1. The oxidation number of an uncombined element (like O_2 or Fe) is:

   ☐ -2

   ☐ 0

   ☐ $+1$

   ☐ equal to its group

2. When balancing a redox equation using oxidation numbers:

   ☐ the total rise in oxidation number must equal the total fall

   ☐ only the masses matter

   ☐ the rise is always bigger than the fall

   ☐ oxidation numbers are ignored

3. The usual oxidation number of oxygen in a compound is:

   ☐ $+6$

   ☐ 0

   ☐ -2 (but -1 in peroxides)

   ☐ $+2$

4. Disproportionation is a reaction in which:

   ☐ two different elements are oxidised

   ☐ no electrons move

   ☐ only reduction happens

   ☐ the same element is both oxidised and reduced

5. In $KMnO_4$, K is $+1$ and each O is -2. What is the oxidation number of Mn? (give the number, e.g. 7)

   _____

6. An oxidising agent:

   ☐ always contains oxygen

   ☐ does not take part in redox

   ☐ takes electrons from another species and is itself reduced

   ☐ gives electrons away and is itself oxidised

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_____

8. An oxidising agent is itself oxidised during a reaction.

   ☐ True ☐ False

9. What is the oxidation number of manganese in MnO_4^-? (Enter a signed number, e.g. 7 for $+7$.)

   _____

10. In acid, MnO_4^- (Mn $+7 \to +2$) oxidises $C_2O_4^{2-}$ to CO_2 (C $+3 \to +4$). How many $C_2O_4^{2-}$ ions react with each MnO_4^-?

    _____

1. **0**

   A free, uncombined element always has an oxidation number of 0.

2. **the total rise in oxidation number must equal the total fall**

   Every electron lost is gained, so the total increase in oxidation number equals the total decrease.

3. **−2 (but −1 in peroxides)**

   Oxygen is normally −2, except −1 in peroxides.

4. **the same element is both oxidised and reduced**

   In disproportionation one element goes both up and down in oxidation number (e.g. $Cl_2 \rightarrow Cl^-$ and ClO^-).

5. **7**

   +1 (K) + Mn + 4×(−2) = 0, so Mn = +7.

6. **takes electrons from another species and is itself reduced**

   An oxidising agent removes electrons from another species, so it gains electrons and is reduced itself.

7. **oxidised**

   OIL: Oxidation Is Loss of electrons.

8. **False**

   False. An oxidising agent gains the electrons lost by the other species, so it is itself reduced.

9. **7**

   $x + 4(-2) = -1$, so $x = +7$.

10. **2.5**

    Each Mn falls by 5. Each $C_2O_4^{2-}$ has two C atoms that each rise by 1, a rise of 2. So 5/2 = 2.5, written as $2MnO_4^- : 5C_2O_4^{2-}$.

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