

Exercise 2_3 Reactions



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Write the date in the margin of your homework jotter.

Write the title of this Exercise as a heading: Exercise 2_3 Reactions.

1.

The dehydration of butan-2-ol can produce two isomeric alkenes, but-1-ene and but-2-ene.

Which of the following alkanols can similarly produce, on dehydration, a pair of isomeric alkenes?

- A Propan-2-ol
- B Pentan-3-ol
- C Hexan-3-ol
- D Heptan-4-ol



6.

Compound X reacted with hot copper(II) oxide and the organic product did not give a colour change when heated with Fehling's solution. Compound X could be

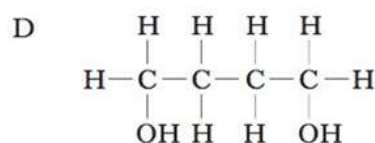
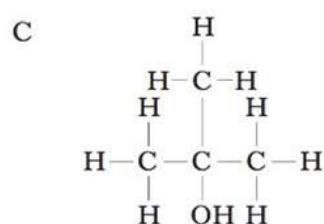
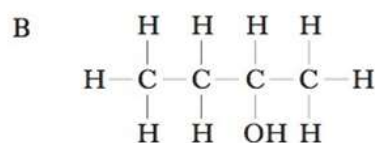
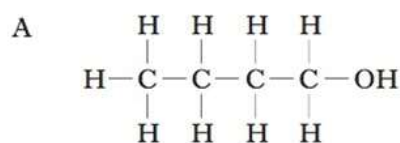
- A butan-1-ol
- B butan-2-ol
- C butanone
- D butanoic acid



2.

The structures for molecules of four liquids are shown below.

Which liquid will be the most viscous?



3.

Which of the following compounds would react with sodium hydroxide solution to form a salt?

- A CH_3CHO
- B CH_3COOH
- C CH_3COCH_3
- D $\text{CH}_3\text{CH}_2\text{OH}$



4.

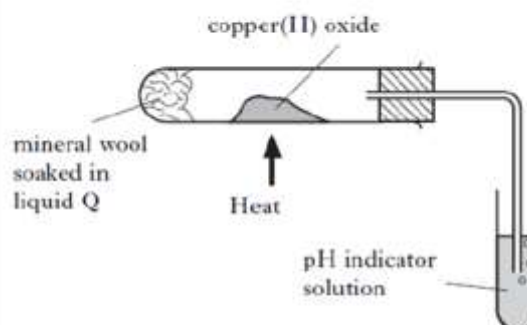
Which of the following solids has a low melting point and a high electrical conductivity?

- A Iodine
- B Potassium
- C Silicon oxide
- D Potassium fluoride



7.

After heating for several minutes, as shown in the diagram, the pH indicator solution turned red.



Liquid Q could be

- A propanone
- B paraffin
- C propan-1-ol
- D propan-2-ol



8.

Which of the following reactions can be classified as reduction?

- A $\text{CH}_3\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{COOH}$
- B $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3 \rightarrow \text{CH}_3\text{COCH}_3$
- C $\text{CH}_3\text{CH}_2\text{COCH}_3 \rightarrow \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
- D $\text{CH}_3\text{CH}_2\text{CHO} \rightarrow \text{CH}_3\text{CH}_2\text{COOH}$



9.

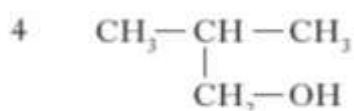
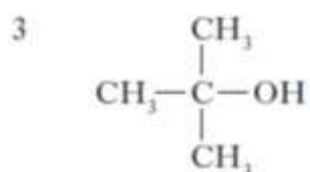
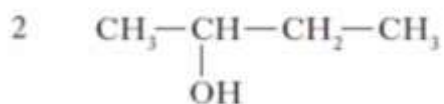
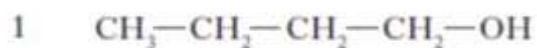
In which of the following liquids does hydrogen bonding occur?

- A Ethanoic acid
- B Ethyl ethanoate
- C Hexane
- D Hex-1-ene



5.

Which two isomers would each produce an acid when warmed with acidified potassium dichromate solution?

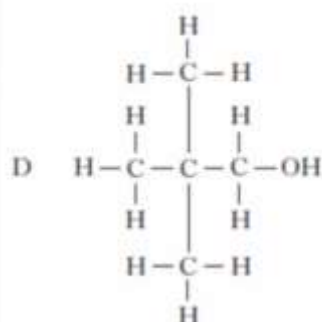
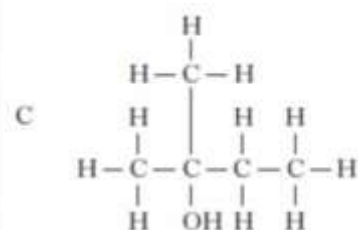
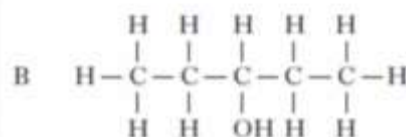
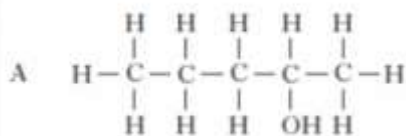


- A 1 and 2
B 2 and 3
C 1 and 4
D 3 and 4



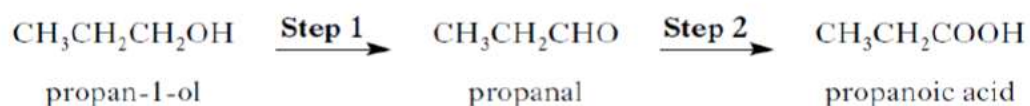
10.

Which alcohol could be oxidised to a carboxylic acid?



11.

Alkanols can be oxidised to alkanoic acids.



(a) Why can Step 1 be described as an oxidation reaction? (1)



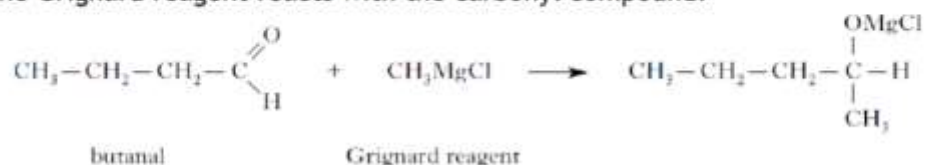
(b) Acidified potassium dichromate solution can be used to oxidise propanal in Step 2. What colour change would be observed in this reaction? (1)



Primary, secondary and tertiary alkanols can be prepared by the reaction of carbonyl compounds with Grignard reagents.

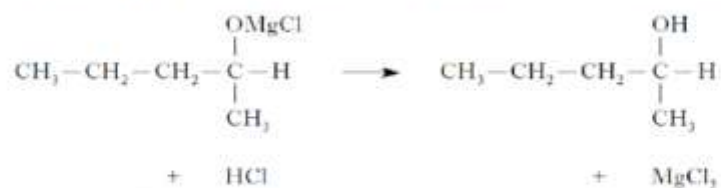
Step 1

The Grignard reagent reacts with the carbonyl compound.



Step 2

The reaction of the product of Step 1 with dilute acid produces the alkanol.



(a) Describe the difference between a primary, a secondary and a tertiary alkanol.

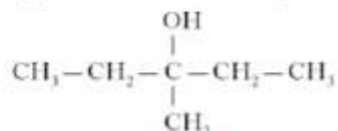
You may wish to include labelled structures in your answer. (1)



(b) Suggest a name for the type of reaction that takes place in Step 1. (1)



(c) The same Grignard reagent can be used to produce the alkanol below.

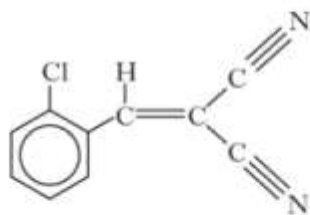


Name the carbonyl compound used in this reaction. (1)

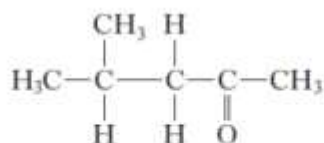


The active chemical in CS spray was developed by two chemists, Corson and Stoughton, after whom it is named.

(a) The active "CS" chemical has the structure shown.



The solvent used in CS spray is commonly known as MiBK and has the structure shown.

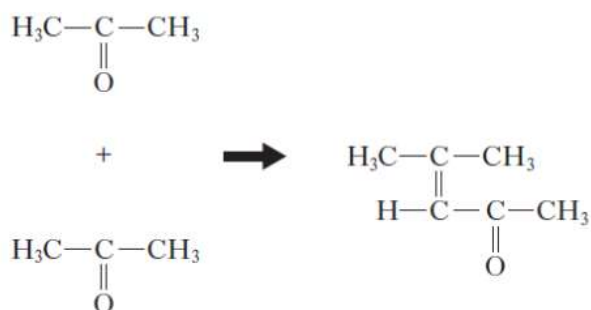


Give the systematic name for this solvent.



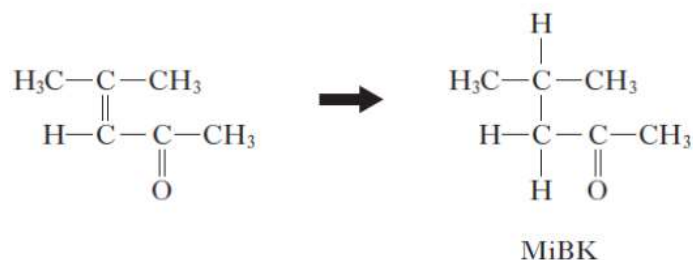
(d) The MiBK solvent is manufactured from propanone as shown in the following reaction sequence.

Step 1 Two molecules of propanone react



In this reaction the carbon carbon double bond forms between the carbonyl group of one molecule and the α -carbon of the second molecule (the α -carbon is the carbon adjacent to the carbonyl group).

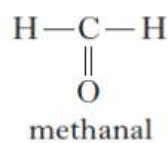
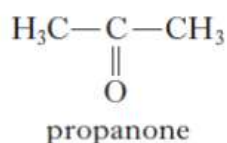
Step 2



(i) What is the name for the type of addition reaction taking place in **Step 2**?

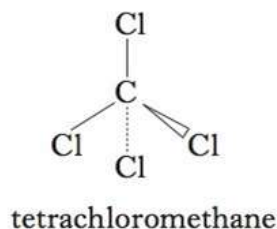
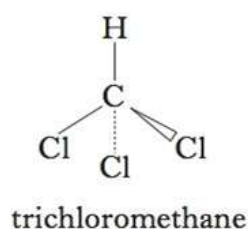


- (ii) Draw the product formed at the end of **Step 1** when a molecule of propanone reacts with a molecule of methanal.



14

The structures below show molecules that contain chlorine atoms.



- (a) The compounds shown above are not very soluble in water. Trichloromethane is around ten times more soluble in water than tetrachloromethane.

Explain clearly why trichloromethane is more soluble in water than tetrachloromethane.

Your answer should include the names of the intermolecular forces involved.

15.

The Periodic Table is an arrangement of all the known elements in order of increasing atomic number. The reason why the elements are arranged as they are in the Periodic Table is to fit them all, with their widely diverse physical and chemical properties, into a logical pattern.

Periodicity is the name given to regularly-occurring similarities in physical and chemical properties of the elements.

Some Groups exhibit striking similarity between their elements, such as Group 1, and in other Groups the elements are less similar to each other, such as Group 4, but each Group has a common set of characteristics.

Adapted from Royal Society of Chemistry, Visual Elements (rsc.org)

Using your knowledge of chemistry, comment on similarities and differences in the patterns of physical and chemical properties of elements in both Group 1 and Group 4.

3