

Paper 9

[Atoms, elements, compounds, mixtures (and separation)]

Q1.(2018)

Which statement about phosphorus is **correct**?

Use the Periodic Table to help you answer this question.

- A A phosphorus atom has 15 protons and 16 electrons.
- B The phosphorus-31 isotope has 16 neutrons.
- C Phosphorus is a metal.
- D The symbol for phosphorus is Po.

Your answer

[1]

Q2.(2018)

Which statement best describes the **stationary phase** in thin layer chromatography (TLC)?

- A A glass plate with chromatography paper
- B Alumina powder in ethanol
- C A plastic plate coated in glue
- D Silica spread on a glass plate

Your answer

[1]

Q3.(2018)

The table shows some common ions.

Negative ions		Positive ions	
Nitrate	NO_3^-	Aluminium	Al^{3+}
Oxide	O^{2-}	Magnesium	Mg^{2+}

- (a) Write the formula for **aluminium oxide**.

..... [1]

Q4.(2018)

A teacher wrote the formula for magnesium nitrate as:



A student says that the formula is incorrect.

Who is right? Explain your answer.

.....

..... [1]

Q5.(2019)

Which separation technique in the laboratory requires a condenser?

- A Chromatography
- B Crystallisation
- C Filtration
- D Distillation

Your answer

☐

[1]

Q6.(2019)

Magnesium ions react with chloride ions to form magnesium chloride.

What is the correct ionic equation for this reaction?

- A $\text{Mg}^+ + \text{Cl}^- \rightarrow \text{MgCl}$
- B $\text{Mg}^{2+} + \text{Cl}^{2-} \rightarrow \text{MgCl}$
- C $\text{Mg}^{2+} + 2\text{Cl}^- \rightarrow \text{MgCl}_2$
- D $\text{Mg}^{2+} + \text{Cl}^- \rightarrow \text{Mg}_2\text{Cl}$

Your answer

☐

[1]

Q7.(2019)

Here is his method.

1. Draw a pen line half way up the paper.
2. Put a large spot of the substance to be tested onto the line.
3. Stand the paper in the solvent. The solvent should be at the same level as the spot.
4. Leave the beaker uncovered.
5. Remove the paper from the beaker before the solvent reaches the top.

Look at his results.

Substance	Distance moved by solvent (mm)	Distance moved by spot (mm)	R _f value
X	95	78	1.22
Y	95	65	1.46
Z	95	51	1.86

Describe and explain the **mistakes** the student has made and suggest corrections.

[6]

Which ionic equation is balanced correctly?

- A** $2\text{Ag}^+ + \text{CO}_3^{2-} \rightarrow \text{Ag}_2\text{CO}_3$
- B** $\text{Al}^{3+} + 3\text{OH}^- \rightarrow \text{Al(OH)}_3$
- C** $\text{Ba}^{2+} + \text{SO}_4^{2-} \rightarrow \text{Ba}_2(\text{SO}_4)_2$
- D** $2\text{Pb}^{2+} + \text{NO}_3^- \rightarrow \text{Pb}_2\text{NO}_3$

1

Q9.a(2020)

People use perfumes to make them smell nice.



Look at the table. It shows the percentages of the different ingredients in a perfume.

Ingredient	Percentage (%)
fragrance	5.2
alcohol	74.8
colour	0.5
UV filter	0.5
water	added to make up to 100%

- (a) What is the name given to a mixture, such as perfume, where the ingredients are combined in exact amounts?

..... [1]

Q9.b(2020)

A bottle contains 25 g of the perfume.

Calculate the mass of water in 25 g of the perfume.

Mass of water in 25 g of perfume = ... [2]

Q9.c(2020)

When the perfume is sprayed onto the skin, the alcohol evaporates very quickly.

- (i) Suggest why the alcohol evaporates very quickly.

.....
..... [1]

Q9.d(2020)

As the alcohol evaporates, the skin starts to feel cold.

Explain why.

Use ideas about energy in your answer.

.....

.....

.....

..... [2]

Q10.(2020)

This question is about compounds of magnesium.

(a) Magnesium hydroxide contains magnesium ions, Mg^{2+} , and hydroxide ions, OH^- .

Write the **formula** of magnesium hydroxide.

..... [1]

Q11.(2021)

A scientist wants to find out the amount of each chemical in a mixture.

Which row in the table shows the chromatographic techniques that the scientist could use?

	Paper chromatography	Thin layer chromatography	Gas chromatography
A	✓	✗	✗
B	✓	✓	✗
C	✗	✗	✓
D	✗	✓	✓

Your answer

[1]

Q12.(2022)

Which substance is an example of a **formulation**?

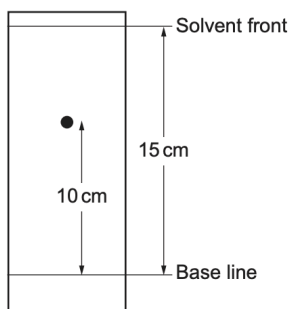
- A A macromolecule
- B A metal
- C An alloy
- D An ionic compound

Your answer

[1]

Q13.(2022)

The diagram shows a chromatogram produced by paper chromatography.



What is the R_f value?

- A -10
- B -5
- C 0.67
- D 1.5

Your answer

[1]

Q14.(2023)

Which substance is described as **pure** by a scientist?

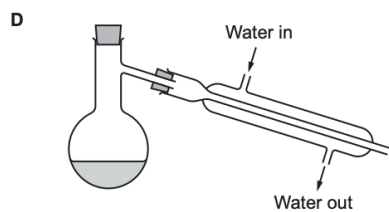
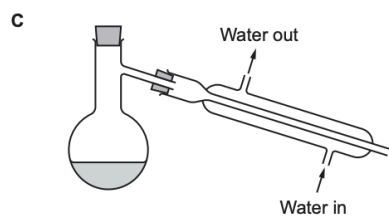
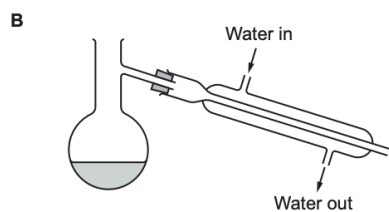
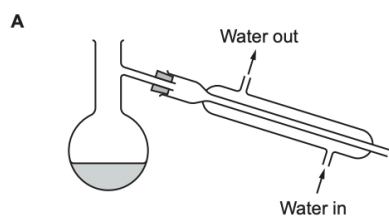
- A A solution of sodium chloride
- B An alloy
- C Dilute sulfuric acid
- D Distilled water

Your answer

[1]

Q15.(2023)

Which diagram shows the correct equipment diagram for simple distillation?



Your answer

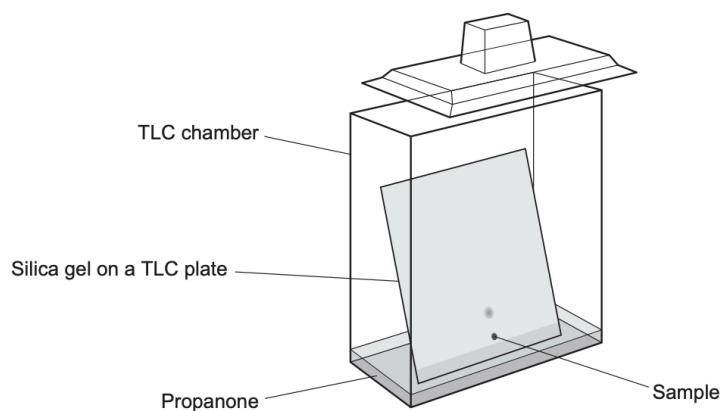
[1]

Q16.a(2023)

Thin layer chromatography (TLC) is used to analyse and identify unknown samples.

Fig. 12.1 shows the apparatus used for thin layer chromatography.

Fig. 12.1



(a) Identify the stationary phase and mobile phase shown in **Fig. 12.1**.

Stationary phase

Mobile phase

[2]

Q16.b(2023)

(b) What determines how far the sample travels up the TLC plate?

Tick (✓) **one** box.

The amount of sample used.

☐

The size of the TLC chamber.

☐

The type of solvent used.

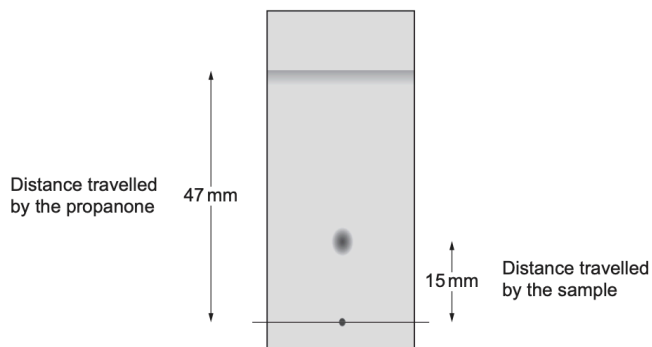
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[1]

Q16.c(2023)

(c) Fig. 12.2 shows the final TLC plate for a sample.

Fig. 12.2



(i) Calculate the R_f value for the sample.

Give your answer to 2 decimal places.

R_f value for sample = ... [3]

Q16.d(2023)

(ii) The table shows the R_f values for four different substances.

Substance	R_f value
A	0.23
B	0.57
C	0.30
D	0.18

Use your answer to (i) to identify which substance, A, B, C or D, is the sample.

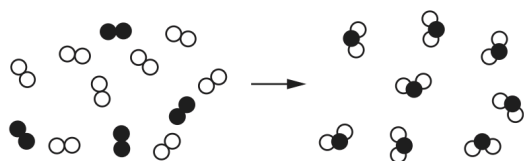
Tick (✓) **one** box.

The sample is substance A ☐ B ☐ C ☐ D ☐

[1]

Q17.(2024)

The diagram represents the particle model for a change in the arrangement of some particles.



Which row describes this change?

	Type of change	Explanation
A	chemical	The particles break up and then join together in a different way.
B	chemical	The particles stay the same but are arranged in a different way.
C	physical	The particles break up and then join together in a different way.
D	physical	The particles stay the same but are arranged in a different way.

Your answer

[1]