Faculty of Science
Chemistry Department
Fourth level (Chemistry)
First Term 2017/2018

Subject: Chemotherapy (Chem. 435)
Total Marks: 100 (70 Written, 10 Oral, 20 continuous)
Date: 15/01/2018
Exam pages (6) (٦ صفحات الإمتحان)

Total no. of Question (6) **(draw the structure if possible)**

1. IN TABLES Compare between of the following: (14 marks)

a.	Tumor	Cancer

b.	Antigen	Antibody

c.	Mode of action of chloramphenicol	Mode of action of quinolones

د/ هبه عبد الغنى صهيون

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d.	Cell differentiation	Cell proliferation

2. Answer the following questions: (9 marks, 1.5 mark for each)

a. What are the advantage of penicillin V over penicillin G? with structure.

.....

.....

b. Why sulfa drugs have selective toxicity to bacterial cell and not human cell?

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.....

c. What is DLT?

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d. What are the Tetracycline side effects?

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e. What is the mechanism of action for penicillin?

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أنظر خلف الورقة ←←←

f. What is the prodrug? Give an example with structure and equation.

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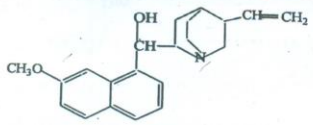
3. Writ the synthesis of the following: (10 marks, 5 marks for each)

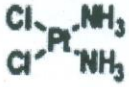
1. **Sulfa drug synthesis.**

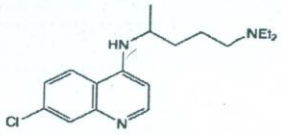
2. **Arsenical drugs synthesis with an example.**

4. A. Complete of the following: (3 marks)

These structures are for _____, _____, _____







B. Choose from the following; each choice may be used once, more than once or not at all. (14 Marks, 1 mark for each)

1. A viral or bacterial invasion of the nose is called.	a. Chemotherapeutic index
2. CA 125	b. Monoclonal antibody
3. A viral or bacterial invasion of the throat is called.	c. Cidal
4. Cancer antigen 19-9	d. False
5. Term used to describe growth or cellular multiplication.	e. Plasia
6. AFP	f. True
7. Substances that can be found in the body when cancer is present	g. Elevated in colorectal cancer and in patients with pancreatic cancer.
8. From its adverse effect is Gray baby syndrome	H. otitis
9. Term used to describe an inhibition of bacterial growth	I. elevated in 90% of patients with advanced ovarian cancer
	J. is elevated in hepatocellular carcinoma
10. CEA	K. Chloramphenicol
11. Parenteral route of administration means	L. Oral
12. It is a response within a system (molecule, cell or organism) that influences the continued activity or productivity of that system	M. Pharyngitis
	N. Tumor marker
13. The maximum tolerated dose per kilogram of body weight to the minimum curative dose per kilogram of body weight	O. Sinusitis
	P. Static
14. Are laboratory-produced molecules that were produced by one type of immune cell to enhance the immune system's attack on cancer cells.	Q. intravenous and intramuscular
	R. Feedback system
	S. Used to diagnose or screen for colorectal cancer

أنظر خلف الورقة ←←←

6. Chose the most correct answer: (20 marks)

1. What statement is true regarding to the mean of infection?

a. An inflammation that causes green mucus.
b. A true diagnosis of an inflammation.
c. The phenomenon caused by overuses of an antibiotic.
d. A disease caused by microorganism such as bacteria, viruses, or fungi.

2. The ..... cells terminate cancer cells and cells infected by virus or bacteria.

a) White blood b) killer T c) red blood d) specific defense

3. Is the expansion of immature cells with a corresponding decrease in the number and location of mature cells.

a) metaplasia b) hyperplasia c) dysplasia d) neoplasia

4. Alkylating agents are most active in the resting phase of the cell therefore they are cell-cycle non-specific (True or false).

5. The greatest number of allergies is reported for what antimicrobic drug?

A) Sulfonamides B) Tetracycline C) Quinolones D) Penicillins

6. ..... cell death is always engaged with inflammation.

a. Apoptotic. b. Necrotic. c. Cancer. d. Bacterial.

7. The trimethoprim mode of action is inhibition of

a- sequential blocking. b- dihydropteroate synthetase.
c- dihydrofolate synthase d- dihydrofolate reductase.

8. The G1 phase has the most variable length of all phases in the cell cycle. (True or False)

9. Replication of the genome occurs in the _____ phase of the cell cycle.

A) G0 B)G1 C)G2 D) M E)S

10. During the cancer cell cycle, there is replication of the entire genome and division of the cell into genetically identical daughter cells (True or False)

11. Which antibacterial drug does not inhibit protein synthesis?

A) Aminoglycoside B) Tetracycline C) Penicillin D) Chloramphenicol

12. Which of the following is an inherited method by which organisms resist antibiotic?

A) Transfer of plasmid B) Synthesis of enzymes that inactivate the drug
C) Decrease in drug uptake and drug permeability into the cell
D) Change in the number or affinity of drug receptor sites

أنظر خلف الورقة ←←←

13. _____**is a protein made by cells of the prostate gland, and its level can be high in prostate cancer**

A) CEA B) CA19-9 C) CA15-3 D) PSA

14. Which of the following antibiotics is bacteriostatic and broad spectrum?

A. Sulphanilamide. B. Penicillin C. Aminoglycosides. D. None of these.

15. Tumor markers can be helpful in

a) Diagnosing cancer b) Predict variety of cancer treatment
c) Detecting recurrent cancer d) Both a and b e) Both a and c

16. Half-life time of a drug is required to

A. Metabolize half of the drug into the active metabolites.
B. Absorb a half of an introduced drug.
C. Change the amount of a drug in the plasma by half during elimination.
D. Half the time needed for the body to localize the drug dose into the infected organ.

17. The entrance of hydroxyl group into the aldehyde molecule reduces the reactivity and physiological action of these bodies. (True or False)

18. What is the characteristics of intramuscular route of administration

a. Only water-soluble solution can be injected
b. Suitable for oily solutions only
c. The action developed are slower than oral administration.

19. At which cell cycle phase is the cell cycle stopped if the cell's DNA is damaged?

a. G0 b. G1 c. G2 d. S e. M

20. The type of programmed cell death that is a part is normal development is called _____.

A) mitosis B) apoptosis C) necrosis D) angiogenesis

The End of exam

Kafr El-Sheikh University
Faculty of Science
Chemistry Department
Fourth Year of Chemistry
Final Exam

Date: 11/1/2018
Time of exam: 2 hours
Score: 70
Chemistry of catalysis

Answer the following questions and write your answer in the answer sheet

Question No.I: Choose the number of the more correct answer (30 درجة)

1 -The rate of the catalytic reaction for production of ammonia depends on: a) what happens on the surface b) how fast the H_2 and N_2 are transported to the surface c) how fast the ammonia is transported away d) All of the above

2- Catalyst affects the rate of the chemical reaction via: a) Increase reaction rates
b) Simplify the reaction steps c) Carry out reaction under mild conditions
d) All of the above

3- Catalysis can participate in reducing the wastes of chemical reactions, and this goal can be achieved by: a) Improving selectivity toward desired products
b) Consuming fewer raw materials for products synthesis c) Less unwanted wastes
d) Replacing harmful/toxic materials with readily available ones. e) All of the above

4- For homogeneous catalysis the rate of the reaction depends on:
a) What happens on the surface b) How fast the reactants are transported to the surface
c) How fast the product is transported away d) none of the above

5- A measure of the catalyst's ability to resist its deactivation is referred as:
a) Activity b) stability c) selectivity d) Reproducibility

6- The substance that converts to catalyst in situ is referred as:
a) Pre-catalyst b) Co-catalyst c) Promoter d) True catalyst

7- Some of the most powerful catalytic poison is: a) arsenious oxide
b) Hydrogen cyanide c) carbon monoxide d) All of the above

8 - The activity of a catalyst can be enhanced by mixing it with a small quantity of a material called: a) Pre-catalyst b) Co-catalyst c) promoters d) Initiators

9 - At the end of the catalytic reaction the catalyst remains unchanged in its:
a) Reactivity b) chemical composition c) stability d) purity

10- Catalysts can be either heterogeneous or homogeneous, depending on whether a catalyst exists in the same phase as: a) the product b) the intermediate
c) The substrate d) none of the above

11- General base catalysis refers to reactions which are catalyzing by all: a) organic bases
b) Proton acceptor c) hydroxyl radical d) All of the above

12 - The stage in reaction where the reactant molecule is strained or distorted but the reaction has not yet occurred is referred as: a) Excited state b) Transition state
c) Ground state d) None of the above

13- There are certain reactions which one of the products formed during the course of the reaction catalyzes the reaction; this kind of catalysts is referred as:
a) Pre-catalyst b) Auto catalyst c) Co-catalyst d) Positive catalyst

14- Increase rate of reaction caused by catalyst allowing for reaction to occur with alternative mechanism with lower activation energy is observed for: a) Heterogeneous catalysis
b) Homogeneous catalysis c) Auto catalysis d) none of the above

15- In the induced-fit model of enzyme action: a) the active site is flexible, not rigid
b) The shapes of the enzyme, active site, and substrate adjust to maximize the fit
c) There is a greater range of substrate specificity d) All of the above

16- Catalysis and catalysts play one of the key roles in pollution controls in combination with industrial processes via: a) reduce the amount of waste b) Change the composition of emissions c) Converting harmful gases to non-harmful ones d) All of the above

17- Deactivation of the catalyst can be caused by: a) Presence of impurities in feed
b) Thermal deterioration, volatility and hydrolysis of active components.
c) Attrition due to mechanical movement or pressure shock d) All of the above

18- A measure of the catalyst's ability to promote only the rate of desired reaction and also retard the undesired reactions is referred as: a) Activity b) stability
c) Selectivity d) Reproducibility

19- A full account of how a catalyst works requires a description of how:
a) Reactant molecules are transported to the catalyst
b) The path way for conversion of reactants into products.
c) Fast the product is transported away d) All of the above

20- A term for a multi step reaction mechanism that involves a catalyst is known as:
a) The catalytic reaction sequence b) The catalytic reaction mechanism
c) The catalytic cycle d) All of the above

21- The substrate molecule activates by intact or it may dissociate in the case of:
a) Chemisorption b) Physisorption c) Absorption d) Desorption

22- A term for a multi step reaction mechanism that involves a catalyst is known as:
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c) The catalytic cycle d) All of the above

23- Reaction mechanisms are poorly understood in general in the case of: a) Heterogeneous catalysis b) Homogeneous catalysis c) Auto catalysis d) Acid base catalysis

24- The surface onto which adsorption can occur is referred as: a) Adsorbent
b) Adsorbate c) Coverage d) None of the above

25 - In the lock-and-key model of enzyme action: a) Only substrates with the matching shape can fit b) The substrate adjust its shape to maximize the fit, which improves catalysis
c) The enzyme, active site adjust its shape to maximize the fit d) All of the above

26- The process, in which adsorbed molecules escape from solid surfaces, is called:
a) Absorption b) Physisorption c) Adsorption d) Desorption

27- A quantitative measure of how fast a catalyst works is referred as:
a) Activity b) stability c) selectivity d) None of the above

28- The surface onto which adsorption can occur is referred as: a) Adsorbent
b) Adsorbate c) Coverage d) None of the above

29- Molecules or atoms that adsorb onto the surface is referred as: a) Adsorbent
b) Adsorbate c) Coverage d) None of the above

30- The substrate molecule can activate by intact or it may dissociate in the case of:
a) Chemisorption b) Physisorption c) Absorption d) Desorption

Question No. II: Check (√) or (X) and for the false write the correct answer **(10درجات)**

1- In the case of the Chemisorption the temperature to occur is low ( )

2- The lock-and-key model of enzyme is more consistent with a wider range of enzymes. ( )

3-For a large-scale application, the stability of a catalyst may be even more important than its activity. ( )

4- Co-catalysts are easier to store but are easily activated in situ. ( )

5- Only a small amount of the catalyst is required but there are some homogenous catalyzed reactions where the rate of the reaction increases with the increase in the concentration of the catalyst. ( )

6- A Catalyst has a range of temperature at which the catalyst is most active. ( )

7- It has been found from thermodynamics that whether a reversible reaction takes place in the presence of a catalyst or not, the free energy of the process is same. ( )

8- If the poison of the catalyst is held on the surface of the catalyst by physical forces, the poisoning is permanent. ( )

9- Typically heterogeneous catalysts are dissolved in a solvent with the substrates. ( )

10- There is little difficulty in separating and recycling the catalyst in the case of autocatalysis. ( )

Question No. III. Complete the following : **(20 درجة)**

1- Based on the catalysts action, catalysts can classify as ……., ……., ……., ……..

2- For enzyme (E) catalysis, the overall reaction for the conversion of substrate (S) to product can be written as: ……

3- Catalysts (enzyme) participates most part of life cycle, e.g. forming, ……., ……., … *etc*

4- The general requirements for a good catalyst are ……., ……. and ……

5- Catalysts generally react with one or more reactants to form …….. that consequently give the final reaction product

6- For the catalytic cycle, the initial step entails …….. of one or more reactants by the catalyst, and the final step is the …….. of the product and …….. of the catalyst.

7- The reason of the poisoning of catalysts is probably due to the preferential …….. of the poison on the active centers of the catalyst.

8- The promoter action can be explained by suggesting that the promoter increases ……

9- For homogeneous catalysis both catalyst and all reactants/products are ……..

10- Based on the ways catalysts work, catalysts can classify as ……

11- For homogeneous catalysis both catalyst and all reactants/products are ……

12- The homogenously catalyzed reactions catalyzed by hydrogen or hydroxyl ions and are generally included under the heading of ……

13- The promoter action can be explained by suggesting that the promoter increases ……

14- In the titration $H_2C_2O_4$ by $KMnO_4$, the reaction is slow in the beginning of but it becomes fast as soon as …….. is formed during the course of the reaction.

15- Catalytic converters reduce car engine emissions by …….. CO and NO onto catalytic surface, where the gases undergo a ……

16- A measure of the extent of adsorption of specie onto a surface is known as ……

- Complete the following sentences describe how heterogonous catalyst work:

17- Firs, the reacting molecules adsorb onto "active sites" on the surface of the catalyst

18- Second, …….. within the reacting molecules are ……

19- Third, …….. between the resulting fragments form in part due to their……..

20- Finally, the products …….. from the surface, …….. the active sites.

Question IV (10 درجات)

i) Chlorine free radicals catalyze the decomposition of ozone molecules, write the reactions involved in this catalytic process.

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ii) - The harmful emissions of a car engine includes

1- .....
2- .....
3- .....

iii) - Catalysis always involves a cycle of reaction steps. Define this catalytic cycle and draw the general catalytic cycle.

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المستوى الرابع الفترة الصباحية الإثنين ٢٠١٨/١/١٥

Kafrelsheikh University
Faculty of Science
Department of Chemistry

جامعة كفر الشيخ
كلية العلوم
قسم الكيمياء

(الفصل الدراسى الأول – العام الأكاديمى ٢٠١٧ / ٢٠١٨م)
(الفرقة الرابعة – كلية العلوم – برنامج الكيمياء)
المادة :- كيمياء الأصباغ (كود المقرر: ك ٤٣٤)
الزمن :- ساعتان

Answer the following questions -:-

[1] Write briefly on the direct azo dyes with discussing desirable features required for obtaining good substantivity. (18 degree)

[3] Write briefly on each of the following -:-

(a) Azo/hydrazone tautomerism for hydroxyazo dyes and its effect on color. (10 degrees)

(b) The optimum azo coupling reaction conditions. (10 degrees)

(c) Reactive azo dye system based on the nucleophilic addition mechanism. (10 degrees)

(d) Azo-metal complex dyes system containing salicylic acid groups. (11 degrees)

(e) Evidences for chemical combination between dye and fiber in reactive azo dyes. (11 degrees)

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(مع خالص تمنياتى بالتوفيق والنجاح)

(أ.د./ أشرف الشهاوى)

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إنتهت الأسئلة

المستوى الرابع الفترة الصباحية الإثنين ١ / ١ / ٢٠١٨م

Kafrelsheikh University
Faculty of Science
Chemistry Department

Subject: Instrumental Analysis
Time: 2 hours
Level: Four

Final Exam for Academic year 2017/2018

Answer the following questions:

1- Put true or false and correct:
   a- Resolving power in electron microscope is directly proportional to the wavelength of the radiation.
   b- Fluorescence signal is monitoring at 180^0 from the light source.
   c- In light microscope, the morphology of the surface nanoparticles could be investigated.
   d- The signal in Raman spectroscopy is diffusion of light.
   e- The photomultiplier detects electrons based on mass.

2- Write on:
   a) Magnification in microscopy. b) Resolving power of SEM.
   c) Ionization techniques in mass spectrometry.
   d) Photoelectric effect. e) Difference between SEM and TEM

3- In order to choose the analytical technique, time, physical property, sample quantity, and accuracy should be considered (Discuss).

4- 20 Carbamazepine tablets were found to weigh 10.0g in total. The tablets were ground to a fine powder using a pestle and mortar. A 0.30g sample of the powder was boiled with 25ml ethanol for a few minutes.

5- The thermal decomposition of the zinc(II) complex $[LZnSC_6H_5](ClO_4)$. 3H2O, was recorded at temperature range of 25 to 900 °C. The results exhibits that the first step in the TG plot corresponds to the lose of three molecules of water (Found 7.6 %), the second step due to the elimination of the perchlorate counter anion (ClO_4) (Found 9.6 %) and the final stable residue is Zn (Found 8.20 %).
   a- Sketch The TGA-DTG curve of complex .
   b- Calculate the theoretically percentage for every steps.

6- Compare between light and electron microscopes?

With my best wishes

Dr. Hamdy El-Sheshtawy

Kafrelsheikh University
Faculty of Science
Geology Department

Full mark: 100 (70 written, 10 oral, 20 Lab)

Date: January, 1, 2018
Time allowed: 2 hrs
Grade: 4th Level – Geology
Exam in two pages
G431

Final Exam (Remote sensing & Geographic Information System GIS)

الامتحان في صفحتين

Note: support your answer by drawings.

Answer on the following questions

1. **Define of the SEVEN ONLY of the following concepts:** (10 marks)

   1) Topology
   2) Pixels
   3) The four Ms
   4) Atmospheric scattering
   5) Attributes
   6) Band
   7) Georeferencing
   8) Revisit period

2. **Compare between ONLY THREE of the following:** (12 marks)

   1) Rayleigh and non-selective scattering.
   2) Graphical representation types of spatial data.
   3) Pattern and texture visual interpretation of image analysis.
   4) Supervised and unsupervised classification.
   5) Linear contrast stretch and histogram-equalized stretch.

3. **Write in brief ONLY TWO of the following:** (20 marks)

   1) Types of resolution in satellite images and discuss two only.
   2) Using remote sensing in mineral exploration and minimize the effects of the natural hazards. (إجباري)
   3) Polarization in microwave energy.

4. **Discuss in details TWO ONLY of the following:** (15 marks)

   1) Geometric correction in preprocessing of digital image processing.
   2) Using edge matching and rubber sheeting in data editing of GIS database.
   3) Using buffering techniques as data analysis method in GIS and its important.

5. **Draw ONE ONLY of the following:** (6 marks)

   1) GIS work flow.
   2) The conceptual view of data stream in GIS.

6. **Mark true or false for the following (correct the wrong one/s)** (7 marks)

   1. The raster storage uses a series of equal-sized cells. ( )
   2. Whenever to be the finer the resolution, the more total ground area can be seen. ( )

3. Raster is a data structure, used to store spatial data. ( )
4. GIS consists of two types of data: non-spatial and attribute. ( )
5. Raster data is always more accurate than vector data. ( )
6. Microwave radiation can penetrate through cloud cover, haze, dust and all but the heaviest rainfall. ( )
7. You can't group points and lines into the same shape file. ( )

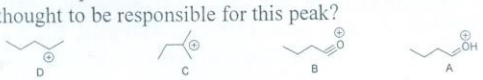
Good Luck

Dr. Mohamed Elhossainy

2. A $C_9H_{12}O_3$ compound has two strong infrared absorptions between 1100 and 1250 cm^{-1} and at 1600 cm^{-1}. The ^1H NMR spectrum has sharp singlet peaks at δ 3.6 and 6.6 ppm (intensity ratio 3:1). The ^{13}C NMR spectrum shows three lines at δ 165, 115 and 55 ppm. Which of the following compounds best fits this data?
   A. 1,3,5-trimethoxybenzene
   B. 1,2,3-trimethoxybenzene
   C. 2,4,6-trimethyl-1,3,5-benzenetriol
   D. 1-phenyl-1,2,3-propanetriol

3. A $C_7H_{14}O$ compound has a strong infrared absorption at 1715 cm^{-1}. The ^1H NMR spectrum consists of two signal groups: δ 1.10 ppm (d) and δ 2.77 (m), ratio 6:1. The ^{13}C NMR spectrum shows three lines at δ 218, 39 and 18 ppm. Which of the following compounds best fits this data?

4. The mass spectrum of 3-pentanone has a very large ion peak at m/z = 71. Which of the following ions is thought to be responsible for this peak?



5. Assuming all the compounds listed below yield an observable molecular ion, which would have an odd number m/z value for this ion?
   A. $C_7H_{10}N_2O$ B. $C_8H_{10}NI$ C. $C_9H_{15}F$ D. All the above have odd mass molecular ions

6. The ^1Hnmr spectrum of diethyl ether shows?
   A. Two peaks, one a triplet, the other a doublet
   B. Four peaks, all doublets
   C. Two peaks, one a triplet, the other a quartet
   D. Four peaks, all triplets

7. Which of the following compounds has three different sets of structurally equivalent hydrogen atoms?

8. Which if any of the following compounds will display spin-spin splitting in the ^1H NMR?
   A. $Cl(CH_2)_3Br$ B. $Me_3CCOOCH_3$ C. $(CH_3)_3CCOCH_3$ D. none of these

9. Which spectroscopic tool would be best for c a sample of bromocyclohexane from chlorocyclohexane?
   A. mass spectrometry B. UV spectroscopy C. IR spectroscopy D. ^1H NMR

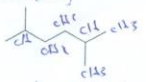
10. Combustion analysis of an organic compound shows it to be 61.2% carbon. It displays a molecular ion at m/z = 98 in the mass spectrum. Which of the following is a plausible molecular formula for this compound?
    A. C_7H_{14} B. $C_6H_{10}O$ C. $C_5H_6O_2$ D. $C_4H_2O_3$

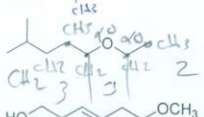
انتهت الأسئلة – مع التمنيات بالتوفيق
أنظر خلف الورقة

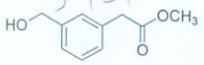
	Final exam of organic spectroscopy (2) Fourth level – written exam Time: 2 hours - two pages	

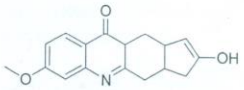
I. Answer the following questions (40 marks):

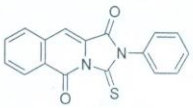
1. State how many peaks you would expect to see in the carbon-13 spectrum of the following molecules:

1. 

2. 

3. 

4. 

5. 

2. Compound **A** have the general formula $C_7H_{14}O$ gave the following spectroscopic data: I.R. ν = 2960 and 1720 cm^{-1}, ^{1}H-NMR ($CDCl_3$, 500 MHz); δ = 0.96 ppm (t, 3H), 1.61 ppm (quintet, 2H), 2.45 (t, 2H); ^{13}C-NMR; δ = 13.5 ppm, 16.7 ppm, 43.0 ppm, 208.2 ppm; MS: m/e, M^+ = 114 (6%), 71 (15%), 43 (100%). Give the chemical structure and make interpretation for all the above data.

3. Compound **A** have the general formula $C_{10}H_{14}O$ gave the following spectroscopic data: I.R. ν = 3250 and 2983 cm^{-1}, ^{1}H-NMR ($CDCl_3$, 500 MHz); δ = 1.34 ppm (s, 9H), 5.00 ppm (broad s, 1H), 6.65 ppm (d, 2H), 7.12 ppm (d, 2H) ; ^{13}C-NMR; δ = 31.5 ppm, 34.8 ppm, 115.3 ppm, 126.6 ppm, 139.7 ppm, 154.2 ppm; MS: m/e, M^+ =150 (21%), 135 (100%), 107 (34%). Give the chemical structure and make interpretation for all the above data.

4. Compound **A** have the general formula $C_4H_{10}O$ gave the following spectroscopic data: I.R. ν = 3340 and 2958 cm^{-1}, ^{1}H-NMR ($CDCl_3$, 500 MHz); δ = 0.96 ppm (t, 3H), 1.21 ppm (d, 3H), 1.48 ppm (quartet, 2H), 2.00 (s, 1H), 3.39 ppm (quintet, 2H); ^{13}C-NMR; δ = 7.5 ppm, 22.7 ppm, 32.9 ppm, 70.6 ppm; MS: m/e, M^+ = 74 (17%), 45 (100%), 29 (36%). Give the chemical structure and make interpretation for all the above data.

5. Compound **A** have the general formula $C_4H_8O_2$ gave the following spectroscopic data: I.R. ν = 2986 and 1743 cm^{-1}, ^{1}H-NMR ($CDCl_3$, 500 MHz); δ = 1.30 ppm (t, 3H), 2.01 ppm (s, 3H), 4.12 ppm (q, 2H) ; ^{13}C-NMR; δ = 13.6 ppm, 17.3 ppm, 59.2 ppm, 171.0 ppm; MS: m/e, M^+ =88 (50%), 59 (32%), 57 (85%), 29 (100%). Give the chemical structure and make interpretation for all the above data.

II. Choose the correct answer (30 marks):

1. An unknown compound displays a molecular ion at m/z = 83. The ^{13}C NMR spectrum shows three lines at δ 126, 28.5 and 28.1 ppm. The infrared spectrum shows a sharp strong absorption at 2235 cm^{-1}. Which of the following compounds best fits this data?

انظر خلف الورقة

Kafrelsheikh University
Faculty of Science
Physics Department

Time: 2h
Subject: Laser and its application
Total Marks: 100 (70 W, 20 Ex, 10 Or)
Date: 25/12/2017
Exam in one pages

Answer the following questions:

Q1. (20 degree)

a) Deduce the occupied probability that energy level E_m of an arbitrary atom (Boltzmann& Fermi-Dirac distribution)?

b) Calculate the ratio of the population numbers (N_1, N_2) for the two energy levels E_2 and E_1 when the material is at room temperature (300K), and the difference between the energy levels is 0.5 [eV]. What is the wavelength (λ) of a photon, which will be emitted in the transition from E_2 to E_1?
(Where, $h=6.626\times10^{-34}$J.sec, $c=3.18\times10^{8}$m/s, $q=1.6\times10^{-19}$J/eV, and $k=1.38\times10^{-23}$J/K)

Q2 (Theory of lasing oscillation) (25 degree)

Explain in detail:

a) Optical amplification and feedback (laser amplification, and feedback and loss in optical resonator)

b) Condition for laser oscillation (threshold gain condition, threshold population difference)

Q3 (25 degree)

Explain in detail:

a) Amplifier power source Rate Equation, and Steady-state population difference in presence of amplifier radiation.

b) Four-and three level pumping schemes (show that N_0, and τ_s are in general nonlinear functions of pumping transition probability W)

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With my best wishes Dr. Abdel-Hamid El-Shaer