Tanta University, Faculty Of Pharmacy
Department Of Pharmaceutical Analytical Chemistry

Examination For 2nd Year-Pharmacy Students

Course Title: **Instrumental Analysis** Course Code:3012

Date: 4/11/2018 | Term : 1st term | Marks: 30 Total pages:5 | Time Allowed : 45 minutes

Student's Name: ..... **Student's Number:**.....

Choose ONE best answer and mark it in the provided separate answer sheet.
(YOU should write your name in the separate answer sheet)

1- **Which of the following information cannot be obtained from IR spectrum?**

a) the presence of C=O bonds b) the presence of O-H bonds
c) the identity of a compound through comparison with other spectra.
d) identification of carbon-hydrogen frameworks (skeleton).
e) none of the above

2- **The region of the IR spectrum which contains the most complex vibrations (400-1250 cm^{-1}) is called the ..... region of the spectrum.**

a) fingerprint region b) functional group region
c) combination region d) hot region e) none of the above

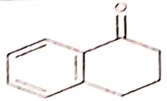
3- **Of the following general statements concerning vibrational frequencies and intensities, Which is INCORRECT?**

a) stretching vibrations have a higher frequency than equivalent bending vibrations.
b) stretching vibrations of double bonds have a higher frequency than triple bonds.
c) stretching vibrations of a C-Y bond have a higher frequency than those of a C-Z bond. (Z atom is heavier than Y).
d) the stretching vibrations of a Y-Z bond is more intense than that of a Y-Y bond . (Y and Z are different atoms).
e) b & c.

4- **Which of the following stretches tends to be the least intense?**

a) C=C b) C=O c) O-H (carboxylic) d) C-H e) O-H (alcohol)

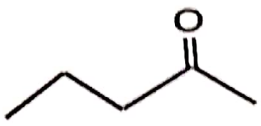
5- **Which of the following compounds has the lowest carbonyl stretching frequency?**

a)	b)	c)	d)
			

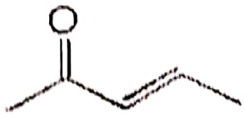
6- **Deduce the structure of an unknown compound with molecular formula C_5H_8O using information given by its infrared spectrum.**

Intensity (peak)	Frequency (cm^{-1})
M	3100
M	2900
S	1684
M	1620

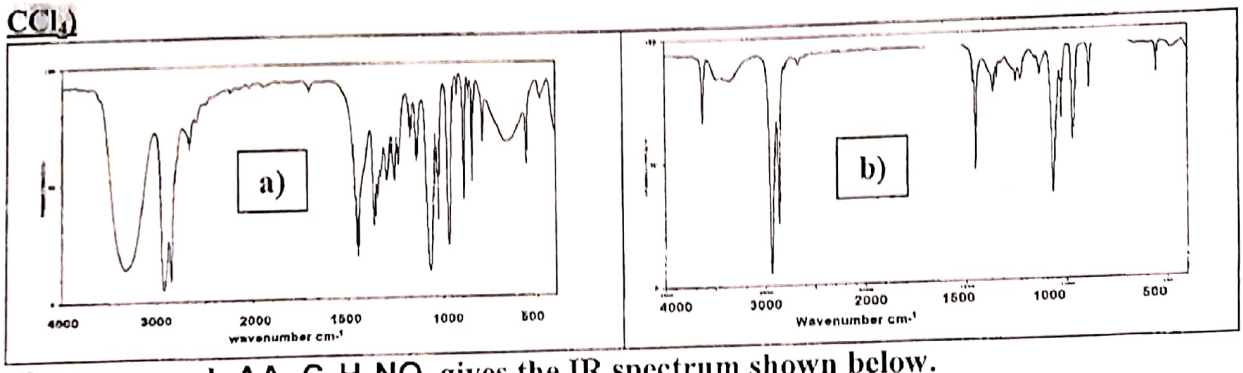
a) 

b) 

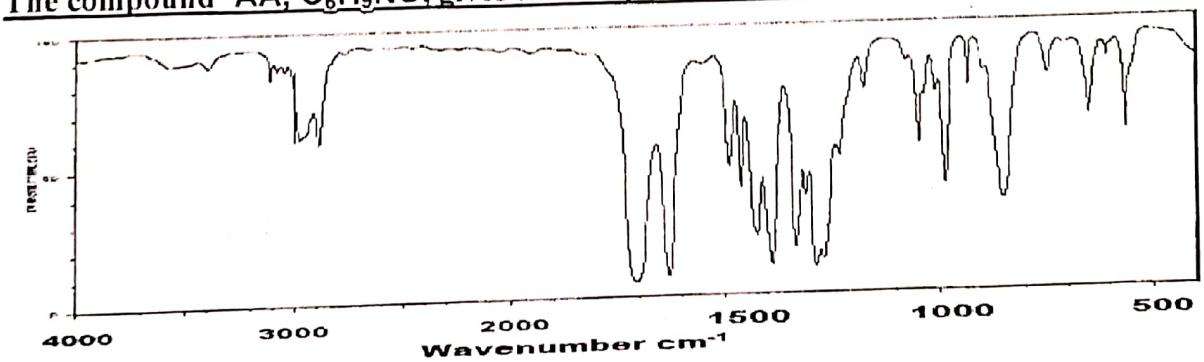
c) 

d) 

7- **Which of the following spectra represents the IR spectrum of cyclohexanol (solution in CCl_4)**



The compound AA, C_6H_9NO, gives the IR spectrum shown below.



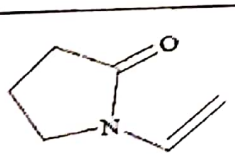
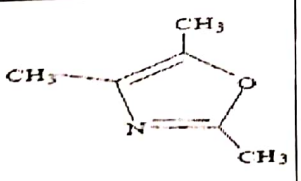
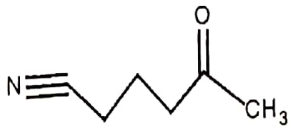
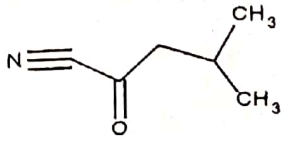
8- **How many DBE's are in compound AA?**

a) 4 b) 3 c) 2 d) 1 e) 0

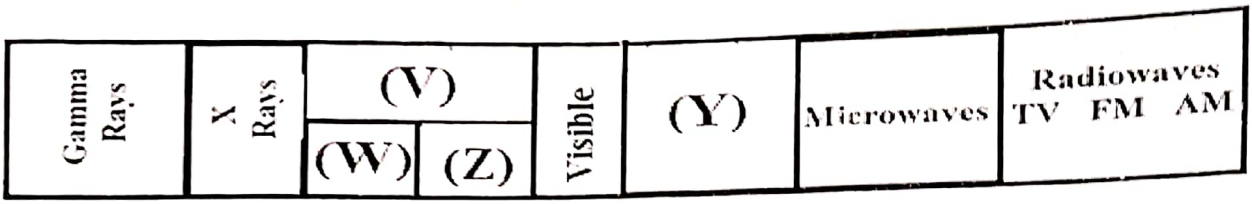
9- **If all of the normal ^{14}N in this compound was replaced by ^{15}N, where would the stretch at 2250 cm^{-1} shifts (in cm^{-1})?**

a) 3300 cm^{-1} b) 2250 cm^{-1} c) 1954 cm^{-1} d) 1600 cm^{-1} e) 1134 cm^{-1}

10- **Compound AA is .....**

a)	b)	c)	d)
			

The following figure represents the electromagnetic spectrum. Answer questions (11 to 14).



11- Which of the following is the expected wavelength of an EMR in region (Z)?

a) 50 μm b) 250 nm c) 100 nm d) 800 nm

12- The wavenumber of the EMR selected in the previous question is ……cm^{-1}.

a) 200 b) 10×10^4 c) 4×10^4 d) 12500

13- An EMR with a wavelength of 500 nm is considered to be ……

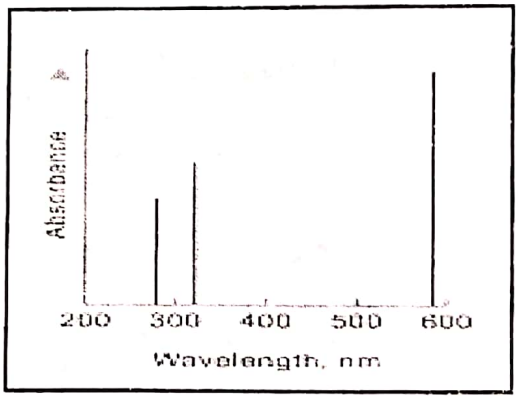
a) monochromatic radiation b) polychromatic radiation c) a and b

14- The energy of a photon in (W) region …… that in (Y) region.

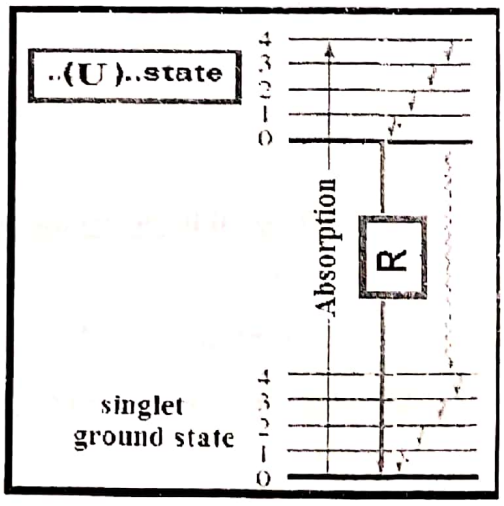
a) greater than b) less than c) Equal to

15- The following absorption spectrum represents ……transition(s).

a) electronic
b) vibrational
c) rotational
d) a, b and c



The following figure is a part of the energy level diagram. Answer questions (16 to 17).



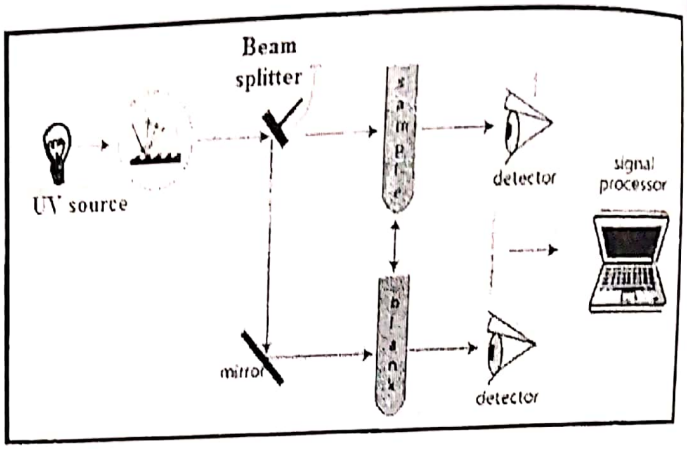
16- State (U) is termed ……

a) singlet ground state b) triplet excited state
c) singlet excited state d) doublet state

17- The relaxation (R) is described as ……

a) delayed emission b) immediate emission
c) intersystem crossing d) vibrational relaxation

This figure represents a spectrophotometer.
Answer questions (18 to 21)



18- **This instrument represents..... spectrophotometer.**

a) double beam UV/Vis absorption
b) single beam UV absorption
c) double beam UV absorption
d) double beam fluorescence

19- **..... is the type of the wavelength selector in this instrument.**

a) Prism b) Diffraction grating c) Filter d) Spectrograph

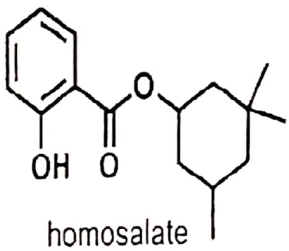
20- **The light source in this instrument is .....**

a) xenon arc b) tungsten c) deuterium d) both a and b

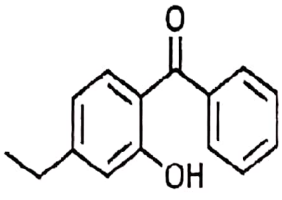
21- **The advantage(s) of this spectrophotometer is/are.....**

a) blank should be measured before sample to correct for the sample absorbance.
b) errors due to light source fluctuations are minimized.
c) Very slow and tedious scanning of the spectrum.
d) a, b and c

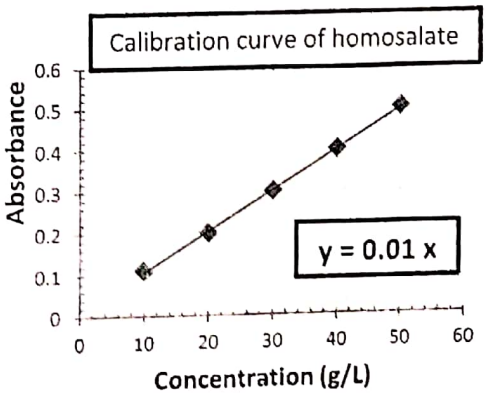
You are provided with the chemical structure of two sunscreen agents; homosalate and oxybenzone. Also the calibration curve of homosalate is illustrated.
Please answer questions (22 to 30)



homosalate



oxybenzone



22- **All possible electronic transitions associated with homosalate in near UV region are .....**

a) n-π* and π-π * b) σ-σ* and π-π* c) σ-σ* d) a and b

23- **Oxybenzone is described to contain ..... chromophores.**

a) isolated b) conjugated

24- **An auxochrome in oxybenzone is .....**

a) -OH b) -C=O c) benzene d) a, b and c.

25- **The most suitable solvent for recording the UV spectrum of oxybenzone is .....**

a) benzene b) acetone c) ethanol d) a, b and c.

26- **The expected λ_{max} for oxybenzone is ..... nm.**

a) 220 b) 240 c) 256 d) 320

27- **..... is expected to have the highest sunscreen protection factor (SPF).**

a) Homosalate b) Oxybenzone

28- **The slope of the provided calibration curve is termed .....**

a) ε b) $A_{1cm}^{1\%}$ c) a d) none of these

29- **If the absorbance of sample containing homosalate equals 0.25, the calculated concentration of homosalate in the sample from regression equation (y = 0.01x) equals .....g/L.**

a) 10 b) 50 c) 30 d) 25

30- **Factors that affect the absorbance of homosalate in sample may include .....**

a) concentration of the sunscreen b) solvent used

c) temperature d) a, b and c

Good Luck!