Chemistry is … the study of matter and the changes it undergoes

Questions

How can I do that?
30 mL of 9 M H$_2$O$_2$ (hydrogen peroxide)
0.5 g activated MnO$_2$ (manganese(IV) oxide)
definitions, units, formula
tools
language is important; not to obscure, but to communicate

Cisplatin
anti-cancer drug: cancers of head and neck, bladder, lung, breast, uterus, cervix, ovaries and testes
Pt(NH$_3$)$_2$Cl$_2$
 cis-diaminedichloroplatinum(II)

Cl
\[\text{Pt(NH}_3\text{)}_2\text{Cl}_2\]
Cl

trans-diaminedichloroplatinum(II)
not effective!

Questions

What happened?
2 H$_2$O$_2$(aq) $\rightarrow$ 2 H$_2$O(g) + O$_2$(g)

experimental science
based on observations

Cisplatin
Barnett Rosenberg
Michigan State University
early 1960's

effect of e$^-$ field on cell growth
E. coli grew 300 times normal length
compound formed at Pt electrode responsible, not e$^-$ field

serendipity: chance discovery

“Chance favors the prepared mind.” Louis Pasteur
French
1822-1895
Why did it do that?
most difficult to answer
atoms (electrons), molecules (structure), energy
hypothesis ⇒ theory ⇒ law
put observations together to explain and predict

Questions

Cisplatin
\[ \text{Pt(NH}_3\text{)}_2\text{Cl}_2 + \text{DNA} \rightarrow \text{Pt(NH}_3\text{)}_2\text{DNA}^{2+} + 2 \text{Cl}^- \]

Stephen J. Lippard
American
1976

carboplatin fewer side effects
designed by knowledge of how cisplatin works