GCSE
CHEMISTRY

Chemistry Test 5: Chemical analysis and Using resources (Foundation)
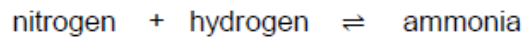
Total number of marks: 38

0 1 This question is about ammonia and fertilisers.

Ammonia is produced from nitrogen and hydrogen.

A catalyst is used to speed up the reaction.

The word equation for the reaction is:

nitrogen + hydrogen ⇌ ammonia

0 1 . 2 Which catalyst is used when ammonia is produced from nitrogen and hydrogen?

[1 mark]

Tick (✓) **one** box.

Chlorine ☐

Iron ✓

Oxygen ☐

Ammonia is used to produce fertilisers.

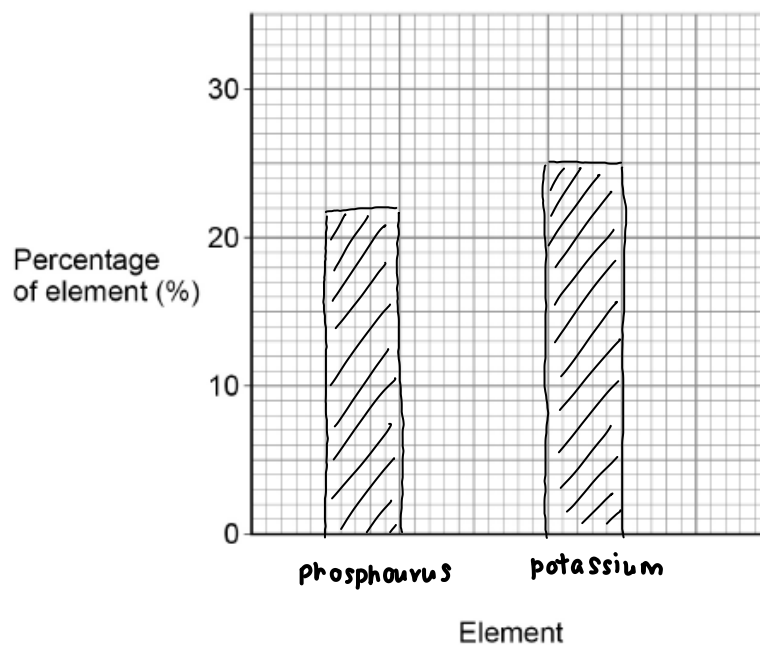NPK fertilisers contain the elements nitrogen, phosphorus and potassium.

A fertiliser contains:

- 22% phosphorus

- 25% potassium.

0 1 . 4   Draw a bar chart on **Figure 2** to show the percentages of phosphorus
and of potassium in this fertiliser.

[2 marks]

Figure 2

Fertilisers help plants grow by adding essential elements to soil.

Table 1 shows the percentages of nitrogen, phosphorus and potassium in four fertilisers, **A**, **B**, **C** and **D**.

Table 1

Fertiliser	Percentage (%) of essential element			Total %
	Nitrogen (N)	Phosphorus (P)	Potassium (K)	
A	14	0	39	53
B	25	16	23	64
C	21	23	0	44
D	21	0	0	21

0 1 . 6   Plants lacking essential elements do not grow well because:

- too little phosphorus can cause slow plant growth

- too little potassium can cause leaves to have brown edges.

Which fertiliser helps prevent slow plant growth **and** brown leaf edges?

Use **Table 1**.

[1 mark]

Tick (✓) **one** box.

A ☐   B ✓   C ☐   D ☐

0 1 . 7   Which fertiliser has the greatest total percentage of essential elements?

Use **Table 1**.

[1 mark]

Tick (✓) **one** box.

A ☐   B ✓   C ☐   D ☐

0 4   This question is about ink.

A student investigated green ink using paper chromatography in a beaker.

Figure 6 shows:

- the results the student obtained

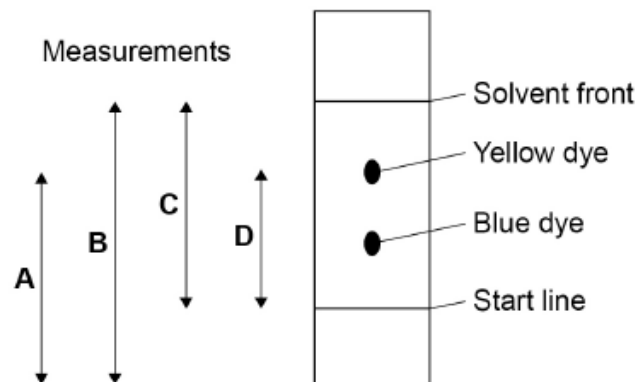- measurements **A**, **B**, **C** and **D** the student could make.

Figure 6

Diagram not to scale

0 4 . 1   The student calculated the R_f value of the blue dye.

The student measured:

- the distance moved by the blue dye = 2.7 cm

- the distance moved by the solvent = 9.0 cm

Calculate the R_f value of the blue dye.

Use the equation:

$$R_f = \frac{\text{distance moved by dye}}{\text{distance moved by solvent}}$$

[2 marks]

$\frac{2.7}{9.0} = 0.3$

$R_f =$ ___0.3___

0 4 . 2 Which measurements on **Figure 6** are needed to calculate the R_f value
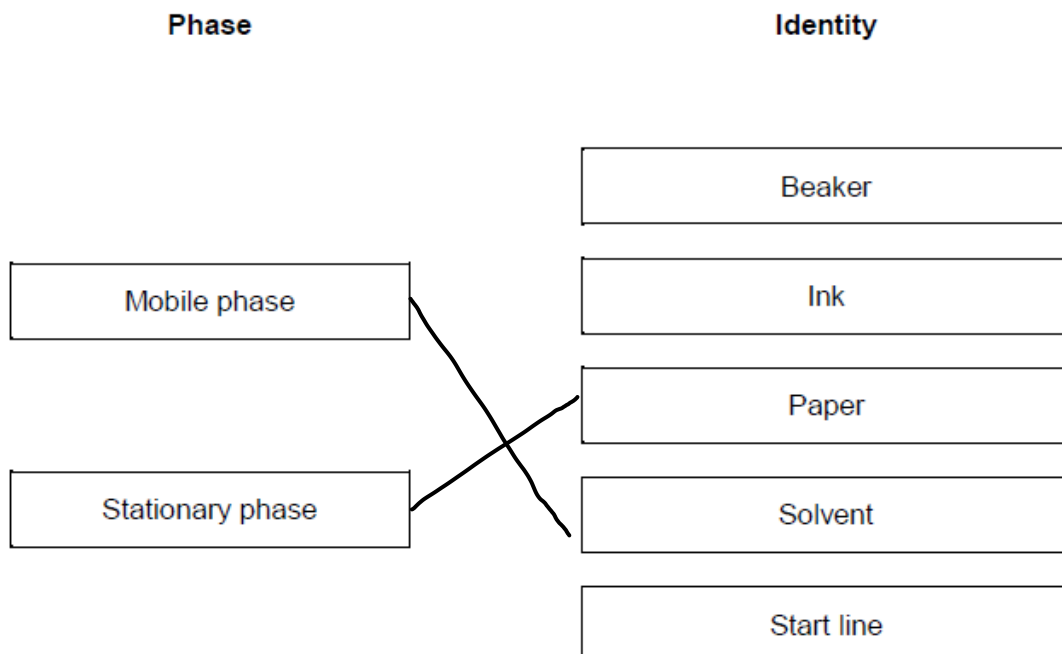of the yellow dye?

[1 mark]

Tick (✓) **one** box.

A and B ☐

A and C ☐

B and D ☐

C and D ✓

0 4 . 3 Paper chromatography has a stationary phase and a mobile phase.

Draw **one** line from each phase to the identity of that phase in the
student's investigation.

[2 marks]

Phase	Identity
	Beaker
Mobile phase	Ink
	Paper
Stationary phase	Solvent
	Start line

The green ink contains 85% yellow dye and 15% blue dye.

0 4 . 5   Which word correctly describes the green ink?

[1 mark]

Tick (✓) **one** box.

Compound   ☐

Element   ☐

Formulation   ✓

Solvent   ☐

0 4 . 6   The student repeated the investigation using green ink containing 75% yellow dye and 25% blue dye.

What would happen to the R_f value of the yellow dye?

[1 mark]

Tick (✓) **one** box.

The R_f value would decrease.   ☐

The R_f value would increase.   ☐

The R_f value would stay the same.   ✓

0 5   This question is about alloys.

0 5 . 1   Bronze is an alloy of copper and one other metal.

What is the other metal in bronze?

[1 mark]

Tick (✓) **one** box.

Aluminium   ☐

Tin   ☑

Zinc   ☐

0 4   A 9 carat gold ring is made from a mixture of metals.

Table 3 shows the mass of different metals in the ring.

The mass of the ring is 5.0 g

Table 3

Metal	Mass of metal in g
Gold	1.9
Silver	2.8
Copper	0.3

0 4 . 2 The cost of gold is £30 per gram.

Calculate the cost of the gold used in the 9 carat gold ring.

Use **Table 3**.

[1 mark]

1.9 × £30 = £57

Cost of gold = £ __57__

0 4 . 3 Rings can be made from 22 carat gold.

The ratio of the mass of gold in 22 carat gold compared to 9 carat gold is 22 : 9

Calculate the mass of gold in a 22 carat gold ring of mass 5.0 g

Use **Table 3**.

[2 marks]

$1.9 \times \frac{22}{9} = 4.64$

Mass of gold = __4.64__ g

Steels are alloys of iron.

0 5 . 5 Spoons are made of stainless steel.

Spoons:

- are washed after use
- must not wear away quickly.

Suggest **one** reason why stainless steel is suitable for making spoons.

[1 mark]

Stainless steel is ressistant to rusting

0 5 . 6   Steel horseshoes are shaped to fit the feet of horses.

Which type of steel is most easily shaped into horseshoes?

[1 mark]

Tick (✓) **one** box.

High carbon steel ☐

Low carbon steel ✓

Stainless steel ☐

0 6   This question is about the corrosion of metals.

The corrosion of iron is called rusting.

0 6 . 1   Plan an investigation to show that both water and air are needed for iron to rust.

You should include the results you expect to obtain.

Use apparatus and materials from the list:

- test tubes
- stoppers
- iron nails
- tap water
- boiled water
- drying agent
- oil.

[6 marks]

In the first test tube, place the nail in tap water. In the second test tube, submerge the nail in boiling water with a layer of oil on the surface of the water. In the third test tube, place the nail with drying agent. use stoppers to seal each test tube.

Only the iron nail in the first test tube will rust, as it is exposed to both air and water. The nail in the second test tube is exposed to water but not air, whereas in the third test tube there is no water, thus both nails will not rust

0 8   This question is about chemical analysis.

A student tested copper sulfate solution and calcium iodide solution using flame tests.

This is the method used.

1. Dip a metal wire in copper sulfate solution.

2. Put the metal wire in a blue Bunsen burner flame.

3. Record the flame colour produced.

4. Repeat steps 1 to 3 using the same metal wire but using calcium iodide solution.

0 8 . 1   What flame colour is produced by copper sulfate solution?

[1 mark]

green

0 8 . 2   Calcium compounds produce an orange-red flame colour.

The student left out an important step before reusing the metal wire.

The student's method did **not** produce a distinct orange-red flame colour using calcium iodide solution.

Explain why.

[2 marks]

The student did not wash the metal wire so there is copper sulfate solution on the metal wire, which will give a green flame.

0 8 . 3   The student added sodium hydroxide solution to:

- copper sulfate solution
- calcium iodide solution.

Give the results of the tests.

[2 marks]

Copper sulfate solution __blue precipitate forms__

_____

Calcium iodide solution __white precipitate forms , insoluble in__

__excess__

0 8 . 4   To test for sulfate ions the student added dilute hydrochloric acid to copper sulfate solution.

Name the solution that would show the presence of sulfate ions when added to this mixture.

[1 mark]

__aqueous barium ions__

0 8 . 5   To test for iodide ions the student added dilute nitric acid to calcium iodide solution.

Name the solution that would show the presence of iodide ions when added to this mixture.

Give the result of the test.

[2 marks]

Solution __dilute silver nitrate solution__

Result __yellow precipitate forms__

_____

0 9   This question is about water.

0 9 . 1   In the UK, potable (drinking) water is produced from different sources of fresh water.

Explain how potable water is produced from fresh water.
The water is passed through filter beds to remove insoluble   [4 marks]
particles and sterilised to kill microbes.

0 9 . 3   Waste water is not fit to drink.

Treatment of waste water produces two substances:

- liquid effluent

- solid sewage sludge.

Draw **one** line from each substance to the way the substance is processed.

[2 marks]

Substance   Process

Aerobic biological treatment

Liquid effluent

Anaerobic digestion

Grit removal

Solid sewage sludge

Screening

Sedimentation