Tanta University
Faculty of Science
Department of Chemistry

Exam. for 3rd year students (Double major)

Quantum Chemistry Course Code: CH3141

Jan. 17, 2023 Term: first Total Assessment Marks: 50 Time Allowed: 2 Hours

Answer the following questions:

I- Choose only one answer for each of the following questions: (20 Marks)

1. The variable affecting on the eigen value of wave function for a particle in box is:
   i-time ii- position iii- time and position iv- None of them
2. The probability density of negative charge cloud at a node equals:
   i-constant ii- imaginary value iii- zero iv- all of them
3. The difference between time-dependent and time-independent Schrödinger equations:
   i- Hamiltonian operator ii- Eigen function iii- kinetic energy iv- Non of them

4- A wave function affected by kinetic and potential energies is:
   i-Eigen function ii- characteristic iii- acceptable iv- All

5- Wave function for any system depends on:
   i-coordinate X ii- coordinate Y iii- coordinate Z iv- all

6- For a particle in box, increasing quantum number n:
   i- increasing energy ii- increasing reactivity iii- increasing energy difference iv-All

7-The Hamiltonian operator is:
   i-square of $\Psi(t)$ ii-square of $\Psi(x)$ iii- square of $\Psi(x,t)$ iv-none of them

8- π -overlap is weaker than σ-overlap because of:
   i-face to face ii- stronger bond iii- lower energy iv- higher energy

9- Noble gas will not exist as a molecule because:
   i-bonding and antibonding orbitals are occupied ii-No overlap iii-bond order=0 iv- All

10- Eigen value of Harmonic Oscillator depends on:
   i-Frequency ii-Mass iii- Length iv-None of them

11- Number of overlaps depends on:
   i-Number of bonds ii- Order of bond iii- Types of overlap iv- Types of bonds

12- The spherical polar function depends on:
   i- Radial function ii- Angular Θ function iii- Angular φ function iv- All

13- Atomic wave function (d-) has quantum numbers:
   i- 2,1,0 ii-3,1,1 iii- 1,0,0 iv-3,2,1

14- Number of bonds for N_2 molecule equals:
   i-One ii- Two iii- Three iv- None of them

15- Cartesian coordinates describe the function with:
   i-polar shape ii- circular shape iii- radius shape iv- None of them

16- 3d orbital has higher energy than 4s orbital because of:
   i- Principle number ii- Magnetic quantum number iii- Shape of charge iv- All

17- The postulates of molecular orbital theory are:
   i- Atomic orbital ii- Molecular orbital iii- Number of overlaps iv- All

18- Any wave function should be solved:
   i- Mathematically ii- Experimentally iii- Virtually iv- None of them

19- Type of overlap is affected by:
   i-Symmetry ii-orientation iii- bond order iv-all

20- Quantum chemistry is a branch of:

i-Quantum physics ii- quantum dot iii- quantum computing iv- None of them

II- Calculate each of the followings: (10 Marks)

a- Eigen value of a particle of mass (m) in the first energy level of one-dimensional box with walls x= +2.

b- Eigen function of a particle in the y-direction box in second energy state with walls y=L.

c- The potential energy of a particle inside one-dimensional box with walls with x= +a and x= -a.

d- The bond order of the formed molecule from atoms with atomic number =3.

e- The number of molecular wave function for the anion H_2^{+1}.

III-1- The formation of molecular wave function is explained by molecular orbital theory, Draw the correlation diagram for F_2 molecule showing the atomic and molecular orbitals and the type of overlap for each molecular orbital.

(At. Number, C=6, N=7, O=8 and F=9) (10 Marks)

2- How many overlaps in a F_2 molecule? (2 Mark)

3- Calculate the bond order of N_2 molecule. (2Mark)

4- Explain the bond in H_2 molecule? (2 Mark)

5- What type of bond in C_2 molecule? (2 Mark)

6- Differentiate between bonding overlap in O_2 and Be_2. (2 Mark)

Good Luck

Prof. Dr. Mohamed K. Awad *Prof.Dr. Faten M. Atlam*

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF CHEMISTRY

FINAL EXAM FOR 3RD LEVEL STUDENTS OF SENIOR STUDENTS (DOUBLE MAJOR)

COURSE TITLE:	TRANSITIOM METALS	COURSE CODE:CH3147
DATE: 24 JANUARY, 2023	TERM: FIRST	TOTAL ASSESSMENT MARKS: 50	TIME ALLOWED: 2 HOURS

Answer the following questions: Questions I and II in Bubble Sheet

Question I: Multiple Choice (25 Marks)

1 Which of the following is not an iron ore?
a. Magnetite b. Hematite c. Pyrohotite d. Siderite

2 The most stable oxidation state for Co is ....., but ..... is an oxidizing agent
a. +2, +3 b. +2, +4 c. +3, +2 d. +4, +2

3 Which one has not a strong magnetic properties?
a. Iron b. Nickel c. Silver d. Cobalt

4 H_2O rusts..... but doesn't react with..... , ...
a. Fe, Ru, Os b. Ru, Os ,Fe c. Os, Fe, Ru d. None of these

5 One of the 3d elements form XCl and XCl_2....
a. Zn b. Fe c. Cu d. Ni

6 ..... forms square planner complexes while ..... forms octahedral complexes.
a. Pt(II), Pt(IV) b. Pt(IV), Pt(II) c. Pd(II), Pd(III) d. Pd(IV), Pd(II)

7 OsO_4 formed when Os react with O_2 and .....
a. dil HCl b. Aqua regia c. dil HNO_3 d. dil HF

8 Which mineral group provides most of the world's economic iron (Fe) for steel production?
a. Silicates b. Sulfides c. Carbonates d. Oxides

9 $2Cu^{+} \rightarrow Cu^{2+} + Cu^{0}$ This is an example of
a. comproportionation b. disproportionation c. synproportionation d. proportionation

10 Which metal is the most widely used (accounts for 95% of total metal production in world)?
a. Iron b. Nickel c. Gold d. Silver

11 Which of these metals will be oxidized by the ions of cobalt?
a. Tin b. Nickel c. Silver d. Iron

12 Ferrous metals have ..... similarity like lanthanides.
a. horizontal b. vertically c. diagonal d. groupal

13 Which of the following transition ions show $\underline{3d^3}$ electronic configuration? (Atomic number of: V = 23, Cr = 24, Mn = 25, Fe = 26)
a. V^{2+}, Cr^{3+}, Mn^{4+}, Fe^{5+} b. V^{4+}, Cr^{6+}, Mn^{7+}, Fe^{2+} c. V^{3+}, Cr^{3+}, Mn^{3+}, Fe^{3+} d. V^{3+}, Cr^{4+}, Mn^{5+}, Fe^{4+}

14 Cobalt is passive towards .....
a. dil. HCl b. aqua regia c. dil. HNO_3 d. dil. H_2SO_4

15 Iron rusts slowly with water forming ..... at red heat.
a. $Fe(OH)_3$ b. Fe_2O_3 c. FeO.OH d. Fe_3O_4

16 Pure iron is .....
a. soft and quite reactive b. highly reactive c. hard and reactive d. white and hard

17 Iron is:
a. More reactive than lead
b. Less reactive than copper
c. More reactive than Calcium
d. Less reactive than mercury

18 Iron (IV) sulfide is produced when Fe reacts with .....
a. the exact amount of S b. less sulfur c. excess sulfur d. sulfur dioxide

19 The ..... state of cobalt can be determined from the color of the metal.
a. oxidation b. reduction c. solid d. liquid

20 ..... is used as a catalyst, but..... . is used as an electroplated
a. Pt & Pd b. Pt & Ni c. Ni & Pt d. Ni & Pd

21 The role of limestone in the extraction of iron from its oxides is ..... .
a. make Fe complexes b. increase the temperature c. reduce slag d. remove silicates

22 Which of the following statements about the given reaction are correct? $3Fe_{(s)} + 4H_2O_{(g)} \rightarrow Fe_3O_{4(s)} + 4H_{2(g)}$
(i) Iron metal is getting oxidized **(ii)** Water is getting reduced **(iii)** Water is acting as a reducing agent **(iv)** Water is acting as an oxidizing agent
a. (i), (ii) and (iii) b. (iii) and (iv) c. (i), (ii) and (iv) d. (ii) and (iv)

23 Which ore contains both iron and copper?
a. Cuprite b. Malachite c. Chalcocite d. Chalcopyrite

24 Galvanized iron sheets have a coating of .....
a. aluminum b. tin c. zinc d. copper

25 Cobalt is the active center of a group of coenzymes called.....
a. cobaltimin b. cobalamin c. cobalimin d. cobaltase

Question II: *State whether the following statements are True or False:* **(10 Marks)**

1. A ligand is a molecule or ion that is ionically bonded to the central metal ion.
2. An oxidation number is a specific number of molecules or ions with which a transition metal will combine.
3. Fe_3O_4 is a mixture of FeO and Fe_2O_3.
4. It is difficult to extract gold from its complexes.
5. Cobalt has the ability to react with water at room temperature but doesn't react with most acids.
6. Silver is rarely found in the +1 oxidation state
7. The alloy of copper and zinc is known as Brass
8. Nickle carbonyl is considered to be highly toxic.
9. Cu is silvery white and not attacked by air at room temperature
10. Nichrome is an alloy of nickel and chromium with small amounts of carbon.

Question III: Answer each of the following: **(15 Marks)**

1. Why is copper a good conductor of electricity but not an electrolyte?
2. Why is gold not affected by the addition of acids?
3. What are the uses of gold nanoparticles when they are colored other than yellow?
4. What happens when osmium reacts with oxygen?
5. Give examples of Cu, Au, and Ag complexes.

BEST WISHES

EXAMINERS **PROF. DR. MOHAMED GABER**
Dr. YUSUF S. AL-NAJJAR

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF CHEMISTRY			
	Final Examination of for third year students (All Double Major)			
	COURSE TITLE:	Physical Organic Chemistry		COURSE CODE: CH3151
DATE:	3/1/2023	TERM: FIRST	TOTAL ASSESSMENT MARKS: 50	TIME ALLOWED: 2 HOURS

Answer the following questions: (50 marks)

1] Choose the correct answer from the alternatives a,b,c and d. (10 marks)

1) The sign of ρ in the ionization of m-and p-substituted phenyl acetic acid is .....

a) +ve b) neither c) +ve & -ve d) –ve

2) The rate of saponification of p- amino ethylbenzoate is.....

a) 1.0 b) <1.0 c) zero d) >1.0

3) The rate of alkylation of p-methoxy N-methyl aniline is .....

a) <1.0 b) >1.0 c) zero d) 1.0

4) Reaction that facilitated by electron with donating groups will have the value of ρ

a) +ve b) -ve c) +ve & -ve d) neither

5) ρ value for standard ionization reaction of benzoic acid in water at 25 °C

a) <1.0 b) zero c) >1.0 d) 1.0

6) The sign of ρ in ionization of p-cyano-phenol in H_2O at 25 °C is .....

a) -ve b) neither c) +ve & -ve d) +ve

7) Which of the following substituents increase the rate of alkylation of phenoxide ion

a) p-OCH_3 b) m- NO_2 c) p-NO_2 d) m-OCH_3

8) Insertion of single carbine with propane gave

a) n-Butane b) 2-methyl propane c) 1-Butene d) Both a and b

9) Hammett substituent constant (σ) is a measure of

a) The electronic effect exerted by a substituent on the reaction center.

b) The sensitivity of a reaction to the electronic effect of a substituent.

c) The sensitivity of a reaction to the steric effect of a substituent. d) None of the above

10) Free radical with $t_{1/2} < 10^{-3}$ second are:

a) Stable radical b) Stabilized & Destabilized radicals c) Persistent radicals d) Both a and c

2] Explain by equation: $\sigma_{p\text{-OMe}}$ substituent in base catalyzed hydrolysis of ethyl benzoate is (-ve) sign while $\sigma_{m\text{-OMe}}$ in the same hydrolysis is (+ve) sign.. (4 points)

⟶

3] Put (√) or (x) and correct the wrong answer (Explain by answers): (16 marks)

a) The sign of ρ in the solvolysis of benzylchloride in acetone is +ve value.

b) The rate of base initiated hydrolysis of p-hydroxy ethylbenzoate is more than unity.

c) Addition of phenyl radical to *tert*-butyl benzene gave 2-phenyl-*tert*- butyl benzene as a major product.

d) For a reaction in which there is no free energy change $\Delta G°$, all starting materials converted into products.

e) Increasing the temperature and using polar solvent increase the value of ρ.

f) The constant, (σ) in Hammett equation with (+ve) sign indicates that the substituent is an electron withdrawing group.

g) CH_3COOEt is more acidic than CH_3COCH_3.

h) SN^1 solvolysis of 3-chloro-1-butene in ethyl alcohol form one product of ether

4] Provide the product of the following reactions. (6 points)

a) Triplet carbene + CH_3-CH_3 →

b) $H_2O_2 + Fe^{+2}$ →

c) $\cdot CH_3 + CH_2$=CHCOOH →

5] How could you prepare: (8 points)

a) Ethyl radical from Ag^+, methyl radical from H_2O

b) Benzoic acid from benzaldehde

c) Cis 1,2-dimethyl cyclopropane from ketene

6] Arrange the following radicals according to their stability (<u>Explain and draw structure</u>) (6 points)

a) Methyl radical b) DPPH c) Isopropyl radical d) Allylic radical

Good Luck

***Prof. Dr.* Mahmmoud Taha & *Ass. Prof. Dr.* Sahar El-khalafy**

	Tanta University Faculty of Science Chemistry Department	

Final Examination for The Third Double Major (CH-BO, CHMB , CH-GE, BC)			
Course Title	Heterocyclic Chemistry		Course Code CH3153
Date 27/12/2022	First Term	Total assessment:100	Time allowed 2hrs

1-Answer by equations the following questions. (34 Marks)

a- Synthesis of 3-Methyl-2-Phenyl Pyrrole using Vilsmeier reaction.

b- o-Nitrotoluene to Indole-2-Carboxylic acid.

c- Using Skraup synthesis how you prepare 4- Methylquinoline.

d- 2-Phenylethylamine to 1-Methylisoquinoline.

2- Explain by mechanism the following. (33 Marks)

a- Aldopentose to 3- Nitrofuran.

b- Hoffman exhaustive methylation of TetrahydroPyrrole.

c- Indole to Tryptophan.

d- Discuss by examples the reactivity of different types of Picoline.

3- Answer the following questions. (33 Marks)

a- Draw the resonating structure of Pyrrole.

b- Reduction and oxidation of Pyridine.

c- Show by mechanism the ring opening of Quinoline.

d- Trimerization of Thiophene.

Prof.Dr. Mahmoud Fahmy

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF GEOLOGY			
	EXAMINATION FOR LEVEL 3 STUDENTS (GEOLOGY & CHEMISTRY/ GEOLOGY SECTION)			
	COURSE TITLE:	**Structural geology (1)**		COURSE CODE: GE 3101
DATE:	JAN. 15, 2023	TERM: FIRST	TOTAL MARKS: 100	TIME ALLOWED: 2 HOURS

I- **Complete** the following: - **(20 pts)**

1- A fold with the hinge line is not horizontal is called: .....
2- In oblique-slip faults, the net slip is equal to .....
3- A fold that closes sideways (right or left) is called: .....
4- An oval folded structure with the oldest strata in the core is termed: .....
5- The trend of north Sinai fold belt is: .....
6- A fold in which both limbs dip in the same direction: .....
7- A reverse fault has more ..... and lesser..... than the thrust.
8- Folds are considered to be close if they display interlimb angles ranging from: .....
9- Young rocks surrounded old in the rule of: .....
10-If sigma-1 and sigma-2 is horizontal, we expect to have ..... fault.

II- **Compare** with **drawing** between the following: **(20 pts)**

a- Horst and graben

b- Normal fault and reverse fault

c- Volume strain and shear strain.

d- Angular unconformity and disconformity

III- **Write** with **drawing** on the following: **(30 pts)**

a- Fault-propagation folding (FPF) and Fault-bend Folding (FBF)

b- Ramsey classification of folds.

VI- Match **TEN** words only from column (A) with column (B): **(30 pts)**

Column (A)	Column (B)
1- Detachment fold	- Recumbent fold
2- Plunge	- Unconformity criteria
3- Planar structure	- Law of superposition
4- Horizontal displacement	- North Sinai fold belts
5- Limbs	- Deformation
6- Isoclinal	- Fault Criteria
7- Thrust fault	- Strike-slip fault
8- Syrian Arc System	- No ramp
9- Basal conglomerate	- Fault plane
10-Slickenlines	- Parallel limbs
	- Fold hinge line
	- Low angle reverse fault
	- Two sides of a fold

Good Luck!

Examiners	**Prof. Mohamed Atef Noweir**	**Prof. Mohamed Abdel Wahed**

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF GEOLOGY			
	EXAMINATION FOR JENOIR (THIRD YEAR) STUDENTS OF CHEMISTRY AND GEOLOGY SECTION			
	COURSE TITLE:	Metamorphic Petrology (2)		COURSE CODE: GE3105
DATE:	JANUARY, 2023	TERM: FRIST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer the following questions, illustrating your answers with diagrams if it possible:

1-Discriminate between:

a- Metamorphic processes and limits of metamorphism ----------(10 marks)

b- Characteristic minerals of lowgrade and high grade metamorphism--------- (10 marks)

c- Textures of contact metamorphism----------(10 marks)

d- Metamorphic facies of regional metamorphism ----------(10 marks)

f- Classification of metamorphic rocks based on textures----------(12 marks

g. Mineralogical changes of basalt during regional metamorphism at different grades ----------(12 marks)

2-Write on the metamorphic reactions: devolatization reactions (rodex reactions), ion exchange, and polymorphic reaction and give examples for each reaction -------(20 marks)

3- Show difference between ACF diagram and AKFdiagram with examples and drawing- ----------(16 marks)

Best wishes

Examiners:

Prof. Gaafar El Bahariya Dr. Ismail Thabet

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF GEOLOGY			
	EXAMINATION FOR JUNIORS (THRID YEAR) STUDENTS OF GEOPHYSICS			
	COURSE TITLE:	FIELD GEOLOGY AND FIELD STUDIES		COURSE CODE: GE 3111
DATE:	1 JAN, 2023	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer the following questions, illustrating with drawing when it possible

I- Write BRIEFLY on the following:- *(30 marks)*

a- The three segments of the GPS system. (10 marks)

b- The main types of geological maps, their scales and uses. (10 marks)

c- Compare between the mapping by following contacts and in poorly exposed regions. (10 marks)

II- Geophysics can play an important role in providing very useful information for any mapping programme. EXPLAIN how passive geophysical techniques can help in geological mapping. **(20 marks).**

III- Choose the CORRECT answer (الإجابة في نموذج التصحيح الالكتروني) *(50 marks)*

1- ..... are ridges of sediment that form in response to wind blowing along a layer of sediment. They are form perpendicular to the wind direction

(A) Bedding and lamination (B) Ripples (C) Cross-stratification (D) Convolute bedding

2- Type of metamorphism occurs due to heating, with or without burial, of rocks that lie close to a magma intrusion.

(A) Cataclastic (B) Burial (C) Contact (D) Regional

3- The main features of igneous rock samples that should be noted in the field are:

(A) Colour, texture, grain size and fabric (B) Mineralogy and chemical composition

(C) degree of homogeneity and rock shape (D) Lateral relationships

4- Which one out of these is a plutonic igneous rocks? .

(A) Gypsum (B) Gneiss (C) Basalt (D) Gabbro

5- .....refers to the size, shape and arrangement of grains or other constituents within the igneous rocks

(A) Crystallization (B) Texture (C) Mineralogy (D) Fabric

6- ..... is a metamorphic rock composed of recrystallized carbonate minerals, most commonly calcite or dolomite and is typically not foliated.

(A) Quartzite (B) Hornfels (C) Marble (D) Serpentinite

7- Stratification that is locally at some angle to the overall stratification as a consequence of changes in the geometry of the depositional surface during deposition:

(A) Graded bedding (B) Cross bedding (C) Flaser bedding (D) Lenticular bedding

8- Symbol for marl (A)  (B)  (C)  (D) 

9- A mass of igneous intrusion, typically concave upward, associated with a structural basin, with contacts that are parallel to the bedding of the enclosing rocks:

(A) Lopolith (B) Laccolith (C) Phacolith (D) Pluton

10- ..... mode of foliation that occurs in certain metamorphic rocks as a consequence of the parallel alignment of platy and lath-shaped mineral constituents.

(A) Gneissosity (B) Cleavage (C) Schistosity (D) Compositional layering

11- Description of hardness for sediment grains that difficult to separate with a pen-knite and difficult to separate with hammer.

(A) Friable (B) Very hard (C) Hard (D) Extremely hard

12- Example of sedimentary rocks that are characterized by anomalously high concentrations of iron compared with all other sediments. Whereas an iron-cemented or red- bed type of sediment can contain as much as 10% iron

(A) Rudaceous Rocks (B) Ferruginous Rocks (C) Siliceous Rocks (D) Salt Rocks

13- .....is an extremely coarse-grained igneous rock (most crystals >5 cm) formed when magma cools very slowly at depth.

(A) Andesite (B) Migmatite (C) Pegmatite (D) Granodiorite

14- All changes (physical & chemical) that occur to sediment following deposition, including compaction, cementation, and dissolution.

(A) Erosion (B) Lithification (C) Deposition (D) Diagenesis

15- is the most silica-rich of volcanic rocks. It is generally glassy or fine-grained (aphanitic) in texture, but may be porphyritic, containing larger mineral crystals (phenocrysts) in an otherwise fine-grained groundmass.

(A) Andesite (B) Rhyolite (C) Diorite (D) Basalt

16- Sedimentary rocks consisting chiefly of material of sand grade. Loose materials are sands; when consolidated they form sandstones, grits, arkoses, graywackes,

(A) Carbonate Rocks (B) Arenaceous Rocks (C) Siliceous Rocks (D) Biochemical Rocks

17-.....is a composite rock found in medium and high-grade metamorphic environments. It consists of two, or more constituents often layered repetitively; one layer was formerly paleosome. reconstituted subsequently by partial melting.

(A) Migmatite (B) Pegmatite (C) Gneiss (D) Granite

18- ..... named lithologic subdivision of a formation

(A) Group (B) Member (C) Bed (D) Flow

19- Igneous rocks have <50% silica, by weight, and contain dark-colored minerals that are abundant in iron, magnesium and calcium (e.g. dunite)

(A) Felsic (B) Mafic (C) Intermediate (D) Ultramafic

20- Field description of foliation in metamorphic rocks should include description of:

(A) Porphyroblastic texture (B) Granoblastic texture

(C) Compositional layering, cleavage and gneissosity (D) Porphyroclastic texture

EXAMINERS	**Prof. Mohamed Abd El-Wahed**	**Prof. Samir Z. Kamh**

☺Good Luck☺