

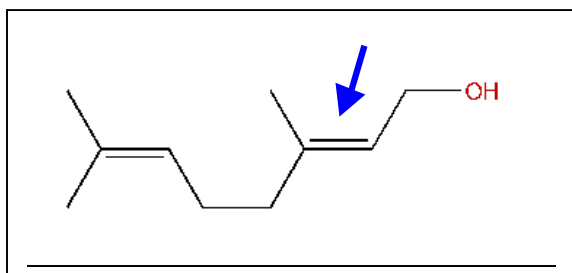
Soal 1 Kimia disekitar Kita

a. M_r geraniol = $((\text{Atom C} \times M_r \text{ C}) + (\text{Atom H} \times M_r \text{ H}) + (\text{Atom O} \times M_r \text{ O})) \text{ gr/mol}$
 $((10 \times 12,011) + (18 \times 1,008)) + (1 \times 15,999) \text{ gr/mol}$
 154,253 gr/mol (1poin)

M_r eugenol = $((\text{Atom C} \times M_r \text{ C}) + (\text{Atom H} \times M_r \text{ H}) + (\text{Atom O} \times M_r \text{ O})) \text{ gr/mol}$
 $((10 \times 12,011) + (12 \times 1,008)) + (2 \times 15,999) \text{ gr/mol}$
 164,204 gr/mol (1poin)

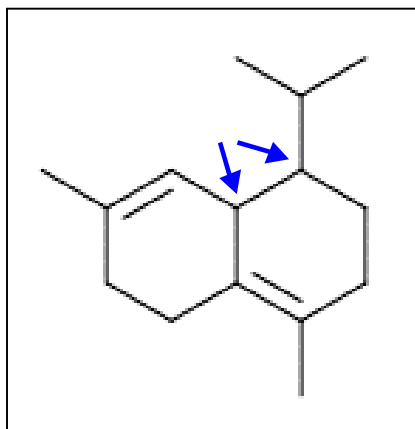
b. Yang bersifat asam adalah eugenol (1poin)

c.

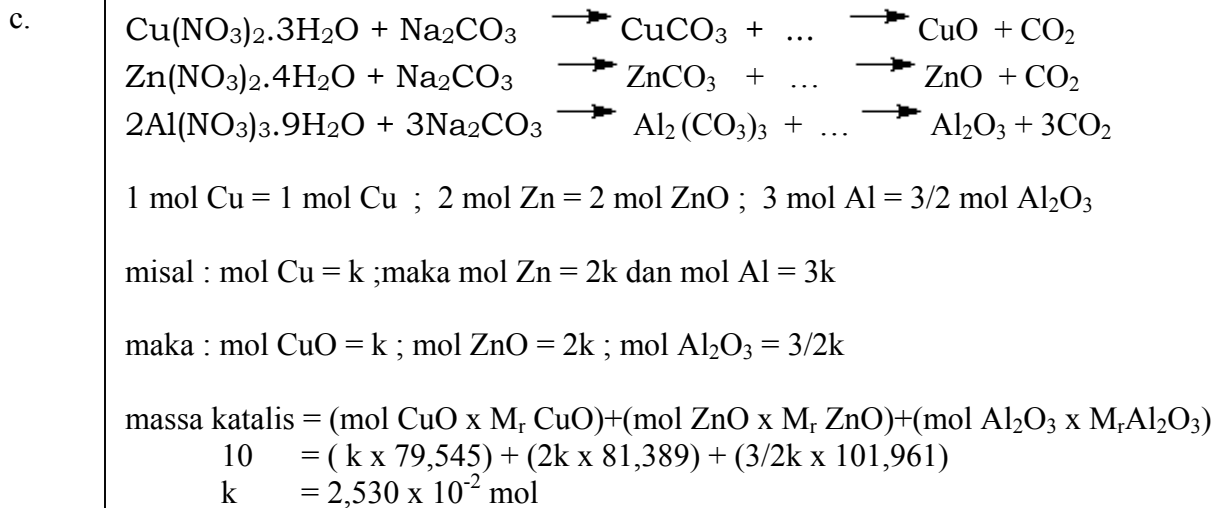
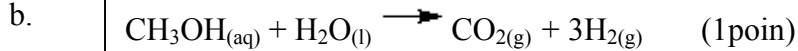
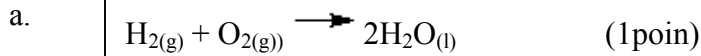


(1poin)

d.



(2poin)

Soal 2 Jantung Hati *Fuel Cell*

Dari persamaan reaksi dapat dilihat bahwa

$$\text{mol CuO} = \text{mol CuCO}_3 = \text{mol Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} = 2,530 \times 10^{-2} \text{ mol}$$

$$\text{mol ZnO} = \text{mol ZnCO}_3 = \text{mol Zn}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O} = 5,060 \times 10^{-2} \text{ mol}$$

$$\text{mol Al}_2\text{O}_3 = \text{mol Al}_2(\text{CO}_3)_3 = 2 \text{ mol Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O} = 7,590 \times 10^{-2} \text{ mol}$$

$$\begin{aligned} \text{Massa Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} &= \text{mol Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} \times M_r \text{ Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} \\ &= 2,530 \times 10^{-2} \times 243,759 = 6,167 \text{ gram} \end{aligned}$$

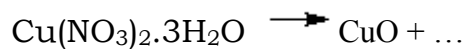
$$\begin{aligned} \text{Massa Zn}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O} &= \text{mol Zn}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O} \times M_r \text{ Zn}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O} \\ &= 5,060 \times 10^{-2} \times 261,618 = 13,238 \text{ gram} \end{aligned}$$

$$\begin{aligned} \text{Massa Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O} &= \text{mol Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O} \times M_r \text{ Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O} \\ &= 7,590 \times 10^{-2} \times 375,369 = 28,491 \text{ gram} \end{aligned}$$

(6 poin)

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d.



$$\begin{aligned} \text{mol Cu} &= \text{mol CuO} = \text{mol Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} \\ \text{mol Zr} &= \text{mol ZrO}_2 \cdot \text{SiO}_2 \end{aligned}$$

$$\text{misal : mol Zr} = k ; \text{ maka mol Cu} = 9/91k$$

$$\begin{aligned} \text{mol Zr} &= \text{massa ZrO}_2 \cdot \text{SiO}_2 : M_r \text{ ZrO}_2 \cdot \text{SiO}_2 \\ &= 10 : 183,316 = 5,455 \times 10^{-2} \text{ mol} \end{aligned}$$

$$\text{mol Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} = 9/91 \times 5,455 \times 10^{-2} \text{ mol} = 5,395 \times 10^{-3} \text{ mol}$$

$$\begin{aligned} \text{Massa Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} &= \text{mol Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} \times M_r \text{ Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} \\ &= 5,395 \times 10^{-3} \times 243,759 = 1,315 \text{ gram} \end{aligned}$$

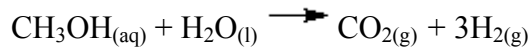
$$\begin{aligned} \text{Massa CuO} &= \text{mol CuO} \times M_r \text{ CuO} \\ &= 5,395 \times 10^{-3} \times 79,545 = 0,429 \text{ gram} \end{aligned}$$

$$\begin{aligned} \text{Massa katalis CuO/ZrO}_2 \cdot \text{SiO}_2 &= \text{massa CuO} + \text{massa ZrO}_2 \cdot \text{SiO}_2 \\ &= 0,429 \text{ gram} + 10 \text{ gram} = 10,429 \text{ gram} \end{aligned}$$

(4poin)

e.

i



Asumsi reaksi sempurna, maka mol $\text{CO}_2 = 1/3$ mol H_2

suhu 150°C

$$\text{mol CO}_2 = 1/3 \times 3,02252 \times 10^{-9} = 1,008 \times 10^{-9} \text{ mol}$$

suhu 200°C

$$\text{mol CO}_2 = 1/3 \times 6,02448 \times 10^{-8} = 2,008 \times 10^{-8} \text{ mol}$$

suhu 250°C

$$\text{mol CO}_2 = 1/3 \times 5,10901 \times 10^{-7} = 1,703 \times 10^{-7} \text{ mol}$$

suhu 300°C

$$\text{mol CO}_2 = 1/3 \times 1,85357 \times 10^{-6} = 6,179 \times 10^{-7} \text{ mol}$$

Suhu ($^\circ\text{C}$)	Gas CO_2 (mol)
150	$1,008 \times 10^{-9}$
200	$2,008 \times 10^{-8}$
250	$1,703 \times 10^{-7}$
300	$6,179 \times 10^{-7}$

(2poin)

ii

$$X_1 = \frac{\text{mol 1}}{\text{mol total}}$$

$$\text{mol total} = \text{mol H}_2 + \text{mol O}_2 + \text{mol N}_2 + \text{mol CO} + \text{mol CO}_2$$

untuk suhu 150°C

$$\text{mol total} = 3,02252 \times 10^{-9} + 4,73847 \times 10^{-8} + 2,34267 \times 10^{-5} + 0 + 1,008 \times 10^{-9}$$

$$= 2,348 \times 10^{-5} \text{ mol}$$

$$X \text{ H}_2 = \frac{3,02252 \times 10^{-9}}{2,348 \times 10^{-5}} = 1,287 \times 10^{-4} \quad X \text{ O}_2 = \frac{4,73847 \times 10^{-8}}{2,348 \times 10^{-5}} = 2,018 \times 10^{-4}$$

$$X \text{ N}_2 = \frac{2,34267 \times 10^{-5}}{2,348 \times 10^{-5}} = 0,998 \quad X \text{ CO}_2 = \frac{1,008 \times 10^{-9}}{2,348 \times 10^{-5}} = 4,293 \times 10^{-5}$$

untuk suhu 200°C

$$\text{mol total} = 6,02448 \times 10^{-8} + 4,02022 \times 10^{-8} + 1,95759 \times 10^{-5} + 0 + 2,008 \times 10^{-8}$$

$$= 1,970 \times 10^{-5}$$

untuk suhu 250°C

$$\text{mol total} = 5,10901 \times 10^{-7} + 4,18568 \times 10^{-8} + 1,98603 \times 10^{-5} + 0 + 1,703 \times 10^{-7}$$

$$= 2,058 \times 10^{-5}$$

untuk suhu 300°C

$$\text{mol total} = 1,85357 \times 10^{-6} + 4,12745 \times 10^{-8} + 2,03296 \times 10^{-5} + 0 + 6,179 \times 10^{-7}$$

$$= 2,284 \times 10^{-5}$$

Suhu (°C)	X H ₂	X O ₂	X N ₂	X CO	X CO ₂
150	$1,287 \times 10^{-4}$	$2,018 \times 10^{-4}$	0,998	0	$4,293 \times 10^{-5}$
200	$3,058 \times 10^{-3}$	$2,041 \times 10^{-3}$	0,994	0	$1,019 \times 10^{-3}$
250	$2,483 \times 10^{-2}$	$2,034 \times 10^{-3}$	0,965	0	$8,275 \times 10^{-3}$
300	$8,115 \times 10^{-2}$	$1,807 \times 10^{-3}$	0,890	0	$2,705 \times 10^{-2}$

(10poin)

iii

$$PV = nRT$$

untuk suhu 150°C

$$(694,153/760) \times (79,49125596/1000)/\text{menit} = n \times 0,082 \times (298,5)$$

$$n = 2,966 \times 10^{-3} \text{ mol/menit}$$

untuk suhu 200°C

$$(694,153/760) \times (81,87772926/1000)/\text{menit} = n \times 0,082 \times (298)$$

$$n = 3,060 \times 10^{-3} \text{ mol/menit}$$

untuk suhu 250°C

$$(694,153/760) \times (83,33333333/1000)/\text{menit} = n \times 0,082 \times (298)$$

$$n = 3,115 \times 10^{-3} \text{ mol/menit}$$

untuk suhu 300°C

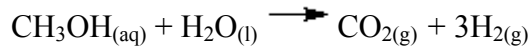
$$(694,153/760) \times (88,71540099/1000)/\text{menit} = n \times 0,082 \times (300)$$

$$n = 3,294 \times 10^{-3} \text{ mol/menit}$$

Suhu (°C)	Jumlah gas total (mol/menit) keluar dari reaktor
150	$2,966 \times 10^{-3}$
200	$3,060 \times 10^{-3}$
250	$3,115 \times 10^{-3}$
300	$3,294 \times 10^{-3}$

(2poin)

iv



$$\text{Jumlah gas H}_2 = \text{jumlah gas total} \times \text{XH}_2$$

$$\text{Jumlah metanol} = 1/3 \times \text{jumlah gas H}_2$$

untuk suhu 150°C

$$\text{jumlah gas H}_2 = 2,966 \times 10^{-3} \times 1,287 \times 10^{-4} = 3,817 \times 10^{-7} \text{ mol/menit}$$

$$\text{jumlah metanol} = 1/3 \times 3,817 \times 10^{-7} = 1,272 \times 10^{-7} \text{ mol/menit}$$

untuk suhu 200°C

$$\text{jumlah gas H}_2 = 3,060 \times 10^{-3} \times 3,058 \times 10^{-3} = 9,357 \times 10^{-6} \text{ mol/menit}$$

$$\text{jumlah metanol} = 1/3 \times 9,357 \times 10^{-6} = 3,119 \times 10^{-6} \text{ mol/menit}$$

untuk suhu 250°C

$$\text{jumlah gas H}_2 = 3,115 \times 10^{-3} \times 2,483 \times 10^{-2} = 7,735 \times 10^{-5} \text{ mol/menit}$$

$$\text{jumlah metanol} = 1/3 \times 7,735 \times 10^{-5} = 2,578 \times 10^{-5} \text{ mol/menit}$$

untuk suhu 300°C

$$\text{jumlah gas H}_2 = 3,294 \times 10^{-3} \times 8,115 \times 10^{-2} = 2,673 \times 10^{-4} \text{ mol/menit}$$

$$\text{jumlah metanol} = 1/3 \times 2,673 \times 10^{-4} = 8,910 \times 10^{-5} \text{ mol/menit}$$

Suhu (°C)	Jumlah mol H ₂ (mol/menit)	Jumlah metanol yang bereaksi (mol/menit)
150	$3,817 \times 10^{-7}$	$1,272 \times 10^{-7}$
200	$9,357 \times 10^{-6}$	$3,119 \times 10^{-6}$
250	$7,735 \times 10^{-5}$	$2,578 \times 10^{-5}$
300	$2,673 \times 10^{-4}$	$8,910 \times 10^{-5}$

(4poin)

$$v$$

$$\% \text{ konversi} = (\text{jumlah metanol bereaksi} : \text{jumlah metanol memasuki reaktor}) \times 100\%$$

untuk suhu 150°C

$$\% \text{ konversi} = (1,272 \times 10^{-7} : 0,000359703) \times 100\% = 3,536 \times 10^{-2} \%$$

untuk suhu 200°C

$$\% \text{ konversi} = (3,119 \times 10^{-6} : 0,000393401) \times 100\% = 0,793 \%$$

untuk suhu 250°C

$$\% \text{ konversi} = (2,578 \times 10^{-5} : 0,000416015) \times 100\% = 6,197\%$$

untuk suhu 300°C

$$\% \text{ konversi} = (8,910 \times 10^{-5} : 0,000438511) \times 100\% = 20,319\%$$

Suhu (°C)	% konversi
150	$3,536 \times 10^{-2}$
200	0,793
250	6,197
300	20,319

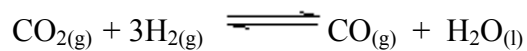
(2poin)

f.

Belum
Karena % konversi masih kecil

(2poin)

g.



(2poin)

Soal 3 Kimia itu Kehidupan

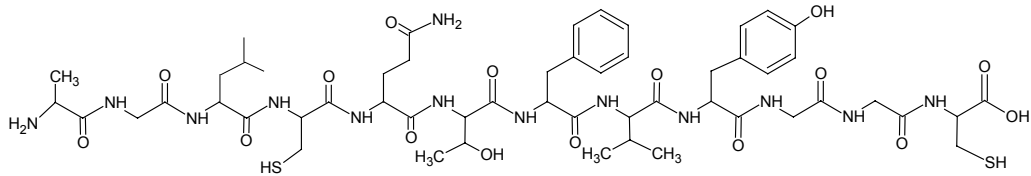
a.

Dapat

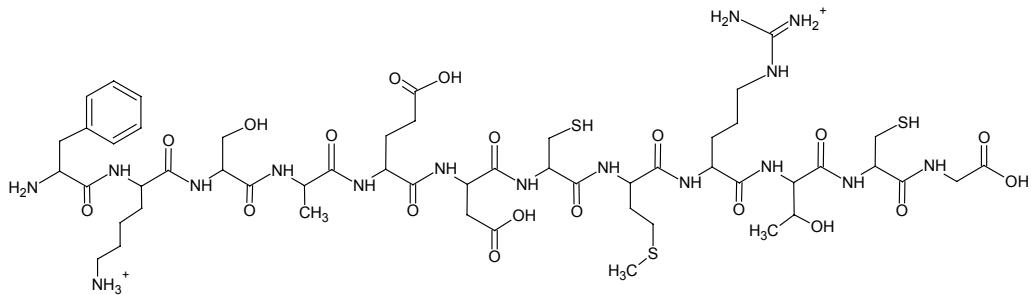
Karena kanji monomernya berikatan dalam bentuk α

b.

A-G-L-C-Q-T-F-V-Y-G-G-G-C

 $M_r = 1002,45$ gram/mol

F-K-S-A-E-D-C-M-R-T-C-G

 $M_r = 1131,57$ gram/mol

(10poin)

c.

A-G-L-C-Q-T-F-V-Y-G-G-G-C

Berbentuk α heliks

F-K-S-A-E-D-C-M-R-T-C-G

Berbentuk β sheet

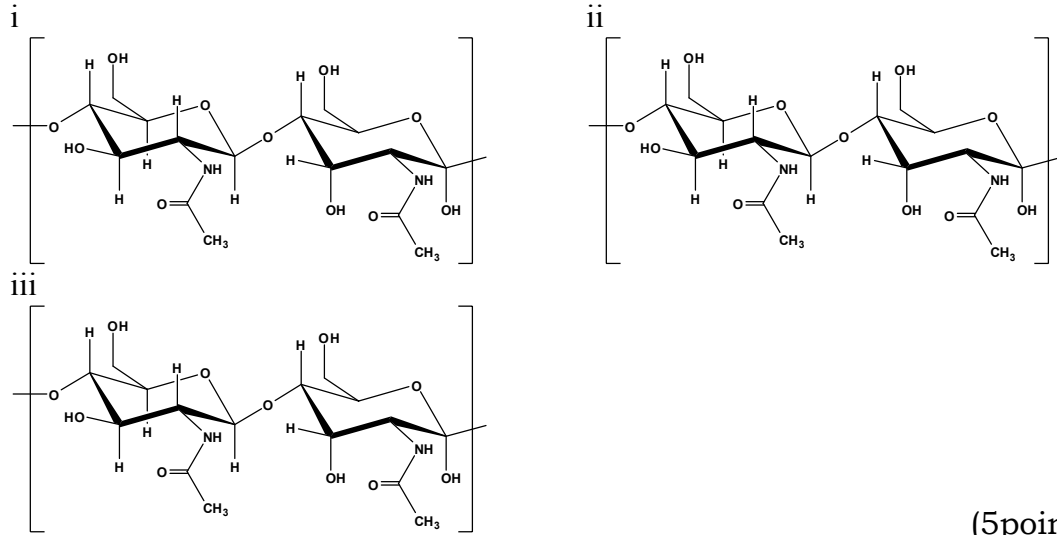
(5poin)

Soal 4 Polimer Laser Kulit Udang

a. Laba-laba, kepiting, udang

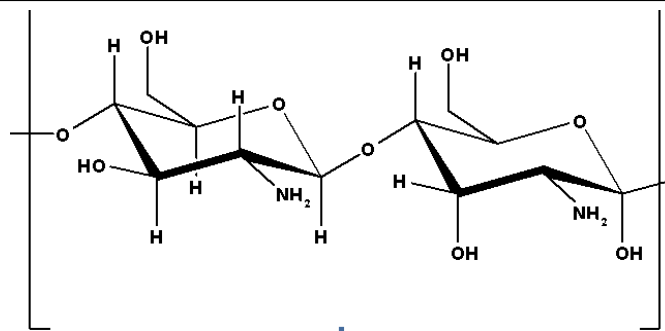
(1point)

b.



(5point)

c.



(3point)

d.

Light Amplification by Stimulated Emission of Radiation

(1point)

e.

Rhodamin B adalah senyawa aromatik
Rhodamin B memiliki ikatan rangkap terkonjugasi

Dilihat dari strukturnya. Terlihat bahwa merupakan senyawa aromatik dan rangkap konjugasi

(3point)

f.

(3poin)

g.

$$\theta_{pl} = \frac{I_{sampel} - I_{sphere}}{I_{laser} - I_{unabsorbed}} \times 100 \%$$

Sampel 1

$$\Theta_{pl} = ((1,45-0,90) : (33,00-14,30)) \times 100\% = 2,941\%$$

Sampel 2

$$\Theta_{pl} = ((1,18-1,00) : (32,50-18,00)) \times 100\% = 1.241\%$$

Sampel 3

$$\Theta_{pl} = ((1,22-1,00) : (306,00-10,10)) \times 100\% = 0,074\%$$

Sampel 4

$$\Theta_{pl} = ((1,14-1,00) : (30,90-9,00)) \times 100\% = 0,639\%$$

Sampel 5

$$\Theta_{pl} = ((1,38-1,00) : (29,60-4,00)) \times 100\% = 1,484\%$$

Sampel 6

$$\Theta_{pl} = ((1,61-0,98) : (29,00-5,75)) \times 100\% = 2,710\%$$

Sampel 7

$$\Theta_{pl} = ((1,35-1,00) : (29,60-8,50)) \times 100\% = 1,659\%$$

Sampel	ϕ_{PL}
1	2,941%
2	1,241%
3	0,074%
4	0,639%
5	1,484%
6	2,710%
7	1,659%

(4poin)

Soal 5 Analisis Limbah Organik

a.

Distilasi Bertingkat

Karena titik didih dari senyawa yang ada di dalam limbah organik hampir sama, sehingga harus dilakukan dengan distilasi bertingkat, tidak bisa dengan distilasi biasa.

(5poin)

b.

A = butiraldehid
B = etil asetat
C = siklobutanon
D = 2-propanol
E = sikloheksena

(15poin)