PAKET 13

PELATIHAN ONLINE

2019

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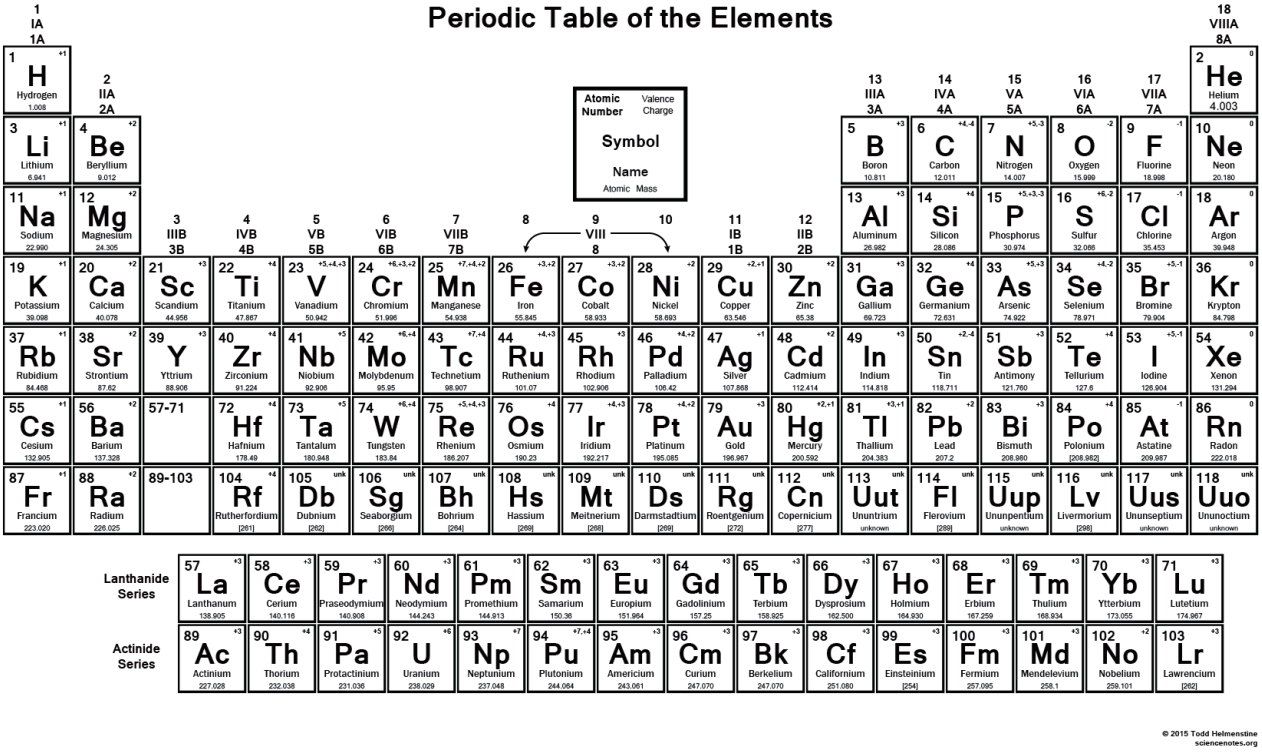
Paket 13 : IR


Periodic Table of the Elements
Atomic Number
Valence Charge
Symbol
Name
Atomic Mass
1 IA 1A
2 IIA 2A
3 IIIB 3B
4 IVB 4B
5 VB 5B
6 VIB 6B
7 VIIB 7B
8
9 VIII 8
10
11 IB 1B
12 IIB 2B
13 IIIA 3A
14 IVA 4A
15 VA 5A
16 VIA 6A
17 VIIA 7A
18 VIIIA 8A
1 H Hydrogen 1.008
2 He Helium 4.003
3 Li Lithium 6.941
4 Be Beryllium 9.012
5 B Boron 10.811
6 C Carbon 12.011
7 N Nitrogen 14.007
8 O Oxygen 15.999
9 F Fluorine 18.998
10 Ne Neon 20.180
11 Na Sodium 22.990
12 Mg Magnesium 24.305
13 Al Aluminum 26.982
14 Si Silicon 28.086
15 P Phosphorus 30.974
16 S Sulfur 32.066
17 Cl Chlorine 35.453
18 Ar Argon 39.948
19 K Potassium 39.098
20 Ca Calcium 40.078
21 Sc Scandium 44.956
22 Ti Titanium 47.867
23 V Vanadium 50.942
24 Cr Chromium 51.996
25 Mn Manganese 54.938
26 Fe Iron 55.845
27 Co Cobalt 58.933
28 Ni Nickel 58.693
29 Cu Copper 63.546
30 Zn Zinc 65.38
31 Ga Gallium 69.723
32 Ge Germanium 72.631
33 As Arsenic 74.922
34 Se Selenium 78.971
35 Br Bromine 79.904
36 Kr Krypton 84.798
37 Rb Rubidium 84.468
38 Sr Strontium 87.62
39 Y Yttrium 88.906
40 Zr Zirconium 91.224
41 Nb Niobium 92.906
42 Mo Molybdenum 95.95
43 Tc Technetium 98.907
44 Ru Ruthenium 101.07
45 Rh Rhodium 102.906
46 Pd Palladium 106.42
47 Ag Silver 107.868
48 Cd Cadmium 112.414
49 In Indium 114.818
50 Sn Tin 118.711
51 Sb Antimony 121.760
52 Te Tellurium 127.6
53 I Iodine 126.904
54 Xe Xenon 131.294
55 Cs Cesium 132.905
56 Ba Barium 137.328
57-71
72 Hf Hafnium 178.49
73 Ta Tantalum 180.948
74 W Tungsten 183.84
75 Re Rhenium 186.207
76 Os Osmium 190.23
77 Ir Iridium 192.217
78 Pt Platinum 195.085
79 Au Gold 196.967
80 Hg Mercury 200.592
81 Tl Thallium 204.383
82 Pb Lead 207.2
83 Bi Bismuth 208.980
84 Po Polonium [208.982]
85 At Astatine 209.987
86 Rn Radon 222.018
87 Fr Francium 223.020
88 Ra Radium 226.025
89-103
104 Rf Rutherfordium [261]
105 Db Dubnium [262]
106 Sg Seaborgium [266]
107 Bh Bohrium [264]
108 Hs Hassium [269]
109 Mt Meitnerium [268]
110 Ds Darmstadtium [269]
111 Rg Roentgenium [272]
112 Cn Copernicium [277]
113 Uut Ununtrium unknown
114 Fl Flerovium [289]
115 Uup Ununpentium unknown
116 Lv Livermorium [298]
117 Uus Ununseptium unknown
118 Uuo Ununoctium unknown
Lanthanide Series
57 La Lanthanum 138.905
58 Ce Cerium 140.116
59 Pr Praseodymium 140.908
60 Nd Neodymium 144.243
61 Pm Promethium 144.913
62 Sm Samarium 150.36
63 Eu Europium 151.964
64 Gd Gadolinium 157.25
65 Tb Terbium 158.925
66 Dy Dysprosium 162.500
67 Ho Holmium 164.930
68 Er Erbium 167.259
69 Tm Thulium 168.934
70 Yb Ytterbium 173.055
71 Lu Lutetium 174.967
Actinide Series
89 Ac Actinium 227.028
90 Th Thorium 232.038
91 Pa Protactinium 231.036
92 U Uranium 238.029
93 Np Neptunium 237.048
94 Pu Plutonium 244.064
95 Am Americium 243.061
96 Cm Curium 247.070
97 Bk Berkelium 247.070
98 Cf Californium 251.080
99 Es Einsteinium [254]
100 Fm Fermium 257.095
101 Md Mendelevium 258.1
102 No Nobelium 259.101
103 Lr Lawrencium [262]
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Materi Singkat

Spektroskopi IR (Infrared)

Spektroskopi IR merupakan salah satu teknik analisis yang sering digunakan untuk menganalisis senyawa organik. Menggunakan spektroskopi ini, dapat ditentukan gugus fungsi yang terdapat dalam suatu senyawa (gugus tertentu akan memiliki serapan pada bilangan gelombang tertentu). Berikut beberapa bilangan gelombang dari gugus-gugus umum dari senyawa organik

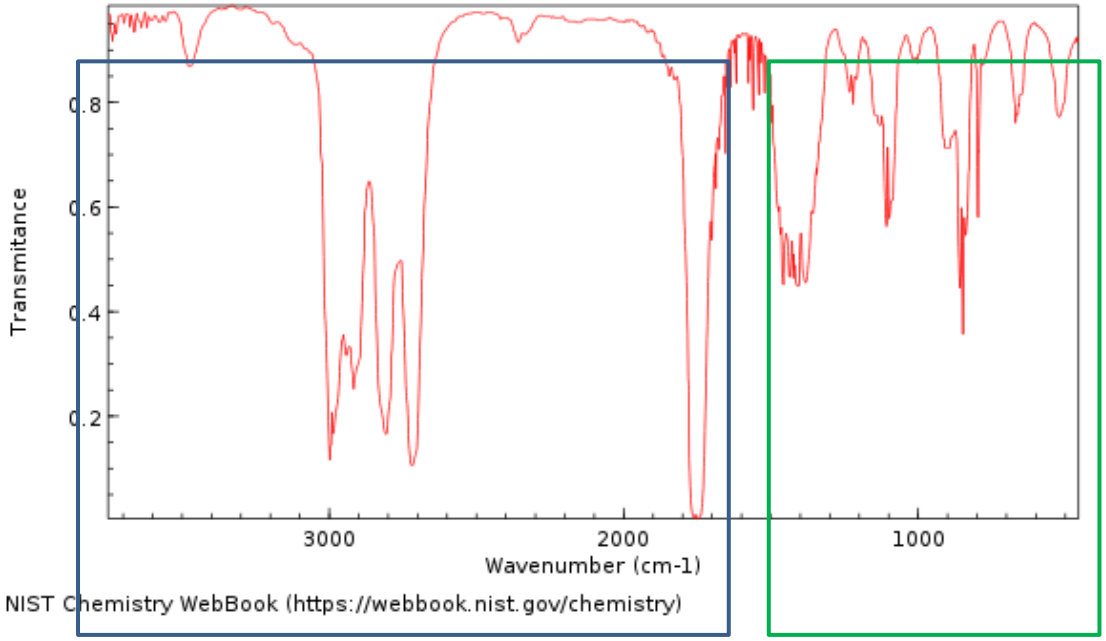
Functional Group	Frequency (cm-1)	intensity
water OH Stretch	3700-3100	strong
alcohol OH stretch	3600-3200	strong
carboxylic acid OH stretch	3600-2500	strong
N-H stretch	3500-3350	strong
≡C–H stretch	~3300	strong
=C-H stretch	3100-3000	weak
-C-H stretch	2950-2840	weak
-C-H aldehydic	2900-2800	variable
C≡N stretch	~2250	strong
C≡C stretch	2260-2100	variable
C=O aldehyde	1740-1720	strong
C=O anhydride	1840-1800, 1780-1740	weak, strong
C=O ester	1750-1720	strong
C=O ketone	1745-1715	strong
C=O amide	1700-1500	strong
C=C alkene	1680-1600	weak
C=C aromatic	1600-1400	weak
CH_2 bend	1480-1440	medium
CH_3 bend	1465-1440, 1390-1365	medium
C-O-C stretch	1250-1050 several	strong
C-OH stretch	1200-1020	strong
NO_2 stretch	1600-1500 and 1400-1300	strong
C-F	1400-1000	strong
C-Cl	800-600	strong
C-Br	750-500	strong
C-I	~500	strong

Gambar 1: tabel IR (http://www.chem.ucla.edu/~bacher/General/30BL/IR/ir.html)

TIPS MENGERJAKAN SOAL

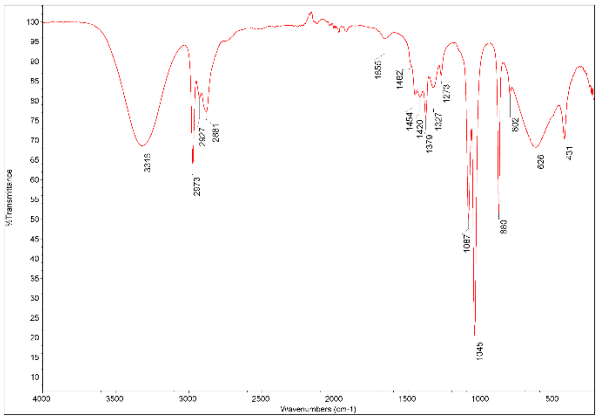
#13 fokus pada daerah gugus fungsi

Dalam spektrum IR, terkadang terdapat banyak puncak untuk suatu senyawa. Perlu diketahui bahwa tidak semua puncak berguna untuk menentukan struktur dengan mudah, di daerah dengan bilangan gelombang kecil (daerah sidik jari) misalnya, akan ada banyak puncak yang tidak membantu banyak dalam penentuan struktur melalui IR

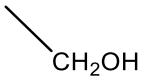


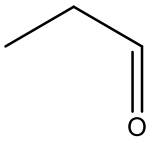
SOAL

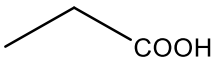
1. Tentukan senyawa yang memiliki sepktrum IR sebagai berikut!

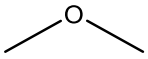


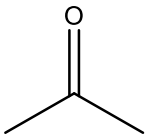
Gambar 2: sumber : http://lisa.chem.ut.ee/IR_spectra/

a. 

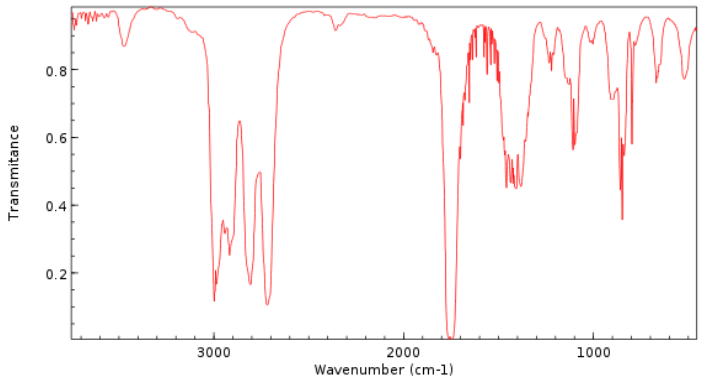
b. 

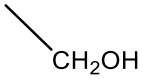
c. 

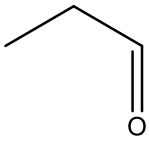
d. 

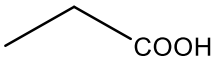
e. 

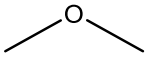
2. Tentukan senyawa yang memiliki spektrum IR sebagai berikut!

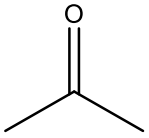


a. 

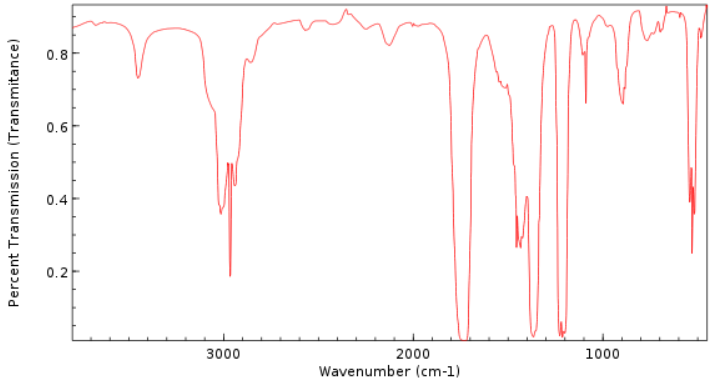
b. 

c. 

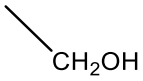
d. 

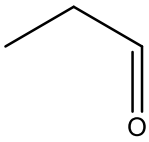
e. 

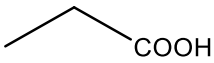
3. Tentukan senyawa dengan spektrum IR sebagai berikut!

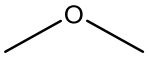


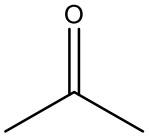
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

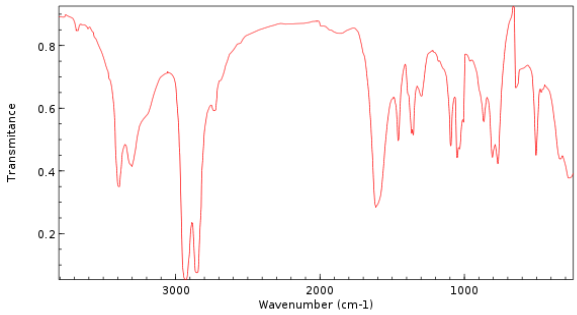
b. 

c. 

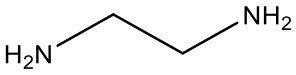
d. 

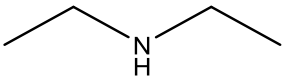
e. 

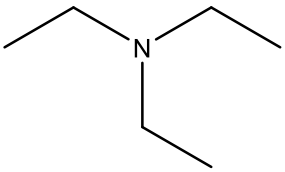
4. Tentukan senyawa dengan spektrum IR sebagai berikut!

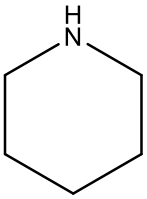


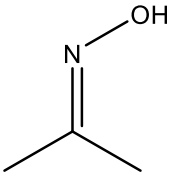
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

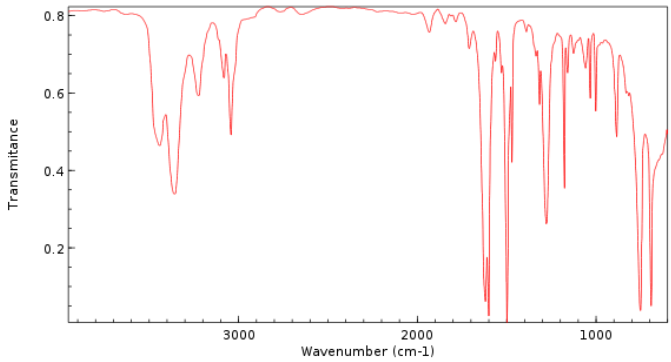
b. 

c. 

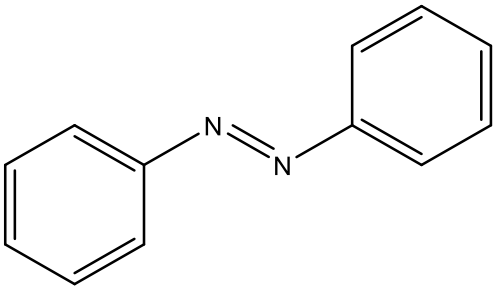
d. 

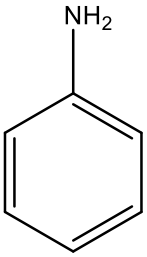
e. 

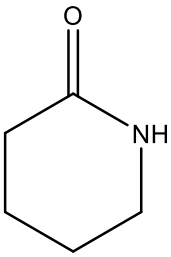
5. Tentukan senyawa dengan spektrum IR sebagai berikut!

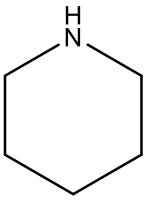


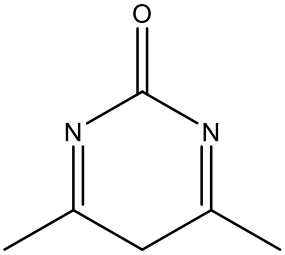
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

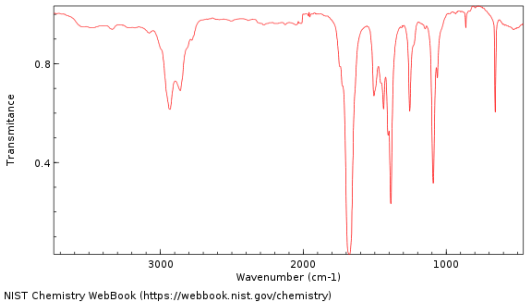
b. 

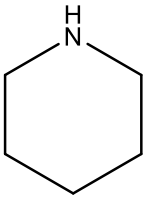
c. 

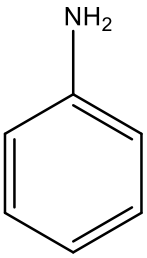
d. 

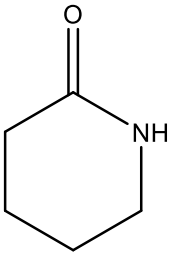
e. 

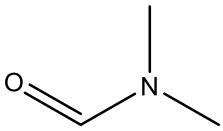
6. Tentukan senyawa dengan spektrum IR sebagai berikut!

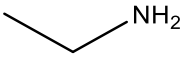


a. 

b. 

c. 

d. 

e. 

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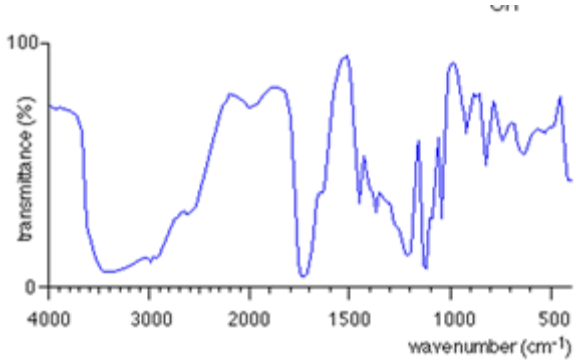
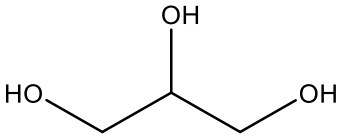
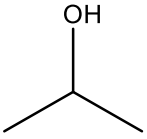
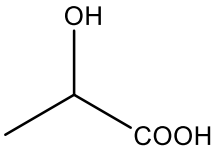
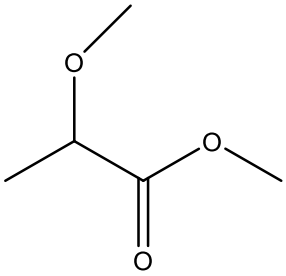


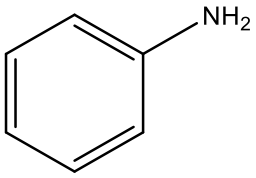
Gambar 3sumber : http://www.dynamicscience.com.au/tester/solutions1/chemistry/analytical%20chem/soln1a.htm

a. 

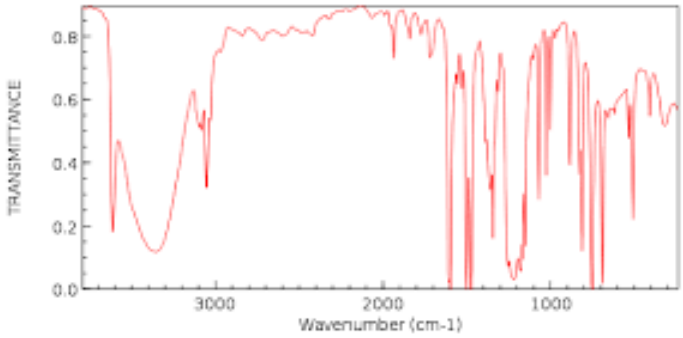
b. 

c. 

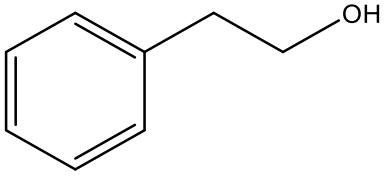
d. 

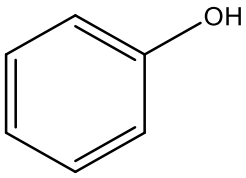
e. 

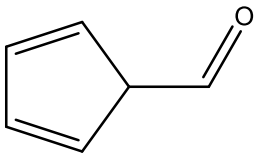
8. Suatu senyawa dengan rumus molekul C_6H_6O memiliki spektrum sebagai berikut, tentukan struktur yang mungkin!

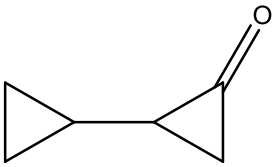


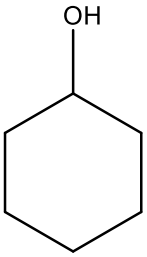
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

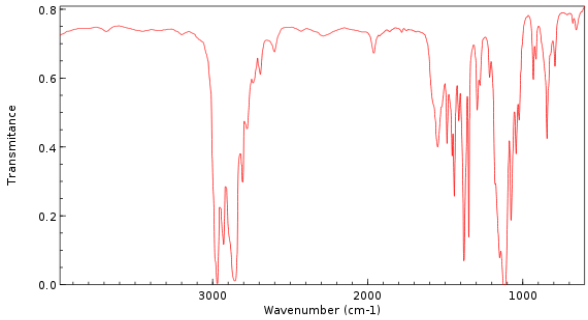
b. 

c. 

d. 

e. 

9. Suatu senyawa dengan rumus molekul $C_4H_{10}O$ memiliki speltrum IR sebagai berikut, tentukan senyawa tersebut!



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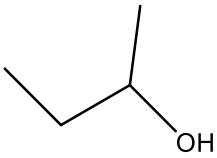
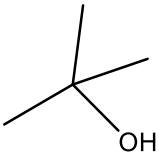
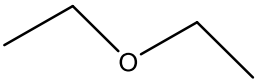
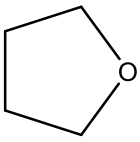
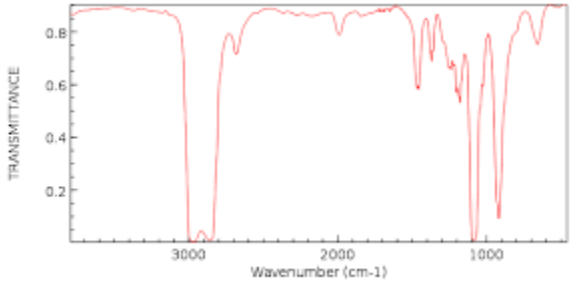
b. 

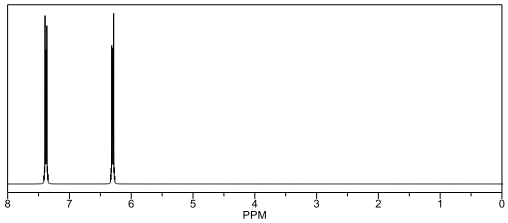
c. 

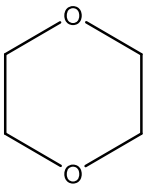
d. 

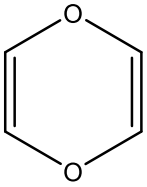
e. 

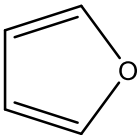
10. Suatu senyawa C_4H_4O diketahui memiliki spektrum IR dan ^{1}H-NMR sebagai berikut, tentukan senyawa tersebut!

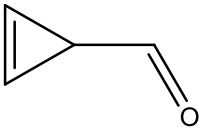


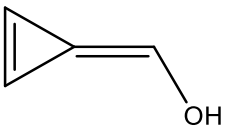


a. 

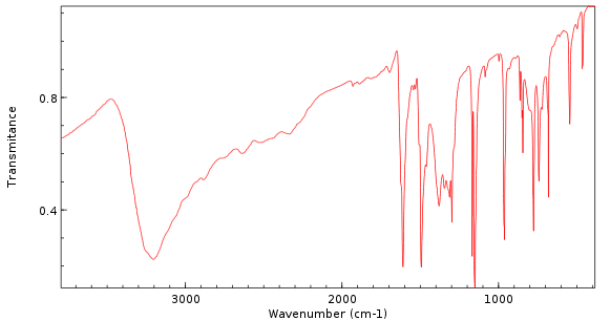
b. 

c. 

d. 

e. 

11. Suatu senyawa $C_6H_6O_2$ diketahui memiliki spektrum IR dan ^{1}H-NMR sebagai berikut, tentukan strukturnya!



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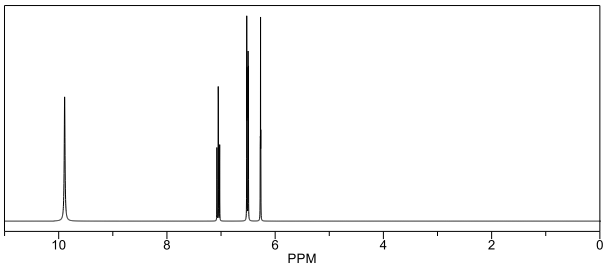
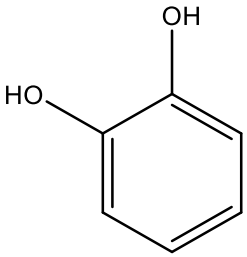
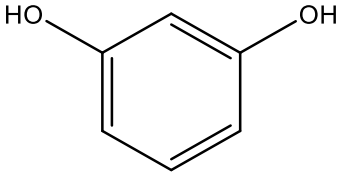
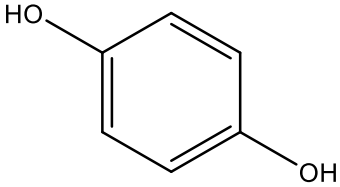
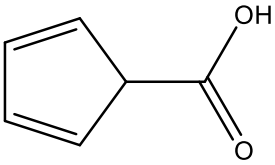
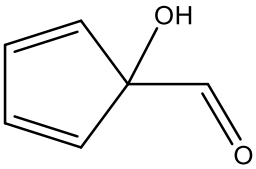


a. 

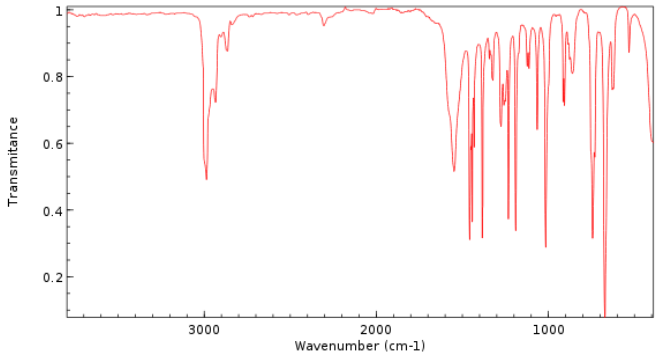
b. 

c. 

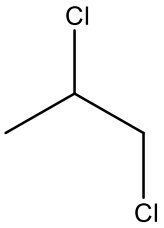
d. 

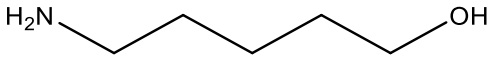
e. 

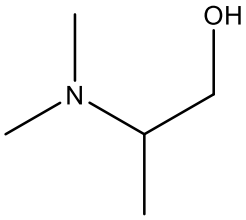
12. Sebuah senyawa dengan massa molekul 105 memiliki spektrum IR sebagai berikut, perkirakan struktur molekul tersebut!

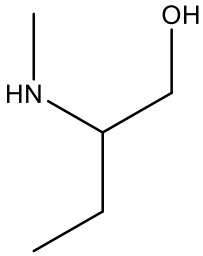


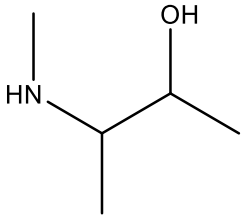
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

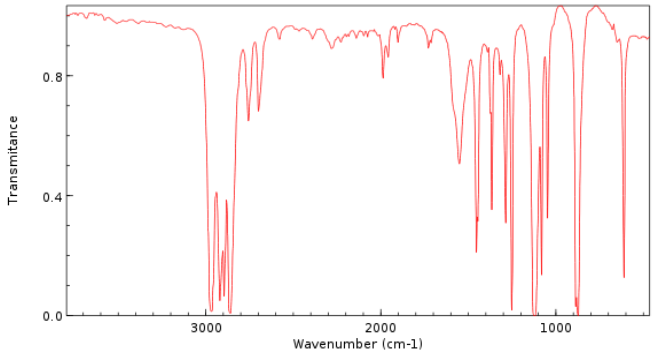
b. 

c. 

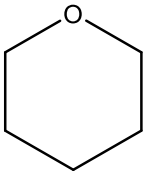
d. 

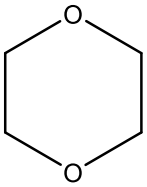
e. 

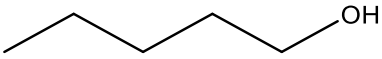
13. Suatu senyawa organik diketahui memiliki Mr=88 dan memiliki spektrum IR sebagai berikut, tentukan senyawa tersebut!

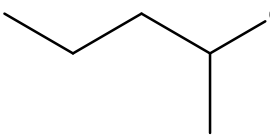


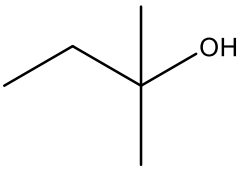
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

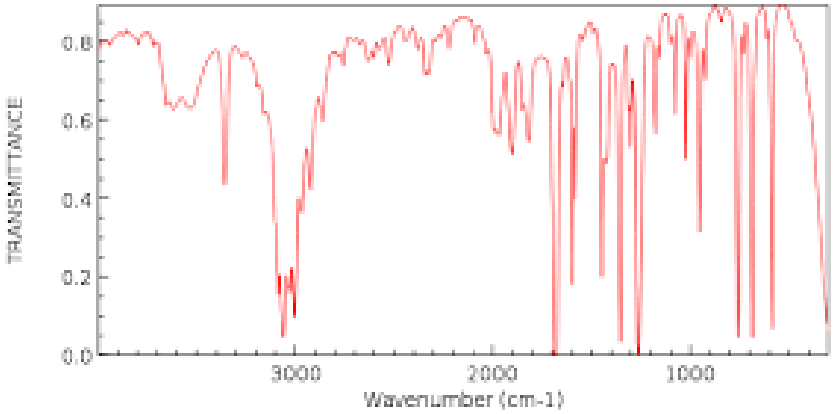
b. 

c. 

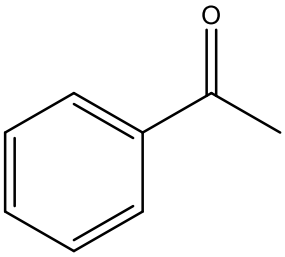
d. 

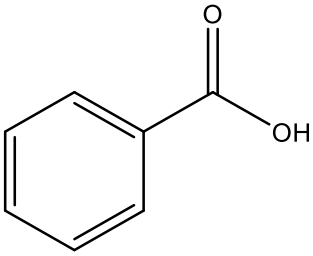
e. 

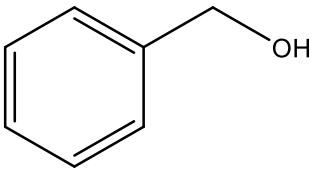
14. Perkirakan mana dari senyawa berikut yang memiliki spektrum IR fasa gas sebagai berikut!

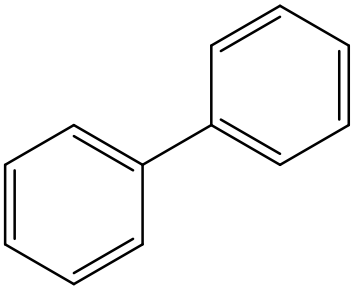


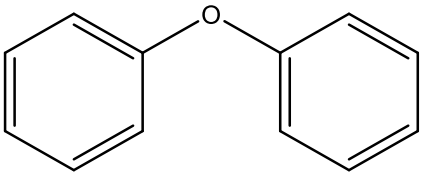
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

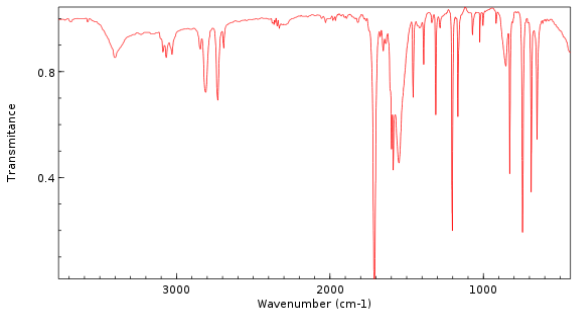
b. 

c. 

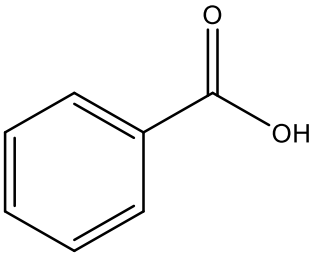
d. 

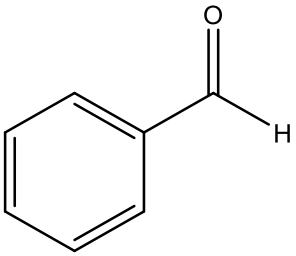
e. 

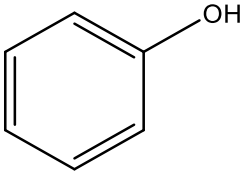
15. Perkirakan mana dari senyawa berikut yang memiliki spektrum IR fasa gas sebagai berikut!

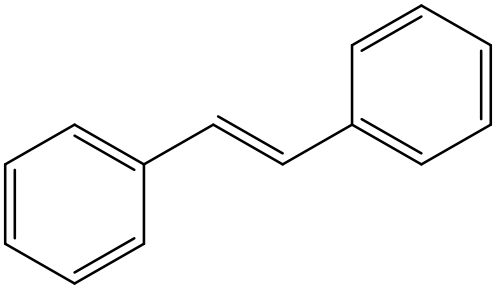


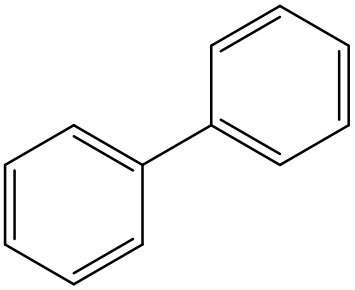
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

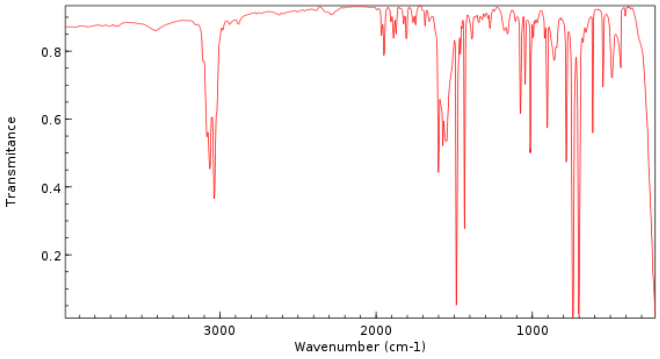
b. 

c. 

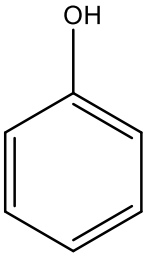
d. 

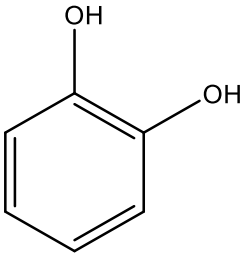
e. 

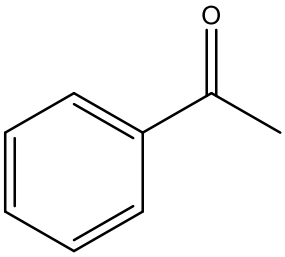
16. Perkirakan mana dari senyawa berikut yang memiliki spektrum IR fasa gas sebagai berikut!

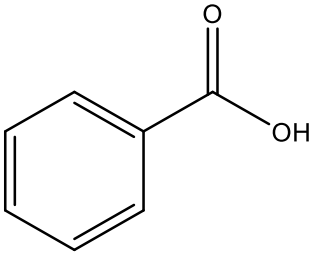


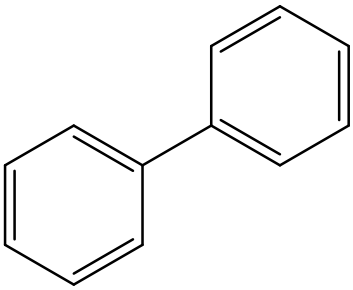
NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

a. 

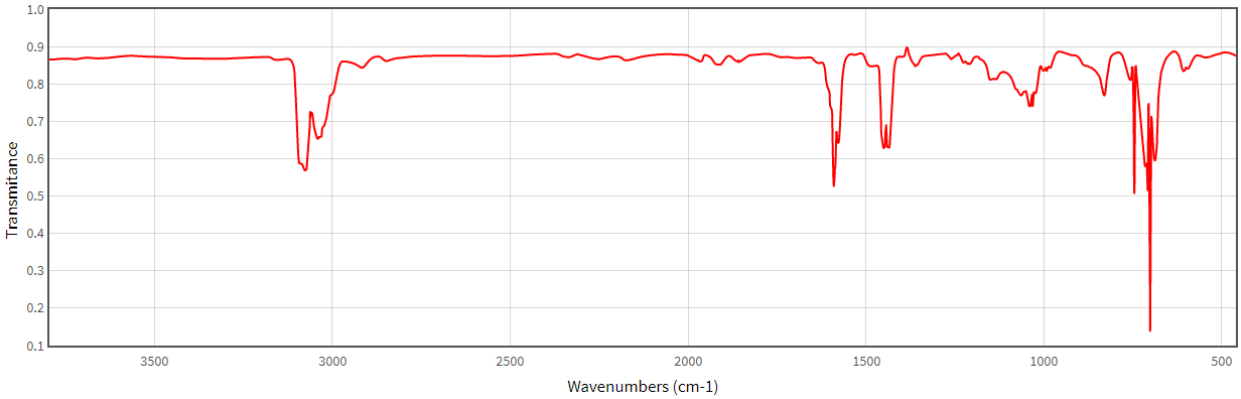
b. 

c. 

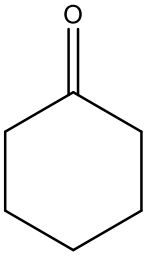
d. 

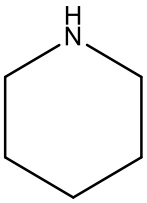
e. 

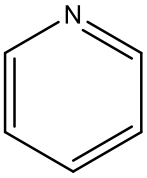
17. Perkirakan mana dari senyawa berikut yang memiliki spektrum IR fasa gas sebagai berikut!

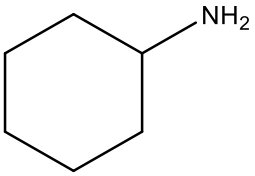


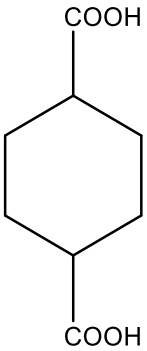
Gambar 4: https://webbook.nist.gov/cgi/cbook.cgi?ID=C110861&Units=SI&Type=IR-SPEC&Index=1#IR-SPEC

a. 

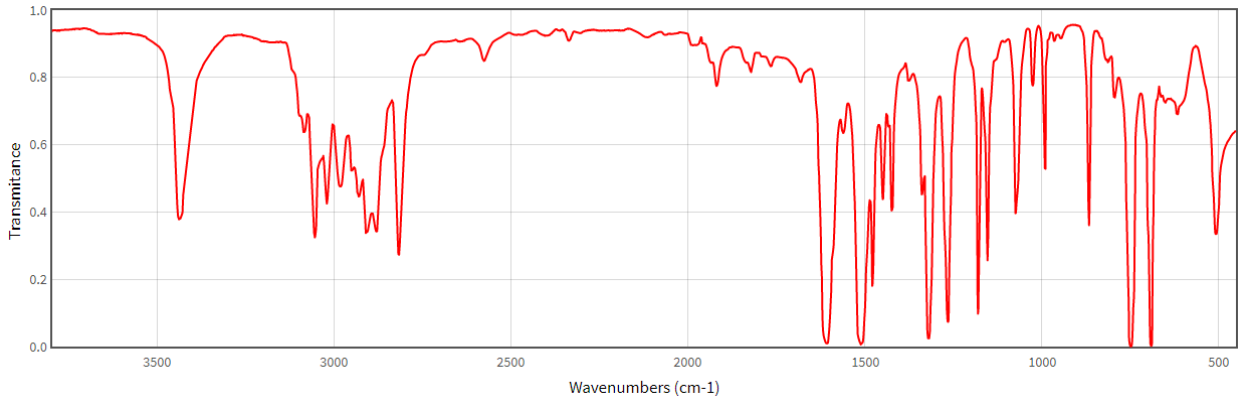
b. 

c. 

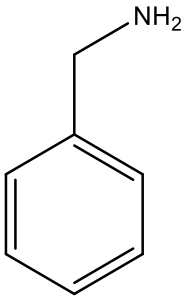
d. 

e. 

18. Perkirakan mana dari senyawa berikut yang memiliki spektrum IR fasa larutan sebagai berikut!



Gambar 5: https://webbook.nist.gov/cgi/cbook.cgi?ID=C100618&Units=SI&Type=IR-SPEC&Index=2#IR-SPEC

a.


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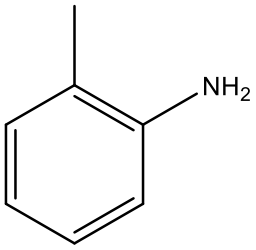

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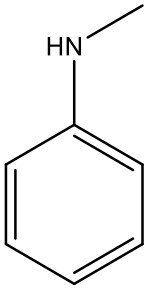
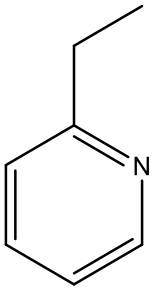
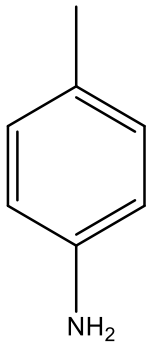
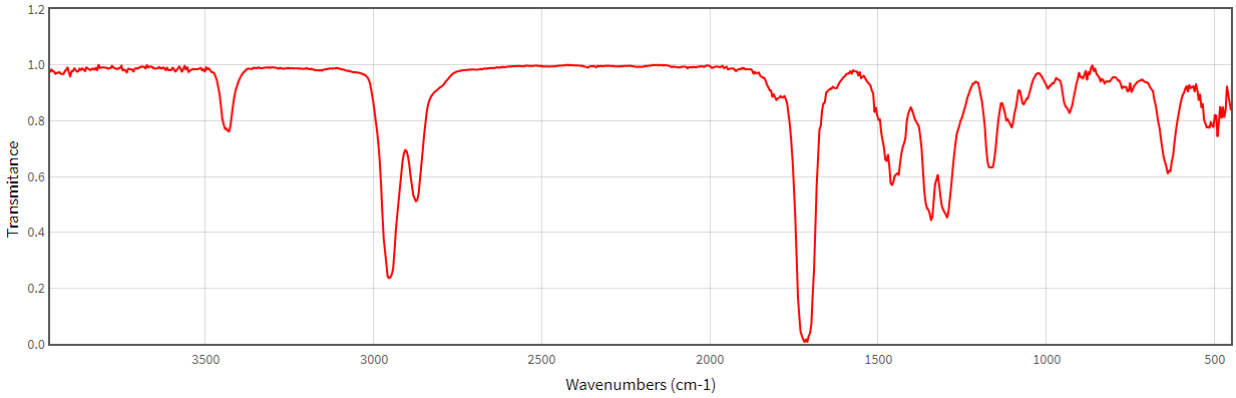


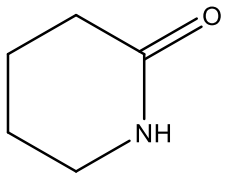
d.


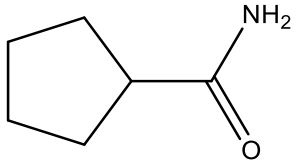
e. 

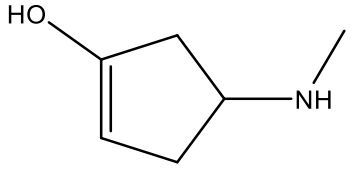
19. Perkirakan mana dari senyawa berikut yang memiliki spektrum IR fasa larutan sebagai berikut!

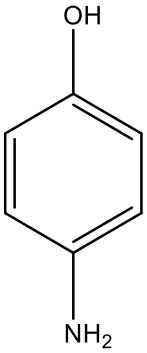


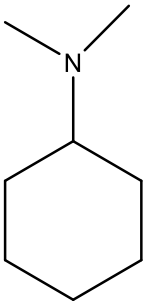
Gambar 6 : https://webbook.nist.gov/cgi/cbook.cgi?ID=C675207&Units=SI&Mask=80

a. 

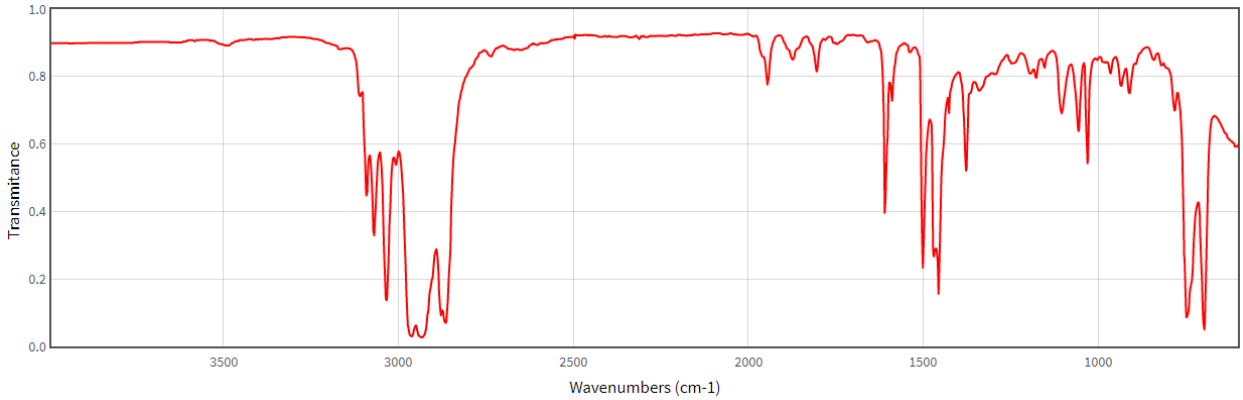
b. 

c. 

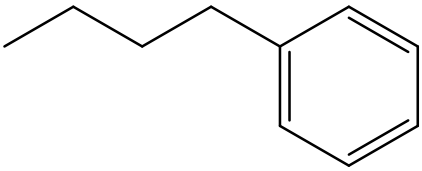
d. 

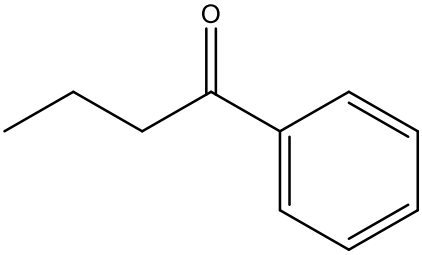
e. 

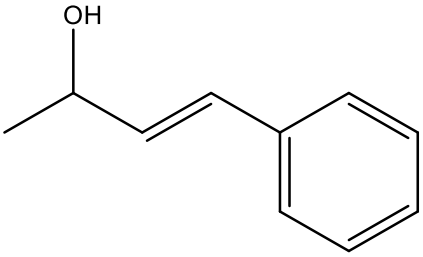
20. Perkirakan mana dari senyawa berikut yang memiliki spektrum IR fasa larutan sebagai berikut!

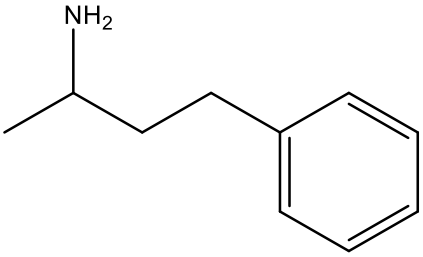
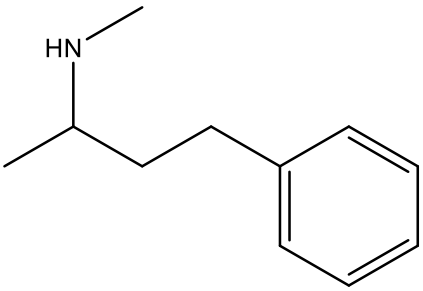


Gambar 7: https://webbook.nist.gov/cgi/cbook.cgi?ID=C104518&Units=SI&Type=IR-SPEC&Index=1#IR-SPEC

a. 

b. 

c. 

d. 

e.