Planning: Titration

Things to take note:

* You have to observe standard protocol. You have no choice!
* Tell me what type of apparatus you are using, what’s its **capacity**

e.g. **100 cm3** beaker, **50.00 cm3** burette

* Standard procedures for
1. Preparing a standard solution (includes dilution)
2. Titration procedure

**1a Preparing a standard solution**

Assume you have the solution prepared in a beaker already…

1. **Transfer** the solution into a (clean) 250 cm3 volumetric flask using a filter funnel.
2. **Wash** the beaker with **deionised water1** and **transfer** the **washings** into the volumetric flask (to ensure that all the solution is transferred into the volumetric flask).
3. **Top up** to the mark with **deionised water1**.
4. **Stopper** the flask and **shake/mix well** until a homogeneous solution is obtained.

**1b Dilution**

Suppose you want to dilute 1.00 mol dm-3 KMnO4 into a concentration of
0.0900 mol dm-3.

If you are filling a 250 cm3 volumetric flask, then you need 22.50 cm3 of
1.00 mol dm-3 KMnO4.

Then you use a **burette**.

1. **Fill** a 50.00 cm3 burette with 1.00 mol dm-3 KMnO4.
2. **Add** 22.50 cm3 of 1.00 mol dm-3 KMnO4 into a (clean) 250 cm3 volumetric flask.
3. Follow steps 3 and 4 in 1a.

Suppose you want to dilute 1.00 mol dm-3 KMnO4 into a concentration of
0.100 mol dm-3.

If you are filling a 250 cm3 volumetric flask, then you need 25.0 cm3 of
1.00 mol dm-3 KMnO4.

Then you use a **pipette**. Note that there are 10.0 cm3, 20.0 cm3 and 25.0 cm3 pipettes.

1. Pipette 25.0 cm3 of 1.00 mol dm-3 KMnO4 into a (clean) 250 cm3 volumetric flask.
2. Follow steps 3 and 4 in 1a.

1 The solvent need not be deionised water. For example in redox reactions, you may be asked to use dilute sulfuric acid as the solvent.

**2a Titration procedure – Acid Base**

Pipette the acid (FA1), add the base from the burette.

1. **Pipette** 25.0 cm3 of FA1 into a (clean) 250 cm3 conical flask.
2. **Add** 3 drops of methyl orange indicator into the conical flask.
3. **Fill** a 50.00 cm3 burette with 1.00 mol dm-3 NaOH (FA2).
4. **Important! Record the initial burette reading.**
5. **Titrate** FA1 with FA2 until the solution changes from red to orange with continuous swirling.
6. **Important! Record the final burette reading.**
7. Repeat the titration until at least 2 consistent titres within 0.10 cm3 are obtained.

**2b Titration procedure – Involving KMnO4**

Titrate a solution of acidified Fe2+ (aq) (FA1) with KMnO4 (FA2).

1. **Pipette** 25.0 cm3 of FA1 into a (clean) 250 cm3 conical flask.
2. **Fill** a 50.00 cm3 burette with FA2.
3. **Important! Record the initial burette reading.**
4. **Titrate** FA1 with FA2 until the solution changes from yellow to orange/light pink/permanent light pink with continuous swirling.
5. **Important! Record the final burette reading.**
6. Repeat the titration until at least 2 consistent titres within 0.10 cm3 are obtained.

**2c Titration procedure – Iodometric titrations**

You have a solution of Cu2+(aq) (FA1). With acidified KI, I2 is liberated.

FA2 is Na2S2O3 (aq).

1. **Pipette** 25.0 cm3 of FA1 into a (clean) 250 cm3 conical flask.
2. **Fill** a 50.00 cm3 burette with Na2S2O3 (FA2).
3. **Important! Record the initial burette reading.**
4. Using a 10 cm3 measuring cylinder, **measure** 10 cm3 of acidified KI (assuming it is enough, if not use a larger measuring cylinder). **Transfer** the solution into the conical flask.
5. **Immediately titrate** FA1 with FA2 until the solution changes from brown to light yellow with continuous swirling.
6. **Add** 10 drops of starch indicator into the conical flask.
7. **Without delay add** FA2 **dropwise** until the solution turns from blue-black to colourless with continuous swirling.
8. **Important! Record the final burette reading.**
9. Repeat the titration until at least 2 consistent titres within 0.10 cm3 are obtained.

General comments

Record the initial and final burette reading, do not miss this out because it’s needed in calculating your titre value.

Take note of the indicator if you need to use it, and the colour change at endpoint.