2. The table below shows the masses of three solids, A, B and C, which can be dissolved in different liquids P, Q, R, S and T.

Same volume of liquid	*Mass of the solid dissolved (g)*		
	A	**B**	**C**
P	5	5	10
Q	2	1	0
R	0	0	10
S	20	10	20
T	8	6	12

(i) Which solids do **not** dissolve in liquid R?

_____

(ii) Which solvent is the best for solid A?

_____

(iii) In which solvents does solid C dissolve equally in?

_____

(iv) If solids B and C are accidentally mixed up, what solvent can you use to separate them?

_____

3. List a solvent and a solution used in homes, in the industries and in agriculture, and give **one** example of its use.

Home

Solvent: _____

Solution: _____

Industries

Solvent: _____

Solution: _____

Agriculture

Solvent: _____

Solution: _____

Exploring Diversity of Matter Using Separation Techniques

UNIT | 4

Section A Multiple Choice Questions

For each question, choose the most suitable option and write its letter (A, B, C or D) in the brackets provided.

1. Which method is used to separate salt from a salt solution?

   A Filtration B Evaporation
   C Condensation D Chromatography [ ]

2. _____ is a method of separation in which we can show that seawater contains dissolved substances.

   A Evaporation B Filtration
   C Condensation D Sublimation [ ]

3. Which of the following involves the process of filtration?

   A Purification of water B Purification of crude oil
   C Purification of oil spill at sea D Purification of polluted air [ ]

4. A mixture of liquids with different boiling points can be separated by _____.

   A evaporation B fractional distillation
   C filtration D crystallisation [ ]

5. Chromatography is based on the technique that _____.

   A different liquid components boil off at different temperatures
   B when a solution is heated the solvent evaporates, leaving behind the residue
   C different components dissolved in a solvent travel at different rates on paper
   D insoluble solids are trapped [ ]

6. The substance that can pass through the filter paper during filtration is called _____.

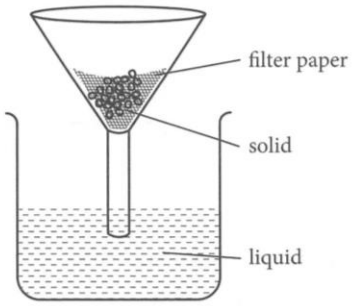
   A filter B residue
   C distillate D filtrate [ ]

Complete

7. Which method is used in water purification plants to remove suspended impurities?

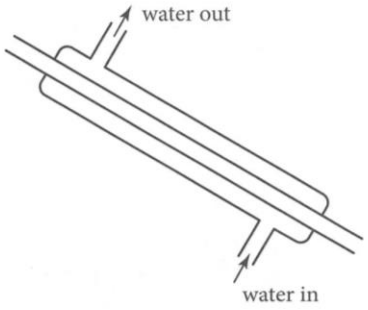
A Evaporation
B Distillation
C Filtration
D Crystallisation [ ]

8. The diagram below shows a method by which a solid can be separated from a mixture of the solid with a liquid. Which one of the following could be that solid?



A Salt
B Sugar
C Sand
D Ice crystals [ ]

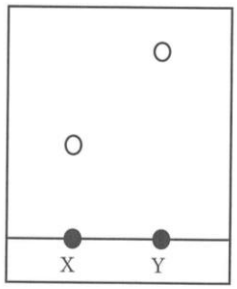
9. Which one of the following substances may be condensed by a condenser?

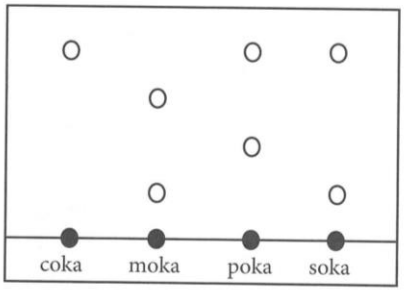


	Melting point(°C)	*Boiling point(°C)*
A	−80	−30
B	−120	35
C	−178	−90
D	50	250

[ ]

10. Different samples of soft drinks are tested for additives by using chromatography. The chromatograms are compared with those of artificial additives, X and Y. The results are as follows.



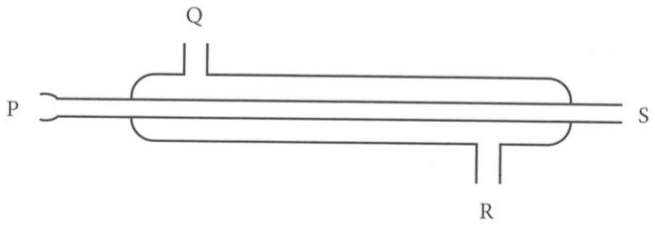


Which soft drink does **not** contain artificial additives X and Y?

A Coka **B** Moka

C Poka **D** Soka [ ]

11. The diagram shows a condenser.



Which of the following shows the correct parts that carry out the functions?

	Hot vapour enters the condenser	*Cold water enters the condenser*
A	P	Q
B	P	R
C	Q	P
D	Q	S

[ ]

12. The table shows some information about the solubilities of three substances.

Substance	*Solubility in water*	*Solubility in alcohol*
X	insoluble	soluble
Y	soluble	insoluble
Z	insoluble	insoluble

The following steps were carried out to obtain Y from the mixture of X, Y and Z.

1 Filter

2 Evaporate to dryness

3 Add alcohol

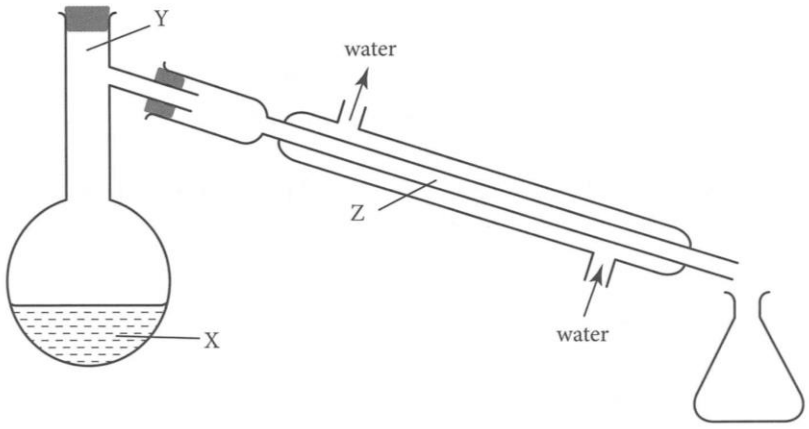
4 Add water

In what order should the above steps be carried out?

A 1, 2, 3, 4 **B** 3, 1, 2 (no step 4)

C 3, 4, 1, 2 **D** 4, 1, 2 (no step 3) [ ]

13. The diagram shows apparatus being used to distil seawater. At which points will the temperature be 100 °C?



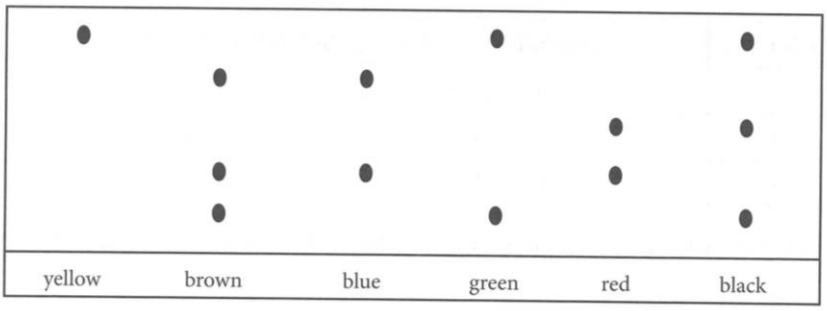
A Y only

B X and Y only

C Y and Z only

D X, Y and Z [ ]

14. The diagram shows a chromatogram of several inks. Which statement is correct?



A Yellow is 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. [ ]

15. Which of the following processes enable pure water to be obtained from seawater?

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 [ ]

16. 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 [ ]

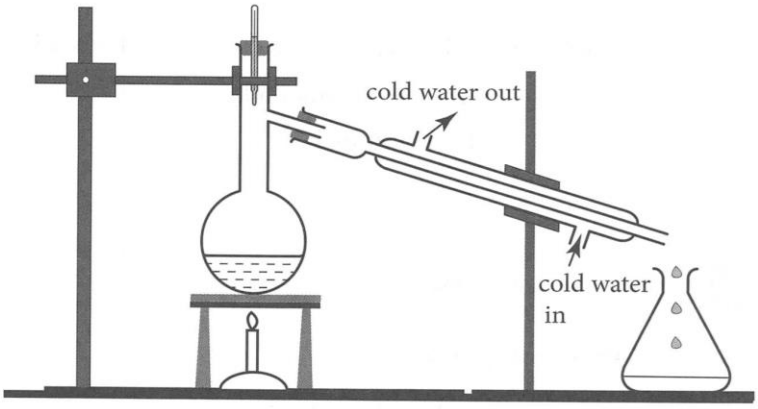
17. A mixture of _____ can be separated by magnetic attraction.

A iron and steel
B copper and steel
C copper and tin
D sand and tin [ ]

18. 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 red dye (boiling point 75 °C).
Which of the following can be used to confirm his suspicion?

A Fractional distillation
B Filtration
C Paper chromatography
D Evaporate to dryness [ ]

19. Which of the following processes are taking place in the set-up shown below?



A Boiling and evaporation
B Evaporation and melting
C Melting and condensation
D Boiling and condensation [ ]

20. For which of the following, is fractional distillation used as a method to obtain its components?

I Air
II Seawater
III Muddy water
IV Crude oil

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

21. Petroleum is a mixture of liquids. Oil refineries use fractional distillation to separate petroleum into products such as petrol, kerosene and diesel. Which statement explains why they can be separated by fractional distillation?

A They are all liquids with different boiling points.
B They have different densities.
C They are very reactive to each other.
D They are gases of different molecules. [ ]

22. Which of the following is **not** a method to separate the components of a mixture?

A Freezing
B Chromatography
C Distillation
D Filtration [ ]

Section B Short Answer Questions

Answer all the questions in the spaces provided.

1. State suitable method(s) to separate each of the following mixtures.

(a) Ink: _____

(b) Obtain salt from seawater: _____

(c) Salt and sand: _____

2. State **two** applications for each of the following methods of separation.

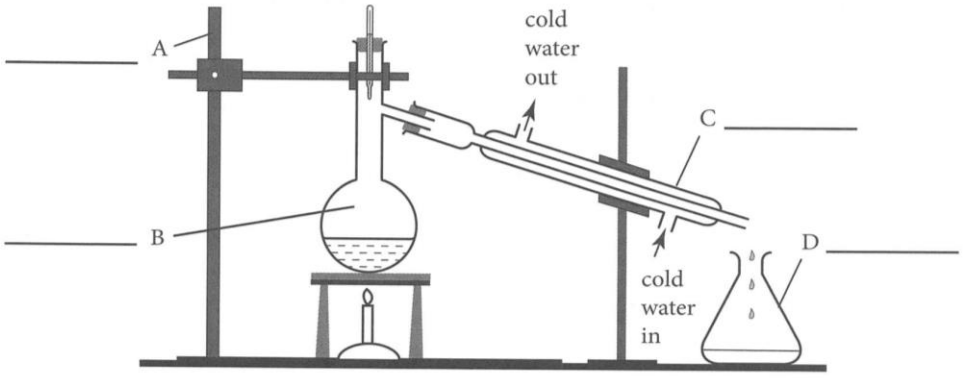
(a) Distillation: _____

_____

(b) Magnetic attraction: _____

_____

3. (a) Desalination is the removal of common salt from seawater. Distillation is one of the methods of desalination. The diagram below shows the apparatus used to purify seawater. Label the apparatus A to D.



(b) Distillation is an expensive method to use for obtaining drinking water from seawater. Why is this so?

_____

_____

_____

(c) Briefly describe how reverse osmosis is used to purify seawater.

_____

_____

_____

4. Name a suitable separation method that can be used to

(a) obtain salt from seawater, _____

(b) obtain pure water from seawater, _____

(c) detect the presence of drugs in a urine sample, _____

(d) obtain iron and steel from a scrap yard, _____

(e) obtain petrol and diesel from crude oil. _____

Section C Free Response Questions

Answer all the questions in the spaces provided.

1. For each of the following mixtures below, describe how you would obtain a pure sample of the first named substance.

   (a) Water containing a little salt.

   _____

   _____

   _____

   _____

   _____

   (b) Sulfur and some iron fillings.

   _____

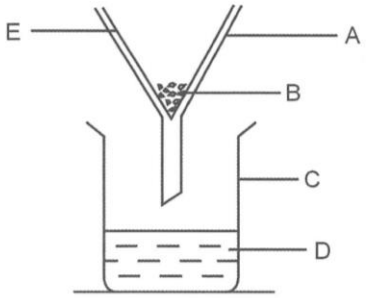
   _____

   _____

   _____

   _____

2. **(a)** Label the parts A to E in the diagram below. Name this method of separation.



A: _____

B: _____

C: _____

D: _____

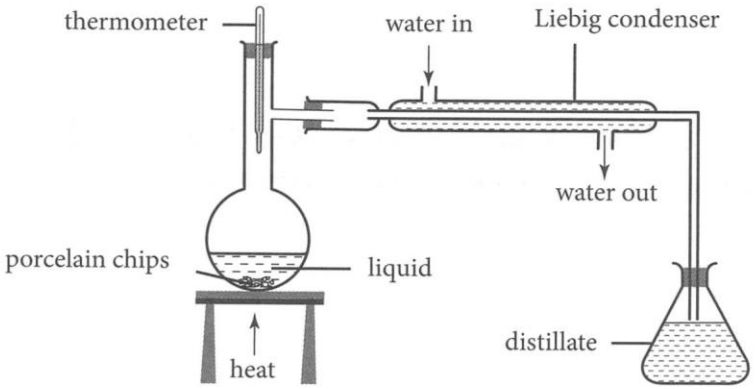
E: _____

Method of separation: _____

(b) Give **one** example of B and D for the given method of separation.

(c) Give **two** applications for this method of separation.

3. The diagram below shows the experimental set-up of a distillation process in the laboratory.



(a) Write down the four mistakes in the above experimental set-up.

(b) Correct each of the mistakes and provide a reason for selecting the method of correction.

4. Sand and salt were accidentally mixed with each other. Explain briefly how you can remove the salt to obtain sand. Draw diagrams to show the procedure.

5. In preparing a chromatogram, the following instructions were given. Suggest a reason for each instruction.

(a) The starting line should be drawn with a pencil rather than with ink.

_____

_____

(b) The solvent level should be below the spots of dyes and solution.

_____

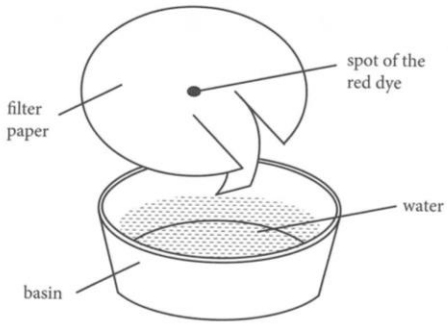
_____

(c) The spots of solutions and dyes on the starting line should be small.

_____

_____

6. Some sweets and candies are coloured red by a mixture containing three dyes. The apparatus shown in the diagram below is used to analyse the mixture.



(a) What name is given to this method of analysis?

_____

(b) What solvent is being used?

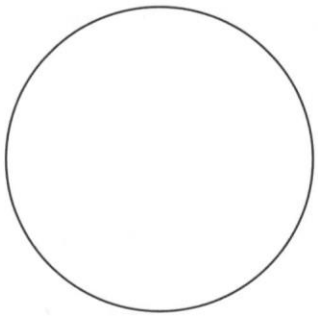
_____

(c) Explain why a strip of the filter paper is made to dip into the liquid?

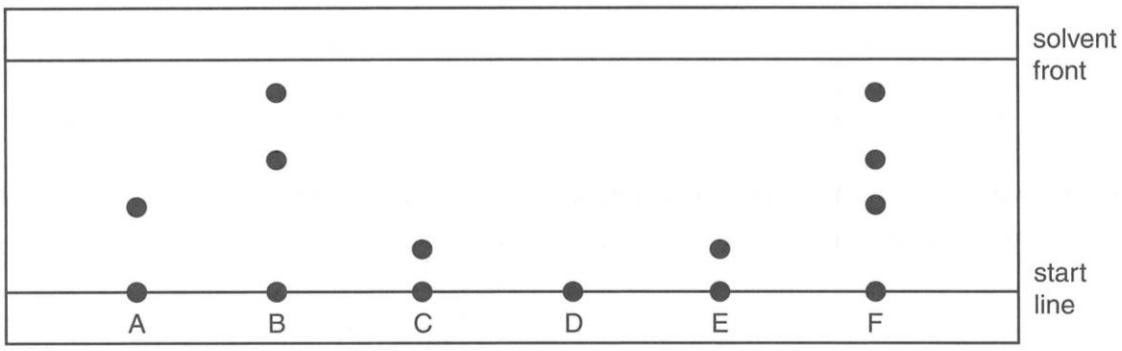
_____

_____

(d) Draw in the diagram below how you would expect the filter paper to appear after several minutes.



7. Paper chromatography was used to investigate dyes A, B, C, D, E and F from the ink of a pen. The resulting chromatogram is shown.



(a) Which dyes are pure substances?

_____

(b) Which **two** dyes can be used to make dye F?

_____

(c) Which dye is insoluble in the solvent?

_____

(d) Why must the solvent front be near the top of the chromatogram?

_____

_____