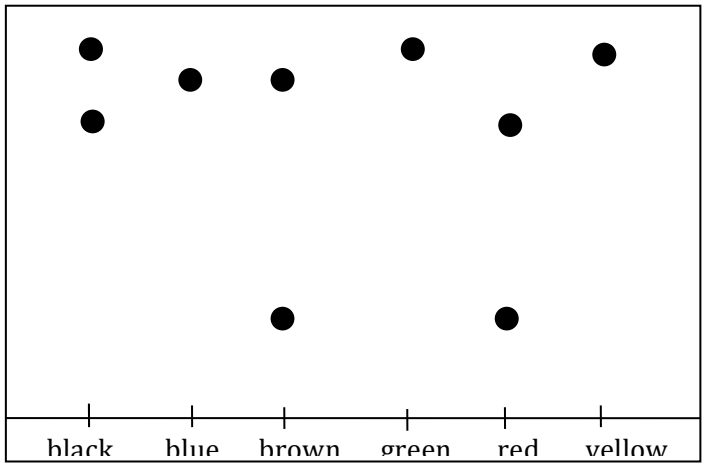
Module 3

Q1 The diagram shows a chromatogram of several inks.



Which statement is correct?

A Black ink can be made by mixing green, red and yellow inks.
B Brown ink can be made by mixing blue and red inks.
C Yellow ink can be used to make brown ink.
D Yellow ink may be present in green ink.

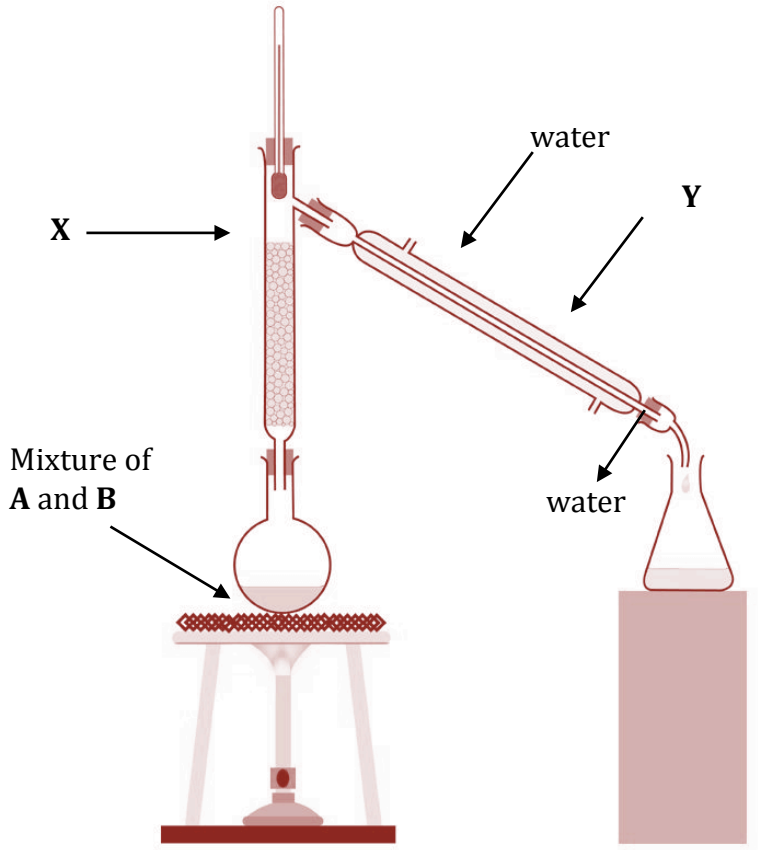
Q2 An impure solid of soluble lead (II) nitrate contains some lead(II) sulfate. Which of the following statements shows the correct sequence to obtain a sample of hydrated lead(II) nitrate?

A Dissolution, filtration followed by distillation.
B Dissolution, filtration followed by crystallisation**.**
C Dissolution, filtration followed by evaporation to dryness.
D Dissolution, filtration followed by drying between pieces of filter paper.

Q3 Fractional distillation is used to separate alcohol from water in fermented liquor. This process depends on the

A boiling point of alcohol.
B ability of the alcohol to ignite.
C solubility of the alcohol in water.
D colourless nature of both liquids.

Q4 A student uses the experimental set up as shown below to separate a mixture of two liquids, **A** and **B**.



(a) Name the parts **X** and **Y**

(b) Deduce from the separation method used by the student, two physical properties of **X** and **Y** in the mixture.

(c) State the purpose of adding glass beads in **P**.

(d) Explain **one change** you would make to the experimental set up so that a more efficient separation can take place.

Q5 In Singapore, consuming Ketamine is illegal. People suspected of drug abuse have to undergo a urine test to confirm whether they are guilty. Regular urine tests are also used for monitoring the fluids of drug addicts.

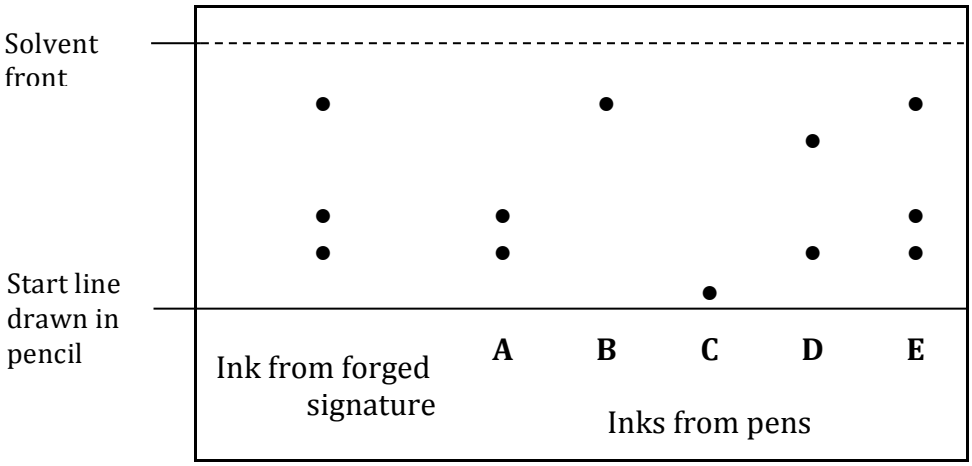
(a) Name the technique used in the tests above.

(b) Briefly explain the principle behind this technique.

(c) Give two advantages of using this technique.

(d) The same technique can also be used to identify sugars and amino acids. At the end, a locating agent is used. Give a reason for the necessity of using a locating agent.

Q6 Chromatography is often used in the police force to solve crimes involving forgery. A sample of ink from a forged signature was tested together with inks from the pens of five suspects A, B, C, D and E. The following chromatogram was obtained with the use of an organic solvent.



(a) Which suspect is using a pen with ink that is pure?

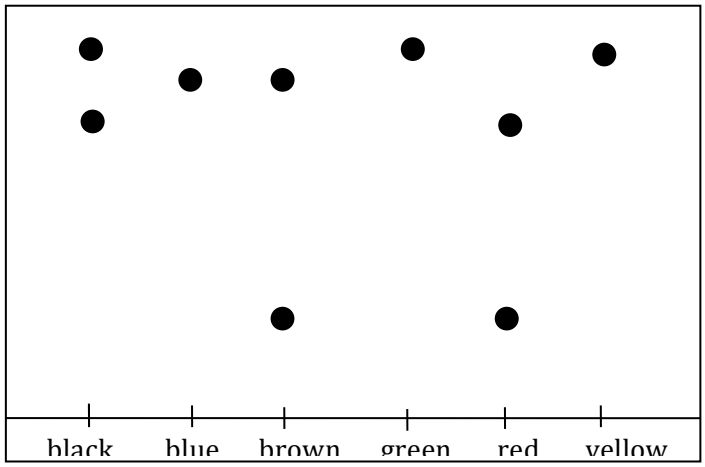
(b) Which suspect is highly likely to have committed the crime?

(c) Which two suspects could have collaborated to commit the crime?

(d) Explain why the ink from suspect R's pen remains at the start line.

Module 3 (Solutions)

Q1 The diagram shows a chromatogram of several inks.



Which statement is correct?

A Black ink can be made by mixing green, red and yellow inks.
B Brown ink can be made by mixing blue and red inks.
C Yellow ink can be used to make brown ink.
D Yellow ink may be present in green ink.

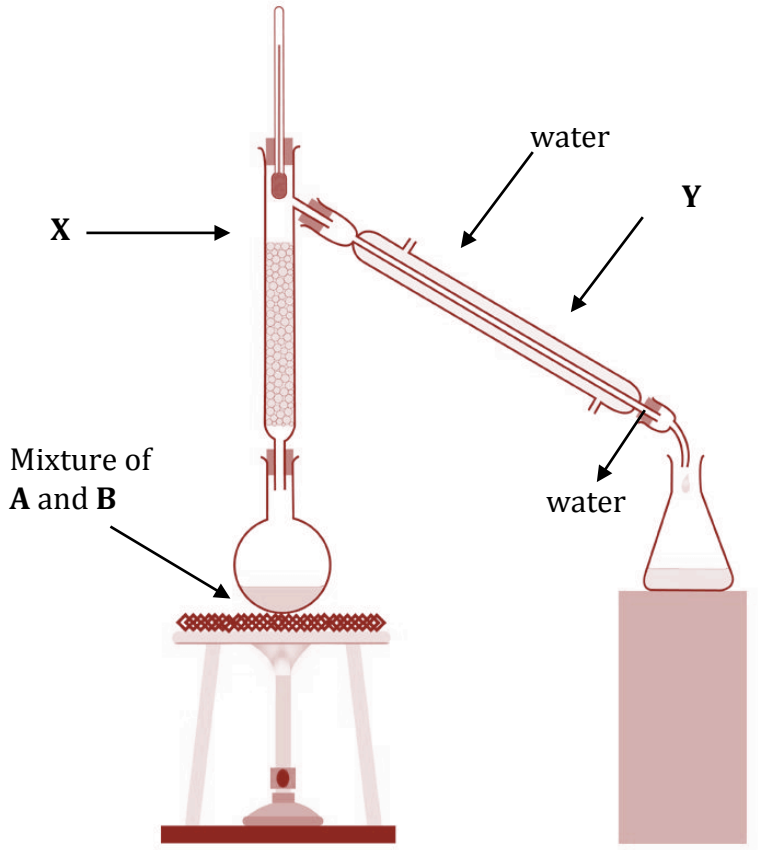
Q2 An impure solid of soluble lead (II) nitrate contains some lead(II) sulfate. Which of the following statements shows the correct sequence to obtain a sample of hydrated lead(II) nitrate?

A Dissolution, filtration followed by distillation.
B Dissolution, filtration followed by crystallisation**.**
C Dissolution, filtration followed by evaporation to dryness.
D Dissolution, filtration followed by drying between pieces of filter paper.

Q3 Fractional distillation is used to separate alcohol from water in fermented liquor. This process depends on the

A boiling point of alcohol.
B ability of the alcohol to ignite.
C solubility of the alcohol in water.
D colourless nature of both liquids.

Q4 A student uses the experimental set up as shown below to separate a mixture of two liquids, **A** and **B**.



(a) Name the parts **X** and **Y**.
X: Fractional Distillation
Y: Condenser

(b) Deduce from the separation method used by the student, two physical properties of **A** and **B** in the mixture.
Boiling point and misicibility of two soultions.

(c) State the purpose of adding glass beads in **P**.
Provide large surface area for vapour to condense.

(d) Explain **one change** you would make to the experimental set up so that a more efficient separation can take place.
Run cold water from the bottom of the condenser to the top.

Q5 In Singapore, consuming Ketamine is illegal. People suspected of drug abuse have to undergo a urine test to confirm whether they are guilty. Regular urine tests are also used for monitoring the fluids of drug addicts.

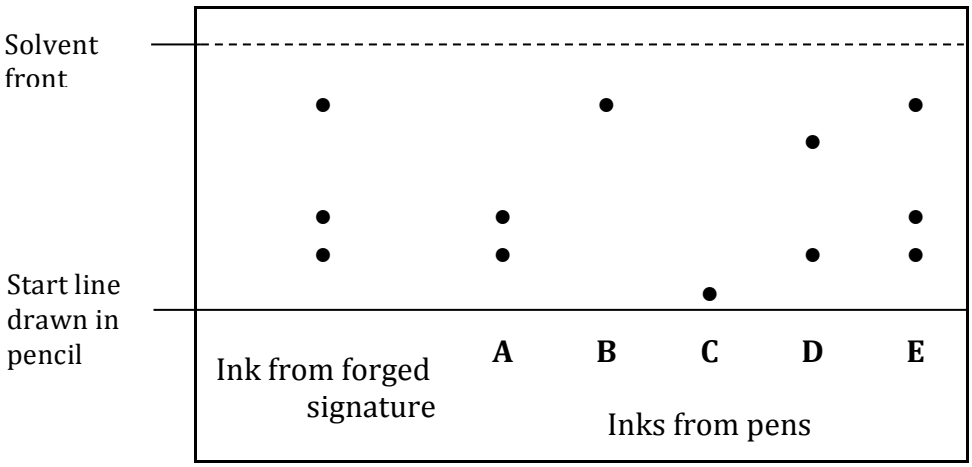
(a) Name the technique used in the tests above.
Chromatography.

(b) Briefly explain the principle behind this technique.
Chromatography separates compononents of a sample by placing capillary actions of a suitable solvent to develop the chromatogram. If the urine sample developed a spot at the same position as Ketamine, then Ketamine is present in drug addicts.

(c) Give two advantages of using this technique.
Separates components into individual components of analysis.
Determine the purity of the compound or samples.

(d) The same technique can also be used to identify sugars and amino acids. At the end, a locating agent is used. Give a reason for the necessity of using a locating agent.
Sugars and amino acids are colourless.

Q6 Chromatography is often used in the police force to solve crimes involving forgery. A sample of ink from a forged signature was tested together with inks from the pens of five suspects A, B, C, D and E. The following chromatogram was obtained with the use of an organic solvent.



(a) Which suspect is using a pen with ink that is pure? B
(b) Which suspect is highly likely to have committed the crime? E
(c) Which two suspects could have collaborated to commit the crime?
A and B
(d) Explain why the ink from suspect C's pen remains at the start line.
The ink is insoluble in the solvent used to develop chromatogram.