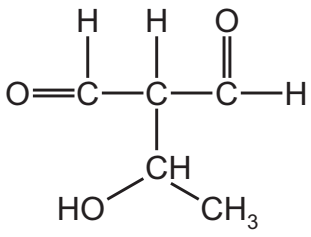
33 The balanced equation for the reaction of X with an excess of acidified $K_2Cr_2O_7$ is shown.

$$X + 3[O] \rightarrow Y + H_2O$$

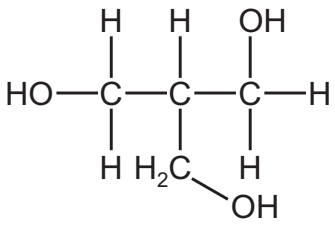
Compound Y is the only organic product of the reaction.

Which compound is X?

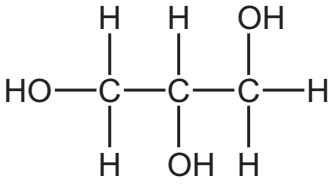
A



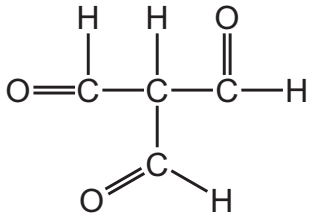
B



C



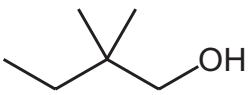
D



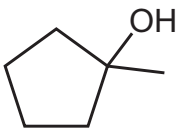
39 Some properties of compound X are listed.

- 1.0 mol X reacts with exactly 8.5 mol oxygen when completely combusted.
- X does **not** react when heated with acidified $KMnO_4$.

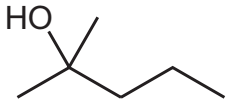
What are the possible identities of X?



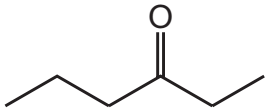
1



2



3



4

A 1 and 3 **B** 2 and 4 **C** 3 only **D** 4 only

32 Which reaction mixture produces a primary alcohol as the major product?

A propanone with $NaBH_4$

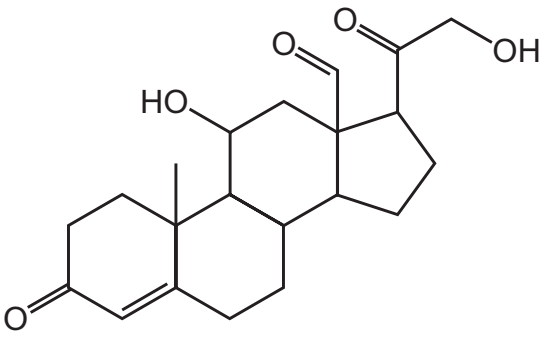
B propene with steam in the presence of H_3PO_4

C butanoic acid with $LiAlH_4$

D ethene with hot concentrated acidified $KMnO_4$

35 The structure of a naturally occurring compound, Q, is shown.

compound Q



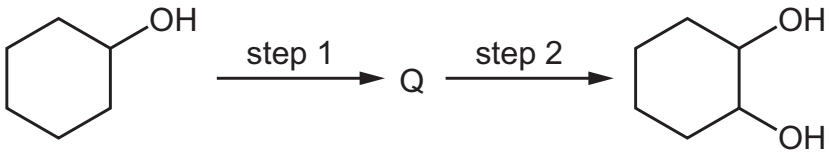
Compound Q is heated under reflux with an excess of acidified $KMnO_4$.

Organic product R is formed.

Which row is correct?

	results of tests with compound Q	results of tests with organic product R
A	orange precipitate with 2,4-DNPH and no reaction with alkaline I_2(aq)	yellow precipitate with alkaline I_2(aq) and no reaction with Fehling's reagent
B	red precipitate with Fehling's reagent and no reaction with alkaline I_2(aq)	orange precipitate with 2,4-DNPH and no reaction with alkaline I_2(aq)
C	yellow precipitate with alkaline I_2(aq) and orange precipitate with 2,4-DNPH	no reaction with alkaline I_2(aq) and no reaction with Fehling's reagent
D	yellow precipitate with alkaline I_2(aq) and red precipitate with Fehling's reagent	yellow precipitate with alkaline I_2(aq) and orange precipitate with 2,4-DNPH

33 Cyclohexanol is converted to cyclohexane-1,2-diol via a two-step synthesis that proceeds via intermediate Q.



Which row identifies the type of reaction in step 1 and in step 2?

	step 1	step 2
A	dehydration	oxidation
B	dehydration	nucleophilic substitution
C	reduction	oxidation
D	reduction	nucleophilic substitution

3 Propan-2-ol, $(CH_3)_2CHOH$, is sometimes added to fuel to help it burn.

Fig. 3.1 shows some reactions of propan-2-ol.

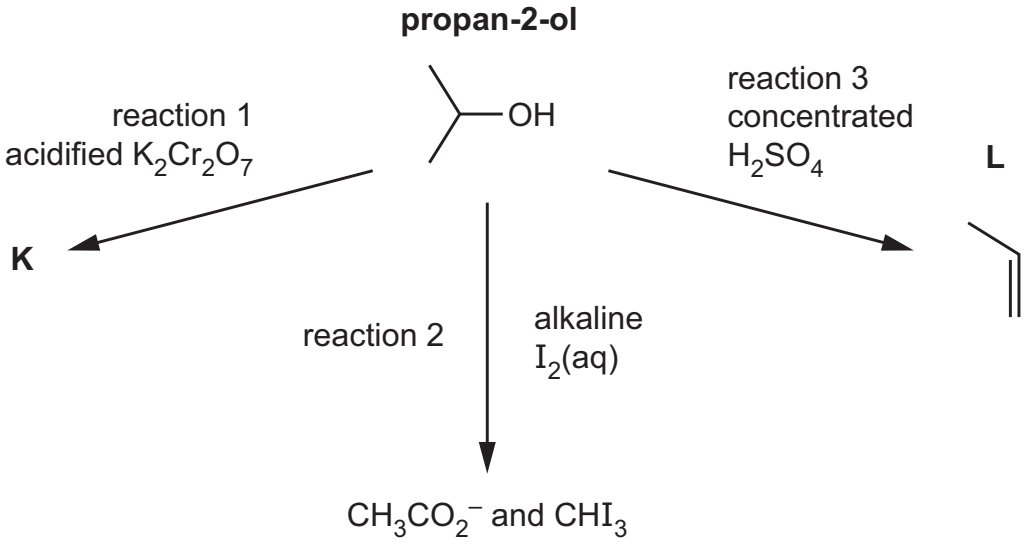


Fig. 3.1

(a) (i) Draw the structure of organic compound **K**.

[1]

(ii) State an observation you would make in reaction 2.

..... [1]

(iii) State the type of reaction that is shown in reaction 3.

..... [1]

(iv) Complete Fig. 3.2 to show the pi (π) bond in **L** that is formed from orbital overlap.

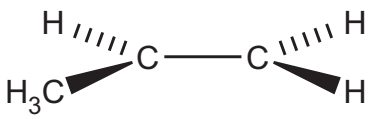


Fig. 3.2

[1]

(b) Propan-2-ol reacts with sodium to produce $(CH_3)_2CH–O^-$ anions.

These anions react with 2-bromopropane to form compound **N**, as shown in Fig. 3.3.

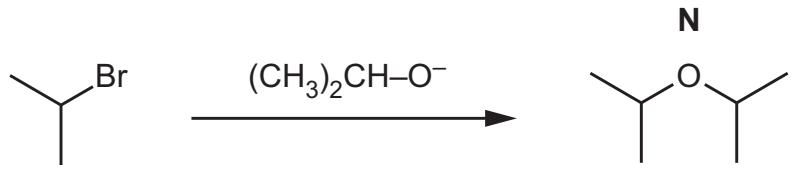


Fig. 3.3

(i) Write an equation for the reaction of propan-2-ol with sodium.

..... [1]

(ii) The reaction of 2-bromopropane with $(CH_3)_2CH–O^-$ anions follows an S_N1 mechanism.

Complete Fig. 3.4 to show this mechanism. Include charges, dipoles, lone pairs of electrons and curly arrows, as appropriate.

Fig. 3.4

[3]

(iii) Suggest how the rate of the S_N1 reaction would change, if at all, if 2-chloropropane were used instead of 2-bromopropane.

Explain your answer.

.....

.....

..... [2]

(iv) **N** is also added to petrol to make it burn more smoothly.

Construct an equation for the complete combustion of **N**, $C_6H_{14}O$.

$C_6H_{14}O$ ..... [1]

[Total: 11]