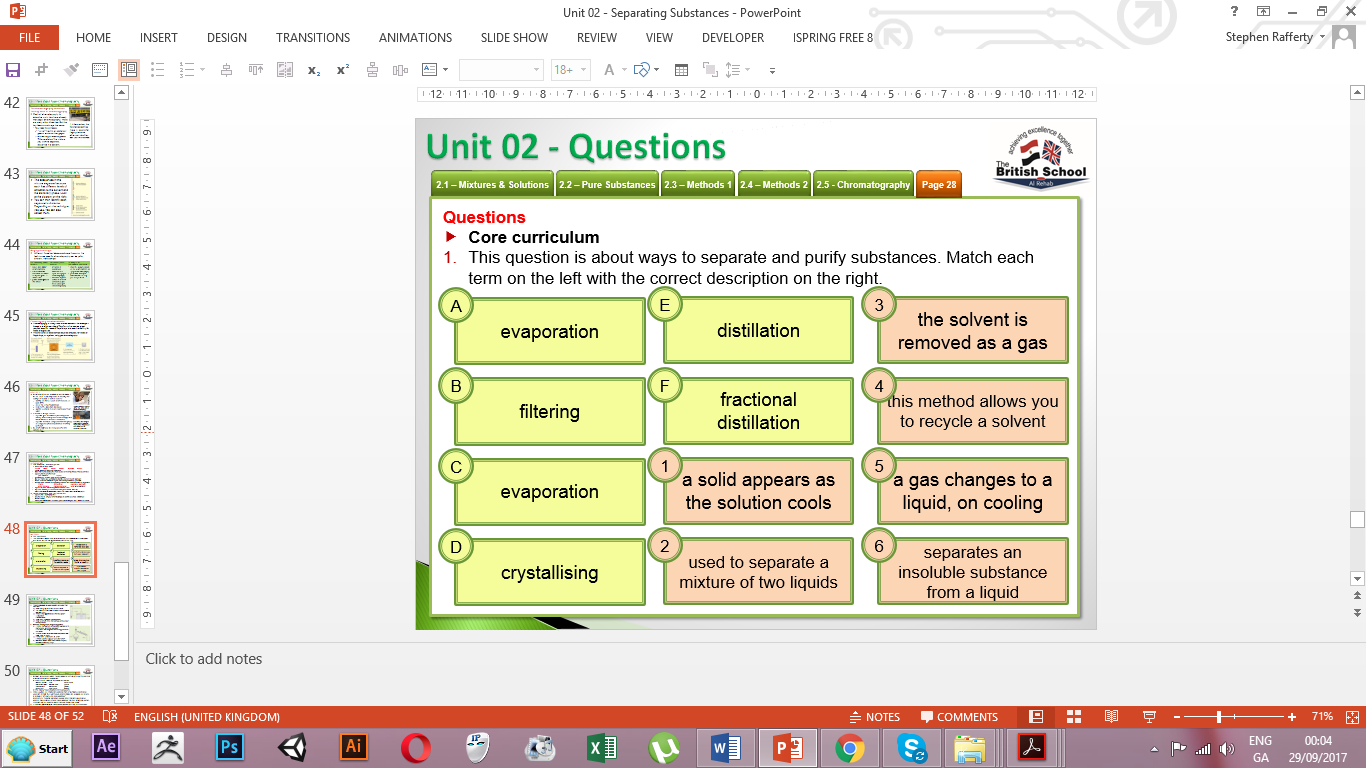
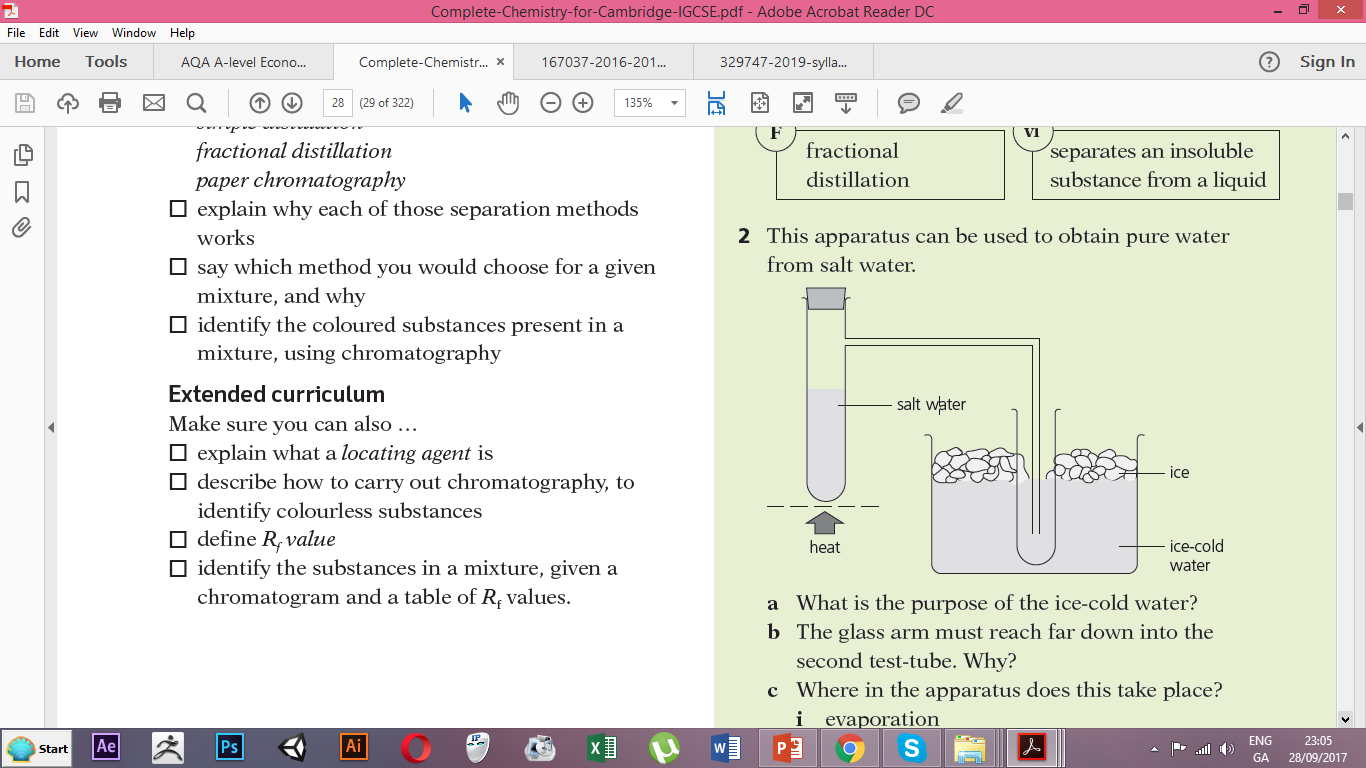
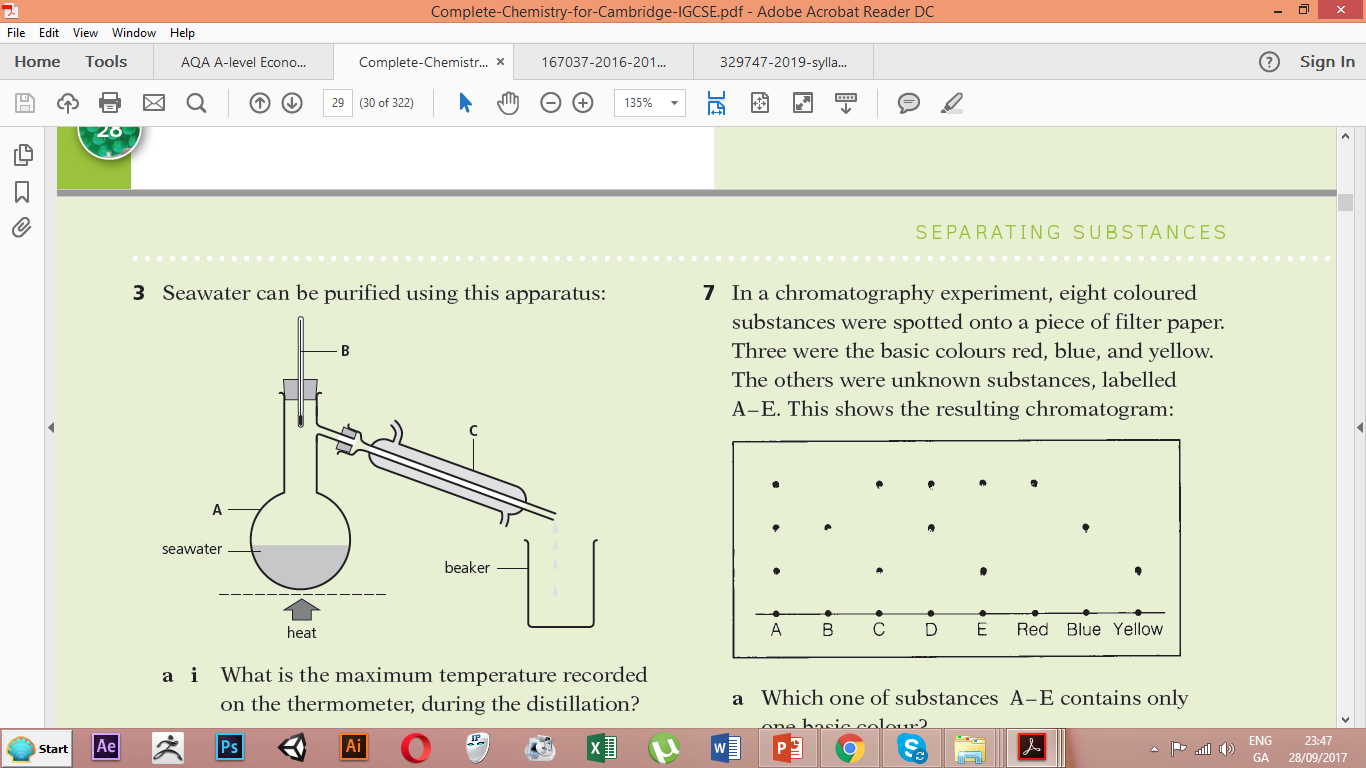
**Questions: Core curriculum**

1. This question is about ways to separate and purify substances. Match each term on the left with the correct description on the right.



1. This apparatus can be used to obtain pure water from salt water.
2. What is the purpose of the ice-cold water?
3. The glass arm must reach far down into the second test-tube. Why?
4. Where in the apparatus does this take place?  
   i evaporation  
   ii condensation
5. What is this separation method called?
6. What will remain in the first test-tube, at the end of the experiment?
7. Seawater can be purified using this apparatus:
8. i What is the maximum temperature recorded on the thermometer, during the distillation?  
   ii How does this compare to the boiling point of the seawater?
9. In which piece of apparatus does evaporation take place? Give its name.
10. i Which is the condenser, A, B, or C?  
    ii Where does the supply of cold water enter?
11. Distillation is used rather than filtration, to purify seawater for drinking. Why?
12. Gypsum is insoluble in water. You are asked to purify a sample of gypsum that is contaminated with a soluble salt.  
    a Which of these pieces of apparatus will you use?

*Bunsen burner filter funnel tripod*

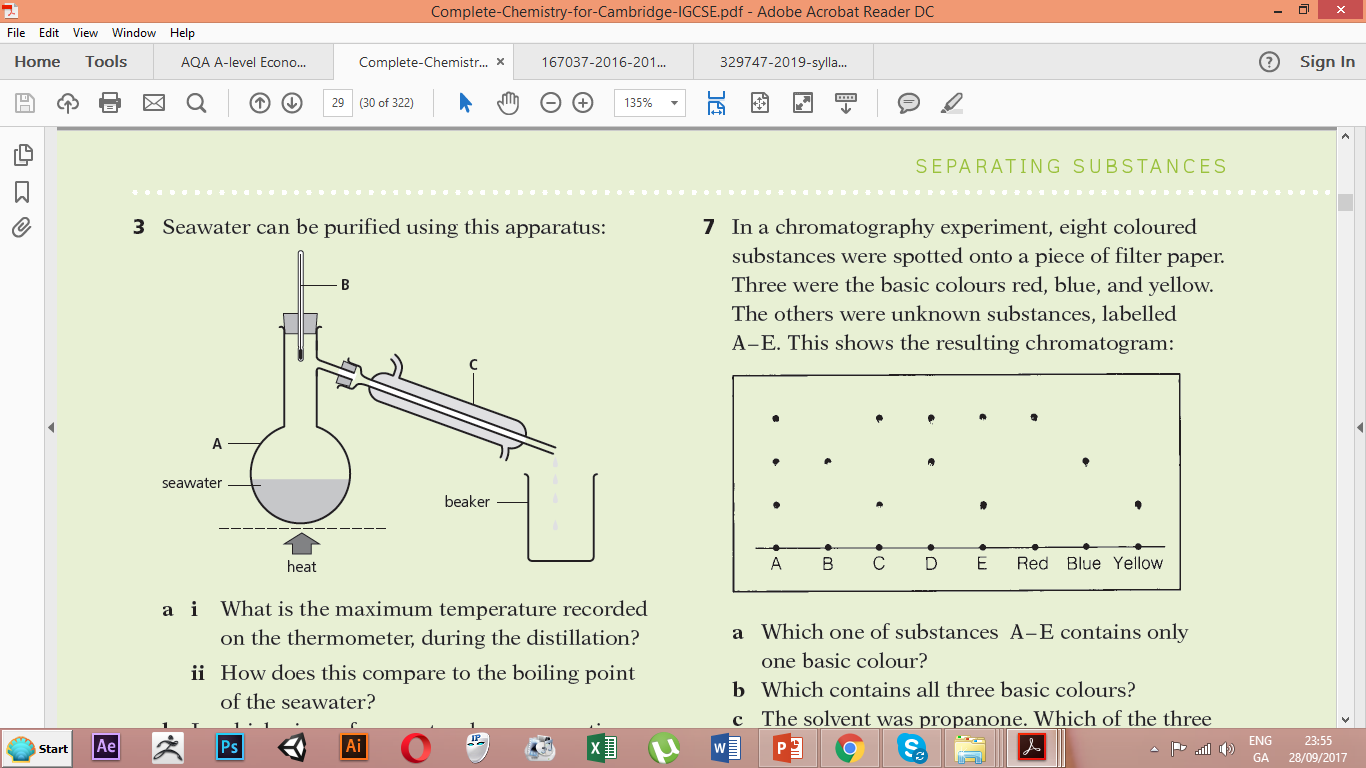
*distillation flask conical flask pipette*

*thermometer condenser gauze*

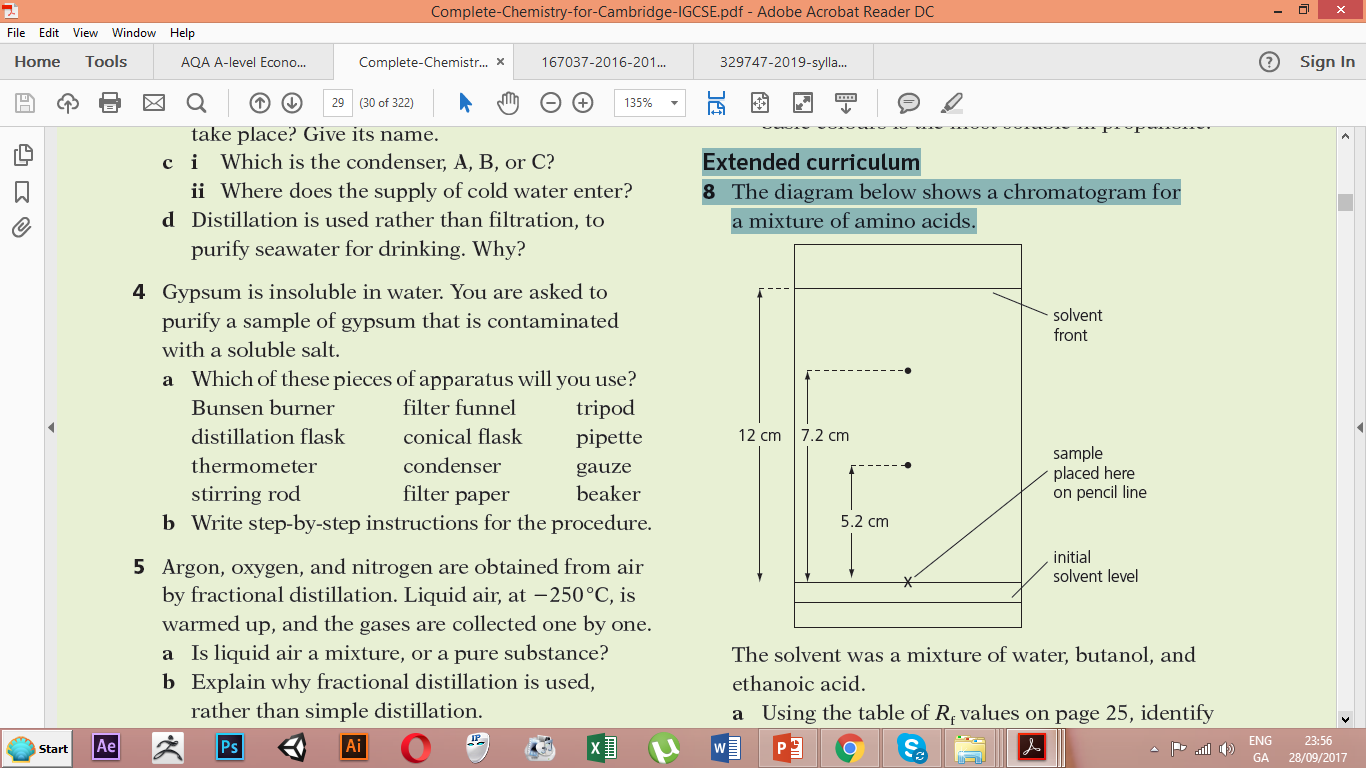
*stirring rod filter paper beaker*

b Write step-by-step instructions for the procedure.

1. Argon, oxygen, and nitrogen are obtained from air by fractional distillation. Liquid air, at 2250 °C, is warmed up, and the gases are collected one by one.  
   a Is liquid air a mixture, or a pure substance?  
   b Explain why fractional distillation is used, rather than simple distillation.   
   c During the distillation, nitrogen gas is obtained first, then argon and oxygen. What can you say about the boiling points of these three gases?
2. A mixture of salt and sugar has to be separated, using the solvent ethanol.   
   a Draw a diagram to show how you will separate the salt.  
   b How could you obtain sugar crystals from the sugar solution, without losing the ethanol?  
   c Draw a diagram of the apparatus for b.
3. In a chromatography experiment, eight coloured substances were spotted onto a piece of filter paper. Three were the basic colours red, blue, and yellow. The others were unknown substances, labelled A – E. This shows the resulting chromatogram:



1. Which one of substances A – E contains only one basic colour?
2. Which contains all three basic colours?
3. The solvent was propanone. Which of the three basic colours is the most soluble in propanone?

**Extended curriculum**

1. The diagram below shows a chromatogram for a mixture of amino acids.   
   The solvent was a mixture of water, butanol, and ethanoic acid.  
   a Using the table of Rf values on page 25, identify the two amino acids.  
   b Which of them is less soluble in the solvent?  
   c How will the Rf values change if the solvent travels only 6 cm?
2. You have three colourless solutions. Each contains an amino acid you must identify.  
   Explain how to do this using chromatography.  
   Use the terms Rf and locating agent in your answer, and show that you understand what they mean.