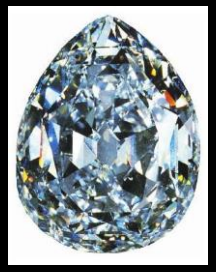
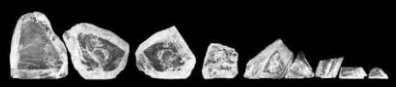
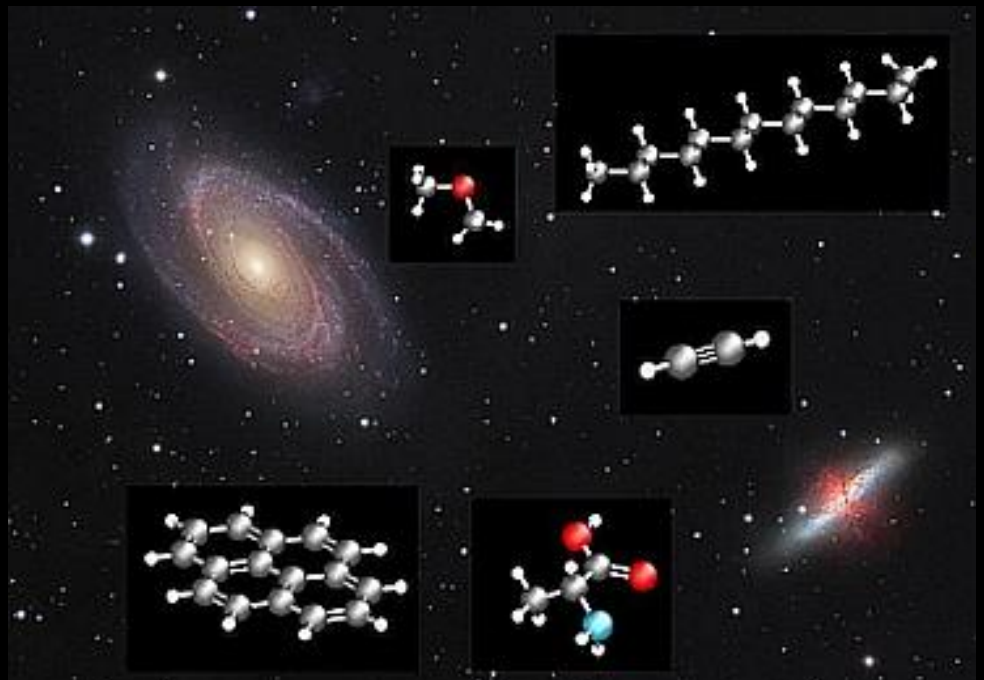
# OGLJIKOVODIKI



Cullinan I



621.35 g



SO SPOJINE OGLJIKA IN VODIKA, najdemo jih v nafti in zemeljskem plinu

# Viri ogljikovodikov – nafta in plin

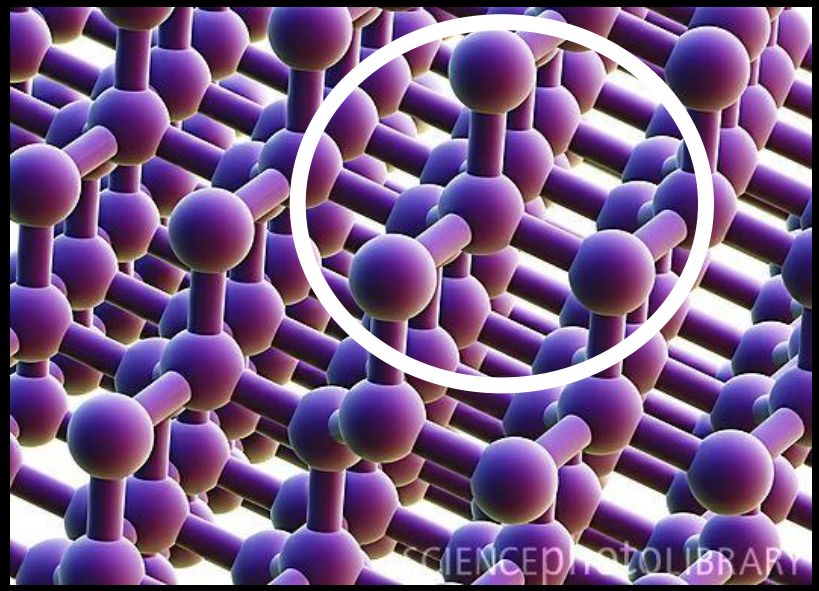
# Zakaj sta nafta in plin tako pomembna?

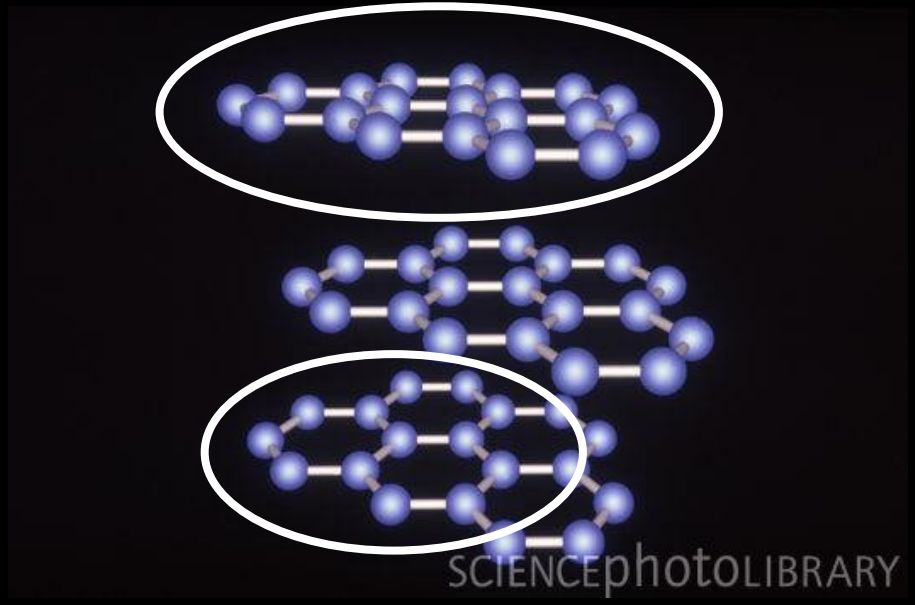
- Strateški surovini
- Vir energije
- Surovinska baza vrste industrijskih panog
- Vir ogljikovodikov

# Zakaj ravno ogljikovodiki?

- Ogljikovi atomi se lahko povezujejo z enojnimi, dvojnimi in  trojnimi vezmi med seboj in s hetero atomi
- Tvorijo lahko nerazvejene, razvejene in obročaste strukture
- So surovine za sintezo drugih organskih spojin

# V zgradbi grafita in diamanta se skriva zgradba ogljikovodikov



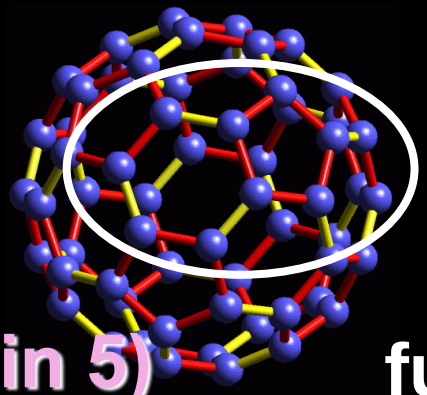



diamant

tetraeder

grafit

obroči (6)

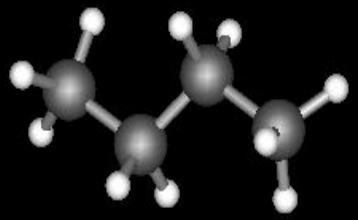


obroči (6 in 5)

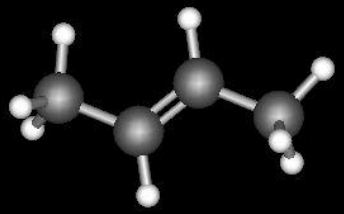
fuleren

# KLASIFIKACIJA OGLJIKOVODIKOV

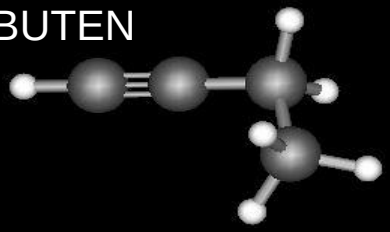
- ACIKLIČNI
  - NASIČENI ALKANI
  - NENASIČENI ALKENI, ALKINI
- CIKLIČNI
  - NASIČENI CIKLOALKAN
  - NENASIČENI CIKOLAKEN, CIKLOALKIN



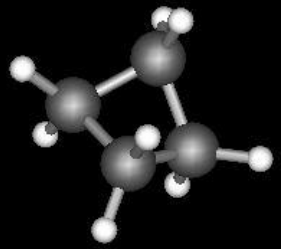
BUTAN



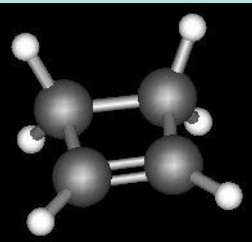
BUTEN



BUTIN



CIKLOBUTAN



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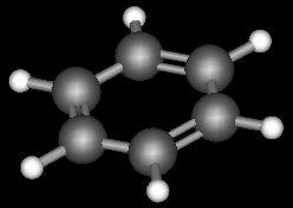
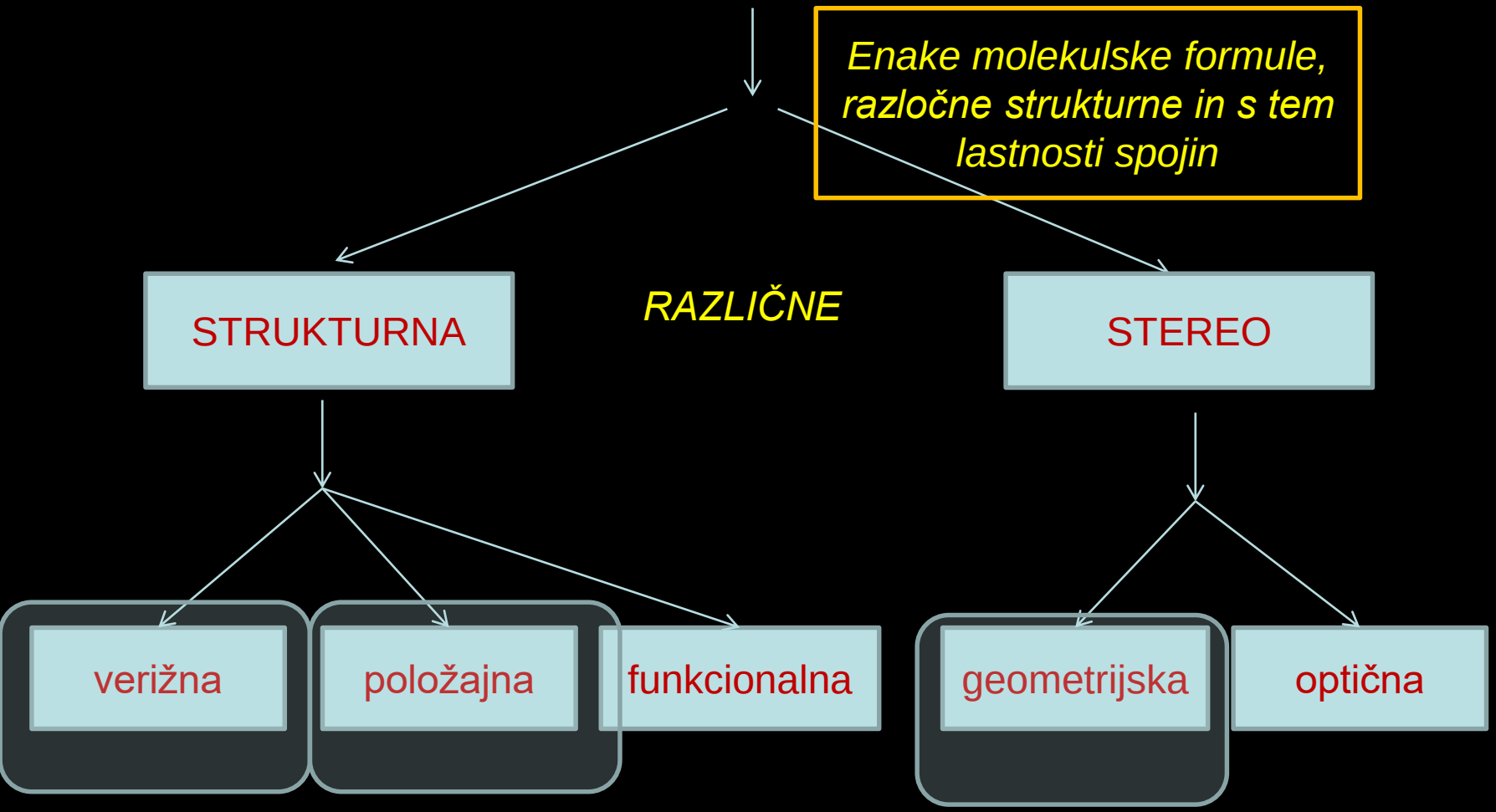
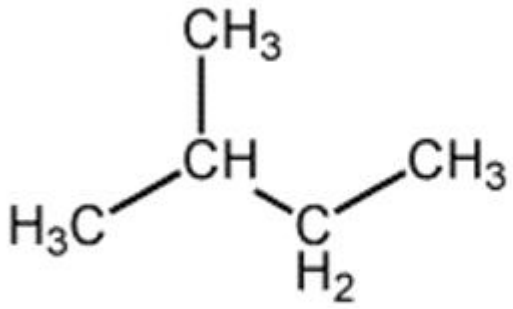


# IZOMERIJA


Enake molekulske formule, razločne strukturne in s tem lastnosti spojin
RAZLIČNE
STRUKTURNA
STEREO
verižna
položajna
funkcionalna
geometrijska
optična

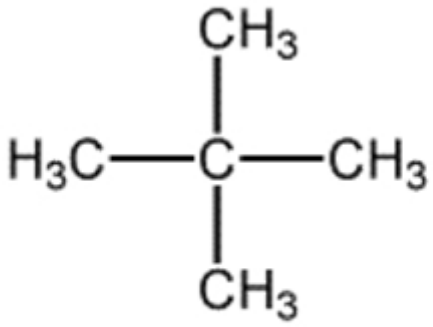
# Verižna izomerija

$C_5H_{12}$



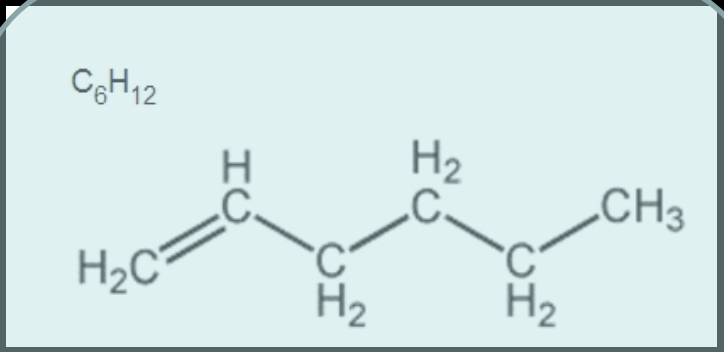

| Properties. | |
|---|---|
| **Formula** | C5H12 |
| **Formula mass** | 72.15 |
| **Melting point**, °C | -160 |
| **Boiling point**, °C | 28 |
| **Vapor pressure**, $mm_{Hg}$ | 727 (25 C) |
| **Vapor density** (air=1) | 2.48 |
| **Saturation Concentration** | 0.8 % (21 C) |
| **Evaporization number** | 1 (butyl acetate=1) |
| **Odor threshold** | 10 ppm |
| **Critical temperature** | 187.8 |
| **Critical pressure** | 32.9 |
| **Density** | 0.620 g/cm3 (20 C) |
| **Solubility in water** | Insoluble |

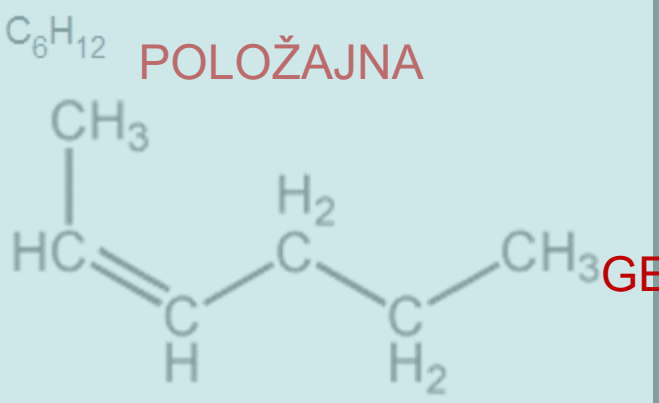
$C_5H_{12}$



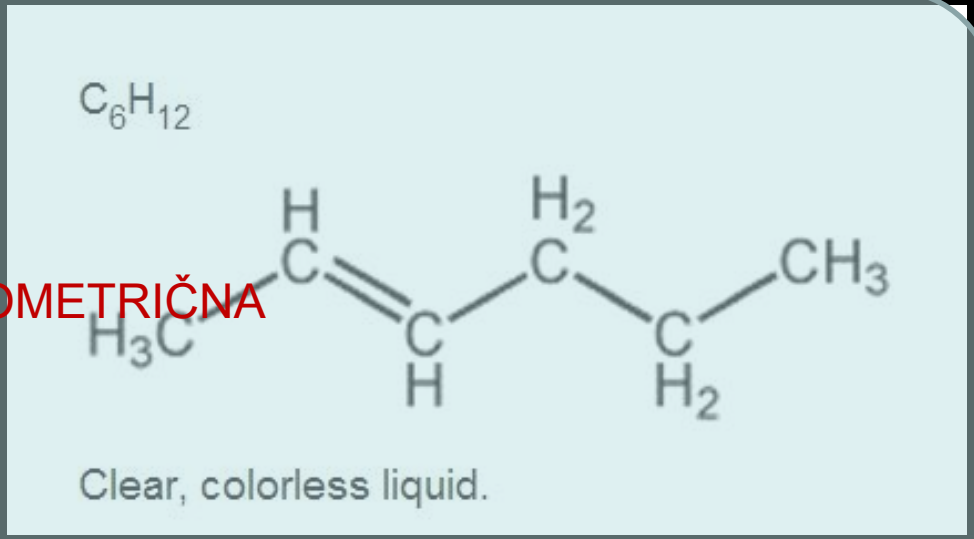

| Properties. | |
|---|---|
| **Formula** | C5H12 |
| **Formula mass** | 72.15 |
| **Boiling point**, °C | 10 |
| **Vapor pressure**, $mm_{Hg}$ | 1290 (25 C) |
| **Vapor density** (air=1) | 2.5 |
| **Critical temperature** | 161 |
| **Critical pressure** | 31.54 |
| **Density** | 0.613 g/cm3 (0 C) |
| **Solubility in water** | Insoluble |
| **Refractive index** | 1.3476 (6 C) |
| **Partition coefficient**, $pK_{ow}$ | 3.11 |
| **Heat of vaporization** | 22.8 kJ/mol |

# Položajna in geometrična izomerija

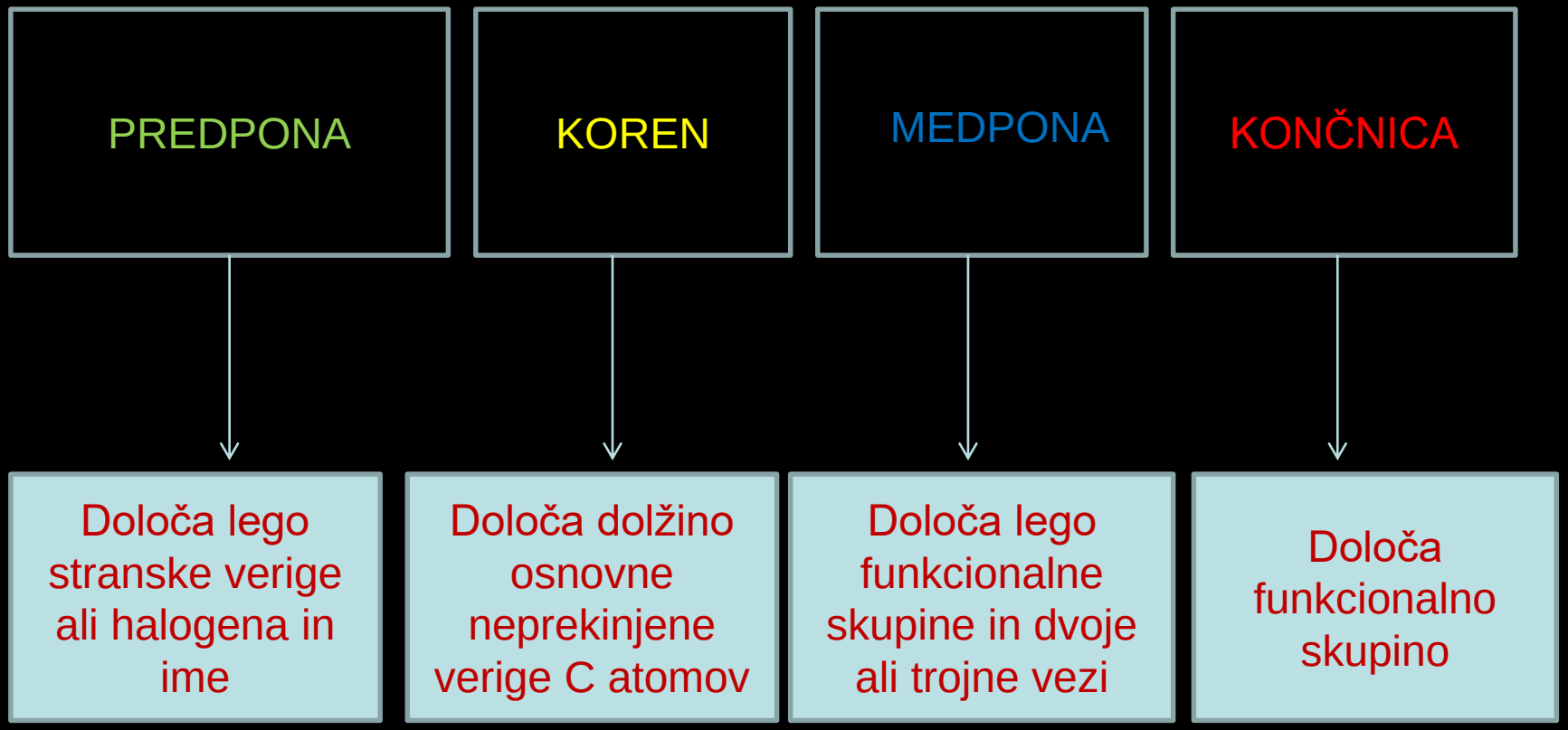



GEOMETRIČNA



# POIMENOVANJE OGLJIKOVODIKOV

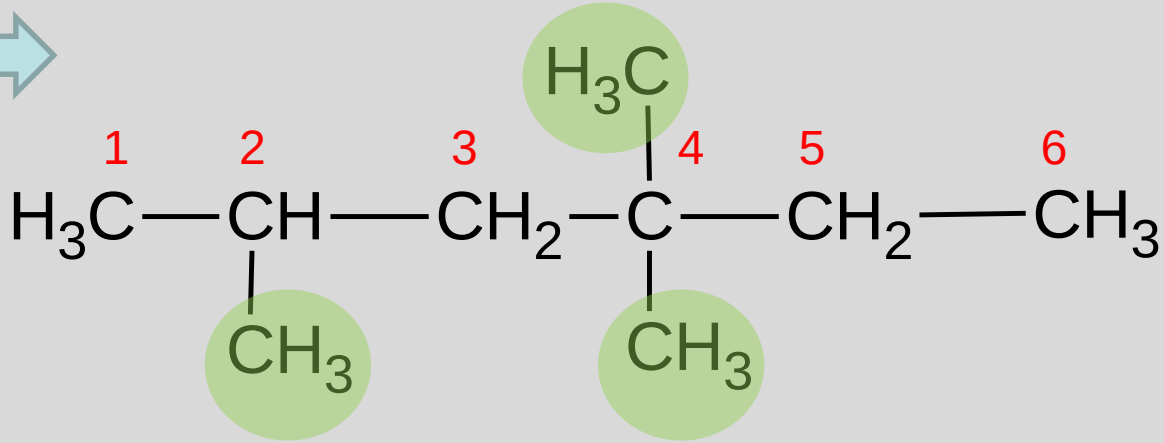


# Osnova poimenovanja – imena alkanov

| Ime | Mol. formula | Racionalna | Št. izomer |
|---|---|---|---|
| metan | $CH_4$ | $CH_4$ | 1 |
| etan | $C_2H_6$ | $CH_3CH_3$ | 1 |
| propan | $C_3H_8$ | $CH_3CH_2CH_3$ | 1 |
| butan | $C_4H_{10}$ | $CH_3(CH_2)_2CH_3$ | 2 |
| pentan | $C_5H_{12}$ | $CH_3(CH_2)_3CH_3$ | 3 |
| heksan | $C_6H_{14}$ | $CH_3(CH_2)_4CH_3$ | 5 |
| heptan | $C_7H_{16}$ | $CH_3(CH_2)_5CH_3$ | 9 |
| oktan | $C_8H_{18}$ | $CH_3(CH_2)_6CH_3$ | 18 |
| nonan | $C_9H_{20}$ | $CH_3(CH_2)_7CH_3$ | 35 |
| dekan | $C_{10}H_{22}$ | $CH_3(CH_2)_8CH_3$ | 75 |

$$C_nH_{2n+2}$$

Kako poimenujemo razvejane alkane?

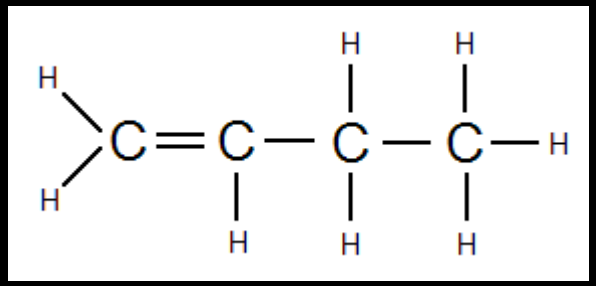



2,4,4-trimetilheksan

ALENI, splošna formula: Cn H2n

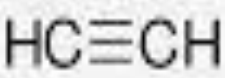
| Rb. | Naziv | Formula | Skrajšana strukturna formula |
|---|---|---|---|
| 1. | Eten | $C_2H_4$ | $H_2C = CH_2$ |
| 2. | Propen | $C_3H_6$ | $CH_3 - CH = CH_2$ |
| 3. | Buten | $C_4H_8$ | $CH_3 - CH_2 - CH = CH_2$ |
| 4. | Penten | $C_5H_{10}$ | $CH_3 - (CH_2)_2 - CH = CH_2$ |
| 5. | Heksen | $C_6H_{12}$ | $CH_3 - (CH_2)_3 - CH = CH_2$ |
| 6. | Hepten | $C_7H_{14}$ | $CH_3 - (CH_2)_4 - CH = CH_2$ |
| 7. | Okten | $C_8H_{16}$ | $CH_3 - (CH_2)_5 - CH = CH_2$ |
| 8. | Nonen | $C_9H_{18}$ | $CH_3 - (CH_2)_6 - CH = CH_2$ |
| 9. | Deken | $C_{10}H_{20}$ | $CH_3 - (CH_2)_7 - CH = CH_2$ |

ALKENI SO NENASIČENI OGLJIKOVODIKI, KI IMAJO POLEG ENOJNIH ŠE DVOJNE VEZI. SO BOLJ REAKTIVNI KOT ALKANI.

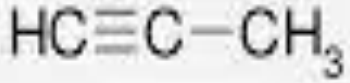


# Alkini

- Predstavljajo drugo skupino nenasičenih ogljikovodikov. **Alkin** je aciklični nenasičen ogljikovodik, ki vsebuje eno ali več **trojnih** vezi.
- Funkcionalna skupina: trojna vez
- Splošna formula alkina z eno trojno vezjo: $C_nH_{2n-2}$



etin



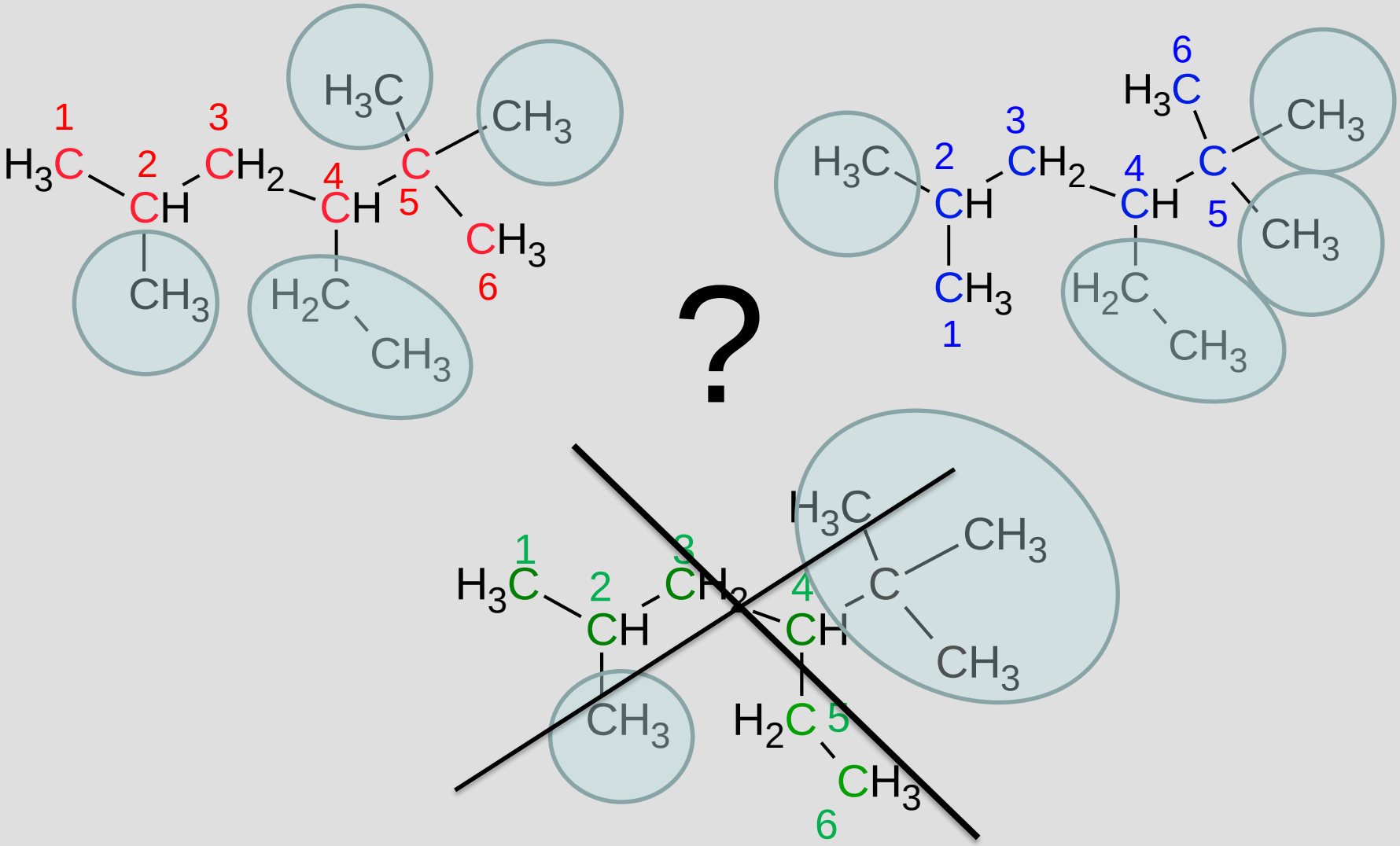
propin

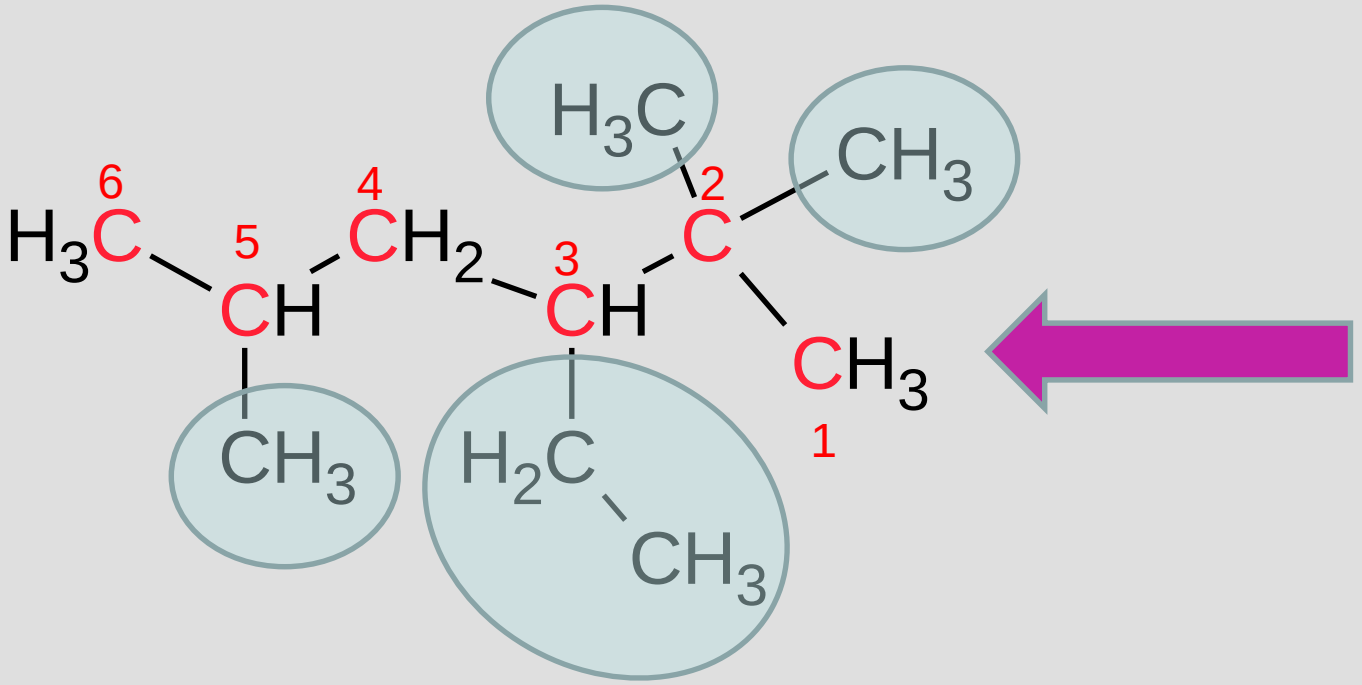
# ALKINI, NENASIČENI OGLJIKOVODIKI

| Rb. | Naziv | Formula | Skrajena strukturna formula |
|---|---|---|---|
| 1. | Etin | $C_2H_2$ | $HC \equiv CH$ |
| 2. | Propin | $C_3H_4$ | $CH_3 - C \equiv CH$ |
| 3. | Butin | $C_4H_6$ | $CH_3 - CH_2 - C \equiv CH$ |
| 4. | Pentin | $C_5H_8$ | $CH_3 - (CH_2)_2 - C \equiv CH$ |
| 5. | Heksin | $C_6H_{10}$ | $CH_3 - (CH_2)_3 - C \equiv CH$ |
| 6. | Heptin | $C_7H_{12}$ | $CH_3 - (CH_2)_4 - C \equiv CH$ |
| 7. | Oktin | $C_8H_{14}$ | $CH_3 - (CH_2)_5 - C \equiv CH$ |
| 8. | Nonin | $C_9H_{16}$ | $CH_3 - (CH_2)_6 - C \equiv CH$ |
| 9. | Dekin | $C_{10}H_{18}$ | $CH_3 - (CH_2)_7 - C \equiv CH$ |

CnH2n-2 , splošna formula

Pravilo: za osnovo vzamemo verigo, ki ima največ substituent

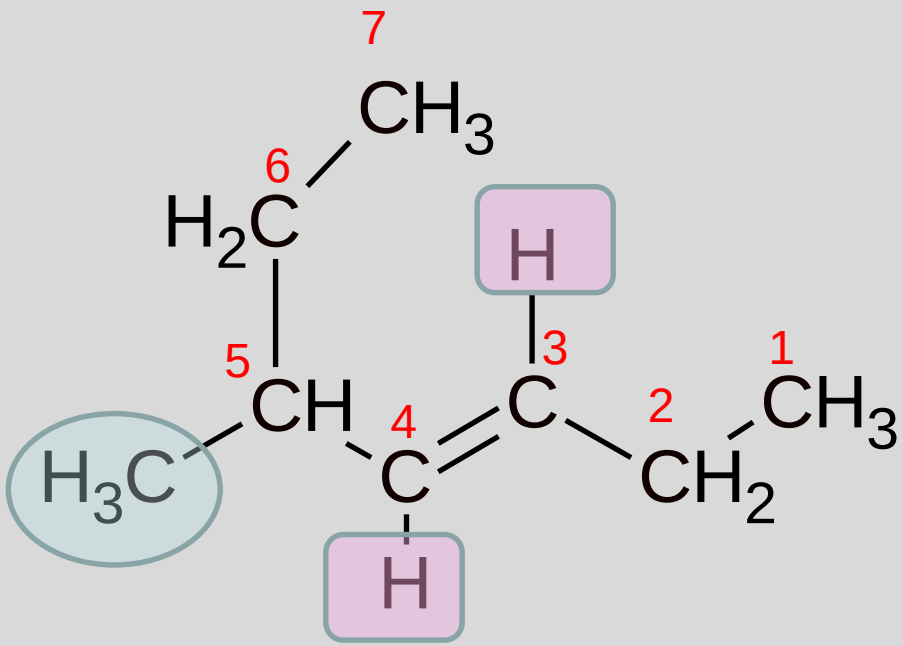





2,2,5-trimetil 3-etil

3-etil-2,2,5-trimetilheksan

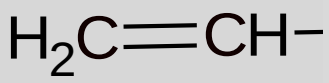
# Poimenovanje alkenov



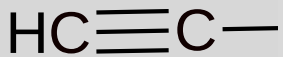

5-metilhept-3-en

*E*-5-metilhept-3-en

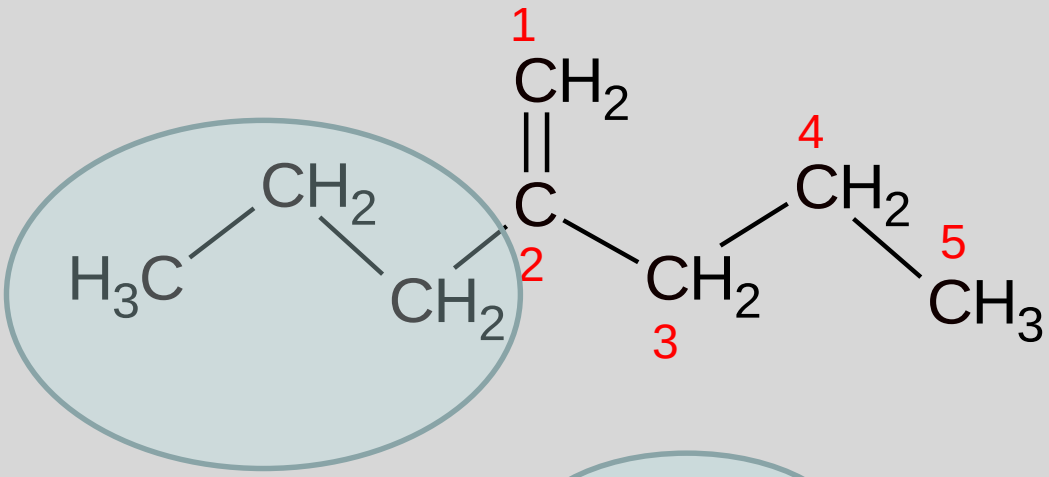
http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/nomen1.htm



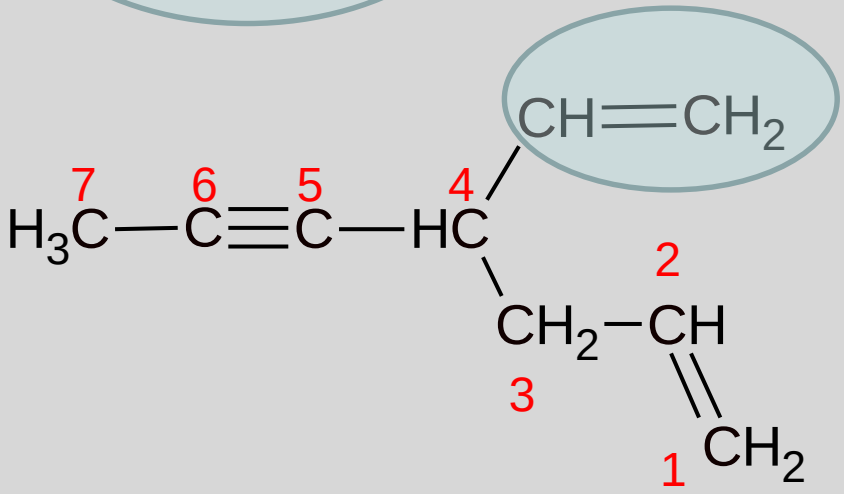
vinil



etinil



2-propilpent-1-en



4-vinilhept-1-en-5-in

# Reaktivnost ogljikovodikov

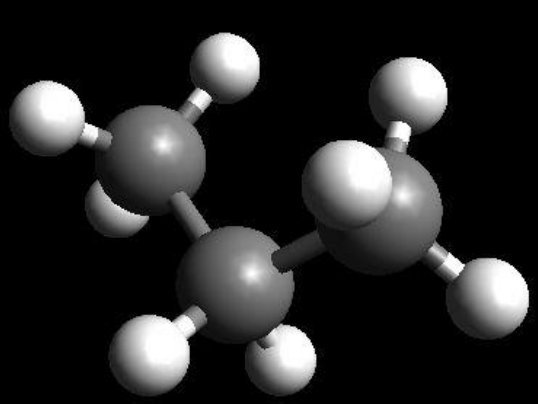
Reaktivnost je odvisna od vrste vezi med ogljikovimi atomi in od reakcijskih okoliščin.

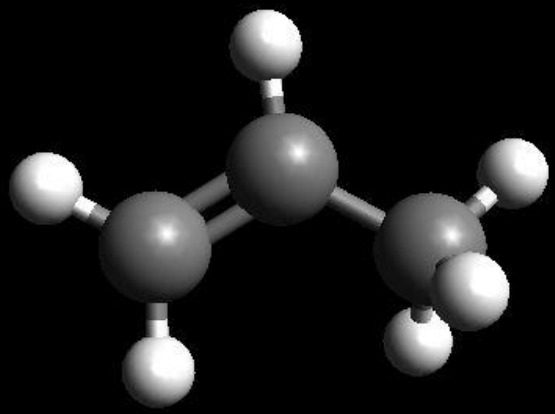
❖Pri sobni temperaturi in v temi so **nasičeni** ogljikovodiki nereaktivne spojine.

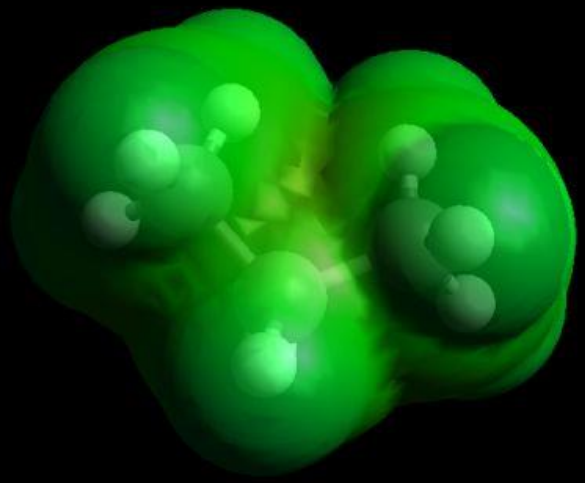
❖ Nasprotno so **nenasičeni** znatno bolj reaktivni, tudi pri sobnih pogojih in v temi.

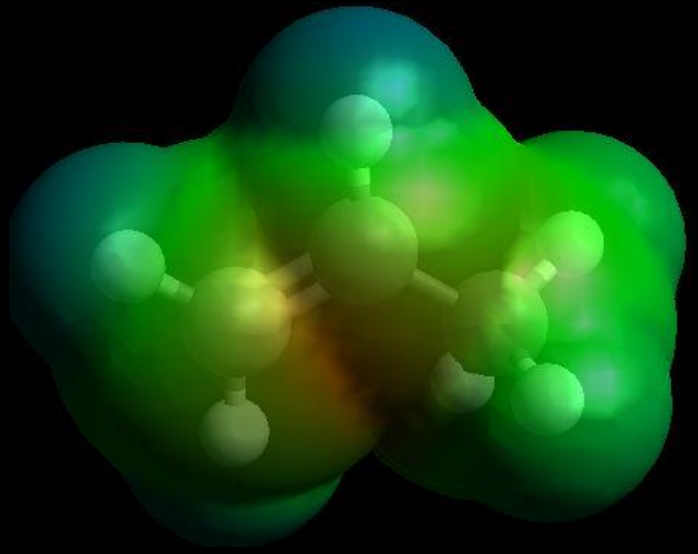
**Eksperiment**

# Zakaj razlike v reaktivnosti nasičenih in nenasičenih ogljikovodikov?









δ(-)

δ (+)

# Gorenje, oksidacija


$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l);$$
$$\Delta_c H^{\ominus} = -890\ \text{kJ mol}^{-1}$$

$$C_4H_{10}(g) + 13/2\ O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l);$$
$$\Delta_c H^{\ominus} = -2875.84\ \text{kJ mol}^{-1}$$

# Poskus

**Ogljikovodiki so spojine ogljika in vodika – eksperimentalni dokaz, C in H( segrevanje, pooglenitev)**

**Iskanje najpreprostejše molekule ogljikovodikov – metana. Ponovitev vezi.**

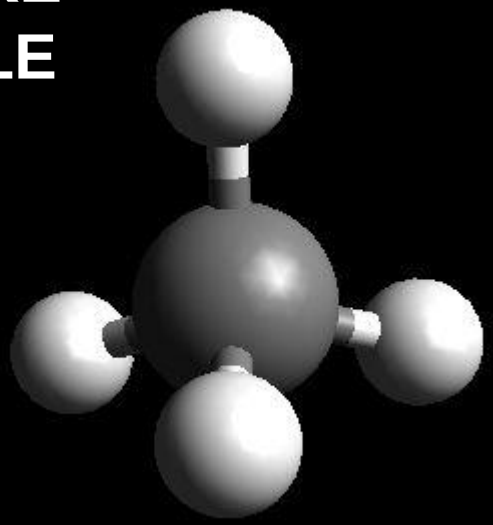
**Koliko "sorodnikov" ima metan? Igra z modeli. Sestavite vse možne ogljikovodike, če so na voljo trije C atomi oz. modeli.**
***Učitelj določi pravila igre!***

Razlikovanje med nasičenimi in nenasičenimi ogljikovodiki - eksperiment

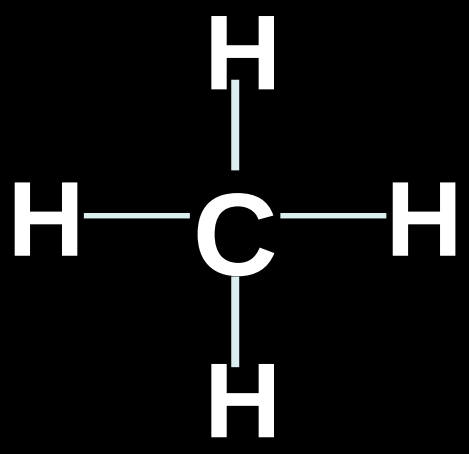
**Molekulska formula**

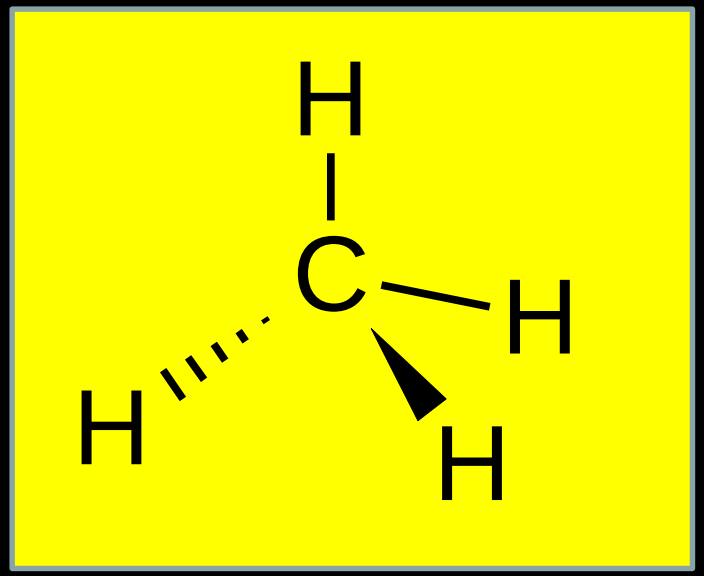
$CH_4$

**KEMIJSKE FORMULE**

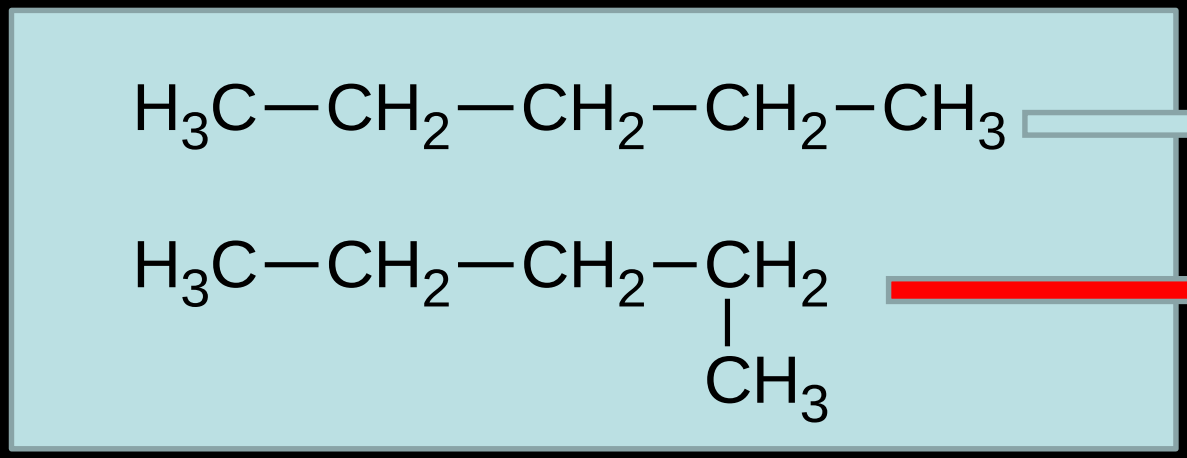


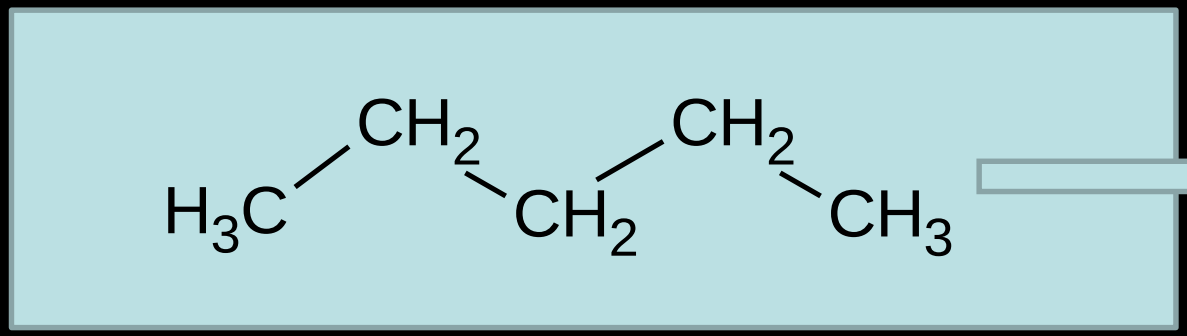
**Strukturna formula**

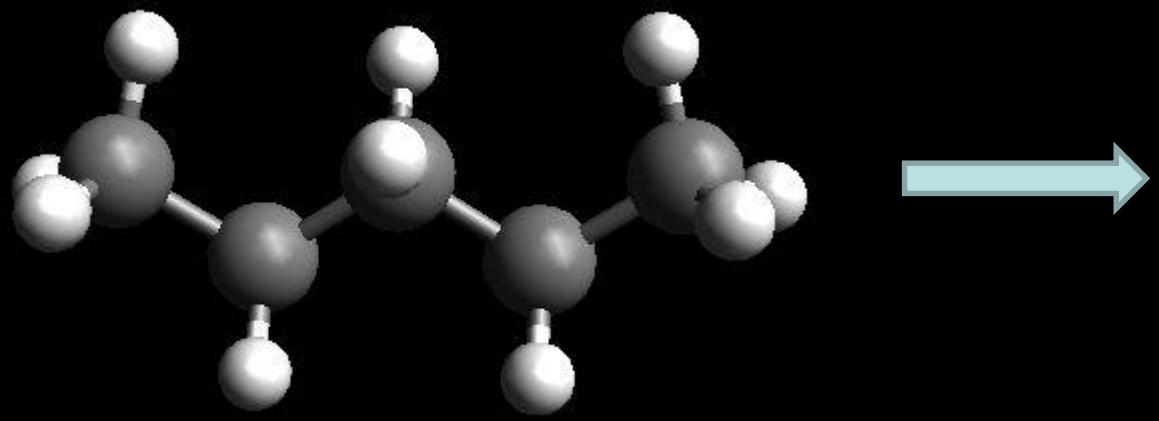


# Pozornost - napake



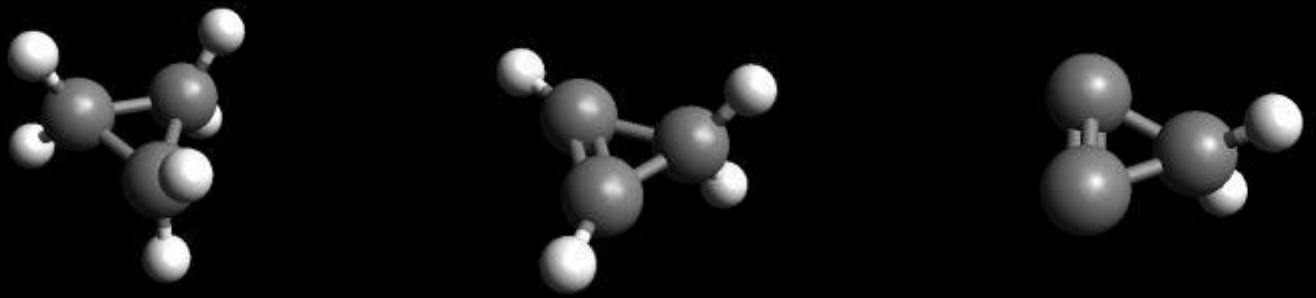



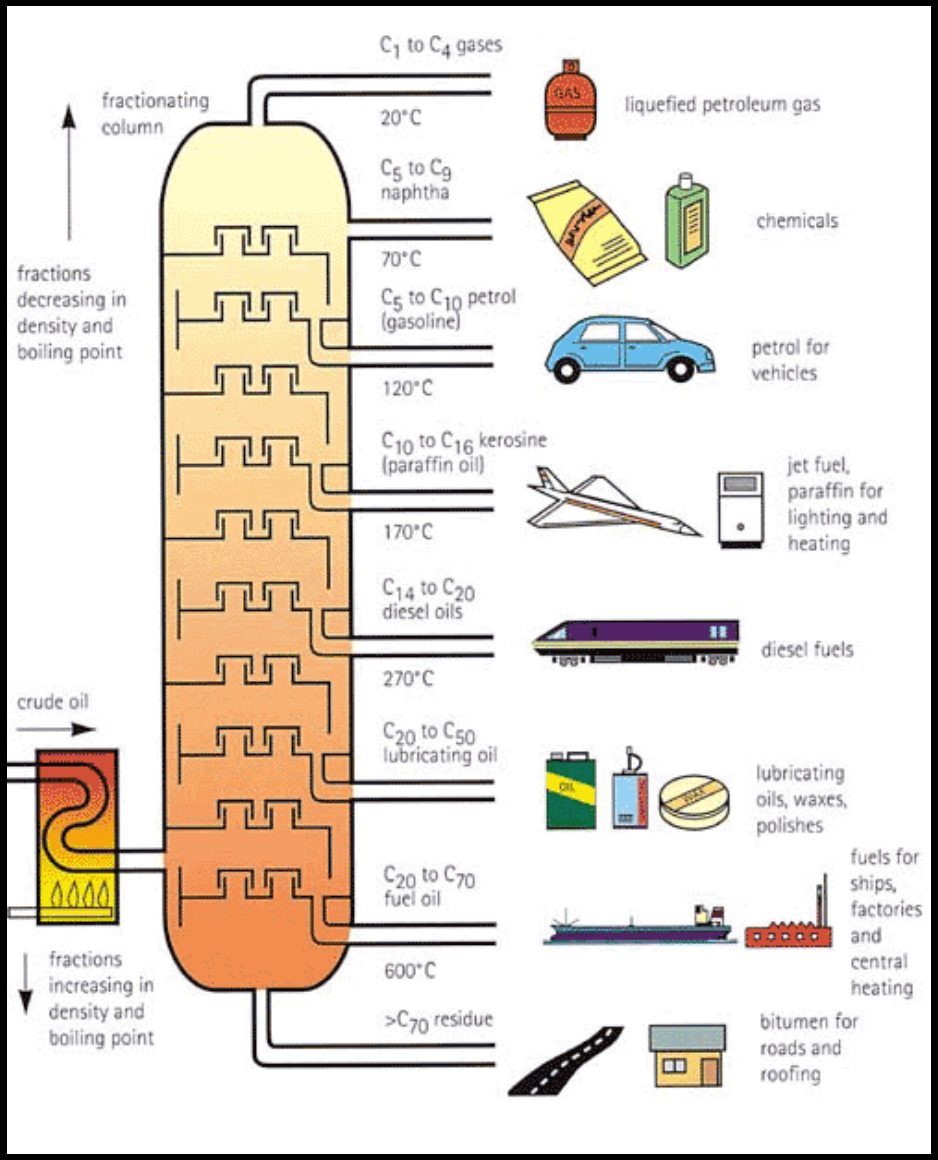
# Rezultati igre – sorodniki metana

**Pojem: aciklične spojine**

**Pojem: ciklične spojine**

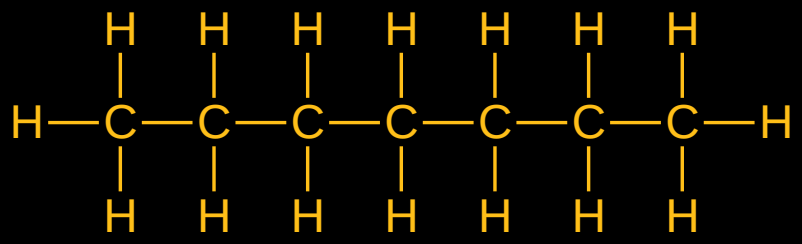


# Naftni derivati – predelava nafte

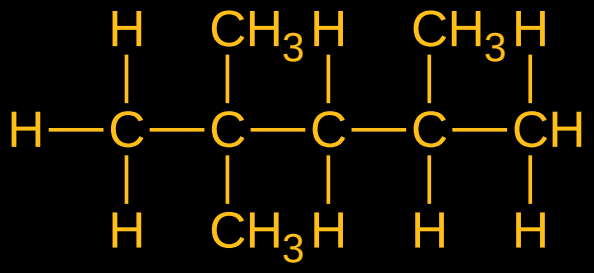


# Bencin – kvaliteta bencina

**Oktansko število – določa koliko kompresije lahko gorivo vzdrži pred vžigom**



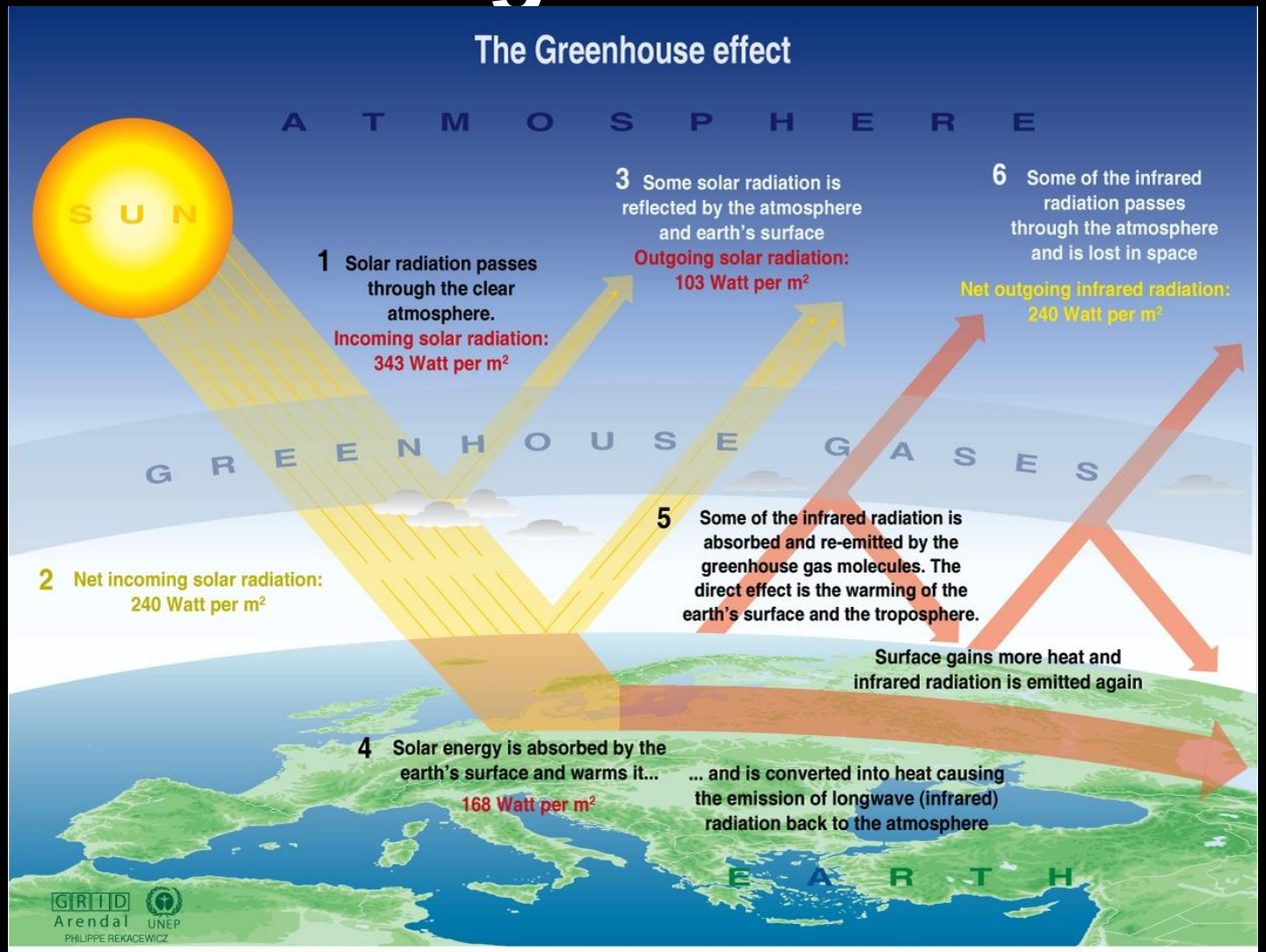
Heptan – oktansko število 0



2,2,4-trimetilpentan (izookotan) – oktansko število 100

Bencinska mešanica z oktanskim številom 95, vzdrži pred vžigom toliko kompresije kot zmes 95 % izooktana in 5 % heptana.

# Vplivi na okolje – pojav tople grede




Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

# Toplogredni plini po sektorjih

# Eksperiment - Zakaj je ogljikov dioksid plin tople grede?

Za eksperiment potrebujete dve brezbarvni literski steklenici. Dva digitalna termometra, zamašek, v katerega vstavite digitalni termometer, merilni valj, žličko, kis, natrijev hidrogenkarbonat. Priporočamo, da eksperiment izvedete doma. V vsako steklenico nalijte 30 mL jedilnega kisa in 30 mL vode. Na eno steklenico nalepite nalepko z napisom $CO_2$, na drugo pa brez $CO_2$. V steklenico z nalepko $CO_2$ dodajte dve žlici jedilne sode (natrijevega hidrogenkarbonata).

Počakajte nekaj minut in nato obe steklenici zaprite z zamaškom z vstavljenim digitalnim termometrom. Steklenici pustite stati eno uro.

Nato steklenici postavite na sonce. Vsakih pet minut pdčitajte temperaturo v obeh steklenicah.

Po pol ure poistavite steklenici v senco in ponovno odčitavajte temperaturo na 5 minut.

Podatke vpišite v tabelo in jih predstavite tudi grafično.

- V kateri steklenici narašča temperatura hitreje? Zakaj?
- V kateri steklenici temperatura hitreje pada? Zakaj?
- Napišite reakcijo, ki poteče v steklenici z nalepko $CO_2$?

# Na kolo za zdravo telo in naravo