Level 3 5-6 marks | All stages are covered and each stage is generally correct and virtually complete. (6 v 5) Answer is well structured, with no repetition or irrelevant points, and covers all aspects of the question. Accurate and clear expression of ideas with no errors in use of technical terms. |
| Level 2 | All stages are covered but stage(s) may be incomplete or may contain inaccuracies OR two stages are covered |

| | |
|------------------------------|--|
| 3-4 marks | and are generally correct and virtually complete (4 v 3) Answer has some structure and covers most aspects of the question. Ideas are expressed with reasonable clarity with, perhaps, some repetition or some irrelevant points. If any, only minor errors in use of technical terms. |
| Level 1 1-2 marks | Two stages are covered but stage(s) may be incomplete or may contain inaccuracies OR only one stage is covered but is generally correct and virtually complete (2 v 1) Answer includes statements which are presented in a logical order and/or linked. |
| 0 marks | Insufficient correct chemistry to warrant a mark. |

Indicative chemistry

Stage 1

Difference between structural & stereoisomers

1a structural isomers = molecules with same molecular formula but different structure

1b stereoisomers = molecules with same structural formula but different arrangement of atoms in space

Stage 2

Stereoisomers

2a lack of rotation around C=C

2b structures of *E*- and *Z*-but-2-ene

2c correct identity of *E* and *Z* isomers

Stage 3

Structural isomers

3a different C chain, e.g. methylpropene & but-1-ene / but-2-ene

3b different position of functional group e.g. but-1-ene & but-2-ene

3c different functional group, e.g. cyclobutane & but-1-ene / but-2-ene / methylpropene

[6]

Q7.

C

3-fluoro-2,2-dimethylpentane

[1]

Q8.

C

Propanenitrile

[1]

Q9.

A

[1]

Q10.

D



[1]

Q11.

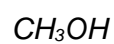
C

4

[1]

Q12.

B



[1]

Q13.

C

[1]

Q14.

A

[1]

Q15.

D

[1]

Q16.

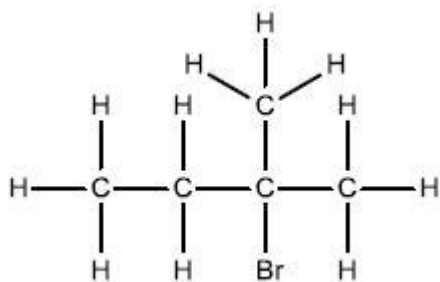
(a)



Must be a skeletal structure

1

(b)



Must be a displayed structure

1

(c) Any correct structural representation of alkene with 4 C atoms, either:

but-1-ene or
but-2-ene or
methylpropene

allow butadiene

1

[3]

Q17.

C

[1]

Q18.

B

[1]

Q19.

B

[1]

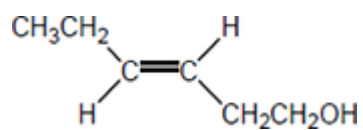
Q20.

D

[1]

Q21.

(a)



1

(b)



1

- (c) **Stage 1:** consider the groups joined to right hand carbon of the C=C bond

Extended response

Maximum of 5 marks for answers which do not show a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Consider the atomic number of the atoms attached

M1 can be scored in stage 1 or stage 2

1

C has a higher atomic number than H, so CH₂OH takes priority

1

Stage 2: consider the groups joined to LH carbon of the C=C bond

Both groups contain C atoms, so consider atoms one bond further away

1

C, (H and H) from ethyl group has higher atomic number than H, (H and H) from methyl group, so ethyl takes priority

1

Stage 3: conclusion

The highest priority groups, ethyl and CH₂OH are on same side of the C=C bond so the isomer is Z

Allow M5 for correct ECF conclusion using either or both wrong priorities deduced in stages 1 and 2

1

The rest of the IUPAC name is 3-methylpent-2-en-1-ol

1

- (d) Moles of maleic acid = $10.0 / 116.0 = 8.62 \times 10^{-2}$

AND mass of organic product expected = $(8.62 \times 10^{-2}) \times 98.0 = 8.45$ g

Or moles of organic product formed = $6.53 / 98.0 = 6.66 \times 10^{-2}$

1

% yield = $100 \times 6.53 / 8.45$

OR = $100 \times (6.66 \times 10^{-2}) / (8.62 \times 10^{-2})$

= $77.294 = 77.3\%$

AND statement that the student was NOT correct

1

[10]