All questions are for separate science students only

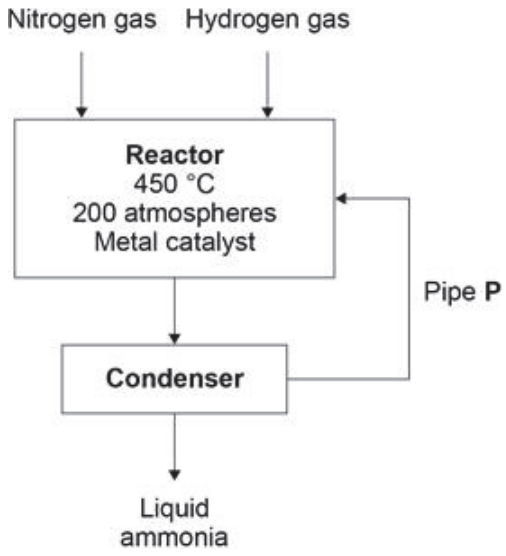
Q1.

This question is about ammonia and nitric acid.

In the Haber process ammonia is produced from nitrogen and hydrogen.

Figure 1 represents the Haber process.

Figure 1



(a) Pipe **P** links the condenser to the reactor.

Why is the condenser linked to the reactor? **(chemistry only)**

Use **Figure 1**.

_____

_____

(1)

(b) Which metal is used as a catalyst in this reaction? **(chemistry only)**

_____

(1)

Nitric acid is produced by reacting ammonia with oxygen.

The word equation for the production of nitric acid is:

ammonia + oxygen → water + nitric acid

Platinum is a catalyst in this reaction.

(c) Describe the test for oxygen gas.

Give the result if oxygen gas is present.

Test _____

_____

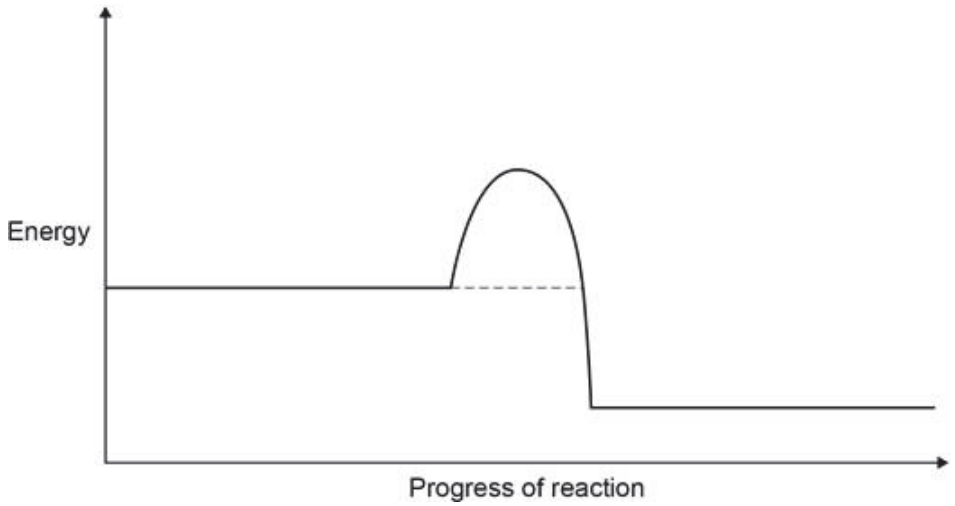
Result _____

_____

(2)

Figure 2 represents the reaction profile of the catalysed reaction between ammonia and oxygen.

Figure 2



(d) Complete the reaction profile for the catalysed reaction in **Figure 2**.

You should:

- label the activation energy
- label the reactants and products, using the names of the reactants and products.

(2)

(e) How would **Figure 2** be different if **no** catalyst was used?

Tick (✓) **one** box.

The final energy level would be higher.	☐
The final energy level would be lower.	☐
The line would reach a higher peak.	☐
The line would reach a lower peak.	☐

(1)

(f) Ammonia and nitric acid react to produce the salt, ammonium nitrate.

Ammonium ions and nitrate ions both contain nitrogen.

Suggest **one** use of ammonium nitrate. **(chemistry only)**

_____

_____

(1)

(Total 8 marks)

Q2.

This question is about fertilisers.

Ammonium nitrate is a fertiliser containing nitrogen.

(a) Complete the sentence. **(chemistry only)**

Choose the answer from the box.

hydrochloric acid	**nitric acid**	**sulfuric acid**

Ammonium nitrate is produced by reacting ammonia with

_____.

(1)

(b) Ammonium nitrate fertiliser is sold in 600 kg bags.

A farmer spreads 40 bags of ammonium nitrate fertiliser on land with an area of 800 000 m^2.

Calculate the mass of ammonium nitrate fertiliser spread per m^2 of land. **(chemistry only)**

_____

_____

_____

Mass per m^2 = _____ kg/m^2

(2)

(c) A scientist works for a company which makes ammonium nitrate fertiliser.

The scientist investigates the effect of different fertilisers on crop growth.

The scientist concludes that the ammonium nitrate fertiliser improves crop growth more than other fertilisers.

Suggest **one** reason why this conclusion might **not** be valid. **(chemistry only)**

_____

_____

(1)

A different fertiliser containing nitrogen has the formula $K_2NH_4PO_4$

(d) How many atoms of nitrogen are in the formula $K_2NH_4PO_4$? **(chemistry only)**

_____

(1)

(e) Nitrogen and potassium in the fertiliser $K_2NH_4PO_4$ are important for good crop growth.

Which other element in the fertiliser $K_2NH_4PO_4$ is important for good crop growth?
(chemistry only)

Tick (✓) **one** box.

Hydrogen	☐
Oxygen	☐
Phosphorus	☐

(1)

(f) Some fertilisers are mixtures of different compounds in fixed proportions.

What name is given to a mixture of different compounds in fixed proportions?
(chemistry only)

_____

(1)

(Total 7 marks)