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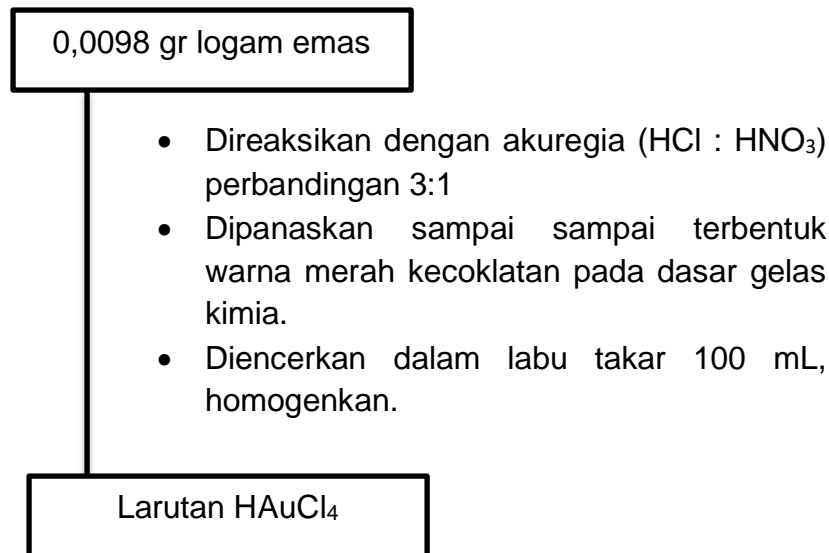
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Lampiran 1. Bagan Kerja

A. Pembuatan Larutan HAuCl$_4$ 0.5 mM

0,0098 gr logam emas

- Direaksikan dengan akuregia (HCl : HNO$_3$) perbandingan 3:1
- Dipanaskan sampai sampai terbentuk warna merah kecoklatan pada dasar gelas kimia.
- Diencerkan dalam labu takar 100 mL, homogenkan.

Larutan HAuCl$_4$

B. Sintesis nanopartikel emas

50 mL larutan HAuCl$_4$ 0.5 mM

- Dipanaskan hingga suhu 37˚C.
- Direaksikan dengan asam askorbat dengan perbandingan mol 1:4.
- Homogenkan.

Larutan nanopartikel emas

- Dikarakterisasi menggunakan spektrofotometer UV-Vis panjang gelombang 400-800 nm.

Larutan nanopartikel emas

C. Optimasi konsentrasi tirosin terhadap pembentukan Nanopartikel emas-Tirosin

> **30 mL larutan nanopartikel emas**

- Dimasukkan masing-masing 5 mL ke dalam 6 botol vial
- Masing-masing botol vial direaksikan 1 mL tirosin dengan variasi konsentrasi 0.001, 0,01, 0,1 dan 1 mM. Homogenkan.
- Karakterisasi dengan spektrofotometer UV-Vis 400-800 nm

> **Optimum konsentrasi Nanopartikel emas-Tirosin**

D. Optimasi pH tirosin terhadap pembentukan Nanopartikel emas-Tirosin

> **5 mL larutan nanopartikel emas**

- Dimasukkan masing-masing ke dalam 14 botol vial
- Masing-masing botol vial direaksikan 1 mL tirosin (konsentrasi optimum) dengan variasi pH 1-14 kemudian dihomogenkan.
- Karakterisasi dengan spektrofotometer UV-Vis 400-800 nm

> **Optimum pH Nanopartikel emas-Tirosin**
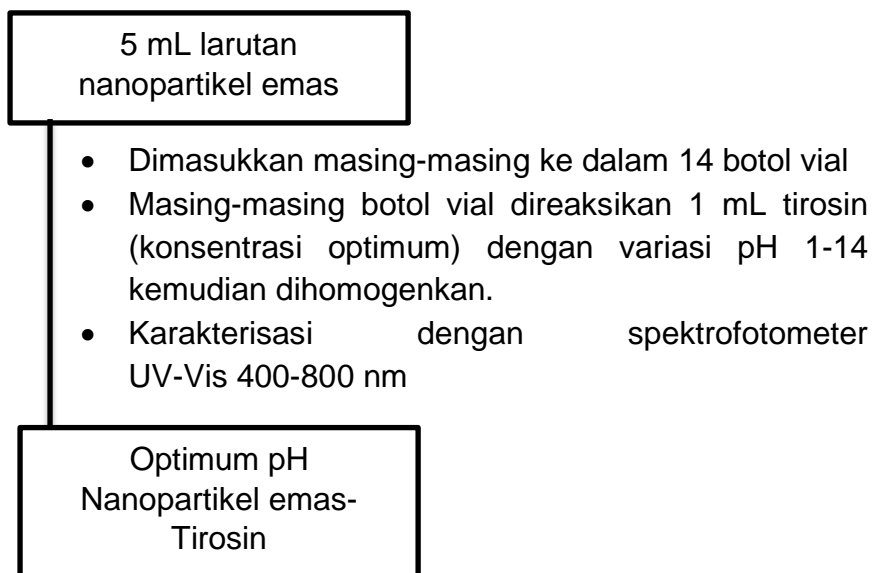
E. Optimasi waktu reaksi terhadap pembentukan Nanopartikel emas-Tirosin

```
┌─────────────────────────┐
│      5 mL larutan       │
│   nanopartikel emas     │
└─────────────────────────┘
```

- Direaksikan ke dalam botol vial
- Ditambahkan tirosin 1 mL (konsentrasi dan pH optimum). Kemudian direaksikan selama 105 menit dengan interval tiap 15 menit dikarakterisasi dengan spektrofotometer UV-Vis 400-800 nm

```
┌─────────────────────────┐
│  Optimum waktu reaksi   │
│   Nanopartikel emas-    │
│         Tirosin         │
└─────────────────────────┘
```

F. Uji kestabilan Nanopartikel emas-Tirosin

```
┌─────────────────────────┐
│      5 mL larutan       │
│   nanopartikel emas     │
└─────────────────────────┘
```

- Direaksikan ke dalam botol vial
- Ditambahkan tirosin 1 mL (konsentrasi dan pH optimum). Kemudian dikarakterisasi dengan spektrofotometer UV-Vis 400-800 nm pada minggu ke 1 hingga ke 8.

```
┌─────────────────────────┐
│       kestabilan        │
│   Nanopartikel emas-    │
│         Tirosin         │
└─────────────────────────┘
```

G. Uji sensor terhadap bakteri *Escherichia coli*

```
┌─────────────────────────────┐
│   Nanopartikel emas-Tirosin │
└─────────────────────────────┘
```

- Direaksikan ke dalam 6 botol vial yang berisi sediaan cair bakteri variasi pengenceran sel 10^6-10^{-1} CFU/mL dengan perbandingan 1:1 dalam 5 mL.
- Dihomogenkan
- Dikarakterisasi dengan spektrofotometer UV-Vis 400-800 nm.
- Ditentukan limit deteks berdasarkan persamaan $y = 0.0554x + 0.6191$

```
┌─────────────────────────────┐
│      Nanopartikel emas       │
└─────────────────────────────┘
```

- Direaksikan ke dalam 6 botol vial yang berisi sediaan cair bakteri variasi pengenceran sel 10^6-10^{-1} CFU/mL dengan perbandingan 1:1 dalam 5 mL.
- Dihomogenkan
- Dikarakterisasi dengan spektrofotometer UV-Vis 400-800 nm
- Ditentukan limit deteks berdasarkan persamaan $y = 0.0484x + 0.8053$

```
┌─────────────────────────────┐
│   Sensor terhadap bakteri    │
│      *Escherichia coli*      │
└─────────────────────────────┘
```

H. Uji selektivitas sensor terhadap bakteri *Salmonella typhi*, *Staphylococcus aureus*, natrium klorida (NaCl), kalsium klorida (CaCl$_2$), magnesium klorida (MgCl$_2$), zink klorida (ZnCl$_2$), besi(III) klorida (FeCl$_3$).
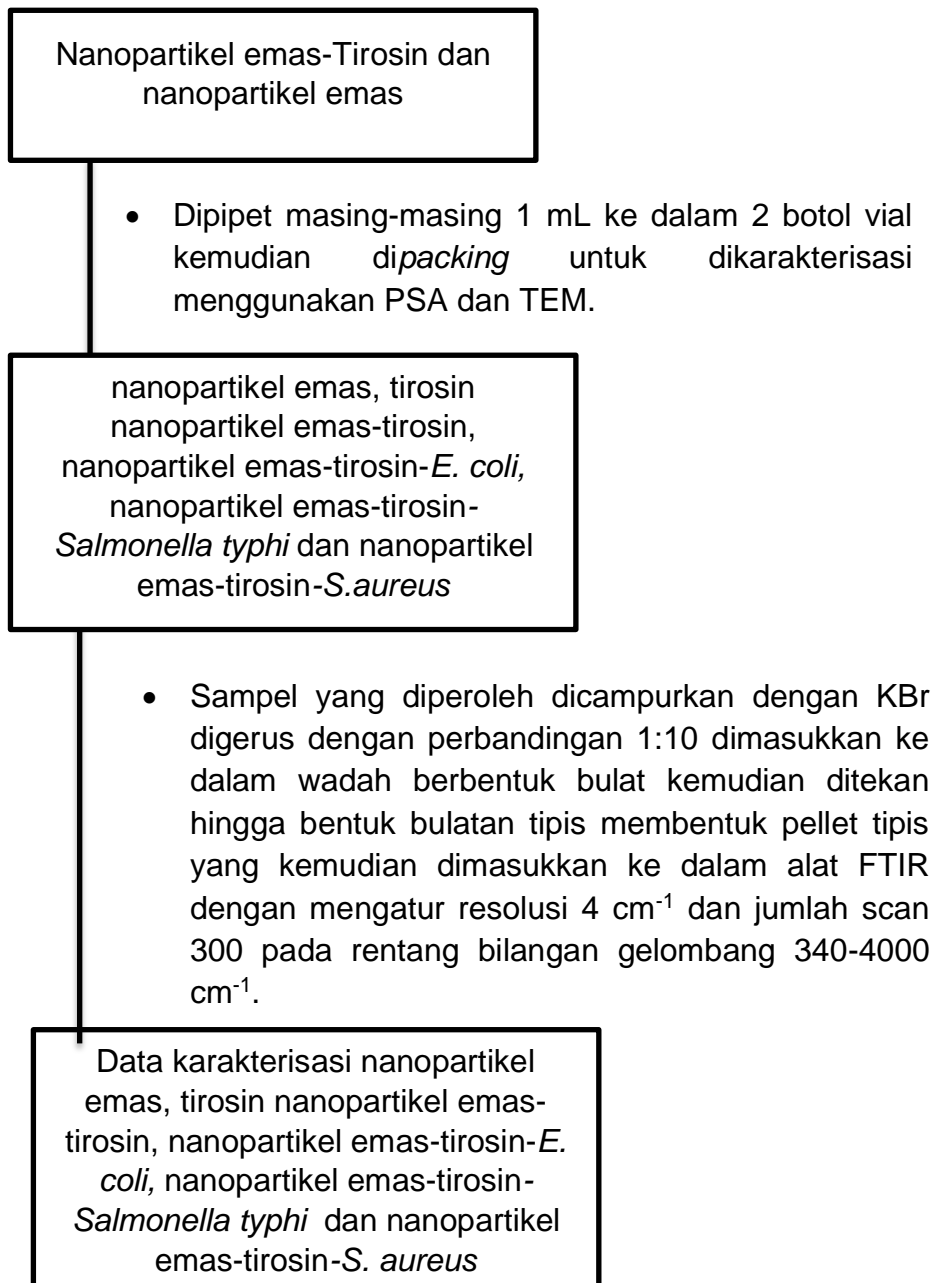
Nanopartikel emas-Tirosin

- Direaksikan ke dalam botol vial yang berisi sediaan cair bakteri *Salmonella typhi*, *Staphylococcus aureus* konsentrasi 10^6 CFU/mL dengan perbandingan 1:1 dalam 5 mL.
- Dihomogenkan
- Dikarakterisasi dengan spektrofotometer UV-Vis 400-800 nm
- Ditentukan nilai agregasi berdasarkan perbandingan nilai absorbansi 690 nm (agregasi) terhadap panjang gelombang 538 nm (kontrol nanopartikel emas-tirosin).

Nanopartikel emas-Tirosin

- Direaksikan ke dalam 5 botol vial yang berisi natrium klorida (NaCl), kalsium klorida ($CaCl_2$), magnesium klorida ($MgCl_2$), zink klorida ($ZnCl_2$), besi(III) klorida ($FeCl_3$)dengan masing-masing konsentrasi 1 mM dengan perbandingan 1:1 dalam 5 mL.
- Dihomogenkan.
- Dikarakterisasi dengan spektrofotometer UV-Vis 400-800 nm.
- Ditentukan nilai agregasi berdasarkan perbandingan nilai absorbansi 690 nm (agregasi) terhadap panjang gelombang 538 nm (kontrol nanopartikel emas-tirosin).
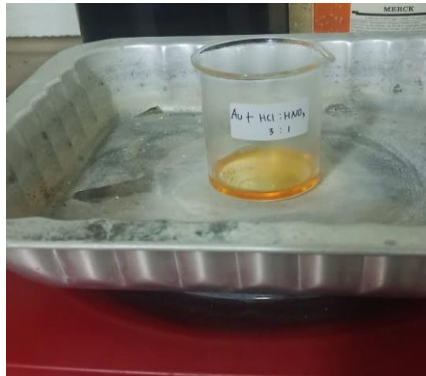
**Data uji selektivitas sensor Nanopartikel emas-Tirosin**

I. Karakterisasi Nanopartikel emas-Tirosin

```
┌─────────────────────────────────┐
│ Nanopartikel emas-Tirosin dan   │
│      nanopartikel emas          │
└─────────────────────────────────┘
```

- Dipipet masing-masing 1 mL ke dalam 2 botol vial kemudian di*packing* untuk dikarakterisasi menggunakan PSA dan TEM.

```
┌─────────────────────────────────┐
│     nanopartikel emas, tirosin  │
│       nanopartikel emas-tirosin,│
│ nanopartikel emas-tirosin-E. coli,│
│       nanopartikel emas-tirosin-│
│  Salmonella typhi dan nanopartikel│
│       emas-tirosin-S.aureus     │
└─────────────────────────────────┘
```

- Sampel yang diperoleh dicampurkan dengan KBr digerus dengan perbandingan 1:10 dimasukkan ke dalam wadah berbentuk bulat kemudian ditekan hingga bentuk bulatan tipis membentuk pellet tipis yang kemudian dimasukkan ke dalam alat FTIR dengan mengatur resolusi 4 cm^{-1} dan jumlah scan 300 pada rentang bilangan gelombang 340-4000 cm^{-1}.

```
┌─────────────────────────────────┐
│   Data karakterisasi nanopartikel│
│   emas, tirosin nanopartikel emas-│
│ tirosin, nanopartikel emas-tirosin-E.│
│   coli, nanopartikel emas-tirosin-│
│  Salmonella typhi  dan nanopartikel│
│     emas-tirosin-S. aureus      │
└─────────────────────────────────┘
```

Lampiran 2. Dokumentasi

Logam Emas + akuregia
(HCl:HNO$_3$)
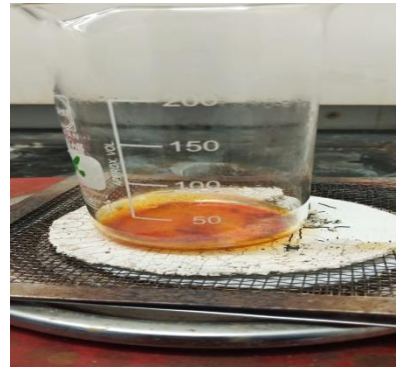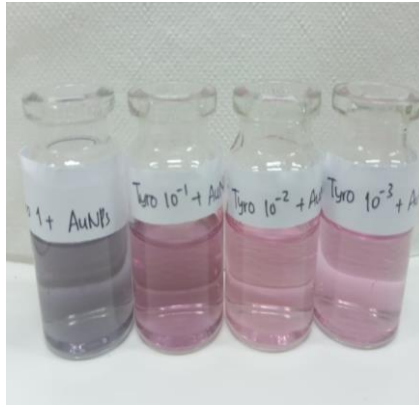

Dipanaskan hingga dasar
gelas kimia berwarna coklat
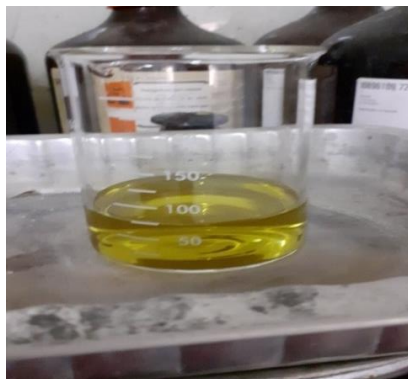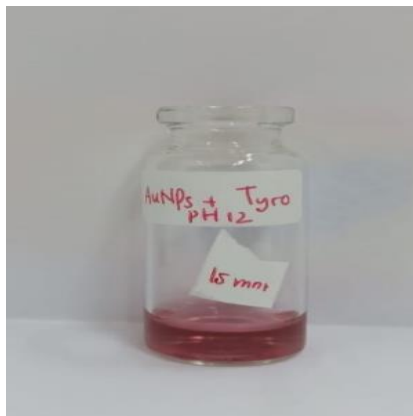

Larutan HAuCl$_4$ 0.5 mM
suhu 37°C

Asam Askorbat

Nanopartikel Emas
(AuNPs)

Nanopartikel Emas (AuNPs) + Tirosin dengan variasi konsentrasi 10^{-3}, 10^{-2}, 10^{-1} dan 1 mM.

Nanopartikel Emas (AuNPs) + Tirosin dengan variasi pH 1-14
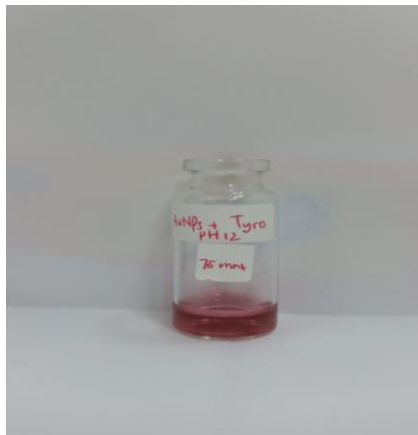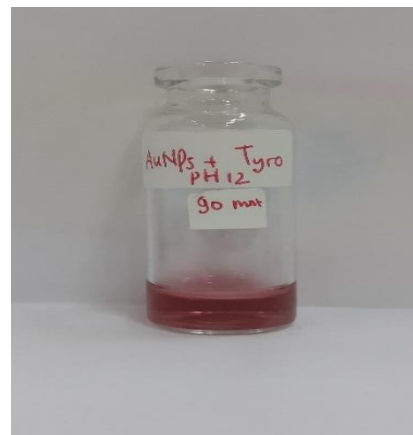
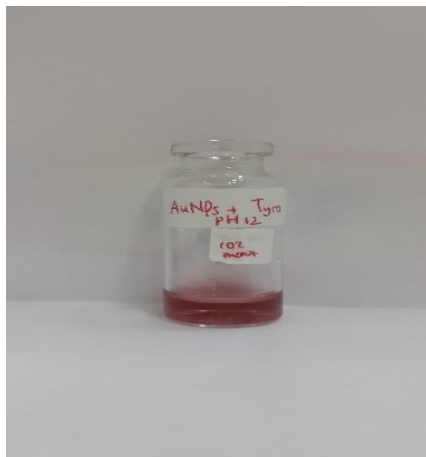

Menit ke 15

Menit ke 30

Menit ke 45

Menit ke 60

Menit ke 75

Menit ke 90

Menit ke 105
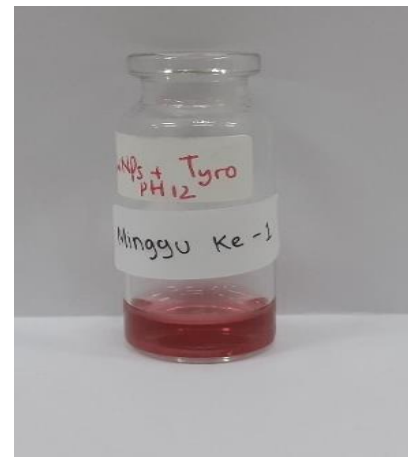
Minggu ke 1

Minggu ke 2
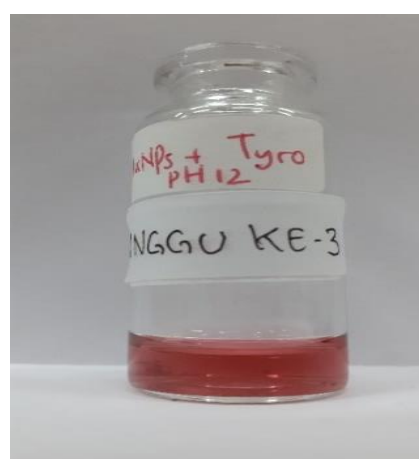
Minggu ke 3
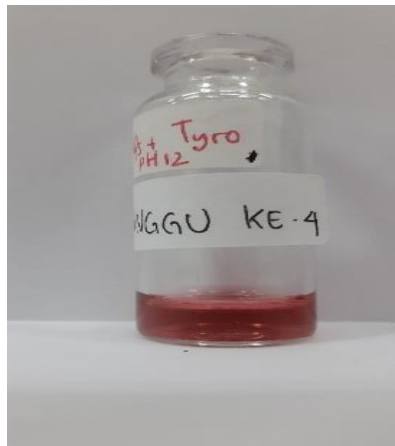
Minggu ke 4
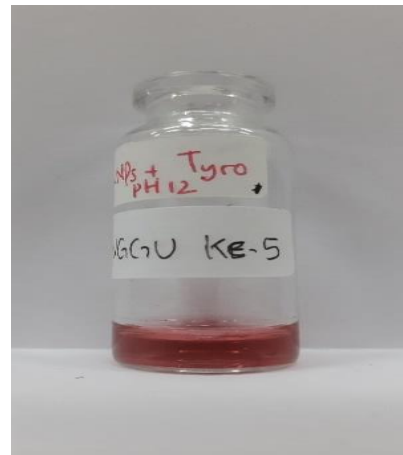
Minggu ke 5
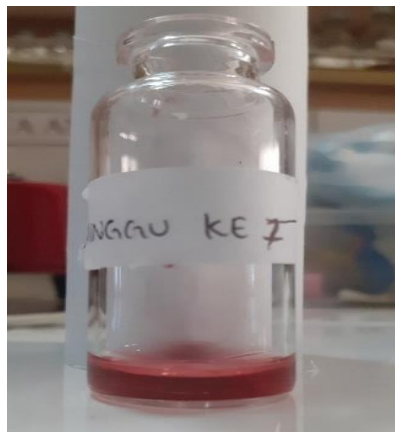
Minggu ke 6
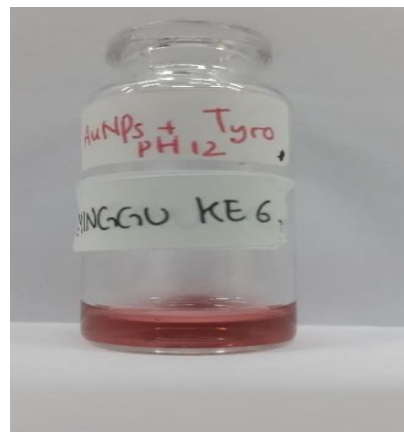
Minggu ke 7
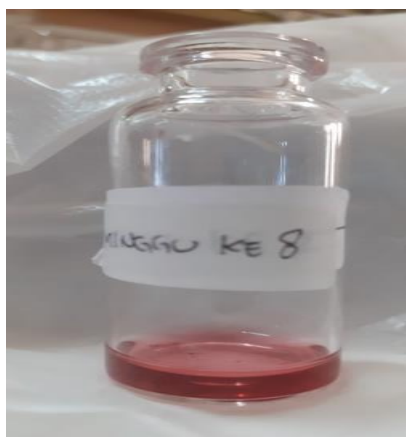
Minggu ke 8

AuNPs, AuNPs-Tirosin +
sediaan cair bakteri *E. coli*
pengenceran sel 10^6 CFU/mL
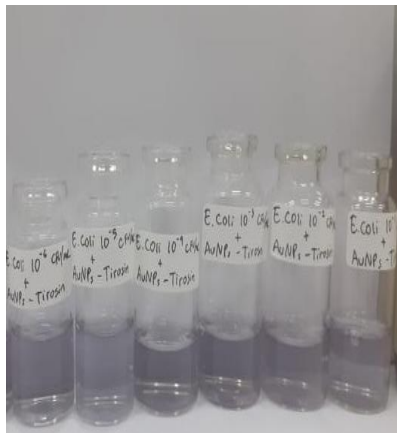
Nanopartikel Emas (AuNPs) + Tirosin dengan konsentrasi, pH dan waktu reaksi optimum + sediaan cair bakteri *E. coli* variasi pengenceran sel 10^6-10^{-1} CFU/mL
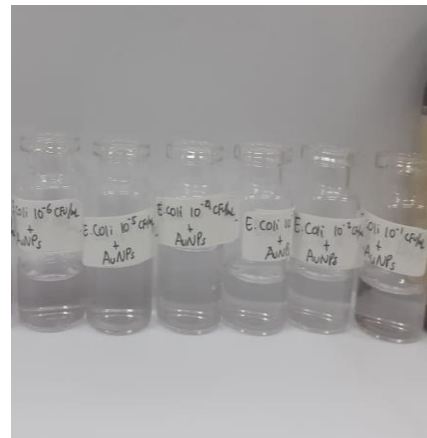
Nanopartikel Emas (AuNPs) + sediaan cair bakteri *E. coli* variasi pengenceran sel 10^6-10^{-1} CFU/mL
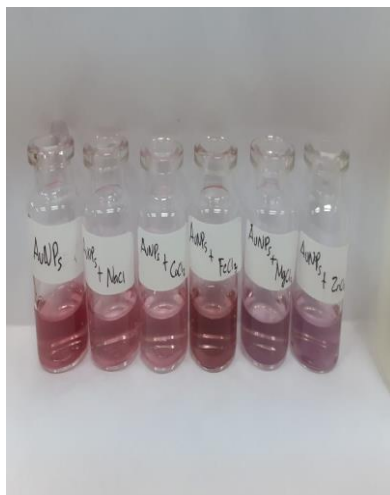
Nanopartikel Emas (AuNPs) bertudung Tirosin + NaCl; CaCl$_2$; FeCl$_3$; MgCl$_2$ dan ZnCl$_2$

Perbedaan warna yang dihasilkan oleh nanopartikel Emas-tirosin-*Salmonella typhi* ; nanopartikel Emas-tirosin-*S. aureus* ; nanopartikel Emas-tirosin-*E. Coli* dan nanopartikel Emas-*E. Coli*

Lampiran 3. Karakterisasi Spektrofotometer UV-Vis

1. **Spektrum spektrofotometer UV-Vis larutan asam tetrakloroaurat (HAuCl$_4$)**
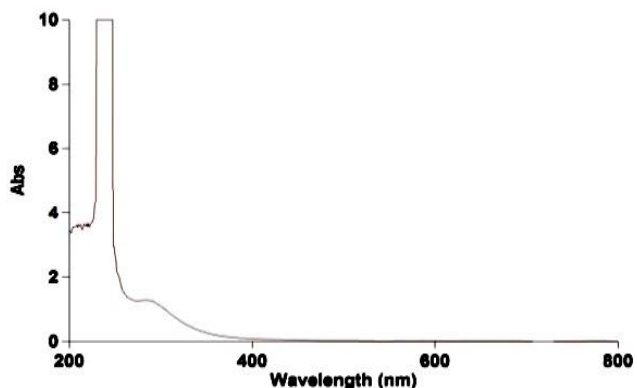
Sample Name: larutan HAuCl4
Collection Time   1/26/2021 2:50:08 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.1nm to 200.0nm

Wavelength (nm)	Abs
282.0	1.280
278.0	1.273
275.1	1.267
247.1	10.000
221.0	3.669
219.0	3.670
216.0	3.648
212.1	3.628
210.0	3.633
208.0	3.616

2. **Spektrum spektrofotometer UV-Vis nanopartikel emas (AuNPs)**
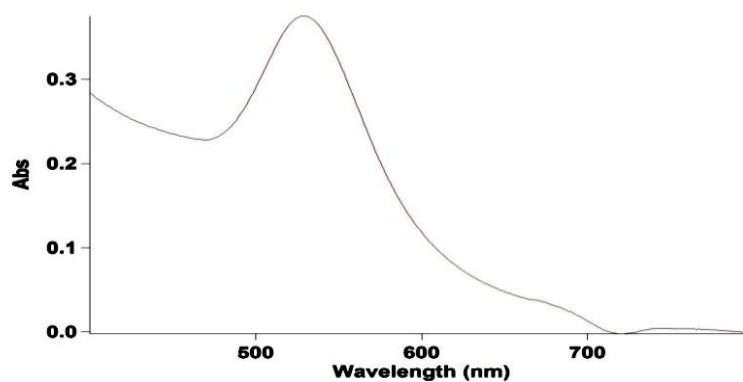
Sample Name: Nanopartikel Emas (AuNPs)
Collection Time   1/26/2021 3:04:30 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)	Abs
528.1	0.375

3. **Spektrum spektrofotometer UV-Vis optimasi konsentrasi tirosin terhadap pembentukan Nanopartikel emas-Tirosin**
   a. **Konsentrasi 0.001 mM**
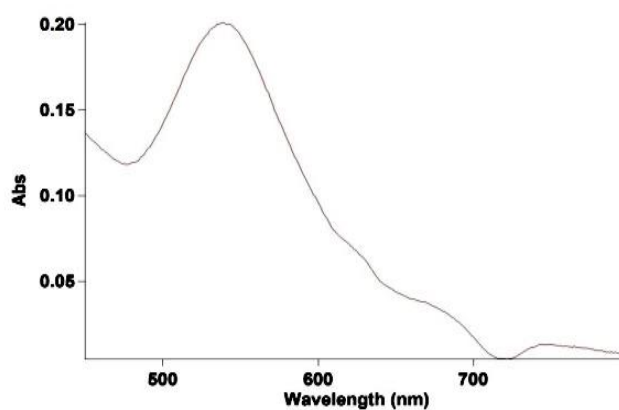
Sample Name: Konsentrasi Tirosin 0.001 mM
Collection Time   2/16/2021 1:19:28 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
    539.0   0.198

b. **Konsentrasi 0.01 mM**

Sample Name: Konsentrasi Optimum Tirosin 0.01 mM
Collection Time   2/16/2021 1:34:31 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
    538.1   0.392

c. Konsentrasi 0.1 mM
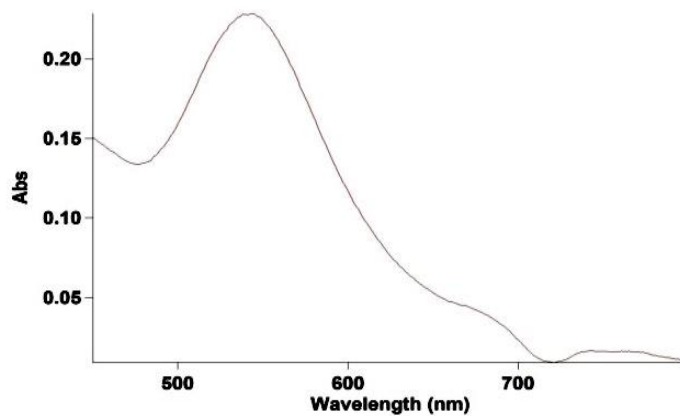
Sample Name: Konsentrasi Optimum Tirosin 0.1 mM
Collection Time   2/16/2021 1:37:46 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      543.0   0.228

d. Konsentrasi 1 mM

Sample Name: Konsentrasi Optimum Tirosin 1 mM
Collection Time   2/16/2021 1:45:05 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      549.9   0.382

4. Spektrum spektrofotometer UV-Vis optimasi pH tirosin terhadap pembentukan Nanopartikel emas-Tirosin

a. Tirosin pH 1
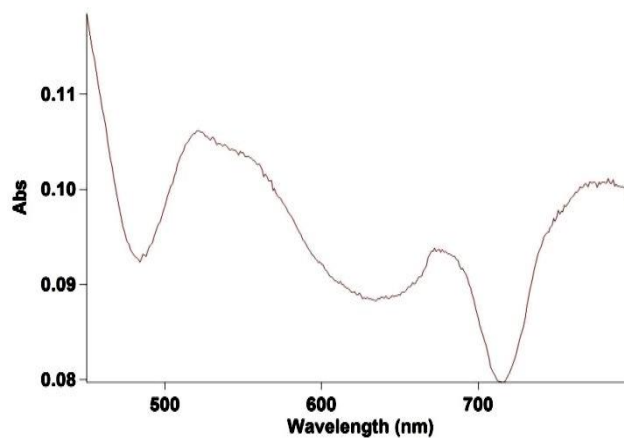
Sample Name: Optimasi Tirosin pH1
Collection Time   2/26/2021 2:33:26 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
      521.0   0.106

b. Tirosin pH 2

Sample Name: Optimasi Tirosin pH2
Collection Time   2/26/2021 2:35:32 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
      530.0   0.187

c. Tirosin pH 3

Sample Name: Optimasi Tirosin pH3
Collection Time   2/26/2021 2:38:08 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
_____
     532.0   0.209

d. Tirosin pH 4
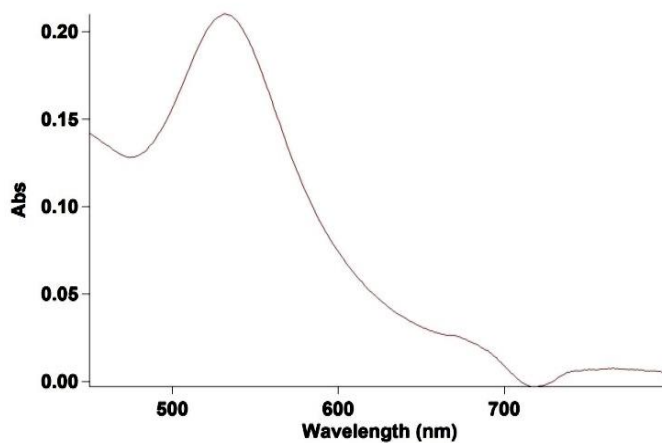
Sample Name: Optimasi Tirosin pH4
Collection Time   2/26/2021 2:39:51 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
_____
     531.1   0.210

e. Tirosin pH 5
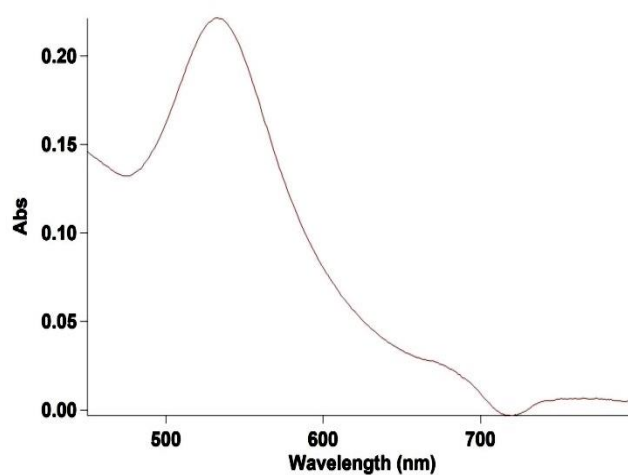
f. Tirosin pH 6

g. Tirosin pH 7

Sample Name: Optimasi Tirosin pH7
Collection Time   2/26/2021 2:45:01 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
      533.0   0.232

h. Tirosin pH 8
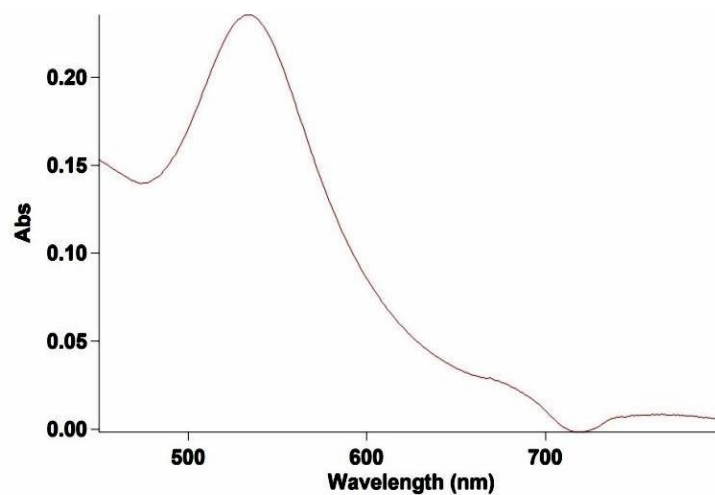
Sample Name: Optimasi Tirosin pH8
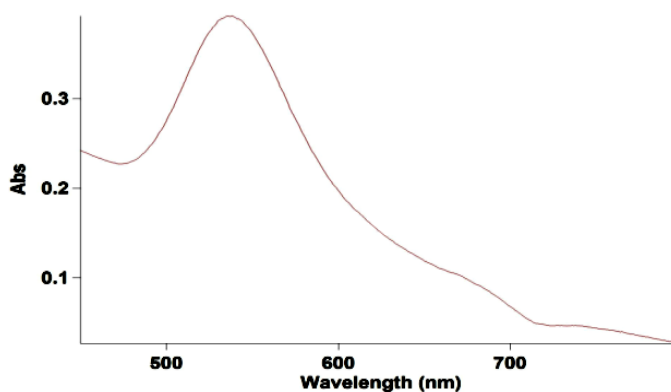Collection Time   2/26/2021 2:46:37 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
      535.0   0.236

i. Tirosin pH 9
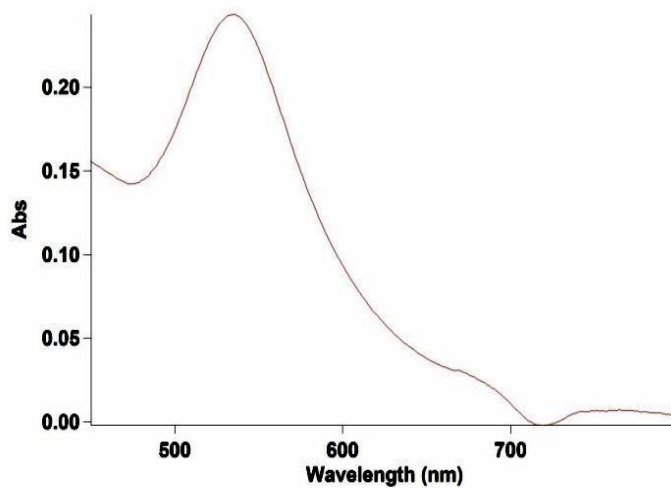
Sample Name: Optimasi Tirosin pH9
Collection Time   2/26/2021 2:48:30 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
_____
    535.0   0.244

j. Tirosin pH 10
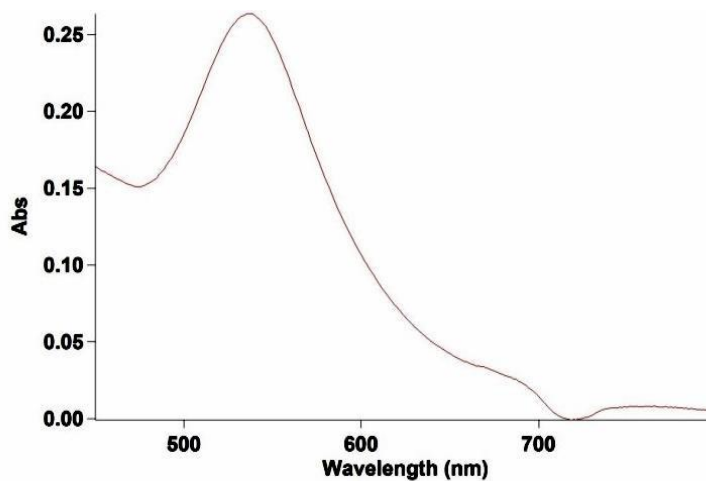
Sample Name: Optimasi Tirosin pH10
Collection Time   2/26/2021 2:50:20 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
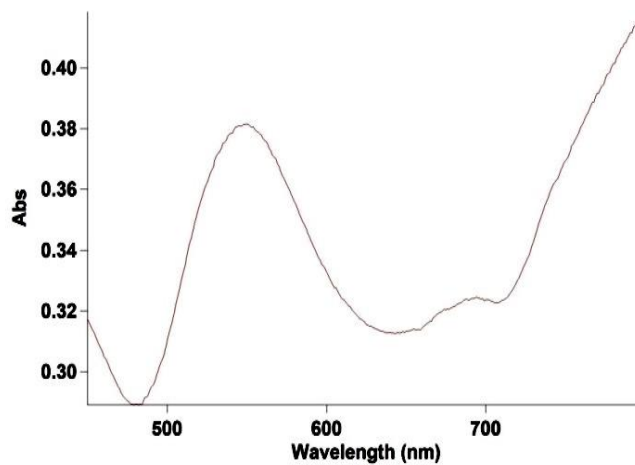Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
_____
    536.9   0.264

k. Tirosin pH 11
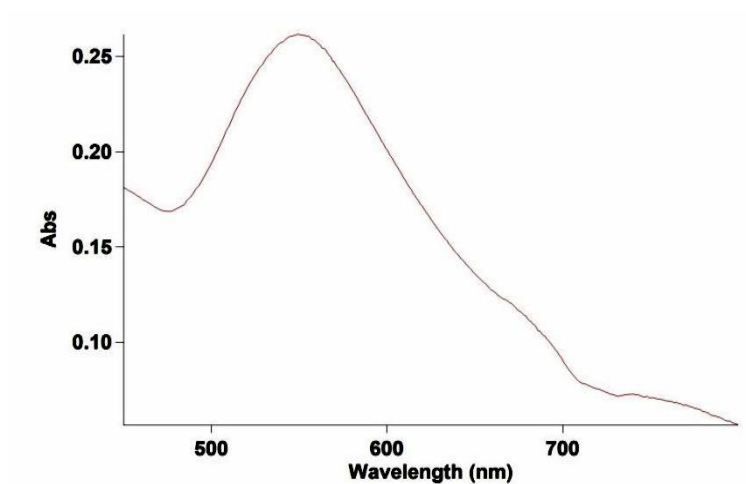
Sample Name: Optimasi Tirosin pH11
Collection Time   2/26/2021 2:51:59 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
_____
     549.0   0.262

l. Tirosin pH 12
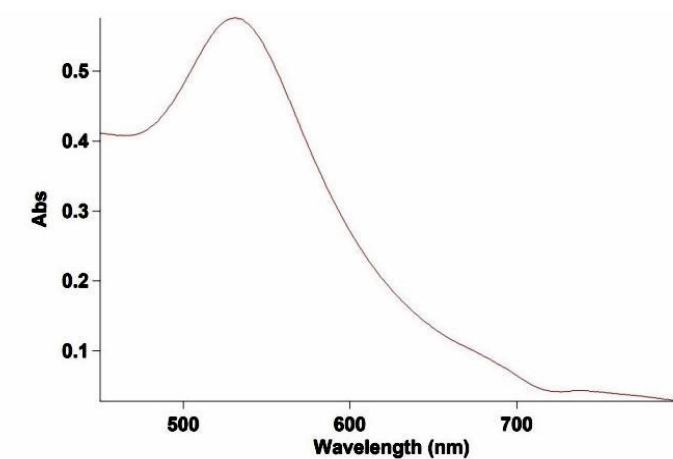
Sample Name: Optimasi Tirosin pH12
Collection Time   2/26/2021 2:54:04 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
_____
     531.1   0.576

m. Tirosin pH 13
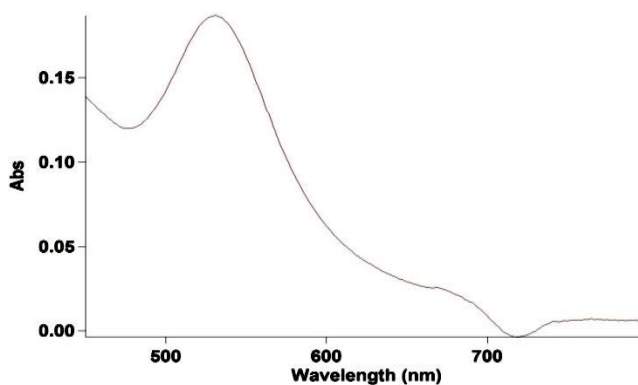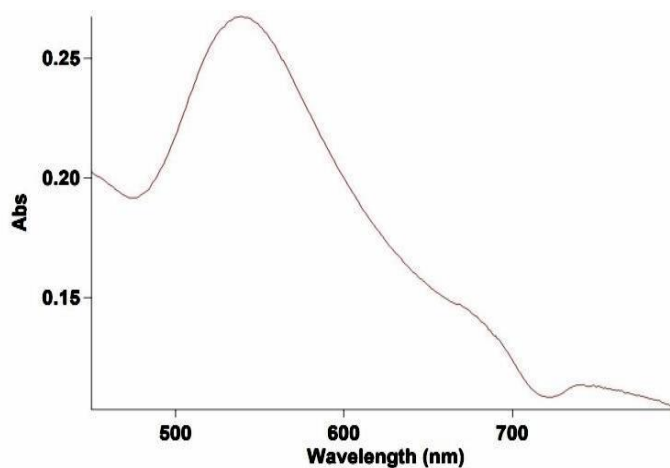

Sample Name: Optimasi Tirosin pH13
Collection Time   2/26/2021 2:56:01 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
    539.1   0.268

n. Tirosin pH 14
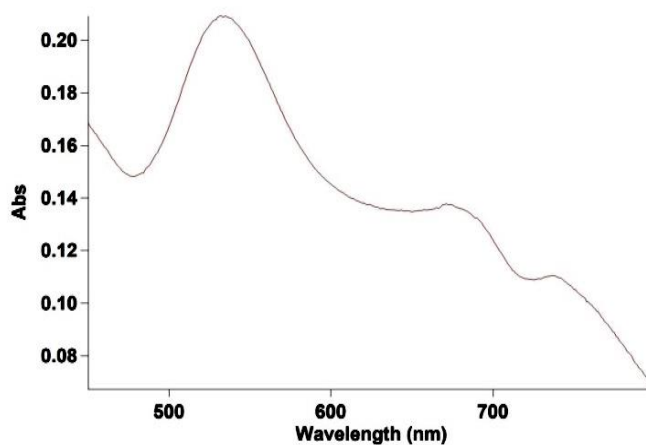

Sample Name: Optimasi Tirosin pH14
Collection Time   2/26/2021 2:58:32 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   799.9nm to 450.0nm

Wavelength (nm)   Abs
    555.0   0.197

5. **Spektrum spektrofotometer UV-Vis optimasi waktu reaksi tirosin terhadap pembentukan Nanopartikel emas-Tirosin**
   a. **Waktu reaksi 0 menit**
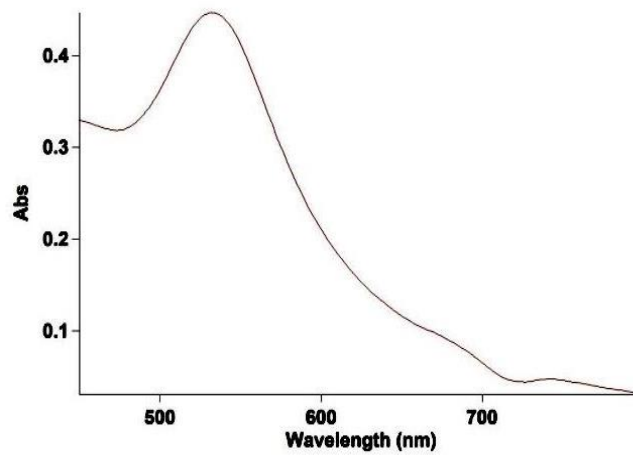
Sample Name: Waktu reaksi 0 menit Tirosin pH 12
Collection Time   3/8/2021 2:35:41 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
    531.0   0.447

b. **Waktu reaksi 15 menit**
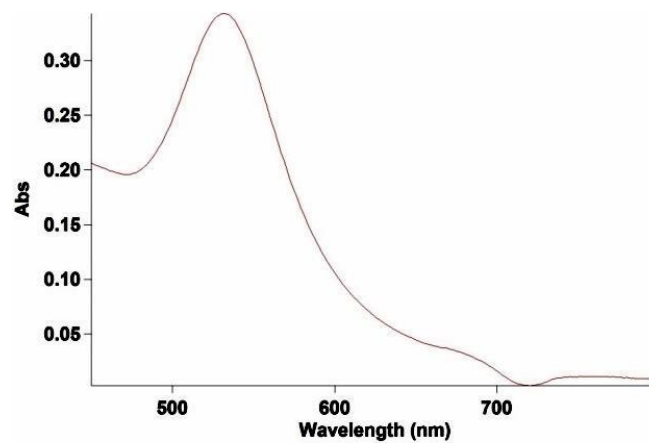
Sample Name: Waktu Reaksi 15 menit Tirosin pH 12
Collection Time   3/8/2021 2:49:22 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
    531.0   0.343

c. Waktu reaksi 30 menit
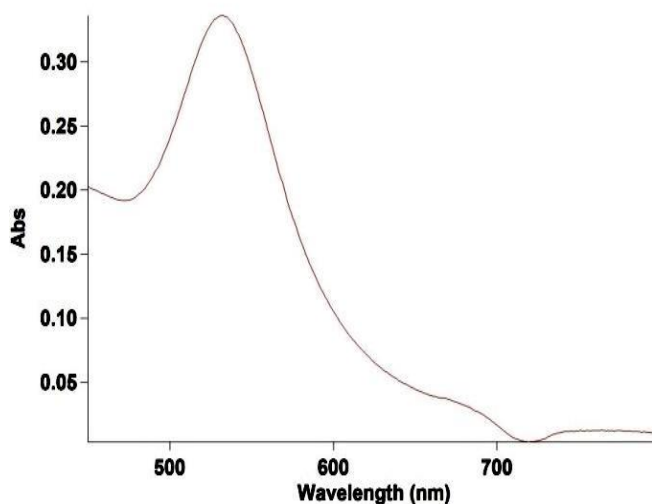
<u>Sample Name: Waktu Reaksi 30 menit Tirosin pH 12</u>
Collection Time   3/8/2021 3:03:42 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      532.0   0.337

d. Waktu reaksi 45 menit

<u>Sample Name: Waktu Reaksi 45 menit Tirosin pH 12</u>
Collection Time   3/8/2021 3:18:41 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      532.0   0.338

e. Waktu reaksi 60 menit

<u>Sample Name:Waktu Reaksi 60 menit Tirosin pH 12</u>
Collection Time   3/8/2021 3:37:19 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      528.0   0.693

f. Waktu reaksi 75 menit

<u>Sample Name: Waktu Reaksi 75 menit Tirosin pH 12</u>
Collection Time   3/8/2021 3:51:20 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      528.0   0.665

g. Waktu reaksi 90 menit

Sample Name: Waktu Reaksin 90 mnt Tirosin pH 12
Collection Time   3/8/2021 4:06:39 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      528.0   0.629

h. Waktu reaksi 105 menit
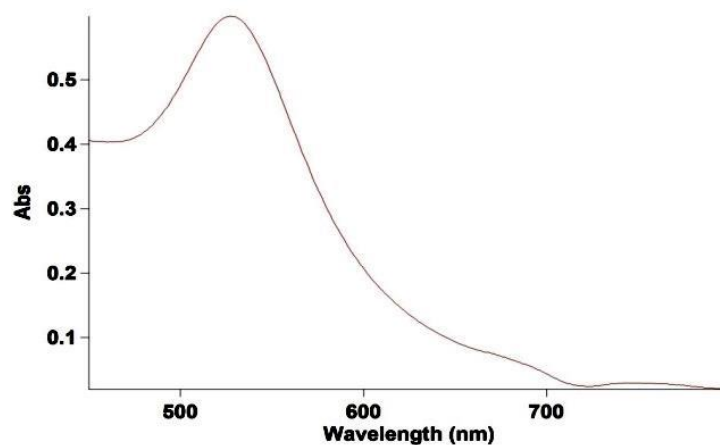
Sample Name: Waktu Reaksi 105 mnt Tirosin pH 12
Collection Time   3/8/2021 4:21:21 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
_____
      527.1   0.599

6. Spektrum Spektrofotometer UV-Vis uji kestabilan tirosin terhadap koloid nanopartikel emas

a. Minggu ke 1
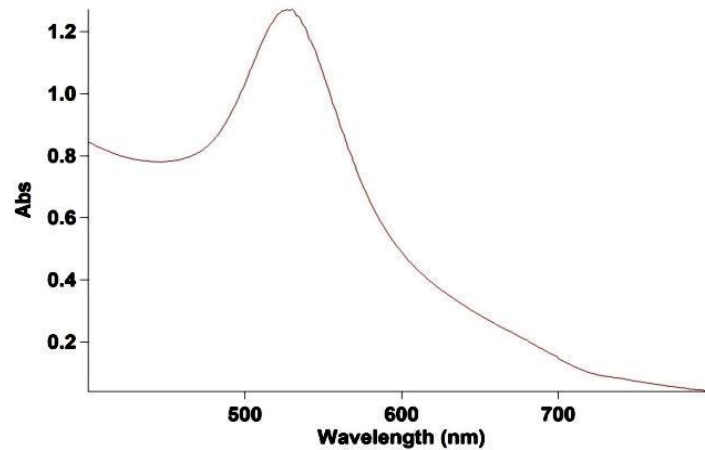
Sample Name: Kestabilan Minggu ke 1
Collection Time   3/15/2021 9:59:08 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)	Abs
530.0	1.273

b. Minggu ke 2

Sample Name: Kestabilan Minggu ke 2
Collection Time   3/15/2021 11:57:51 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)	Abs
526.0	1.363

c. **Minggu ke 3**
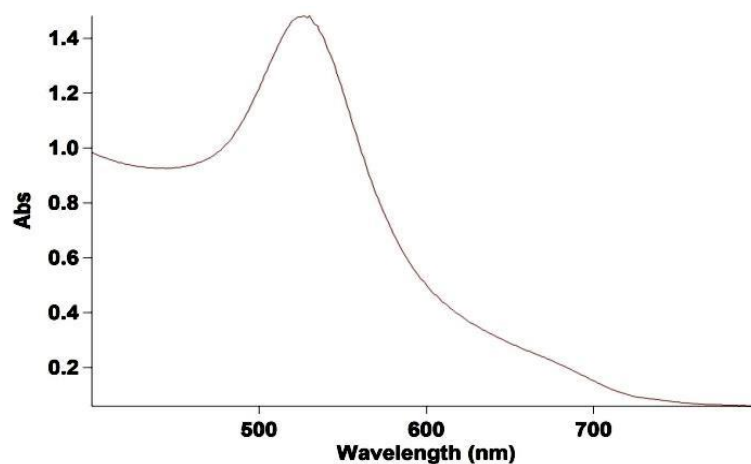
Sample Name: Kestabilan Minggu ke 3
Collection Time   3/22/2021 9:35:26 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)   Abs
───────────────────────────────────
      530.0   1.482

d. **Minggu ke 4**
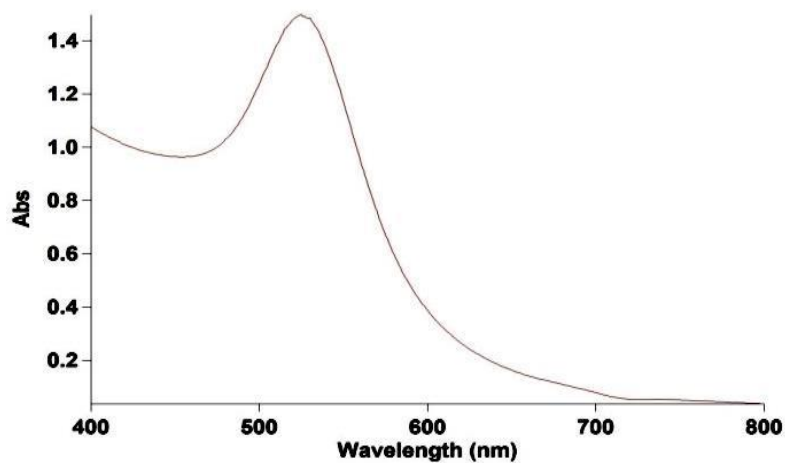
Sample Name: Kestabilan Minggu ke 4
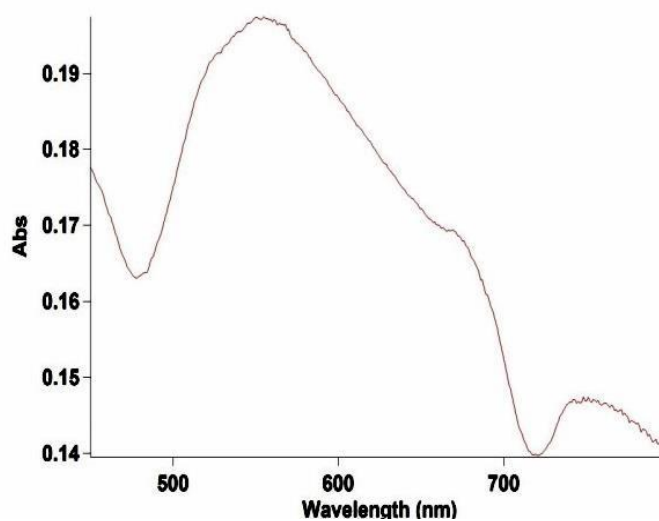Collection Time   3/29/2021 11:54:44 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.1nm to 400.0nm

Wavelength (nm)   Abs
───────────────────────────────────
      525.0   1.498

e. Minggu ke 5
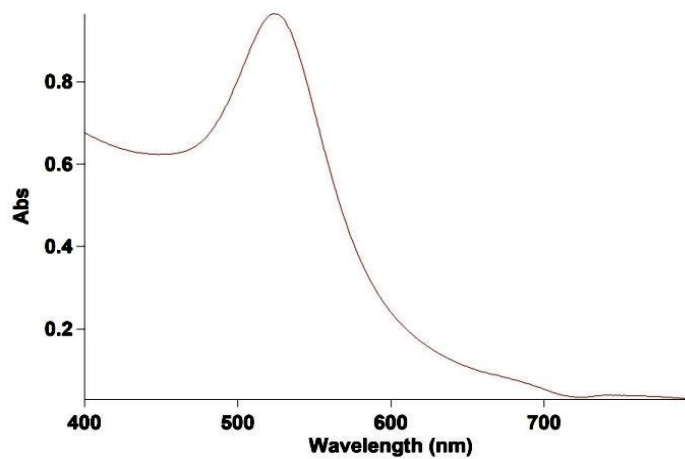
Sample Name: Kestabilan Minggu ke 5

```
Collection Time              4/5/2021 11:12:07 AM

Peak Table
Peak Style                   Peaks
Peak Threshold               0.0100
Range                        799.9nm to 399.9nm

Wavelength (nm)        Abs
      523.9                0.965
```

f. Minggu ke 6
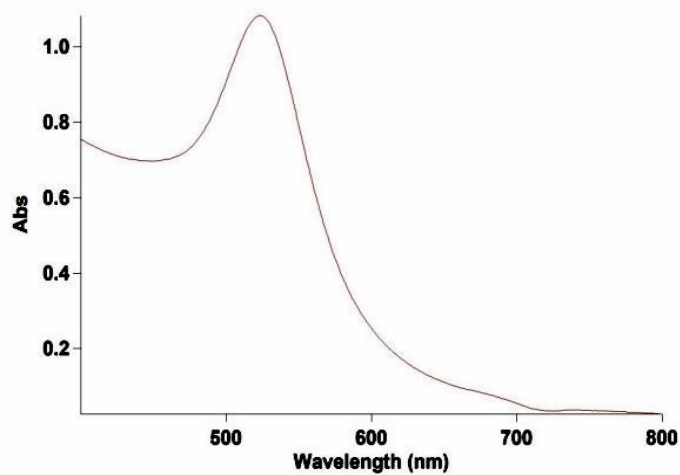
Sample Name: Kestabilan Minggu ke 6

```
Collection Time              4/12/2021 11:36:07 AM

Peak Table
Peak Style                   Peaks
Peak Threshold               0.0100
Range                        800.1nm to 400.0nm

Wavelength (nm)        Abs
      523.1                1.083
```

g. Minggu ke 7
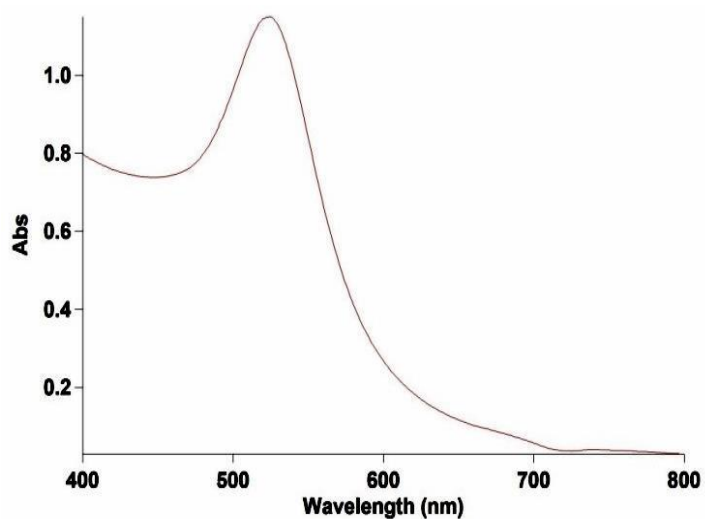
<u>Sample Name: Kestabilan Minggu ke 7</u>
Collection Time   4/19/2021 9:53:30 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 399.9nm

Wavelength (nm)   Abs
_____
     524.0   1.150

h. Minggu ke 8

<u>Sample Name: Kestabilan Mingguke 8</u>
Collection Time   4/26/2021 10:11:52 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm
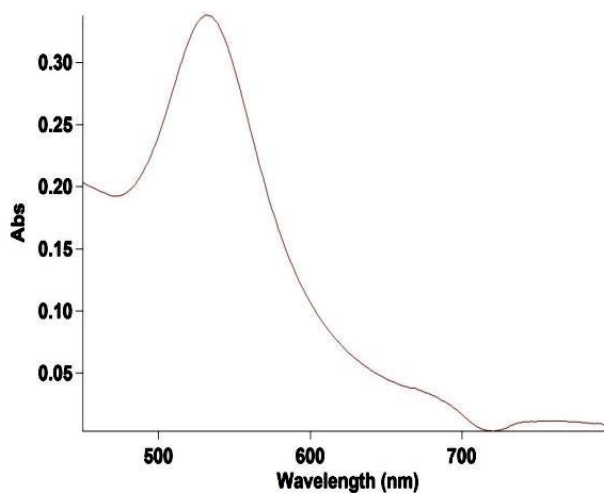
Wavelength (nm)   Abs
_____
     524.1   1.783

7. **Spektrum Spektrofotometer UV-Vis uji sensor terhadap bakteri** *Escherichia coli*
   a. **Nanopartikel emas-tirosin-*E. coli* 10^1**
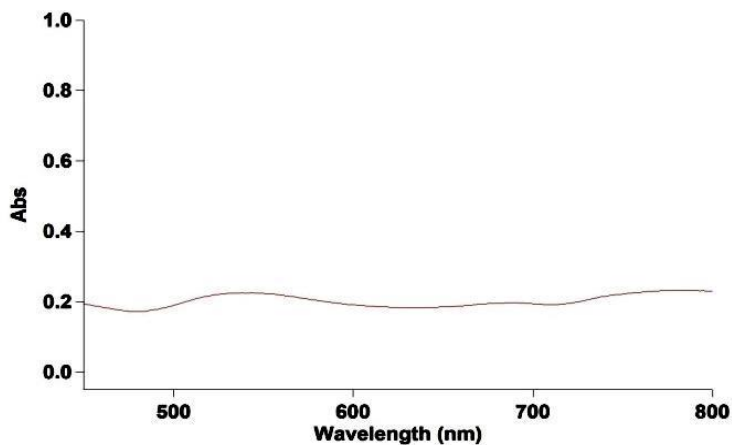
Sample Name: AuNPs-Tirosin-E.coli 10^1
Collection Time   5/17/2021   1:35:25 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)	Abs
538.0	0.225

   b. **Nanopartikel emas-tirosin-*E. coli* 10^2**

Sample Name: AuNPs-Tirosin-E.coli 10^2
Collection Time   7/15/2021   1:55:22 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
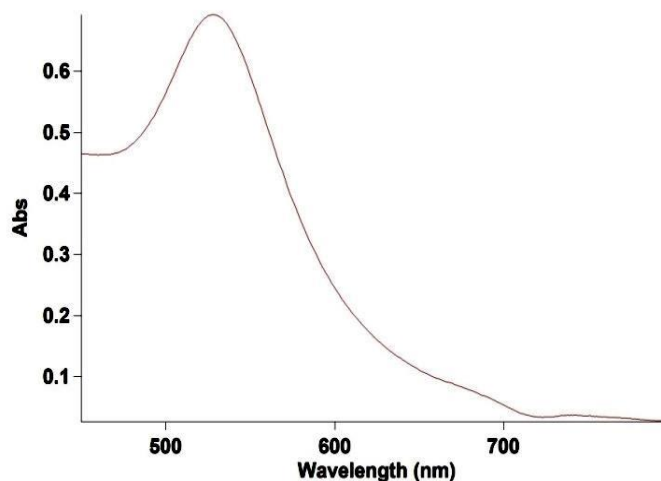Range   800.0nm to 450.0nm

Wavelength (nm)	Abs
538.0	0.194

c. Nanopartikel emas-tirosin-*E. coli* 10^3

Sample Name: AuNPs-Tirosin-E.coli 10^3
Collection Time   5/17/2021   2:15:45 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
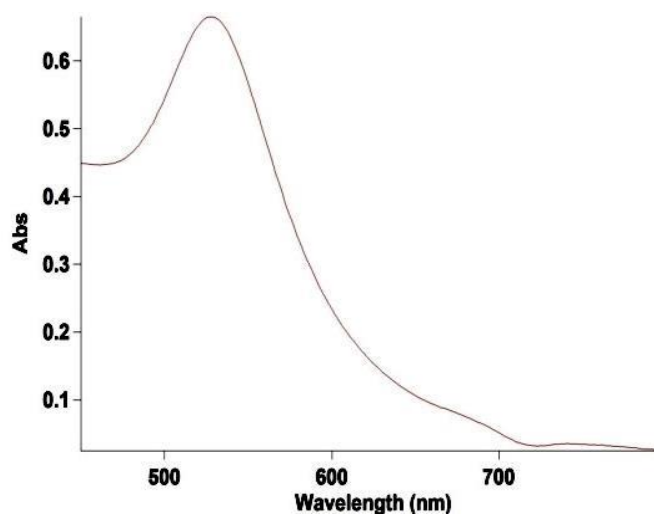Range   800.0nm to 450.0nm

Wavelength (nm)	Abs
543.1	0.199

f. Nanopartikel emas-tirosin-*E. coli* 10^6

Sample Name: AuNPs-Tirosin-E.coli 10^6
Collection Time   5/17/2021   3:05:01 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
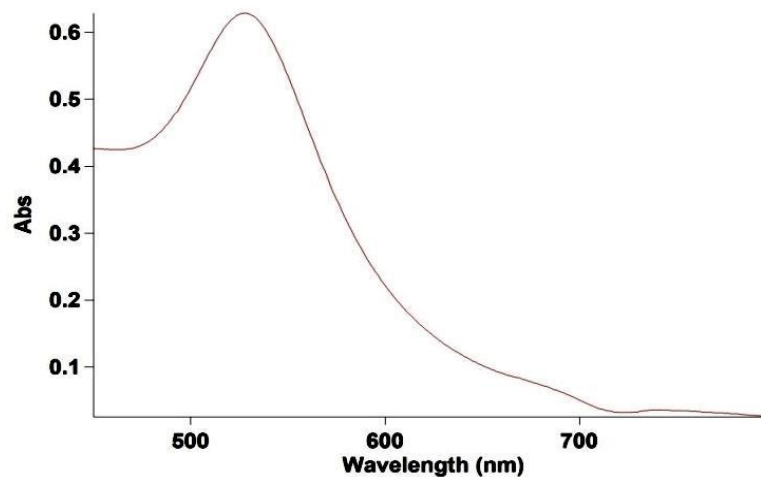Range   800.0nm to 450.0nm

Wavelength (nm)	Abs
743.0	0.228
683.0	0.230

8. **Spektrum Spektrofotometer UV-Vis uji nanopartikel emas terhadap bakteri *Escherichia coli***
   a. **Nanopartikel emas-*E. coli* 10^1**

Sample Name:AuNPs-E.coli 10^1
Collection Time   5/21/2021 11:57:06 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs

     548.0   0.155

b. **Nanopartikel emas-*E. coli* 10^2**

Sample Name: AuNPs-E.coli 10^2
Collection Time   5/21/2021 11:49:50 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs

     534.9   0.198

c. Nanopartikel emas-*E. coli* 10^3
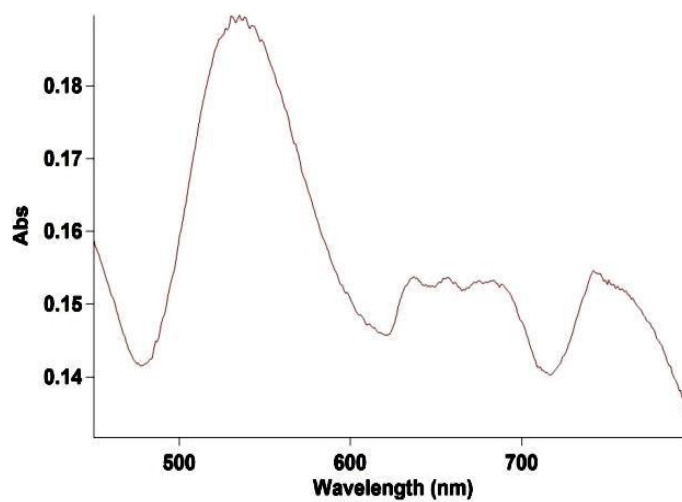
Sample Name: AuNPs-E.coli 10^3
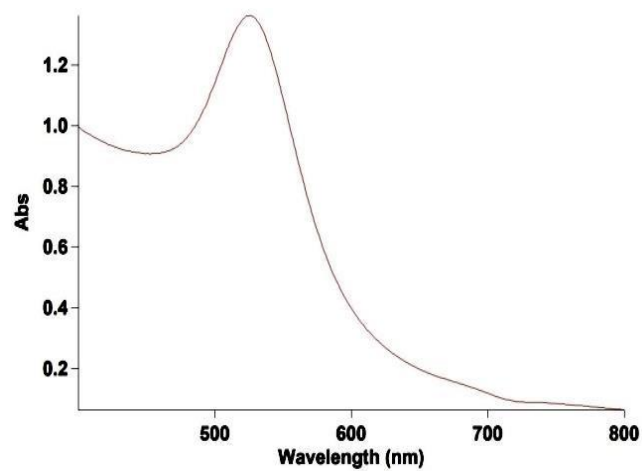Collection Time   5/21/2021 11:42:53 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)	Abs
742.0	0.155
534.9	0.190

d. Nanopartikel emas-*E. coli* 10^4
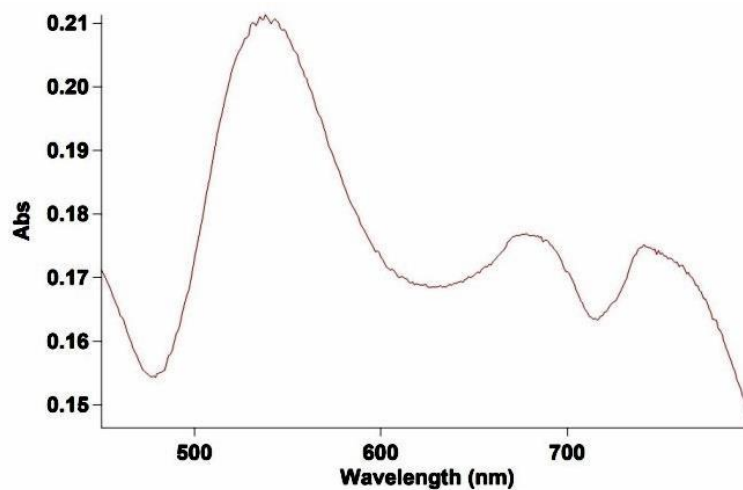
Sample Name:AuNPs-E.coli 10^4
Collection Time   5/21/2021 11:24:20 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)	Abs
741.0	0.175
537.9	0.211

e. Nanopartikel emas-*E. coli* 10^5

Sample Name:AuNPs-E.coli 10^5
Collection Time   5/21/2021 11:16:26 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
─────────────────────────────
    543.1   0.228

f. Nanopartikel emas-*E. coli* 10^6

Sample Name: AuNPs-E.coli 10^6
Collection Time   5/21/2021 11:06:17 AM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 450.0nm

Wavelength (nm)   Abs
─────────────────────────────
    771.9   0.154
    537.9   0.143

9. **Spektrum Spektrofotometer UV-Vis uji sensor terhadap bakteri larutan garam**
   a. **Nanopartikel emas-tirosin-CaCl$_2$**
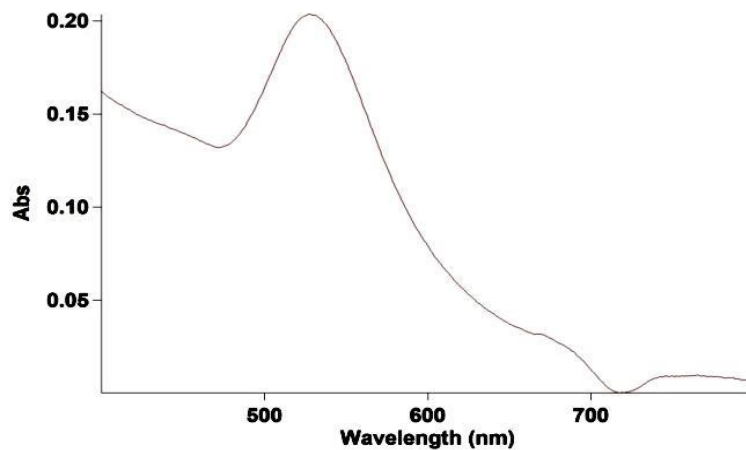
Sample Name: AuNPs-Tirosin-CaCl2
Collection Time   7/15/2021 3:20:44 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)	Abs
527.0	0.203

b. **Nanopartikel emas-tirosin-FeCl$_3$**
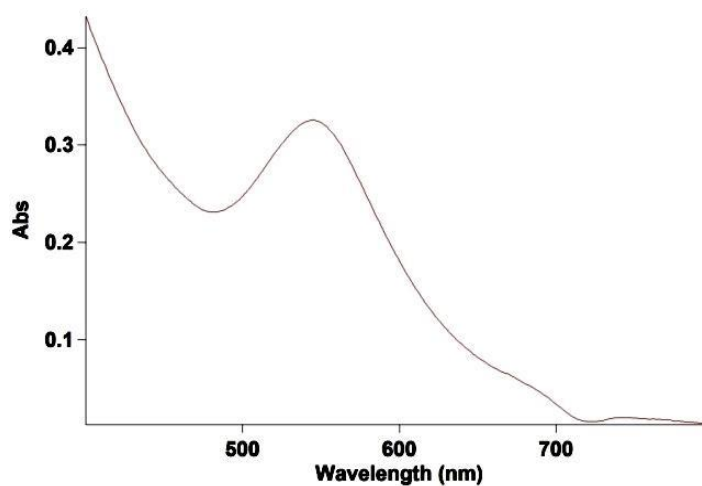
Sample Name: AuNPs-Tirosin-FeCl3
Collection Time   7/15/2021 3:17:41 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)	Abs
545.1	0.325

124

c. Nanopartikel emas-tirosin-MgCl₂
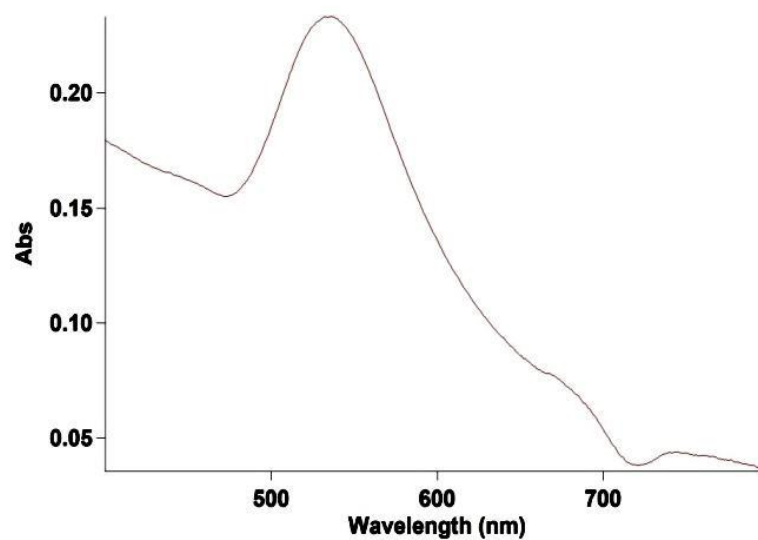
Sample Name: AuNPs-Tirosin-MgCl2
Collection Time   6/15/2021 3:11:01 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)   Abs
─────────────────────────────────────
      536.0   0.233

d. Nanopartikel emas-tirosin-ZnCl₂
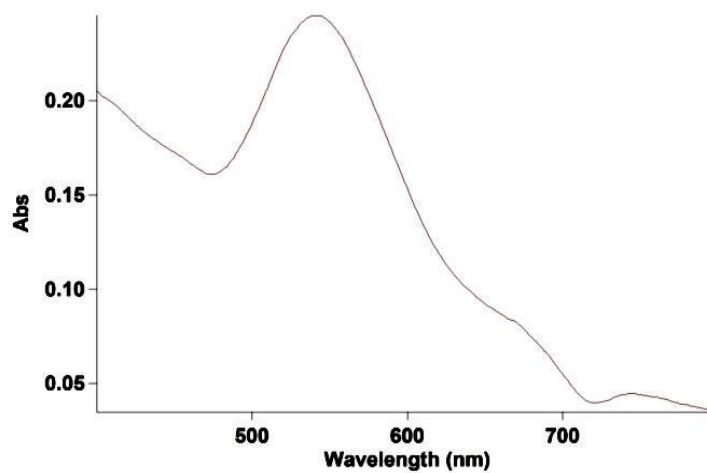
Sample Name: AuNPs-Tirosin-ZnCl2
Collection Time   7/15/2021 3:14:11 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm
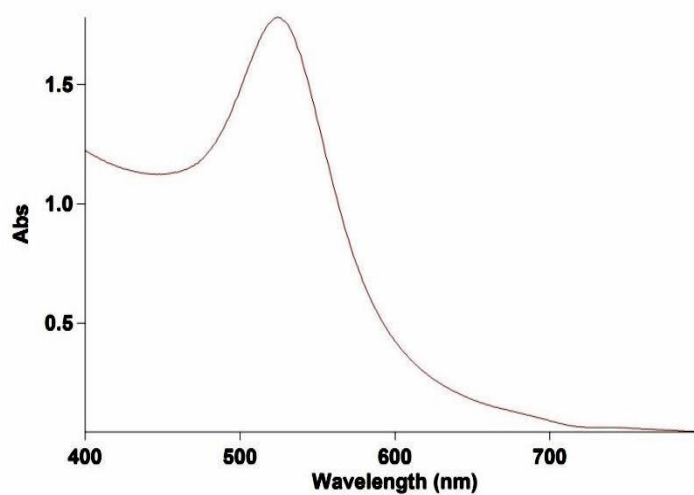
Wavelength (nm)   Abs
─────────────────────────────────────
      540.0   0.245

e. Nanopartikel emas-tirosin-NaCl
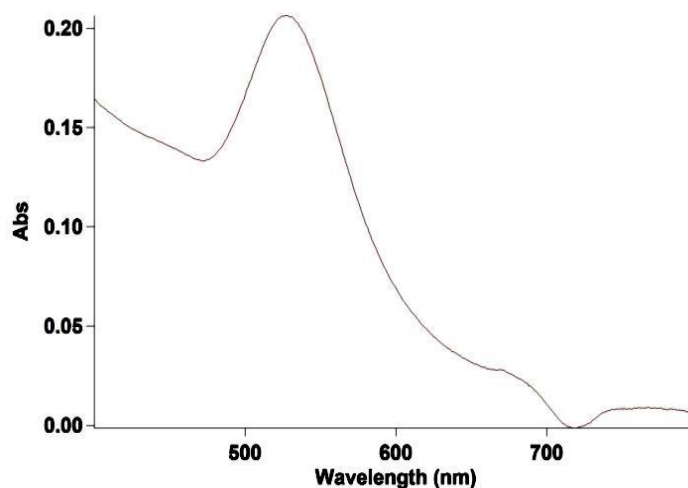
Sample Name: AuNPs-Tirosin-NaCl
Collection Time   7/15/2021 3:23:27 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.0nm to 400.0nm

Wavelength (nm)   Abs
────────────────────────────────────
      527.0   0.206

10. **Spektrum Spektrofotometer UV-Vis uji perbandingan sensor terhadap bakteri *Escherichia coli, Salmonella thypi* dan *S.aureus***
    a. Nanopartikel emas-*E. coli* 10⁻⁶
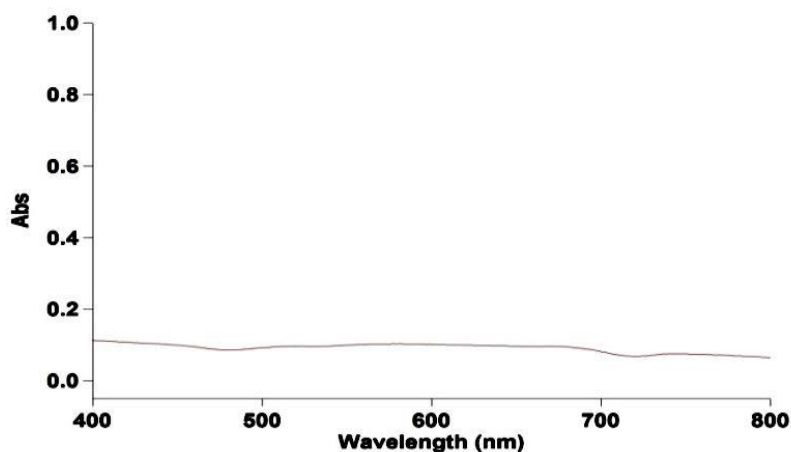
Sample Name: AuNPs-E.coli 10^6
Collection Time   6/10/2021   2:19:59 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
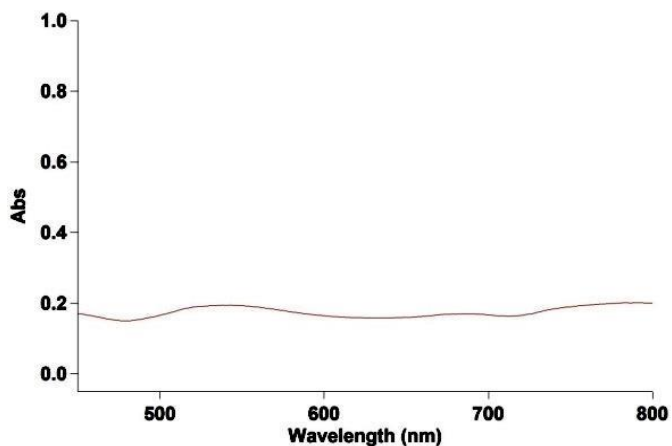Range   800.1nm to 400.0nm

Wavelength (nm)   Abs
────────────────────────────────────
      577.1   0.103

b. Nanopartikel emas-tirosin-*E. coli* 10⁶
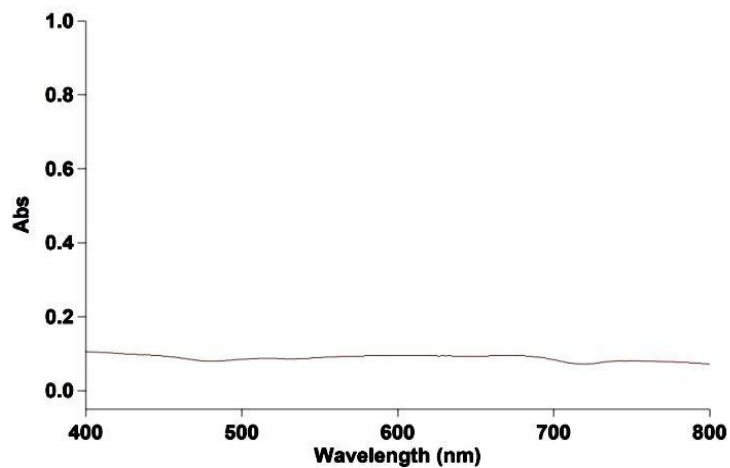
Sample Name: AuNPs-Tirosin-E.coli 10^6
Collection Time   6/10/2021 2:30:58 PM

Peak Table
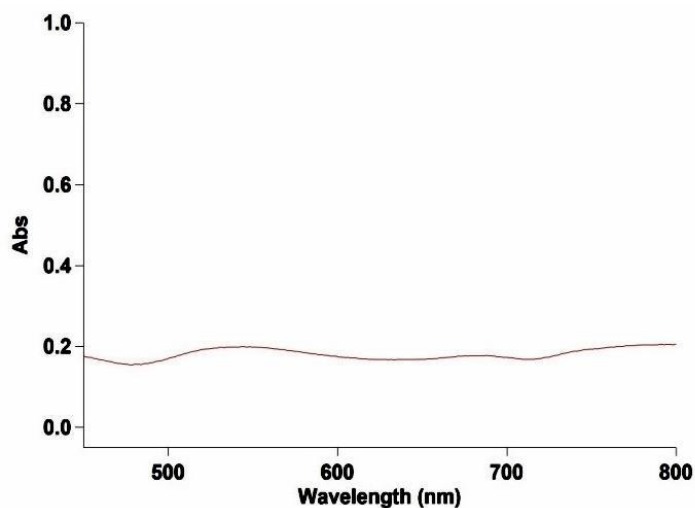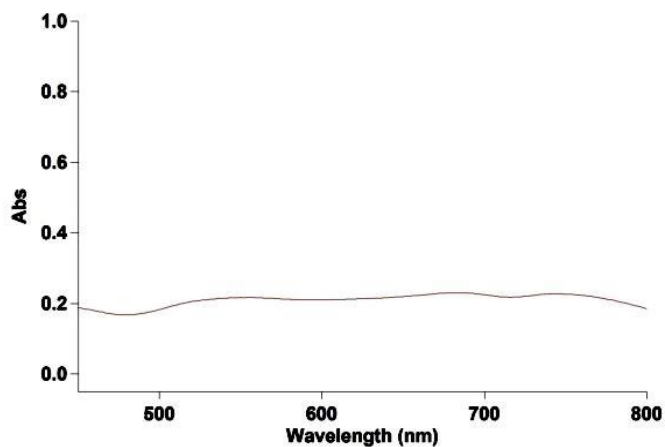Peak Style   Peaks
Peak Threshold   0.0100
Range   800.1nm to 400.0nm

Wavelength (nm)	Abs
669.0	0.096

c. Nanopartikel emas-tirosin-*Salmonella typhi* 10⁶
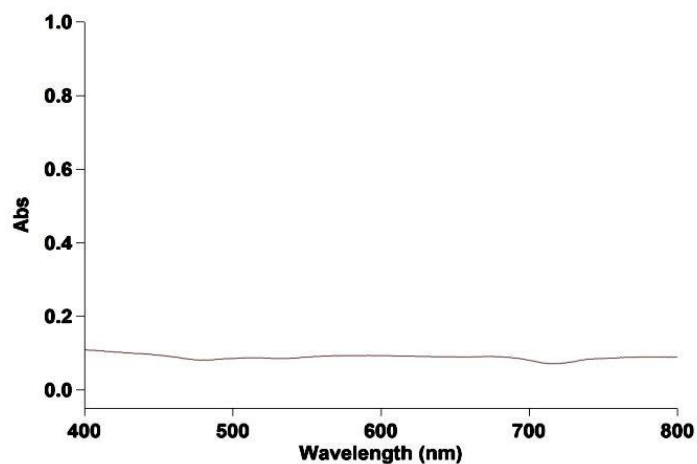
Sample Name: AuNPs-Tirosin-Salmonella Thp 10^6
Collection Time   6/10/2021 2:26:58 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.1nm to 400.0nm

Wavelength (nm)	Abs
591.1	0.094

d. **Nanopartikel emas-tirosin-*S. aureus* 10^6**
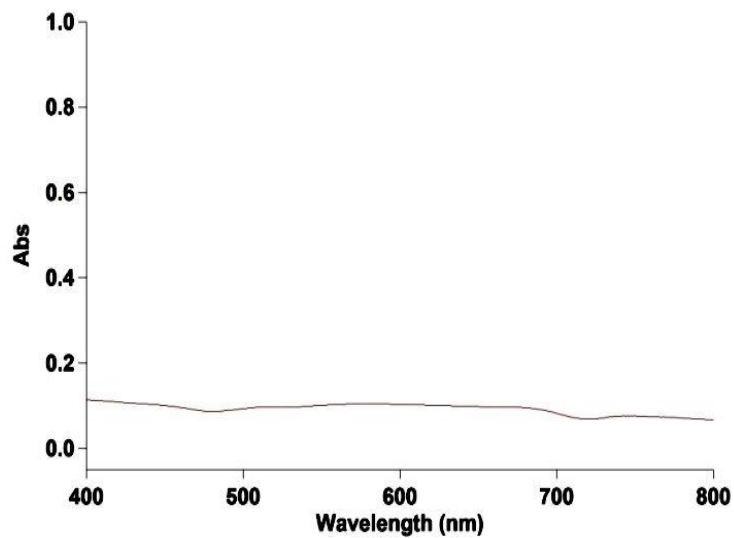
Sample Name: AuNPs-Tirosin-S.Aureus 10^6
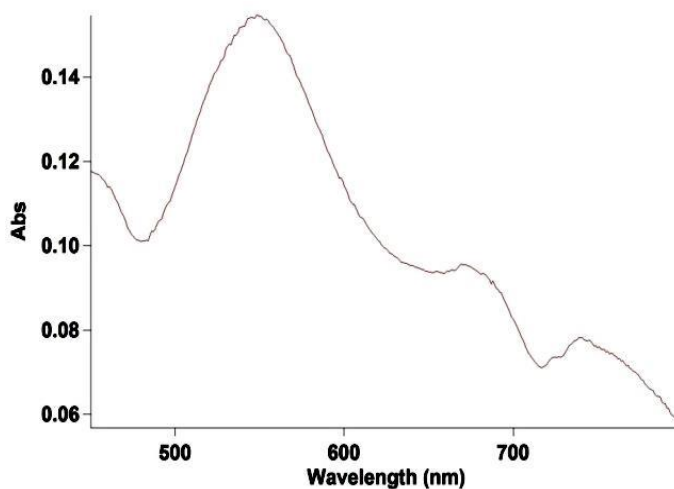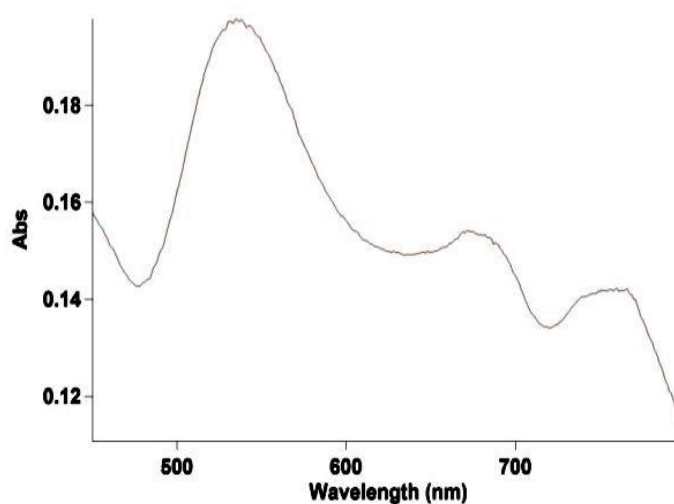Collection Time   6/10/2021 2:34:16 PM

Peak Table
Peak Style   Peaks
Peak Threshold   0.0100
Range   800.1nm to 400.0nm

Wavelength (nm)   Abs
─────────────────────────────────
    580.1   0.104

Lampiran 4. Karakterisasi Spektrofotometer FTIR

a. Spektrum FTIR Nanopartikel emas
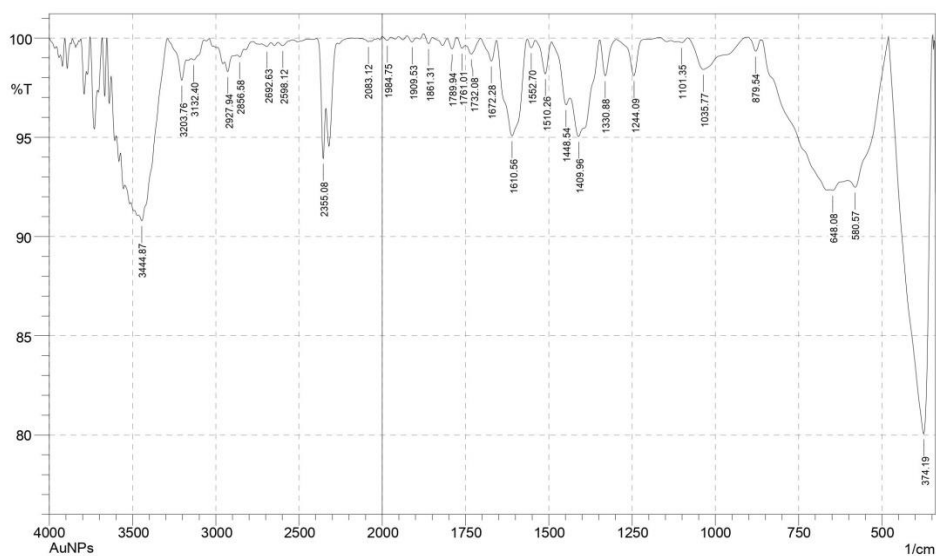
	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	374.19	80.057	19.95	480.28	349.12	7.13	7.144
2	580.57	92.479	1.601	601.79	482.2	2.645	0.718
3	648.08	92.32	0.108	655.8	603.72	1.734	0.006
4	879.54	99.335	0.627	908.47	864.11	0.049	0.045
5	1035.77	98.415	1.601	1083.99	908.47	0.611	0.629
6	1101.35	99.769	0.129	1112.93	1083.99	0.02	0.009
7	1244.09	98.102	1.837	1298.09	1207.44	0.238	0.214
8	1330.88	98.095	1.815	1348.24	1298.09	0.181	0.162
9	1409.96	95.038	0.927	1436.97	1396.46	0.758	0.079
10	1448.54	96.639	0.942	1490.97	1436.97	0.428	0.044
11	1510.26	98.197	1.635	1541.12	1490.97	0.179	0.144
12	1552.7	99.513	0.398	1564.27	1541.12	0.032	0.023
13	1610.56	95.07	4.835	1656.85	1566.2	1.222	1.184
14	1672.28	98.836	1.075	1705.07	1656.85	0.123	0.108
15	1732.08	99.186	0.581	1751.36	1705.07	0.096	0.055
16	1761.01	99.475	0.305	1776.44	1751.36	0.035	0.016
17	1789.94	99.448	0.554	1805.37	1776.44	0.034	0.034
18	1861.31	99.717	0.397	1876.74	1847.81	0.008	0.023
19	1909.53	99.8	0.253	1924.96	1897.95	0.008	0.015
20	1984.75	99.881	0.173	2000.18	1973.18	0.004	0.01
21	2083.12	99.822	0.046	2125.56	2073.48	0.023	0.002
22	2355.08	93.932	3.526	2393.66	2339.65	0.677	0.25
23	2598.12	99.612	0.213	2627.05	2538.32	0.093	0.034
24	2692.63	99.58	0.159	2723.49	2669.48	0.082	0.02
25	2856.58	99.048	0.199	2872.01	2829.57	0.149	0.017
26	2927.94	98.299	0.58	2947.23	2872.01	0.381	0.041
27	3132.4	98.902	0.243	3147.83	3070.68	0.265	0.072
28	3203.76	97.873	1.278	3290.56	3176.76	0.476	0.193
29	3444.87	90.796	1.267	3464.15	3290.56	4.158	0.677

Comment;

AuNPs

Date/Time;   8/20/2021 12:14:34 PM

No. of Scans;

Resolution;

Apodization;

b. Spektrum FTIR Tirosin

SHIMADZU

Tirosin
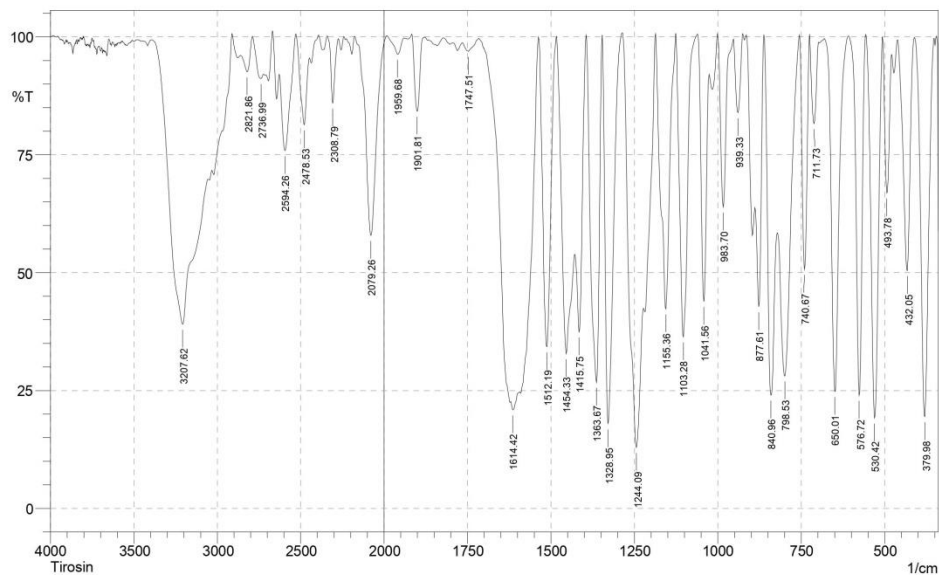
	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	379.98	19.46	80.217	408.91	352.97	14.148	14.07
2	432.05	50.443	49.221	460.99	410.84	6.148	6.068
3	493.78	66.913	30.848	505.35	480.28	2.56	2.287
4	530.42	19.188	80.971	555.5	507.28	13.29	13.323
5	576.72	23.992	76.395	607.58	557.43	9.635	9.711
6	650.01	24.78	75.102	680.87	609.51	11.866	11.844
7	711.73	81.65	18.084	725.23	698.23	1.357	1.318
8	740.67	50.692	48.326	754.17	727.16	4.31	4.188
9	798.53	28.12	45.115	821.68	756.1	17.571	10.206
10	840.96	24.027	53.635	860.25	823.6	13.179	8.582
11	877.61	42.773	34.695	887.26	862.18	5.243	2.964
12	939.33	83.945	16.143	952.84	925.83	1.166	1.181
13	983.7	63.923	36.173	1001.06	954.76	3.293	3.274
14	1041.56	43.9	51.076	1058.92	1028.06	5.643	4.977
15	1103.28	36.392	63.266	1124.5	1060.85	9.732	9.708
16	1155.36	42.312	58.378	1186.22	1126.43	9.43	9.608
17	1244.09	12.934	48.009	1284.59	1224.8	27.954	16.444
18	1328.95	17.912	82.618	1346.31	1286.52	15.47	15.637
19	1363.67	26.753	72.205	1394.53	1348.24	13.641	13.489
20	1415.75	37.445	33.411	1427.32	1396.46	7.68	3.735
21	1454.33	32.824	42.489	1483.26	1429.25	15.667	8.162
22	1512.19	34.319	65.126	1535.34	1485.19	10.41	10.293
23	1614.42	20.924	2.214	1620.21	1595.13	16.19	0.534
24	1747.51	96.949	2.151	1766.8	1716.65	0.427	0.255
25	1901.81	84.256	15.912	1915.31	1878.67	1.196	1.212
26	1959.68	96.318	3.613	1992.47	1940.39	0.378	0.376
27	2079.26	57.887	42.297	2175.7	1992.47	15.35	15.494
28	2308.79	85.985	13.885	2339.65	2276	1.674	1.632
29	2478.53	81.371	15.97	2528.68	2449.6	3.754	3.038
30	2594.26	75.873	18.938	2627.05	2530.61	6.557	4.923
31	2736.99	91.185	2.566	2789.07	2723.49	1.785	0.597
32	2821.86	92.608	5.655	2860.43	2791	1.526	0.941
33	3207.62	39.041	44.03	3392.79	3057.17	70.92	44.32

Date/Time;   8/20/2021 12:09:34 PM
No. of Scans;

c. Spektrum FTIR Nanopartikel emas-Tirosin

SHIMADZU

AuNPs-Tirosin
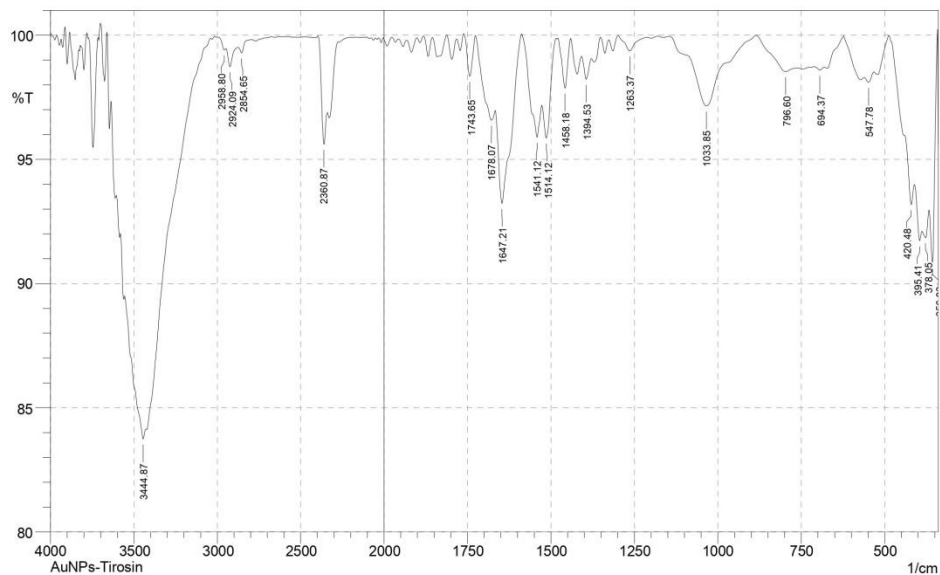
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	356.83	90.832	4.925	366.48	341.4	0.666	0.281
2	378.05	91.843	0.649	387.69	366.48	0.75	0.035
3	395.41	91.728	1.003	410.84	387.69	0.773	0.048
4	420.48	93.182	1.555	487.99	410.84	1.159	0.118
5	547.78	98.106	0.294	561.29	532.35	0.221	0.019
6	694.37	98.584	0.135	711.73	680.87	0.18	0.008
7	796.6	98.53	0.507	885.33	763.81	0.495	0.144
8	1033.85	97.15	2.825	1145.72	885.33	1.273	1.247
9	1263.37	99.367	0.579	1298.09	1213.23	0.107	0.085
10	1394.53	98.223	0.883	1408.04	1379.1	0.168	0.055
11	1458.18	97.871	2.005	1479.4	1440.83	0.182	0.162
12	1514.12	95.862	2.169	1527.62	1485.19	0.466	0.19
13	1541.12	95.895	1.928	1587.42	1527.62	0.633	0.268
14	1647.21	93.232	4.499	1666.5	1589.34	1.337	0.836
15	1678.07	96.581	0.974	1726.29	1666.5	0.588	0.188
16	1743.65	98.341	1.685	1761.01	1726.29	0.122	0.126
17	2360.87	95.614	2.397	2397.52	2339.65	0.65	0.248
18	2854.65	99.288	0.296	2873.94	2794.85	0.131	0.016
19	2924.09	98.731	0.745	2949.16	2873.94	0.256	0.087
20	2958.8	99.409	0.148	2995.45	2949.16	0.067	0.005
21	3444.87	83.749	1.047	3554.81	3429.43	8.263	0.513

Comment;
AuNPs-Tirosin

Date/Time;　7/14/2021 3:50:32 PM
No. of Scans;
Resolution;
Apodization;

d. Spektrum FTIR Nanopartikel emas-Tirosin-*E. coli*

⊕ **SHIMADZU**

AuNPs-Tirosin-E. Coli
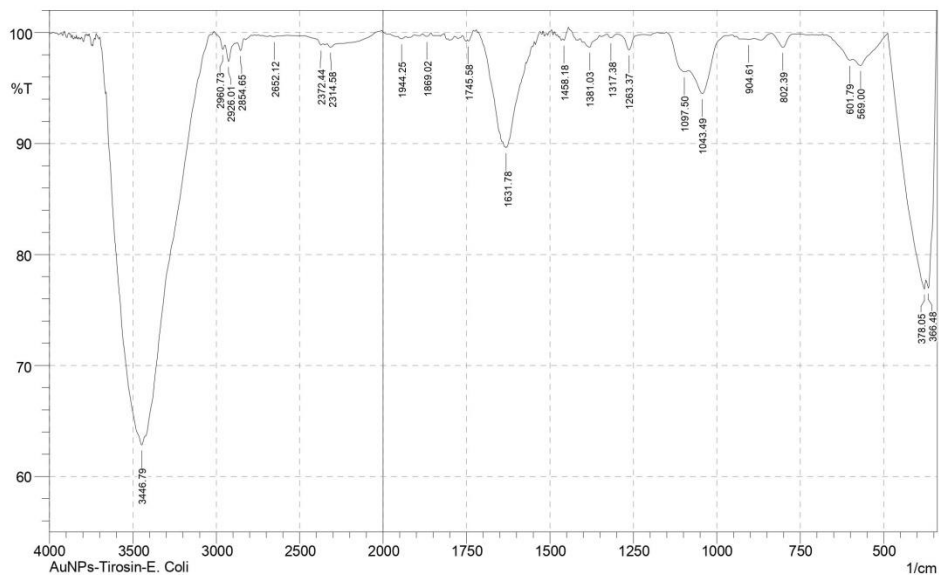
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	366.48	76.98	5.68	372.26	339.47	2.24	0.99
2	378.05	76.89	1.54	487.99	374.19	7.51	1.14
3	569	97.03	1.11	594.08	487.99	0.83	0.25
4	601.79	97.5	0.31	669.3	594.08	0.45	0.02
5	802.39	98.67	1.24	837.11	765.74	0.19	0.16
6	904.61	99.38	0.06	918.12	887.26	0.08	0
7	1043.49	94.5	3.23	1083.99	974.05	1.49	0.62
8	1097.5	96.47	0.8	1151.5	1083.99	0.65	0.14
9	1263.37	98.44	1.4	1300.02	1224.8	0.19	0.14
10	1317.38	99.54	0.32	1328.95	1300.02	0.04	0.02
11	1381.03	98.69	0.69	1400.32	1350.17	0.19	0.07
12	1458.18	99.31	0.34	1462.04	1444.68	0.02	0.02
13	1631.78	89.63	0.3	1633.71	1554.63	1.99	0.05
14	1745.58	99.25	0.19	1747.51	1730.15	0.03	0.02
15	1869.02	99.66	0.29	1882.52	1857.45	0.03	0.02
16	1944.25	99.43	0.21	1955.82	1930.74	0.05	0.01
17	2314.58	98.68	0.3	2333.87	2264.43	0.34	0.04
18	2372.44	98.88	0.19	2461.17	2358.94	0.28	-0.01
19	2652.12	99.63	0.01	2655.98	2630.91	0.04	0
20	2854.65	98.39	0.87	2875.86	2833.43	0.21	0.07
21	2926.01	97.39	1.53	2947.23	2889.37	0.42	0.16
22	2960.73	98.49	0.63	3014.74	2947.23	0.19	0.04
23	3446.79	62.84	3.36	3660.89	3427.51	32.58	6.71

Comment;
AuNPs-Tirosin-E. Coli

Date/Time;   7/14/2021 3:26:59 PM
No. of Scans;
Resolution;
Apodization;

e. Spektrum FTIR Nanopartikel emas-Tirosin-*Salmonella typhi*

Au NPs + Tirosin + Salmonella. Th.
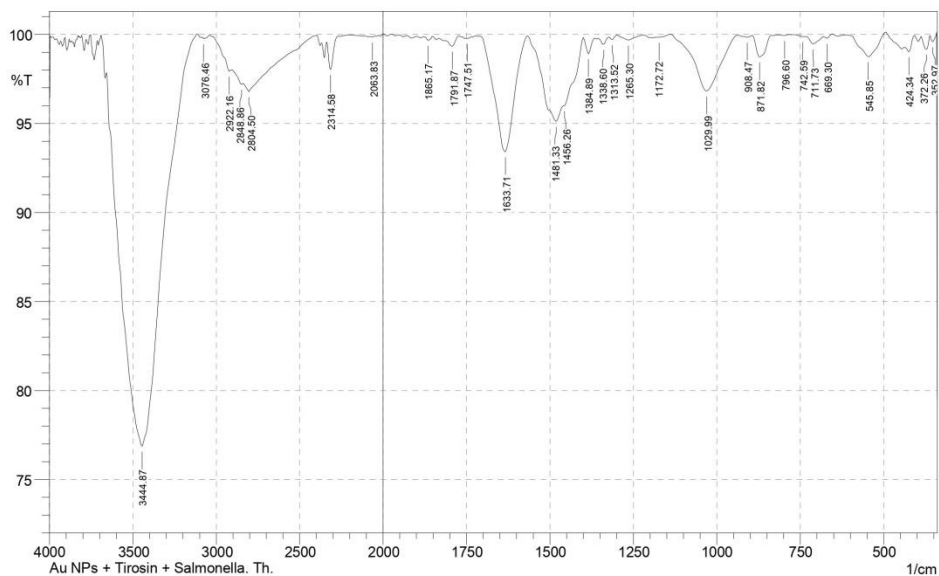
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	352.97	99.593	0.398	360.69	341.4	0.021	0.021
2	372.26	99.178	0.727	387.69	360.69	0.061	0.05
3	424.34	99.034	0.537	437.84	406.98	0.085	0.033
4	545.85	98.76	1.305	611.43	491.85	0.296	0.326
5	669.3	99.789	0.147	680.87	653.87	0.014	0.008
6	711.73	99.469	0.407	732.95	680.87	0.074	0.046
7	742.59	99.887	0.009	771.53	740.67	0.008	0
8	796.6	99.94	0.053	819.75	786.96	0.005	0.004
9	871.82	98.738	1.215	894.97	837.11	0.179	0.167
10	908.47	99.845	0.081	923.9	894.97	0.015	0.006
11	1029.99	96.83	3.151	1138	937.4	1.221	1.206
12	1172.72	99.85	0.019	1176.58	1139.93	0.015	0.004
13	1265.3	99.693	0.268	1298.09	1220.94	0.057	0.044
14	1313.52	99.716	0.175	1323.17	1298.09	0.019	0.008
15	1338.6	99.452	0.366	1355.96	1323.17	0.051	0.024
16	1384.89	98.926	0.884	1400.32	1365.6	0.092	0.063
17	1456.26	96.003	0.135	1458.18	1400.32	0.623	0.09
18	1481.33	95.119	1.713	1568.13	1458.18	1.411	0.419
19	1633.71	93.422	6.491	1708.93	1568.13	1.915	1.861
20	1747.51	99.774	0.034	1751.36	1735.93	0.013	0.002
21	1791.87	99.344	0.449	1813.09	1772.58	0.075	0.038
22	1865.17	99.676	0.202	1876.74	1853.59	0.024	0.012
23	2063.83	99.857	0.039	2077.33	2048.4	0.015	0.002
24	2314.58	98.034	1.654	2337.72	2270.22	0.291	0.215
25	2804.5	96.786	0.662	2837.29	2416.81	2.952	0.344
26	2848.86	97.211	0.138	2908.65	2839.22	0.733	0.01
27	2922.16	97.941	0.282	3039.81	2908.65	0.541	-0.038
28	3076.46	99.767	0.105	3086.11	3039.81	0.033	0.014
29	3444.87	76.879	21.818	3657.04	3116.97	30.491	27.965

Comment;

Au NPs + Tirosin + Salmonella. Th.

Date/Time; 9/21/2021 2:33:14 PM

No. of Scans;

Resolution;

Apodization;

f. Spektrum FTIR Nanopartikel emas-Tirosin-*S. aureus*

⊕ SHIMADZU

AuNPs-Tirosin-S. Aureus
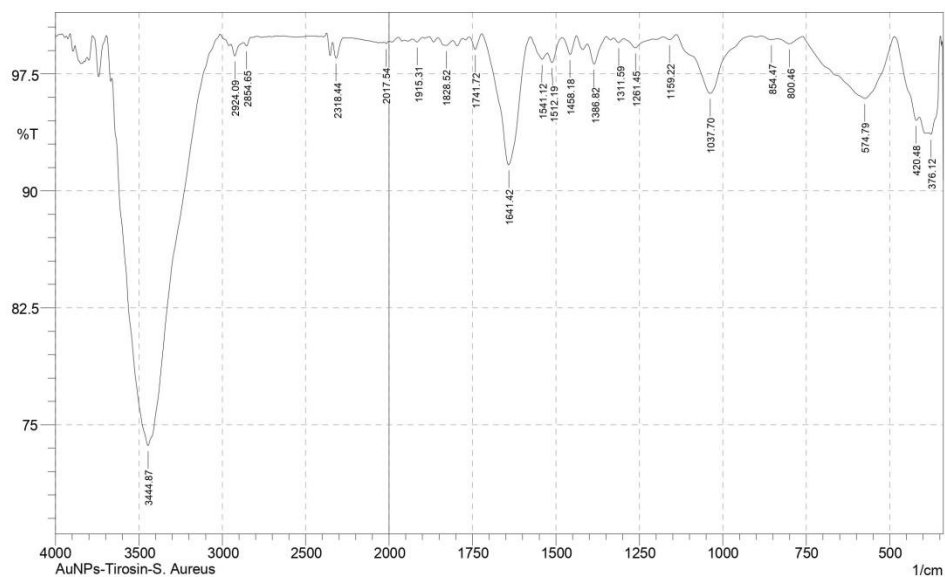
	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	376.12	93.635	1.181	381.91	349.12	0.726	0.259
2	420.48	94.523	0.748	484.13	412.77	0.99	0.119
3	574.79	95.934	3.975	759.95	486.06	2.906	2.799
4	800.46	99.439	0.391	835.18	759.95	0.116	0.063
5	854.47	99.693	0.136	885.33	835.18	0.048	0.015
6	1037.7	96.253	3.724	1139.93	916.19	1.479	1.452
7	1159.22	99.693	0.254	1178.51	1139.93	0.031	0.022
8	1261.45	99.178	0.569	1296.16	1209.37	0.183	0.087
9	1311.59	99.509	0.265	1327.03	1296.16	0.047	0.017
10	1386.82	98.136	1.442	1406.11	1348.24	0.246	0.16
11	1458.18	98.753	1.146	1481.33	1438.9	0.12	0.1
12	1512.19	98.225	0.916	1525.69	1481.33	0.202	0.072
13	1541.12	98.432	0.716	1577.77	1525.69	0.23	0.084
14	1641.42	91.667	8.292	1720.5	1577.77	2.44	2.42
15	1741.72	99.072	0.893	1761.01	1722.43	0.073	0.067
16	1828.52	99.32	0.402	1853.59	1809.23	0.097	0.046
17	1915.31	99.55	0.243	1928.82	1899.88	0.041	0.015
18	2017.54	99.455	0.103	2031.04	2000.18	0.065	0.006
19	2318.44	98.518	1.092	2339.65	2270.22	0.243	0.143
20	2854.65	99.295	0.356	2873.94	2827.64	0.096	0.031
21	2924.09	98.655	0.776	2949.16	2873.94	0.273	0.093
22	3444.87	73.667	24.48	3660.89	3014.74	40.922	37.007

Comment;
AuNPs-Tirosin-S. Aureus

Date/Time; 7/14/2021 3:40:02 PM
No. of Scans;
Resolution;
Apodization;

Lampiran 5. Karakterisasi PSA

LABORATORIUM PENGUJIAN OBAT, MAKANAN DAN KOSMETIK
UNIVERSITAS ISLAM INDONESIA

Jl. Kaliurang KM. 14,5 Sleman Yogyakarta – Telp. (0274) 898444 ext. 3037 – Fax. (0274) 896439

2. Karakterisasi PSA nanopartikel emas

3. Karakterisasi PSA nanopartikel emas-tirosin

HORIBA Scientific HORIBA SZ-100 for Windows [Z Type] Ver2.00

SZ-100

096.C.PSA.VIII.2021 R1.nsz

Measurement Results

Date	: Tuesday, August 24, 2021 1:03:32 PM
Measurement Type	: Particle Size
Sample Name	: AuNPs + Tirosin pH 12
Scattering Angle	: 90
Temperature of the Holder	: 24.8 °C
Dispersion Medium Viscosity	: 0.898 mPa·s
Transmission Intensity before Meas.	: 20380
Distribution Form	: Standard
Distribution Form(Dispersity)	: Monodisperse
Representation of Result	: Scattering Light Intensity
Count Rate	: 604 kCPS

Calculation Results

Peak No.	S.P.Area Ratio	Mean	S. D.	Mode
1	1.00	66.6 nm	29.8 nm	53.8 nm
2	---	--- nm	--- nm	--- nm
3	---	--- nm	--- nm	--- nm
Total	1.00	66.6 nm	29.8 nm	53.8 nm

Cumulant Operations

Z-Average	: 53.0 nm
PI	: 0.281

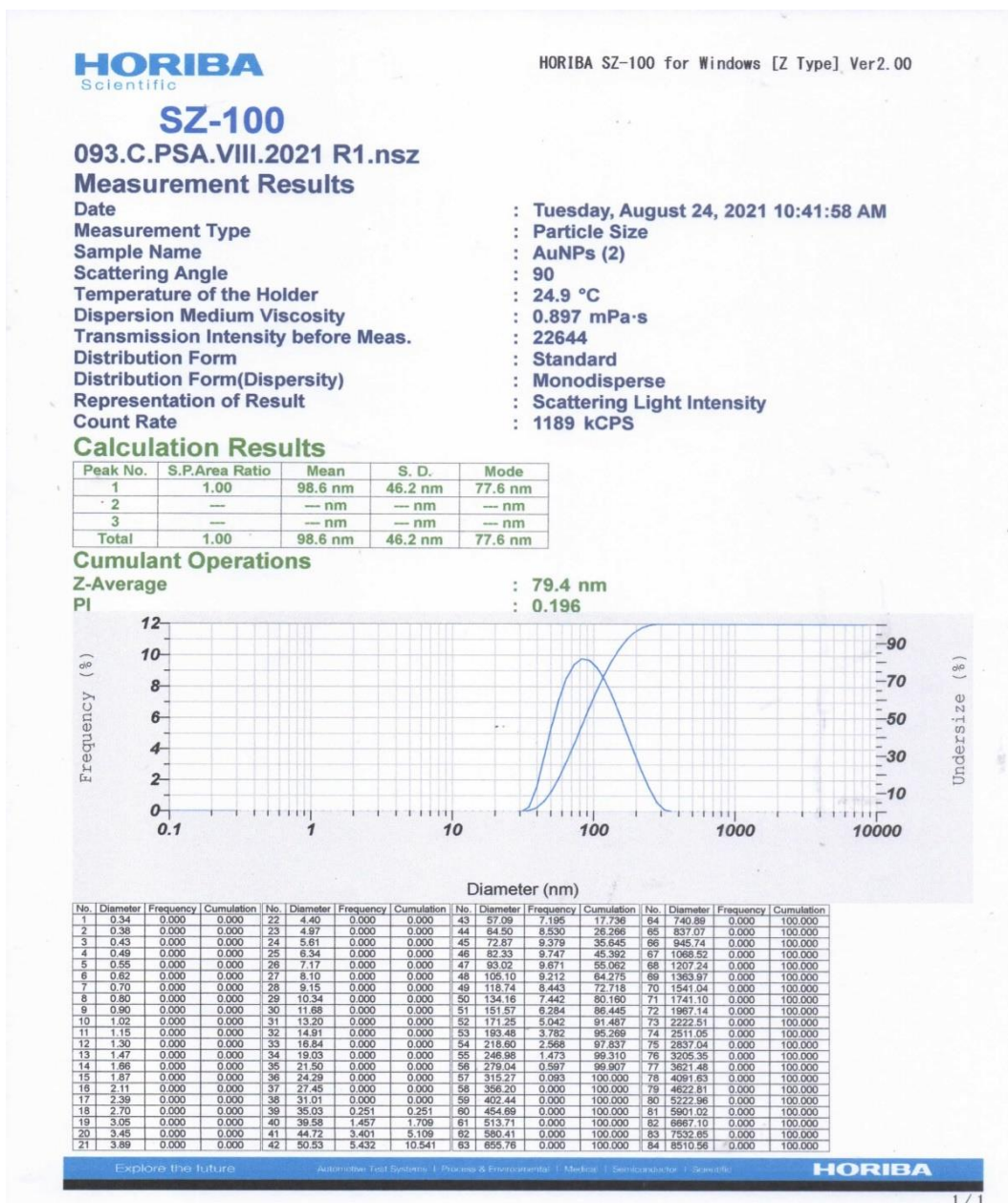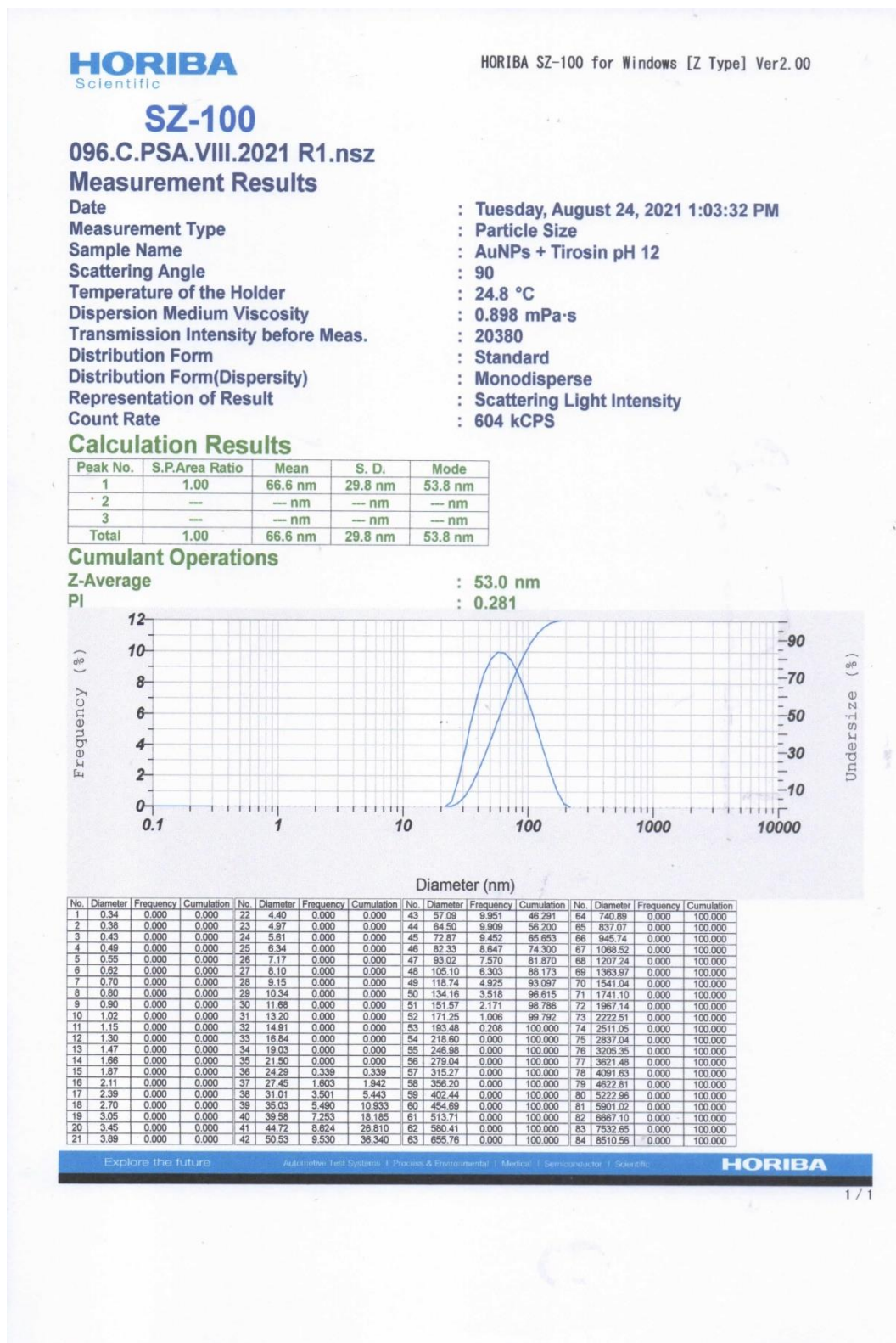| No.	Diameter	Frequency	Cumulation	No.	Diameter	Frequency	Cumulation	No.	Diameter	Frequency	Cumulation	No.	Diameter	Frequency	Cumulation
1	0.34	0.000	0.000	22	4.40	0.000	0.000	43	57.09	9.951	46.291	64	740.89	0.000	100.000
2	0.38	0.000	0.000	23	4.97	0.000	0.000	44	64.50	9.909	56.200	65	837.07	0.000	100.000
3	0.43	0.000	0.000	24	5.61	0.000	0.000	45	72.87	9.452	65.653	66	945.74	0.000	100.000
4	0.49	0.000	0.000	25	6.34	0.000	0.000	46	82.33	8.647	74.300	67	1068.52	0.000	100.000
5	0.55	0.000	0.000	26	7.17	0.000	0.000	47	93.02	7.570	81.870	68	1207.24	0.000	100.000
6	0.62	0.000	0.000	27	8.10	0.000	0.000	48	105.10	6.303	88.173	69	1363.97	0.000	100.000
7	0.70	0.000	0.000	28	9.15	0.000	0.000	49	118.74	4.925	93.097	70	1541.04	0.000	100.000
8	0.80	0.000	0.000	29	10.34	0.000	0.000	50	134.16	3.518	96.615	71	1741.10	0.000	100.000
9	0.90	0.000	0.000	30	11.68	0.000	0.000	51	151.57	2.171	98.786	72	1967.14	0.000	100.000
10	1.02	0.000	0.000	31	13.20	0.000	0.000	52	171.25	1.006	99.792	73	2222.51	0.000	100.000
11	1.15	0.000	0.000	32	14.91	0.000	0.000	53	193.48	0.208	100.000	74	2511.05	0.000	100.000
12	1.30	0.000	0.000	33	16.84	0.000	0.000	54	218.60	0.000	100.000	75	2837.04	0.000	100.000
13	1.47	0.000	0.000	34	19.03	0.000	0.000	55	246.98	0.000	100.000	76	3205.35	0.000	100.000
14	1.66	0.000	0.000	35	21.50	0.000	0.000	56	279.04	0.000	100.000	77	3621.48	0.000	100.000
15	1.87	0.000	0.000	36	24.29	0.339	0.339	57	315.27	0.000	100.000	78	4091.63	0.000	100.000
16	2.11	0.000	0.000	37	27.45	1.603	1.942	58	356.20	0.000	100.000	79	4622.81	0.000	100.000
17	2.39	0.000	0.000	38	31.01	3.501	5.443	59	402.44	0.000	100.000	80	5222.96	0.000	100.000
18	2.70	0.000	0.000	39	35.03	5.490	10.933	60	454.69	0.000	100.000	81	5901.02	0.000	100.000
19	3.05	0.000	0.000	40	39.58	7.253	18.185	61	513.71	0.000	100.000	82	6667.10	0.000	100.000
20	3.45	0.000	0.000	41	44.72	8.624	26.810	62	580.41	0.000	100.000	83	7532.65	0.000	100.000
21	3.89	0.000	0.000	42	50.53	9.530	36.340	63	655.76	0.000	100.000	84	8510.56	0.000	100.000

Explore the future   Automotive Test Systems | Process & Environmental | Medical | Semiconductor | Scientific   **HORIBA**

1 / 1

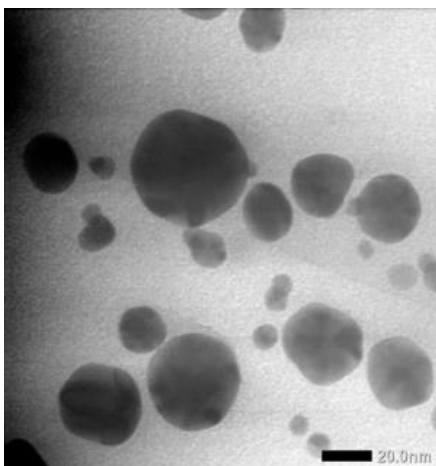**Lampiran 6. Karakterisasi TEM**

UNIT LAYANAN TEM

DEPARTEMEN KIMIA

FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

UNIVERSITAS GADJAH MADA

Jl. Sekip Utara, Bulaksumur, Yogyakarta 55281, Inndonesia – Telp. 0274-545188, Fax. 0274-545188, email: chemistry@ugm.ac.id

1. Karakterisasi TEM nanopartikel emas

Perbesaran 20 nm   Perbesaran 50 nm
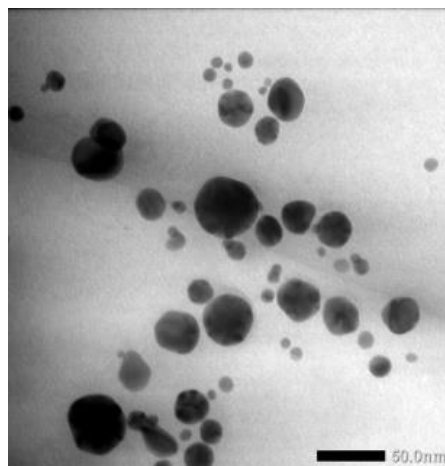
Perbesaran 100 nm

2. Karakterisasi TEM Nanopartikel emas-tirosin

Perbesaran 20 nm

Perbesaran 50 nm

Perbesaran 100 nm

Perbesaran 200 nm

Lampiran 7. Data TEM nanopartikel emas dan nanopartikel emas- tirosin

1. Data TEM nanopartikel emas

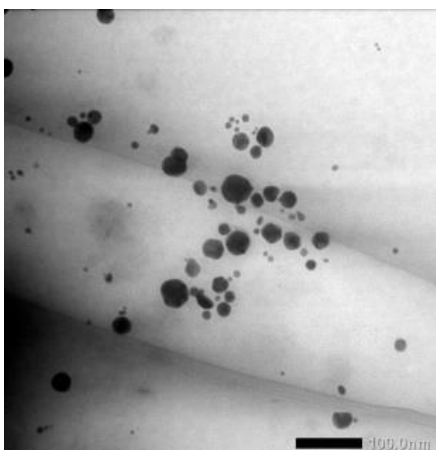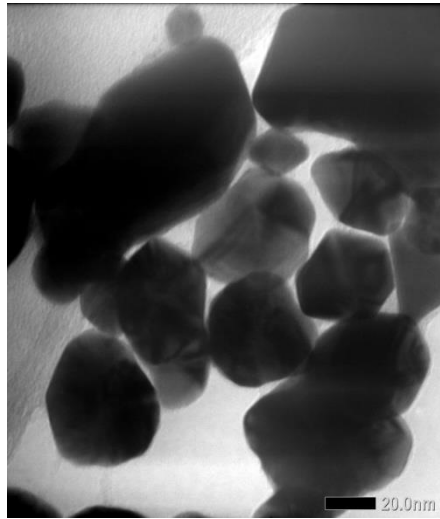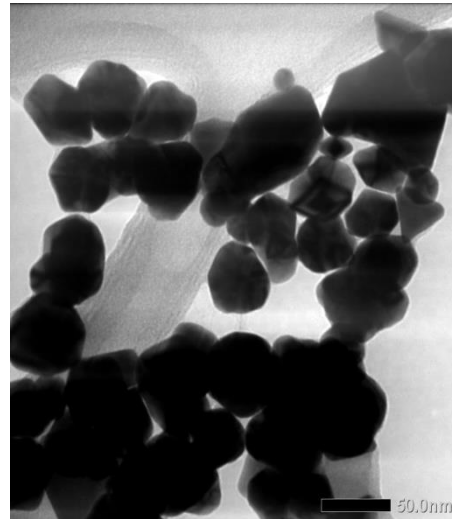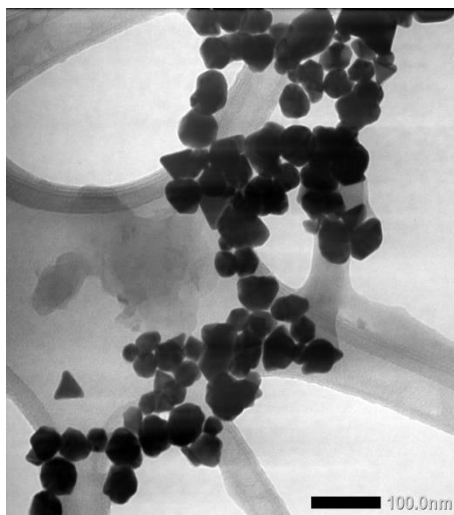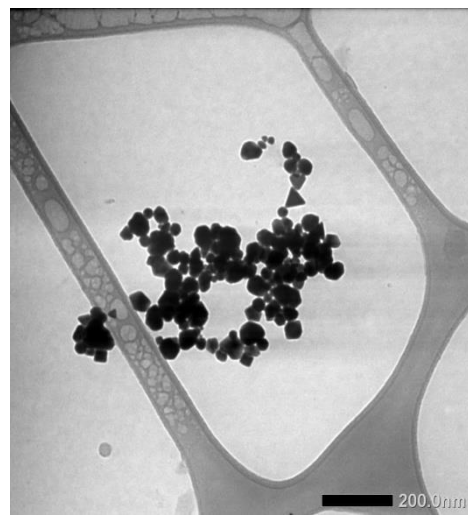| No.	Area	%Area	r^2	r	d	A (nm^2)	V(nm^3)
1	34.08	100	10.85	3.29	6.59	136.31	149.65
2	21.10	100	6.72	2.59	5.18	84.38	72.89
3	180.13	100	57.34	7.57	15.14	720.52	1818.61
4	566.76	100	180.40	13.43	26.86	2267.03	10149.84
5	437.34	100	139.21	11.80	23.60	1749.36	6880.07
6	139.56	100	44.42	6.67	13.33	558.24	1240.23
7	234.09	100	74.51	8.63	17.26	936.35	2694.20
8	1312.02	100	417.63	20.44	40.87	5248.08	35749.91
9	4.87	100	1.55	1.24	2.49	19.47	8.08
10	329.43	100	104.86	10.24	20.48	1317.70	4497.78
11	460.06	100	146.44	12.10	24.20	1840.24	7423.08
12	59.64	100	18.98	4.36	8.71	238.55	346.45
13	518.48	100	165.04	12.85	25.69	2073.92	8880.97
14	337.95	100	107.57	10.37	20.74	1351.78	4673.40
15	75.46	100	24.02	4.90	9.80	301.84	493.09
16	24.34	100	7.75	2.78	5.57	97.37	90.34
17	12.98	94	4.13	2.03	4.07	51.93	35.19
18	99.40	100	31.64	5.62	11.25	397.58	745.45
19	47.87	100	15.24	3.90	7.81	191.49	249.16
20	60.45	100	19.24	4.39	8.77	241.80	353.55
21	659.66	100	209.98	14.49	28.98	2638.65	12745.18
22	231.65	100	73.74	8.59	17.17	926.61	2652.27
23	43.82	100	13.95	3.73	7.47	175.26	218.17
24	1005.72	100	320.13	17.89	35.78	4022.88	23992.72
25	523.75	100	166.72	12.91	25.82	2095.01	9016.82
26	510.37	100	162.45	12.75	25.49	2041.46	8673.34
27	706.72	100	224.96	15.00	30.00	2826.89	14133.08
28	348.09	100	110.80	10.53	21.05	1392.35	4885.35
29	143.21	100	45.59	6.75	13.50	572.84	1289.22
30	462.90	100	147.35	12.14	24.28	1851.60	7491.92
31	3.25	100	1.03	1.02	2.03	12.98	4.40
32	36.51	100	11.62	3.41	6.82	146.05	165.97
33	2.43	100	0.77	0.88	1.76	9.74	2.86
34	133.07	100	42.36	6.51	13.02	532.27	1154.71
35	2.43	100	0.77	0.88	1.76	9.74	2.86

2. Data TEM nanopartikel emas-tirosin

No.	Area	%Area	r^2	r	d	A (nm^2)	V(nm^3)
1	217	100	69.07	8.31	16.62	868	2404.66
2	5593	100	1780.31	42.19	84.39	22372	314652.39
3	3462	100	1101.99	33.20	66.39	13848	153233.74
5	2760	100	878.54	29.64	59.28	11040	109075.55
6	2584	100	822.51	28.68	57.36	10336	98810.38
7	3547	100	1129.05	33.60	67.20	14188	158911.59
8	993	100	316.08	17.78	35.56	3972	23538.98
9	917	100	291.89	17.08	34.17	3668	20889.01
10	138	100	43.93	6.63	13.26	552	1219.50
11	26	100	8.28	2.88	5.75	104	99.73
12	2196	100	699.01	26.44	52.88	8784	77412.72
13	37	100	11.78	3.43	6.86	148	169.30
14	39	100	12.41	3.52	7.05	156	183.21
15	21	100	6.68	2.59	5.17	84	72.39
16	8	100	2.55	1.60	3.19	32	17.02
17	265	100	84.35	9.18	18.37	1060	3245.13
18	450	100	143.24	11.97	23.94	1800	7180.96
19	3768	100	1199.39	34.63	69.26	15072	173992.35
20	21	100	6.68	2.59	5.17	84	72.39
21	4	100	1.27	1.13	2.26	16	6.02
22	8	100	2.55	1.60	3.19	32	17.02
23	10	100	3.18	1.78	3.57	40	23.79
24	30	100	9.55	3.09	6.18	120	123.61
25	30	100	9.55	3.09	6.18	120	123.61
26	25	100	7.96	2.82	5.64	100	94.03
27	21	100	6.68	2.59	5.17	84	72.39
28	189	100	60.16	7.76	15.51	756	1954.59
29	98	100	31.19	5.59	11.17	392	729.80
30	569	100	181.12	13.46	26.92	2276	10210.15
31	150	100	47.75	6.91	13.82	600	1381.98
32	114	100	36.29	6.02	12.05	456	915.63
33	102	100	32.47	5.70	11.40	408	774.93
34	40	100	12.7	3.57	7.14	160	190.31
35	25	100	8.0	2.82	5.64	100	94.03

Lampiran 8. Perhitungan limit deteksi

1. **Deteksi bakteri *E. coli* menggunakan sensor nanopartikel emas**

Log 10^x (X)	Pengukuran konsentrasi (y)	Perhitungan konsentrasi (y')	y-y'	(y-y')²
1	0,64	0,67	-0,034	0,0011290
2	0,76	0,73	0,037	0,0013983
3	0,80	0,78	0,016	0,0002657
4	0,85	0,84	0,005	0,0000235
5	0,90	0,90	-0,002	0,0000023
6	0,94	0,95	-0,018	0,0003386

Grafik AuNPs-E. coli, y = 0.0554x + 0.6191, R² = 0.9452
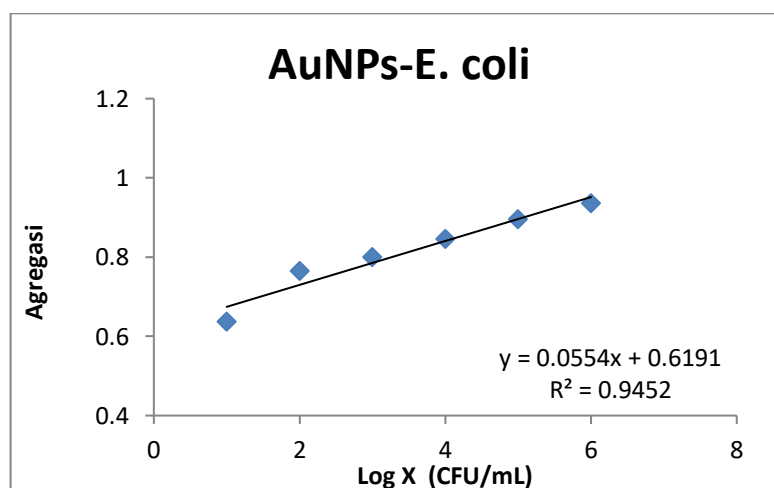
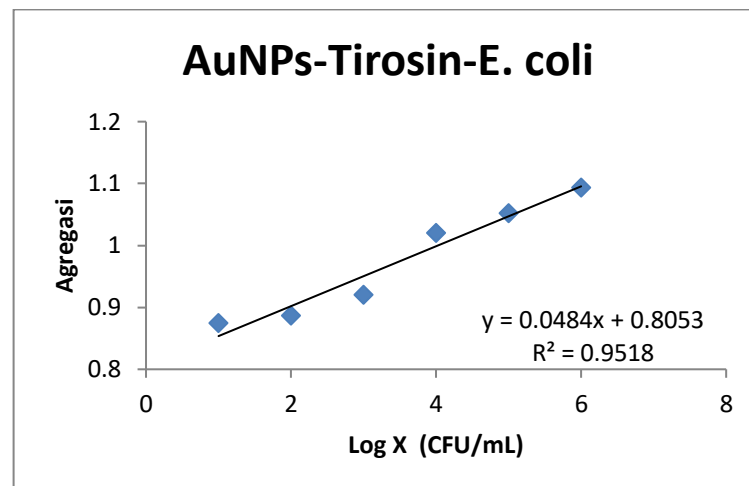$$S_{X/Y} = SD = \sqrt{\frac{\Sigma\,(y_i - y')^2}{n-2}}$$

$$= \sqrt{\frac{0.00303}{6-2}}$$

$$SD = 0,02809$$

Y_{LoD} = 3 x SD + a

               = 3 (0,02809) + 0,619

               = 0,70327

LoD $= \dfrac{Y_{LOD} - a}{b}$

               $= \dfrac{0,70327 - 0,619}{0,0554}$

               = Antilog 1,52

                 atau

               = 33,11 CFU/mL

2. **Deteksi bakteri *E. coli* menggunakan sensor nanopartikel emas-tirosin**

Log 10^x (X)	Pengukuran konsentrasi (y)	Perhitungan konsentrasi (y')	y-y'	(y-y')²
1	0,87	0,85	0,023	0,00054
2	0,89	0,90	-0,015	0,00022
3	0,92	0,95	-0,032	0,00100
4	1,02	1,00	0,018	0,00033
5	1,05	1,05	0,000	0,00000
6	1,09	1,10	-0,008	0,00006

AuNPs-Tirosin-E. coli

Chart: Y-axis labeled "Agregasi" (0.8 to 1.2), X-axis labeled "Log X (CFU/mL)" (0 to 8)

$$y = 0.0484x + 0.8053$$
$$R^2 = 0.9518$$

$S_{X/Y} = SD \quad = \sqrt{\dfrac{\Sigma\,(yi - y')^2}{n-2}}$

$\qquad\qquad = \sqrt{\dfrac{0.00216}{6-2}}$

$SD \qquad = 0{,}02323$

$Y_{LOD} \qquad = 3 \times SD + a$

$\qquad\qquad = 3\,(0{,}02323) + 0{,}619$

$\qquad\qquad = 0{,}87499$

$LOD \qquad = \dfrac{Y_{LOD} - a}{b}$

$\qquad\qquad = \dfrac{0{,}87499 - 0{,}805}{0{,}0484}$

$\qquad\qquad = \text{Antilog } 1{,}44$

$\qquad\qquad \text{atau}$

$\qquad\qquad = 27{,}54 \text{ CFU/mL}$

Lampiran 9. Perhitungan nilai agregasi

1. Nilai agregasi optimasi pH tirosin terhadap nanopartikel emas

pH	Abs690	Abs538	Nilai Agregasi
1	0,200	0,3000	0,67
2	0,2135	0,2488	0,86
3	0,0172	0,1036	0,17
4	0,0180	0,1027	0,18
5	0,0135	0,0860	0,16
6	0,0256	0,1140	0,22
7	0,0149	0,0800	0,19
8	0,0139	0,0758	0,18
9	0,0125	0,0826	0,15
10	0,0280	0,0968	0,29
11	0,0488	0,1815	0,27
12	0,0900	0,5921	0,15
13	0,0609	0,1578	0,39
14	0,1022	0,1118	0,19

2. **Nilai agregasi uji selektifitas terhadap bakteri *E. coli, Salmonella typhi* dan *S. aureus.***

	Abs690	Abs538	Nilai Agregasi
Nanopartikel emas-*E. coli*	0,094	0,096	0,98
Nanopartikel emas-Tirosin-*E. coli*	0,094	0,087	1,08
Nanopartikel emas-Tirosin-*Salmonella typhi*	0,084	0,079	1,06
Nanopartikel emas-Tirosin-*S. aureus*	0,093	0,091	1,02

Contoh penyelesaian nilai agregasi

Nilai Agregasi $= \dfrac{A690}{A538}$

$= \dfrac{0,094 \ \text{nm}}{0,096 \ \text{nm}}$

$= 0,98$

3. **Nilai agregasi uji selektifitas larutan garam**

	Abs690	Abs538	Nilai Agregasi
Nanopartikel emas-Tirosin	0,0311	0,375	0,08
$ZnCl_2$	0,0745	0,237	0,31
$CaCl_2$	0,0551	0,203	0,13
$FeCl_3$	0,0699	0,307	0,18
$MgCl_2$	0,0237	0,231	0,30
NaCl	0,0311	0,206	0,11

4. **Nilai agregasi nanopartikel emas dan nanopartikel emas-tirosin terhadap bakteri *E. coli.***

Konsentrasi nanopartikel Emas-*E. coli* (CFU/mL)	Abs690	Abs538	Nilai Agregasi
10^{-1}	0,0908	0,1427	0,64
10^{-2}	0,1494	0,1955	0,76
10^{-3}	0,1510	0,1880	0,80
10^{-4}	0,1756	0,2077	0,85
10^{-5}	0,1991	0,2222	0,90
10^{-6}	0,1291	0,1374	0,94

Konsentrasi nanopartikel Emas-tirosin-*E. coli* (CFU/mL)	Abs690	Abs538	Nilai Agregasi
10^{-1}	0,1959	0,2240	0,85
10^{-2}	0,1700	0,1917	0,89
10^{-3}	0,1777	0,1942	0,92
10^{-4}	0,2165	0,2114	1,02
10^{-5}	0,2152	0,2042	1,05
10^{-6}	0,2295	0,2098	1,09