Purity

Characteristics of pure substances:

- Pure substances have sharp melting and boiling points.
  Example: Boiling point of pure water is 100^0C while melting point of pure ice is 0^oC.

Effect of impurities on "pure substances":

- Due to the presence of impurities, the melting and the boiling points will not be sharp any more. Substances will melt and boil over a range of temperatures.
- The boiling point will be increased further due to the presence of impurities. Example: Impure water will boil above 100^0C.
- The greater the impurity, the greater will be the increase in the boiling point.
- The melting point is decreased by impurities. So impure ice will not melt at 0^0C but will melt at a lower temperature

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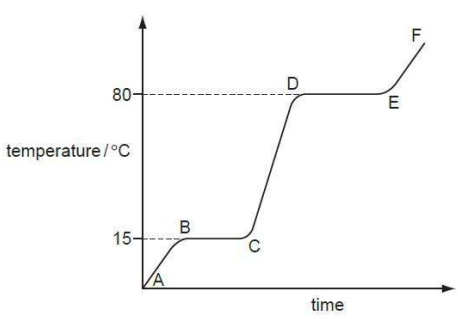
Graphs of pure and impure substances

1. Graphs of pure substances show horizontal regions which represent the melting points and boiling points of substances.
2. These temperatures are described as sharp/ fixed / specific temperatures.[2m]



Graphs of pure substances :

Have Regions[1]m

- Region where the solids melts(Example region BC)

Region where the liquid boils (Example: Region DE) And

- The solid melts and the liquids boils at a fixed or a specific temperature [1m]

Define:

- **Melting point: It is the temperature at which a solid changes into a liquid.**
- **Boiling point: It is the temperature at which a liquid changes into a gas.**

Naming the test for purity of substances:

The following are the tests to check the purity of substances:

- **Testing for the melting points and boiling points of substances.**
- **Performing chromatography and checking the purity of substances**

Application based questions: Extended Theory

[M/J/2015-V-62-Q3]

3 Three bottles of liquid have lost their labels. The liquids are known to be:

- aqueous potassium hydroxide,
- octane,
- pure water.

Outline tests you would do to identify and distinguish the liquid in each bottle.

liquid	test	result
pure water		

Look at the marking scheme below: It tells you that you need to be able to mention the melting and boiling points of pure water.

	pure water boiling point / melting point; 100 °C / 0 °C;

[M/J/2009-v32-Q1 a (ii)]

(ii) Given a pure sample of chlorophyll, how could you show that the green solution from the grass contained chlorophyll?

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..... [2]

Application based questions: Extended MCQ

Skill 1:Identify methods of testing purity of substances

[M/J/2003-Q3]

3 Some chemical compounds are purified by recrystallisation.

What can be used to test the purity of the crystals?

A melting point

B colour of crystals

C size of crystals

D solubility

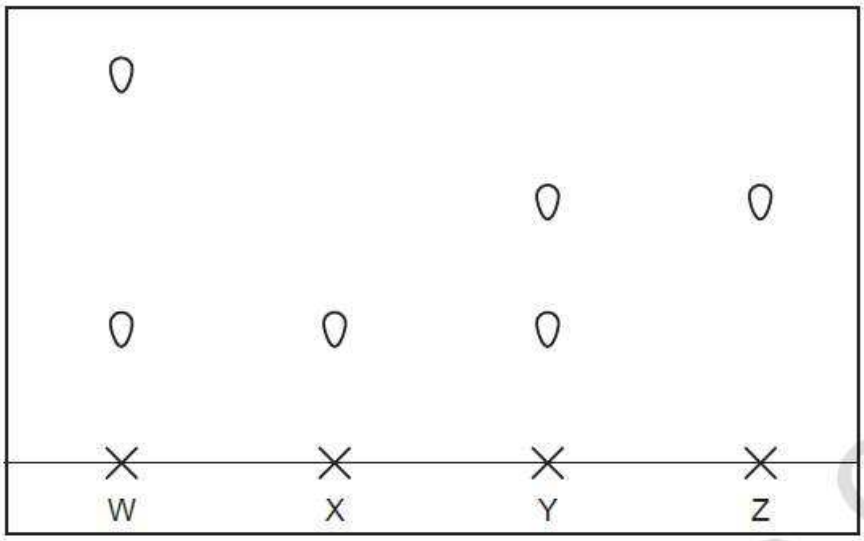
[M/J/2003-Q4]

4 What could be the melting point and boiling point of water containing a dissolved impurity?

	melting point / °C	boiling point / °C
A	+3	96
B	+3	104
C	–3	96
D	–3	104

[M/J/2009-V11-Q3]

3 The diagram shows the paper chromatograms of four substances, W, X, Y and Z.



Which two substances are pure?

A W and X **B** W and Y **C** X and Y **D** X and Z

Extended theory: Testing Purity-Graphical questions

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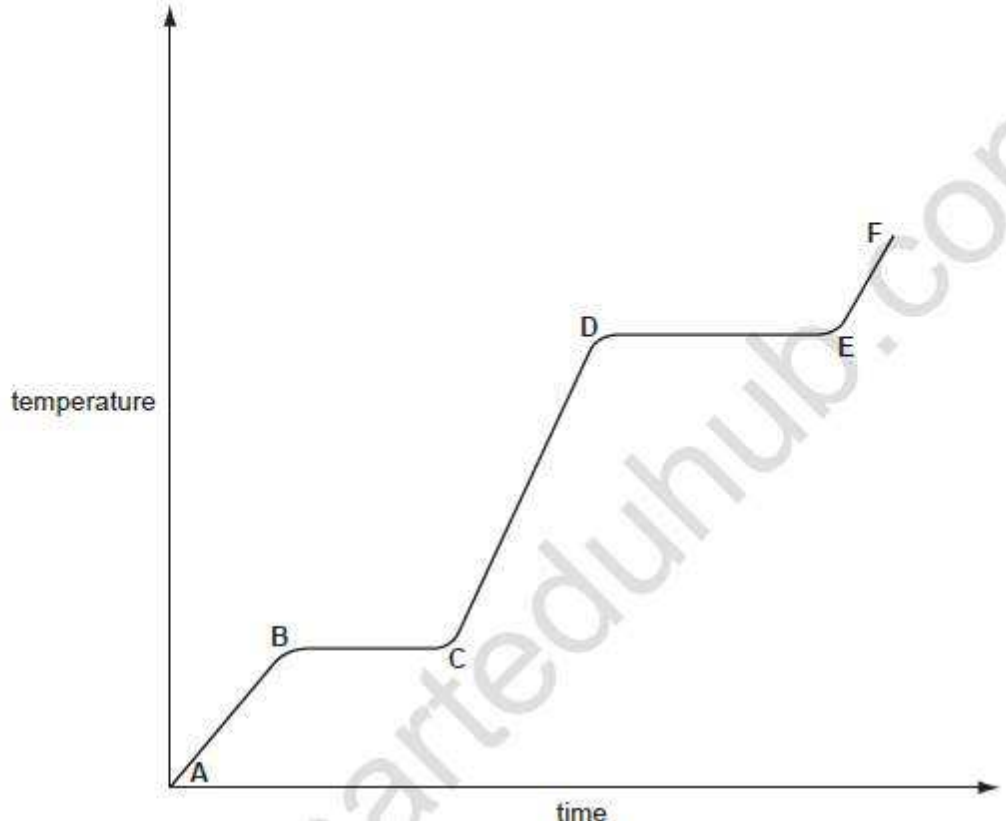
2 Ethanoic acid is a colourless liquid at room temperature. It has the typical acid properties and forms compounds called ethanoates.

(a) A pure sample of ethanoic acid is slowly heated from 0°C to 150°C and its temperature is measured every minute. The results are represented on the graph below.

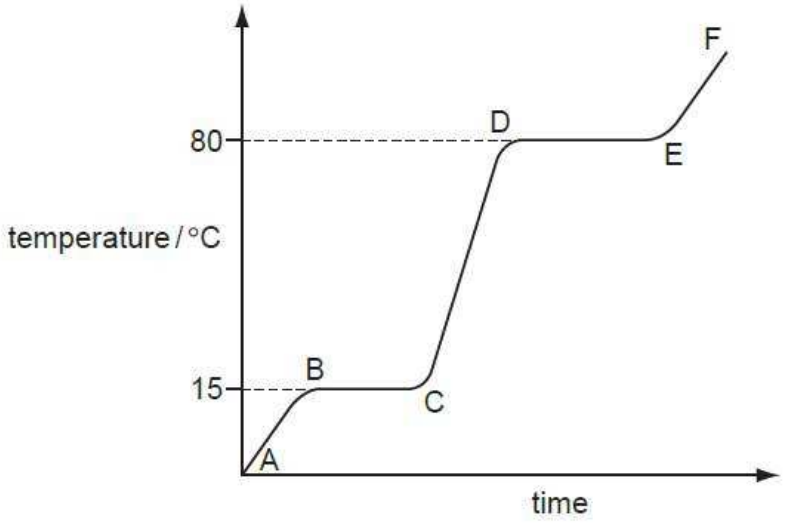


(ii) What would be the difference in the region **B** to **C** if an impure sample had been used?

.....[1]

[O/N/2012-V32-Q2]

2 The diagram shows a heating curve for a sample of compound X.



(d) Explain how the curve shows that a pure sample of compound X was used.

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