Section A

Please answer all MCQ in the table as provided below.

<table>
<thead>
<tr>
<th></th>
<th>7</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>2</td>
<td>8</td>
<td>14</td>
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<td>3</td>
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<td>4</td>
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<td>5</td>
<td>11</td>
<td>17</td>
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<tr>
<td>6</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

2003

1. Which technique could be used to obtain the elements X and Y from the compound XY?
   A Filtration
   B Distillation
   C Electrolysis
   D Crystallisation

2. The diagram shows apparatus being used to distil seawater. At which points will the temperature be 100°C?
   A Y only
   B X and Y only
   C Y and Z only
   D X, Y and Z
3. The diagram shows a chromatogram of several inks. Which statement is correct?

- ♠  ♦  ♦  ♦  ♦  ♦
- ♦  ♦  ♦  ♦  ♦
- ♦  ♦  ♦  ♦  ♦

| black | blue | brown | green | red | yellow |

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

2004

4 A separating funnel is used to separate the components of a mixture of

A iodine and sugar.
B ethanol and water.
C cooking oil and water.
D ammonium chloride and iron filings.

5 Sugar cannot be separated from sugar solution by evaporation to dryness because sugar will

A catch fire and burn.
B sublime on heating.
C form a lump on heating.
D char and decompose on heating.
6. Which of the following processes take place in the set-up shown below?

A. boiling and evaporation  
B. evaporation and melting  
C. boiling and condensation  
D. evaporation and condensation

7. In paper chromatography, the chromatography paper is placed in a liquid which dissolves the substances in the dye on the chromatography paper. The liquid(s) that can be used for such a purpose is/are

I. distilled water.  
II. iodine solution.  
III. ethanol.

A. I only  
B. I and III only  
C. II and III only  
D. All of the above
2005

8 Which of the following processes enable pure water to be obtained from sea water?

I filtration
II distillation
III evaporation
IV reverse osmosis

A I and II only
B I and III only
C II and IV only
D III and IV only

9 A cheque was suspected to be forged. Which technique could be used to compare the various pigments in the different inks?

A Chromatography
B Evaporation
C Crystallisation
D Sublimation

2006

10 Which of the following methods is most suitable for obtaining a pure, dry sample of sodium chloride from a mixture of solid sodium chloride and sand?

A Shake the mixture with water, filter and dry the residue on the filter paper.
B Shake the mixture with water, filter and evaporate the filtrate.
C Heat the mixture gently and collect the substance which sublimes.
D Heat the mixture gently and collect the substance which boils off.

11 Which statement explains why oxygen can be separated from nitrogen by the fractional distillation of liquid air?

A Oxygen is more dense than nitrogen.
B Oxygen is more reactive than nitrogen.
C The two elements have different boiling points.
D The two gases are in different groups of the Periodic Table.
12. A mixture of ______________ can be separated by magnetic attraction.
   A. Iron and steel
   B. Copper and Steel
   C. Copper and Tin
   D. Sand and Tin

2007

13. Which of the following is not a way to separate the components of a mixture?
   A. Evaporation
   B. Electrolysis
   C. Chromatography
   D. Sublimation

14. During distillation, some porcelain chips are added to the mixture being distilled to ______________.
   A. make the distilling flask more stable
   B. purify the mixture
   C. raise the temperature
   D. make the boiling smoother

15. A public health inspector suspects that in addition to two harmless dyes (boiling points 69°C and 71°C), a lollipop also contains a poisonous green dye (boiling point 73°C).

Which of the following can be used to confirm his suspicion?
   A. Fractional distillation
   B. Paper chromatography
   C. Filtration
   D. Crystallization
16 Fractional distillation is used to obtain the components of which of the following?

I air
II seawater
III muddy water
IV crude oil

A I, II
B II, III
C I, IV
D II, III

2008

17 John tried to separate sugar from its solution using the evaporation method. However, he was unsuccessful. Which of the following is the likely reason?

A There was insufficient sugar in the solution.
B He had forgotten to stir the solution during heating.
C The sugar had decomposed.
D The sugar had vaporised.
Section B

Answer the following in the spaces provided.

1 Sand that is needed for a project has some common salt accidentally mixed with it. Explain briefly how you can remove the common salt to obtain sand. [4]

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2 (a) Desalination is the removal of common salt from sea water. Distillation is one of the methods of desalination and the diagram below shows the apparatus used to purify sea water. Label the apparatus A to D. [4]

Diagram:

A ____________  B ____________  C ____________  D ____________
(b) Distillation is an expensive method to use for obtaining drinking water from sea water. Why is this so? [2]

______________________________________________________________

______________________________________________________________

______________________________________________________________

(c) Briefly describe how reverse osmosis is used to purify sea water. [3]

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

3 A shopkeeper notices that a packet of baby food has been tampered with and sends it to a laboratory for investigation. The food is found to contain tiny pieces of glass. All the glass pieces, free from baby food, are needed for analysis. The baby food is soluble in water.

Outline the method you would use to separate the glass pieces from a sample of the contaminated baby food. [2]

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

(2005)

(2006)
Name a suitable separation method that can be used to

(a) get petrol and diesel from petroleum
(b) get iodine from a mixture of iodine and sodium chloride
(c) detect the presence of drugs in a urine sample
(d) obtain pure water from sea water
(e) obtain salt from sea water

(2006)

A mixture of alcohol and water can be separated using the apparatus below.

(a) Name the process occurring in apparatus Z.

(b) If the boiling points of alcohol and water are 78°C and 100°C respectively, what is the liquid left in Q when the temperature reaches 90°C?

(2007)
6 State a suitable method/apparatus to be used for:

(a) separating cooking oil and water

(b) removing copper (II) sulphate from its solution

(2008)

7 A chromatogram is shown below.

(a) Which of the inks can be added together to produce black ink? [1]

(b) A spot of the same black ink was put at the centre of a filter paper, resting flat on a petri dish. Water was then slowly dripped onto the spot, one drop at a time.

Show the expected results by completing the diagram given below. Label the colours of the components clearly. [2]

(2008)
Section C

Answer the following questions on a piece of foolscap. Please remember to leave a line after every question.

1. (a) Name a suitable method to achieve each of the following:

   (i) To obtain common salt from seawater. [1]

   (ii) To collect pure water from pond water. [1]

   (iii) To separate the drugs from urine sample. [1]

   (iv) To remove leaves from a swimming pool. [1]

(b) A student was given a mixture of barley seeds, common salt and a solid blue dye whose characteristics are shown in the table.

<table>
<thead>
<tr>
<th>Item</th>
<th>Soluble in water</th>
<th>Soluble in ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley seeds</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Common salt</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Solid blue dye</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

He was provided with ethanol, water and other apparatus needed, and asked to separate the three substances from one another. Describe the procedure that he should take. [6]  
(2003)

2 The table gives some information about three substances.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Solubility in water</th>
<th>Solubility in alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>common salt</td>
<td>Soluble</td>
<td>Insoluble</td>
</tr>
<tr>
<td>chalk dust</td>
<td>Insoluble</td>
<td>Insoluble</td>
</tr>
<tr>
<td>food colouring powder</td>
<td>Insoluble</td>
<td>Soluble</td>
</tr>
</tbody>
</table>

Using the information in the table and assuming that you start with a mixture of all three, how would you obtain pure dry samples of common salt, chalk dust and food colouring powder? [5]  
(2004)
You are given a mixture of three different substances, X, Y and Z. Below is some information about them.

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Solid</td>
<td>Solid</td>
<td>Solid</td>
</tr>
<tr>
<td>Solubility</td>
<td>Soluble in water</td>
<td>Soluble in water</td>
<td>Insoluble in water</td>
</tr>
<tr>
<td></td>
<td>Soluble in ethanol</td>
<td>Insoluble in ethanol</td>
<td>Soluble in ethanol</td>
</tr>
<tr>
<td>Effect of heat on substances</td>
<td>Stable</td>
<td>Stable</td>
<td>Decompose</td>
</tr>
</tbody>
</table>

With the aid of two labelled diagrams showing two separation techniques used, explain how you would separate the three components to obtain pure and dry samples. [10]

(a) Mr. Tan is a laboratory assistant. He accidentally contaminated a sample of copper (II) sulphate crystal with starch powder and iodine crystals.

Describe the procedure Mr. Tan should follow to obtain pure dry samples of any two of them. [6]
The diagram below shows the experimental set-up of a distillation process in the laboratory.

(i) Write down four mistakes in the experimental set-up. [4]
(ii) What is the use of the porcelain chips? [1]
(iii) If the liquid in the distilling flask contains water, ethanol and butanol, which liquid is first obtained as the distillate? The boiling points of the three liquids are shown below. [1]

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Boiling point / °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>100</td>
</tr>
<tr>
<td>Ethanol</td>
<td>78</td>
</tr>
<tr>
<td>Butanol</td>
<td>117</td>
</tr>
</tbody>
</table>

(2008)