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- $\pi$ -overlap is weaker than $\sigma$-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 $\Theta$ function iii- Angular $\varphi$ 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)

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*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<br>FACULTY OF SCIENCE<br>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)**

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**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**

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|---|---|---|
| | Tanta University<br>Faculty of Science<br>Chemistry Department | |

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

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|---|---|---|---|
| 1969 | Tanta University - Faculty of Science<br>Department of Zoology | | |
| | Examination for the third level (juniors) students Chemistry/Zoology program | | |
| | Invertebrates of Egypt | | Course code: Zo 3143 |
| Date: 15 Jan. 2023 | Term: first | Total assessment marks: 150 | Time allowed: 2 hours |

## First question :.....( 35 marks).

### A) Write on the following :.....(10marks).

1- Main taxonomic characters to classify Animal kingdom.
2- Diagnostic feature of phylum: Porifera.

### B) Complete the empty spaces by correct answers : ....(15marks).

1- In pelagic province,the biozones which extend to 200 m.are called ..... and..... while in benthic is called ..... .
2- Larva of demospongia is called ..... and its development is characterized by ..... .
3- Monaxonida can be classified into 3 orders called ....., ..... and .....
4- In Woese system, the living organisms are included in three domains called....., ....., and..... .which contains four kingdoms called ....., ....., ..... and..... .

C) 1- **By only full-labeled drawings show the following: .....(6 marks).**
Reduction bodies – Gemmule – Amphiblastula larva.

2- Classify marine environment according to amount of light.....**(4marks).**

## Second question :.....( 40 marks).

### I)In a table compare between the following couples(6 marks, 3 each):

**a.**Calyptoblastea and Gymnoblastea

**b.**Discomedusa and Rhizostomea.

### II) Mention the scientific terms (14 marks, 2 each):

**a.** Skin fold the found on the periphery of the medusa and has a taxonomic fnction and increase velocity of the organisms ( )

**b.** Production and emission of light in some marine organismis that is famous in schyphomedusa ( ).

**c.** Many mouths found on arms of rhizostomea ( ).

**d.**Sense organs specialized in scyphomedusa ( ).

**e.** The perisarc that covered the hydranth in calyptoblastea ( ).

**f.** A medusoid form that has a function of floating ( ).

**g.** An expression that means a variations in zooids in the life cycle ( ).

## III) Complete the following with suitable words (20 marks, 1 each):

**a.** Phylum cnidarian includes four classes. All are represented in Egyptian fauna except class----

**b.** The migration of marine organisms from Mediterranean to Red Sea called----------migration.

**c.** Life cycle of *Obelia dichotoma* has two forms of larva called....., and .....larva, while *Tubularia Larynx* life cycle has----------, and ----------larva.

**d.** The entron cavity of any hydroid in class hydrozoa have no---------- nor ----------, so it is primitive.

**e.** The craspedot medusa is .....and represented in class Hydrozoa

**f.** *Obelia dichotoma* has .....hydrotheca, while *O. geniculate* has .....hydrotheca. Their habitat in .....and discovered by .....

**g.** The sessile schyphomedusa has a shape of ....., the exumbrella is modified to be .....and the subumbrella is modified to be .....

**h.** The mauve stinger is characterized by purple color and belongs to family .....,that characterized by .....water canals. Its habitat in.....that discovered by .....

## Third question :..... (35 Marks).

1- Mention two differences between *Syllis*sp., *Cirratulus*sp., *Polydora*sp., and *Aphrodite* sp.(10 Marks).

2- Describe *Mixicola* sp. and *Dasychone*with drawing a diagram for each one. (10 Marks)

3- Mention the general characters of Phylum Rotifera and their affinities to Arthropods and Annelids. (15 Marks)

**Fourth Question :..... (40 Marks).**

**A- Write shortly on the specific characters of: (10 Marks, 5 Marks each):**

1- Class Pycnogonida 2- Super order Phyllocarida

**B- Compiete the following: (18 Marks, 2 Marks each) :**

1- All thoeacic appendages in Sub order Gammaridea are ....., specially 2nd appendage is ..... .

2- The specific character of *Corophium* sp. is ..... .

3- *Melita* sp. is characterized by ..... abdomen.

4- In *Xiphosuridians,* body is divided into ..... and ....., with ..... eyes and carry ..... pairs of walking legs, then the body ends with ..... .

**C- Put True (√) or False (X) and correct the wrong sentences: (12 Marks, 2 Marks each)**

1- Amphipods have transparent carapace cover all the body.

2- Pleon in Family Sphaeromatidae composed of 2-4 segments while, in Cirolanidae composed of 6 segments.

3- Gills present on thoracic segments in Isopods while, on abdominal segments in Amphipods.

4- Tail fan is well developed in Sub order Valvifera, but absent in Flabellifera.

5- *Nebalia* sp. has carapace covered head, thorax and 2 abdominal segments.

6- Eucaridean animals never carry oostegite.

**With best wishes**

**Examiners: Prof.SamiaEissaProf.NahlaOmran**

**Prof.Wesam Salama Dr.AalaaAtlam**

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| | TANTA UNIVERSITY<br>FACULTY OF SCIENCE<br>DEPARTMENT OF ZOOLOGY | | | |
| | EXAMINATION FOR SENIORS (THIRD YEAR) STUDENTS OF CHEMISTRY AND ZOOLOGY | | | |
| | COURSE TITLE: | Functional Histology | | COURSE CODE: Z0 3145 |
| DATE: | 1 /1/ 2023 | TERM: FIRST | TOTAL ASSESSMENT MARKS:100 | TIME ALLOWED: 2 HOURS |

**A- Answer the following questions (with draw if possible).** **(20 Marks)**

1- Write the main histological alterations among esophagus, stomach and ileum?

2- Discuss briefly why liver and pancreas are considered a mixed gland?

**B-Compare between the following:** **(30 marks)**

1- Thick skin and thin skin.

2- Olfactory mucosa and respiratory mucosa.

3- Upper esophagus and lower esophagus.

**C- Complete the following:** **(20 Marks)**

1- The apocrine sweat glands are characterized by ……..,……,……

2- Gastric mucosa are composed of different types of cells like……..,……,……..,……,……..,……which functions are ……,……,……..,……..,……..,……

3- The skin epidermis consists of the following cells ……..,……..,……..,…… Which exhibit the following functions ……,……..,……..,……respectively

4- The mucosa of the dorsal surface of the tongue is modified to form four types of papillae called ……..,……,……..,……

5- The small intestine is composed of ……..,……..,…… The mucosa of the small intestine presents folds, known as …… Which appeared like……in duodenum and ……..in the ileum.

6- The thick skin differs from the thin skin in the absence of ……..,……

7- The sub mucosa of the duodenum contains numerous glands are called ……..which function are ……

8- The conducting portion of the respiratory system consists of ……..,……..,……..,……..,……..,…… While the respiratory portion consists of ……..,……..,……..,……..

9- The wall of the alveoli is composed of two type of cells ……..and ……which functions are ……..and ……..respectively.

10- ……is the largest organ of the body which is composed of the skin and its derivatives like……..,……..,……

**D- Choose the correct answer (s) and write them in the answer sheet:** **(10 Marks)**

1- The merocrine sweat glands are characterized by:
a- Secreting a watery product containing solutes b- containing clear and dark cells
c-having no myoepithelial cells d- being simple coiled tubular merocrine gland

2- Which of the following are functions of skin keratinocytes:
a- Produce keratin b- produce interleukin
c- Produce immunogenic molecules d- produce interferons and tumor necrosis factors

3- Which of the following are functions of sebaceous glands
b- Help to keep the skin and hair soft b- help to protect epidermis from water penetration
c- They secrete the antibacterial substances d- they form keratin filaments

4- Cells of the basal stratum of epidermis include:
a- Melanocytes b- Highly divided columnar cells
b- Merkel's cells d- Langerhan's cells

5- Alveolar type II cells are :
a- Cuboidal cells that secrete surfactant b- squamous cells involved in gas exchange
c- Ciliated cells that move mucous d-columnar cells that secrete mucous

**E- Draw (3) three from the following:** **(20 marks)**

1- The structural and the functional units of the liver
2- T.S of trachea of mammal
3- V.s of thick skin
4- T.S of duodenum
5- T.S of lower esophagus

Good luck

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|---|---|
| **EXAMINERS** | **PROF. DR. AHMED MASSOUD** |
| | **DR. MONA ELWAN** |