3 A student tests two solids: solid **E** and solid **F**.

Tests on solid E

Solid **E** is ammonium sulfate.

Record the expected observations.

The student dissolves solid **E** in distilled water to form solution **E**. The student divides solution **E** into three approximately equal portions.

(a) (i) To the first portion of solution **E**, the student adds about $2\,cm^3$ of aqueous sodium hydroxide. The student warms the mixture gently and tests any gas produced.

observations .....

..... [1]

(ii) Identify the gas given off in **(a)(i)**.

..... [1]

(b) To the second portion of solution **E**, the student adds about $1\,cm^3$ of dilute nitric acid followed by a few drops of aqueous barium nitrate.

observations .....

..... [1]

(c) To the third portion of solution **E**, the student adds a few drops of acidified aqueous potassium manganate(VII).

observations .....

..... [1]

Tests on solid F

Table 3.1 shows the tests and the student's observations for solid **F**.

Table 3.1

tests	observations
test 1 Carry out a flame test on solid **F**.	yellow flame
test 2 Dissolve the remaining solid **F** in distilled water to form solution **F**. Divide solution **F** into three portions. To the first portion of solution **F**, add about $1\,cm^3$ of dilute nitric acid followed by a few drops of aqueous silver nitrate.	yellow precipitate forms
test 3 To the second portion of solution **F**, add aqueous sodium hydroxide dropwise until in excess.	white precipitate forms the precipitate dissolves in excess aqueous sodium hydroxide to form a colourless solution
test 4 To the third portion of solution **F**, add aqueous ammonia dropwise until in excess.	white precipitate forms the precipitate dissolves in excess aqueous ammonia to form a colourless solution

(d) Identify the **three** ions in solid **F**.

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..... [3]

[Total: 7]