Week 1 question:

Nitrogen and phosphorus occur in the same group of the periodic table. Nitrogen, however, exists as diatomic molecules while phosphorus exists as P4 molecules which have a trigonal pyramid shape.

Account for these differences using the bond energy data in the table below.

|  |  |
| --- | --- |
| Bond | Bond Enthalpies / kJ mol-1 |
| N–N | 163 |
| N≡N | 945 |
| P–P | 200 |
| P≡P | 481 |

Week 1 answer (NZIC 2009)

 Energy for bonds in P4 : 6 × 200 = 1200 kJ mol–1

Energy for 2 × PP: 2 × 481 = 962 kJ mol-1

i.e. More energy released when P4 formed so more favorable.

For 2 × NN energy:2 × 945 = 1890 kJ mol–1

For N4 energy: 6 × 163 = 978 kJ mol–1

i.e. More energy in 2 × N2 so more favorable.

Week 2 question: (NZIC 2008)

a) Alkenes are known to react with ozone, O3, followed by reaction with zinc and acid as shown in the following example.



α-terpinene, C10H16 is a hydrocarbon that has been isolated from oil of marjoram. On reaction with hydrogen over a palladium catalyst, α-terpinene absorbs 2 molar equivalents of hydrogen to yield a hydrocarbon C10H20. On ozonolysis, followed by reduction with zinc and ethanoic acid, α-terpinene yields ethandial and 6-methylheptan-2,5-dione.

Draw the structures of

* ethandial and 6-methylheptan-2,5-dione
* α-terpinene
* the major product formed on reaction of α-terpinene with HBr