Using data to make your own simple Redox table

Example problem:

1. Four metals A, B, C, & D were tested with separate solutions of A2+, B2+, C2+ & D2+. Some of the results are summarized in the following table:

|  |
| --- |
| Solution |
| Metal | A2+ | B2+ | C2+ | D2+ |
| A |  | (1) no reaction | (2) reaction |  |
| B |  |  |  | (4) no reaction |
| D | (3) reaction |  |  |  |

NOTE: For the same element: The more positive species is always the Oxidizing Agent.

Eg.) A2+ A

OA

RA

List the ions in order from the strongest to weakest oxidizing agent.

# Using data

1. – Since B2+ does not oxidize A: B2+ must be below A on the table.

|  |  |
| --- | --- |
| Oxidizing agents | Reducing agents |
| A2+ + 2e- = A |
| B2+ + 2e- = B |

1. – Since C2+ reacts with A: C2+ must be above A:

|  |
| --- |
| C2+ + 2e- = C |
| A2+ + 2e- = A |
| B2+ + 2e- = B |

1. – Since A2+ reacts with D: A2+ must be above D on the table. But is D2+ above or below B2+? We don’t know yet.

C2+

Here

D2+

A2+

B2+

Or here?

Let’s look at the next information:

1. – D2+ does not react with B
* Now we know that D2+ must be below B on the table

So now we have our complete table:

|  |  |  |
| --- | --- | --- |
| Oxidizing agents | Reducing agents |  |
|  | C2+ + 2e- = C |  |
| A2+ + 2e- = A |
| B2+ + 2e- = B |
| D2+ + 2e- = D |

* At this point it’s good to go back and recheck that all the data given is consistent with your table.
* So now we have our answer; The ions in order of strongest to weakest ox agent is: C2+, A2+, B2+, D2+
* Just in case you’re asked, you can see that the order of reducing agent from strongest to weakest is D, B, A, C.

## Another example –

Four non-metal oxidizing agents X2, Y2, Z2 and W2 are combined with solutions of ions: X-, Y-, Z- and W-.

NOTE: For the same element: The more positive species is always the Oxidizing Agent.

Eg.) X2 X-

OA

RA

The following results were obtained;

1. X2 reacts with W- and Y- only.
2. Y- will reduce W2

### List the reducing agents from strongest to weakest

1. X2 will be above W- & Y-, but below Z-

|  |  |  |
| --- | --- | --- |
| Oxidizing agents |  | Reducing agentsBoth W- & Y- are below X2, but we don’t know in which order yet. |
| Z2 + 2e- |  |  2Z- |
| X2 + 2e- |  |  2X- |

1. Since Y- reduces W2, Y- must be lower on the right of W2.

|  |
| --- |
|  OA’s RA’s |
|  |  Z2 + 2e-  2Z- |  |
|  X2 + 2e-  2X- |
|  W2 + 2e-  2W- |
|  Y- + 2e-   2Y- |

To answer the question:

 The reducing agents from strongest to weakest are: Y‑, W‑, X‑, Z‑

Question:

Four solutions A(NO3)2, B(NO3)2, C(NO3)2, and D(NO3)2 are added to metals, A, B, C, & D

The following information is found:

1. The metal A will not react with any of the solutions
2. C(NO3)2 reacts spontaneously with B
3. B will not react with D(NO3)2
4. Make a small reduction table showing reductions of the metallic ions. (Don’t forget to **discard** the **spectator** nitrate ions.
5. List the oxidizing agents in order of strongest to weakest: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. List the reducing agent in order of strongest to weakest: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Would it be safe to store A(NO3)2 solution in a container made of the metal D? \_\_\_\_\_\_\_\_\_\_\_\_\_\_