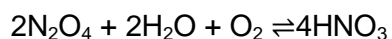
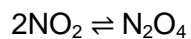
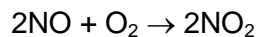
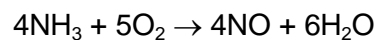


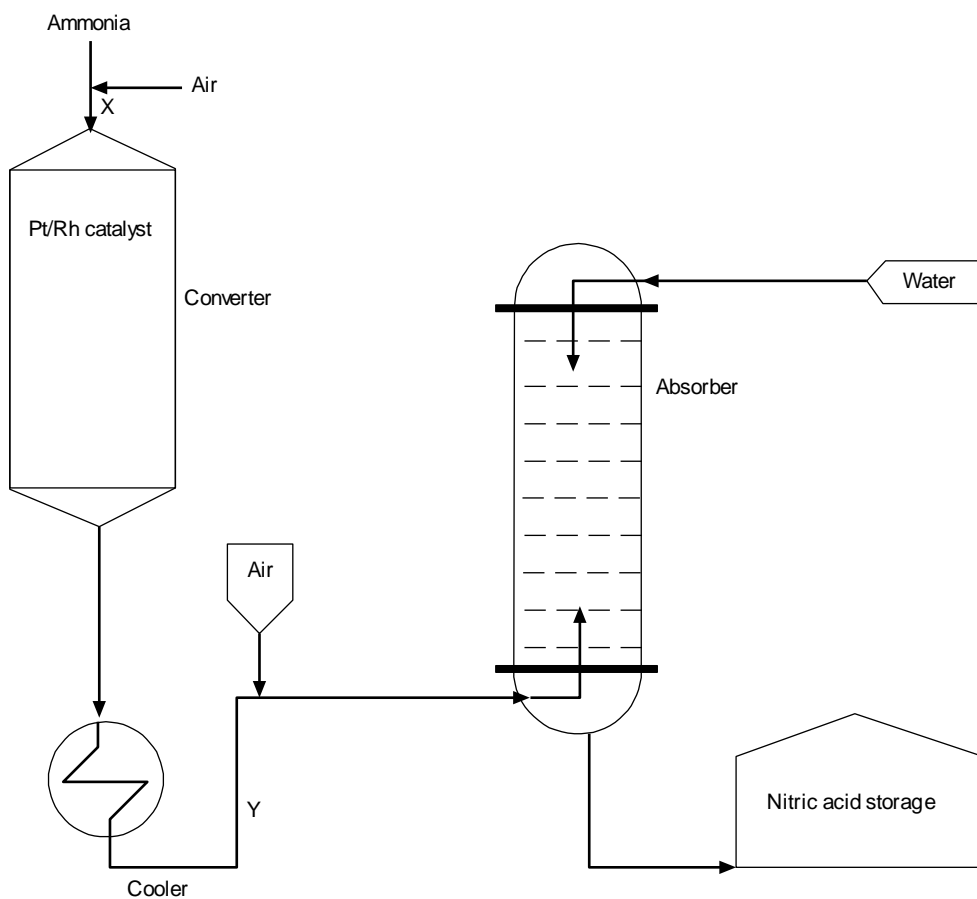
Nitric Acid: Questions

1. The equations for the reactions taking place in the manufacture of nitric acid include:



The diagram summarises the steps taking place in the process.

- (a) The mixture of ammonia and air contains approximately 90% air.
Suggest two reasons why so much air is needed in the reaction mixture.



(i) _____

(ii) _____ [2]

- (b) (i) Why is the catalyst used in the converter in the form of a fine gauze rather than lumps?

_____ [1]

- (ii) Suggest why the catalyst has to be replaced every 4–6 weeks.

_____ [1]

- (iii) The gauze is heated initially to 900 °C by jets of burning hydrogen. Once the reaction has started, the heating is not necessary.

Why is this? _____ [1]

- (c) Two places in the process are marked X and Y on the diagram. The table compares the concentrations of different gases at X and Y. Finish the table by adding words from the list. One has been done for you.

Decreases

Increases

Stays the same

Gas	Change in concentration from X to Y
Nitrogen dioxide	Increases
Ammonia	
Nitrogen	
Oxygen	
Steam	

[4]

- (d) The fumes leaving the factory contain very low concentrations of oxides of nitrogen, especially nitrogen dioxide. Nitrogen dioxide is brown in colour.

- (i) Suggest why the fumes leaving the factory chimney are more obvious than gases escaping from factories producing other chemicals.

_____ [1]

- (ii) Suggest an economic reason why the manufacturer does not want oxides of nitrogen to escape.

_____ [1]

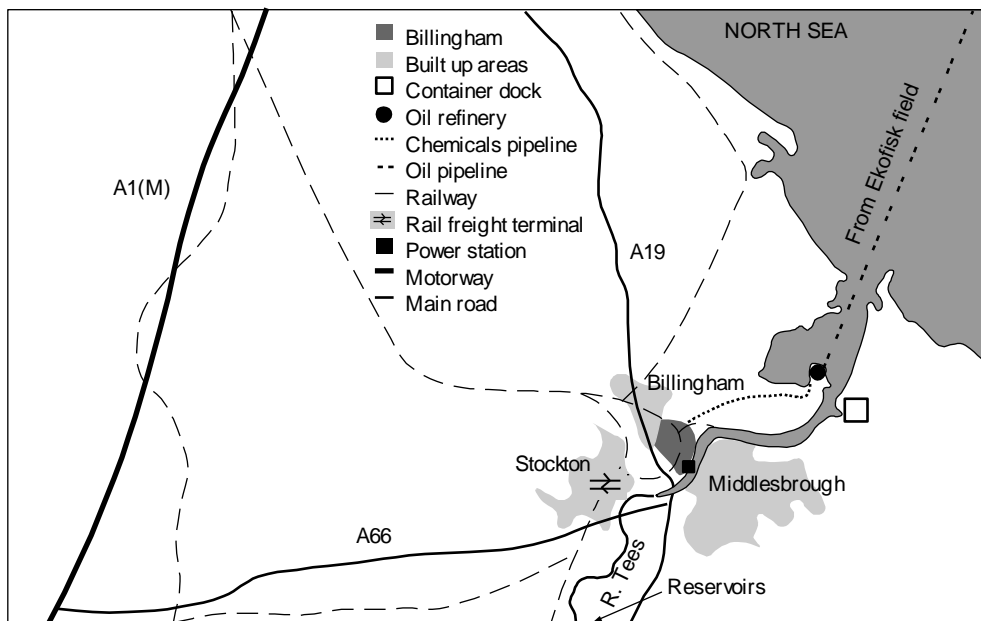
- (iii) Suggest one advantage and one disadvantage to local farmers of oxides of nitrogen escaping from the factory.

Advantage _____

Disadvantage _____

_____ [2]

2. Ammonia, nitric acid and ammonium nitrate are all made at factories in Billingham.



The raw materials for these chemicals are air, water and oil or natural gas. The sketch map shows the area around the Billingham factories. Suggest three reasons why these factories were built in this area.

[3]