Ph.D. Competitive EXam. in Organic Chemistry 2017-2018

Q Choose the correct answer for each of the followings:

1- The reaction of phenyl magnesium bromide with CH_3CH_2CHO followed by hydrolysis yields:

a- 2-phenyl-1-propanol
b- 1-phenyl-1-propanol
c- 2-phenyl-2-propanol
d- 3-phenyl-1-propanol

2- Which of the following is the strongest acid

a- $ClCH_2CO_2H$
b- ICH_2CO_2H
c- $BrCH_2CO_2H$
d- FCH_2CO_2H

3- Crossed Cannizzaro reaction can be represented by this equation

a- $2\,PhCHO + KOH \longrightarrow PhCO_2K + PhCH_2OH$
b- $PhCHO + CH_3CHO \longrightarrow PhCH{=}CHCHO + H_2O$
c- $PhCHO + HCOH \longrightarrow HCOO^{\ominus} + PhCH_2OH$

4- Both m-bromo anisol and o-bromo anisol on treatment with $NH_2^{\ominus}/NH_3$ yield the same product m-amino anisol because:

a- they form the same carbocation.
b- they form the same benZyne
c- they form the Same steric hindrance.

5- Which one of the followings would not be a suitable solvent for Grignard reagent:

a- $CH_3CH_2OCH_2CH_3$
b- CH_3CH_2OH
c- THF

6- Which pair of reagents would be used to prepare the following amine by reductive amination: $? + ? \xrightarrow{H_2/Pd} CH_3CH_2CH(CH_3)CH_2NHCH_3$

a- methyl amine and 2-methyl butanoic acid
b- methyl amine and 2-methyl butanal
c. Ammonia and 3-methyl-2-pentanone
d- dimethyl amine and 2-butanone

7- What is the product of the following sequence of reactions?

$(CH_3)_2CHCO_2H \xrightarrow{LiAlH_4} \xrightarrow{PBr_3} \xrightarrow{KCN} \xrightarrow{H_2O/H^{\oplus}}$

a- $(CH_3)_2CHCH_2CH_2NH_2$
b- $(CH_3)_2C{=}CHCO_2H$
c- $(CH_3)_2CHCH(Br)CO_2H$
d- $(CH_3)_2CHCH_2CO_2H$

8- Which compound below fits the following ^{1}H-NMR data?

triplet δ= 1.22 ppm (3H), singlet δ= 1.98 ppm (3H), quartet δ= 4.07 ppm (2H)

a- $CH_3CH_2CO_2CH_3$

b- $CH_3CO_2CH_2CH_3$

c- $CH_2=C(OCH_3)CH_3$

d- $CH_3COCH_2OCH_3$

Q2 Answer the followings:

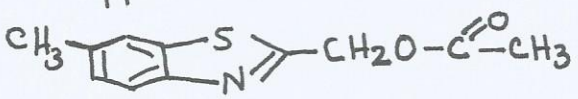
1- Oxidation, reduction and substitution reactions in anthracene happened only at positions (9) and (10) explain the reason?

2- Write chemical structures of the products A, B and C in this equation:

$$CH_3CH=\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}-CH_2CH_2CH=CHC_2H_5 \xrightarrow{O_3} \xrightarrow{Zn/H_2O} A+B+C$$

3- Write chemical equation that describes Bischler-Napieralski synthesis.

4- Write the expected signals and their chemical shift(δ) values which are appeared in ^{13}C-NMR spectrum of compound (Z).



compound (Z)

Ph.D. Competative examination (Analytical Chemistry)

NOTE : (10marks) for each question

Q1: Calculate the cell potential and ΔG° for : (tick the correct answer):

Pt /Fe^{+2}, Fe^{+3} //Ce^{+4}, Ce^{+3}/ Pt $E^{o}_{Fe^{+3},Fe^{+2}}$ = 0.771 Volt and $E^{o}_{Ce^{+4},Ce^{+3}}$ = 1.61Volt

a) - 90.96 b) -80.96 c) 95.96 d) 85.96 e) 80.96 f) 90.96 g) – 95 .96

Q2: Four steps are involved in laser production; numerate them:

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

3---------- . 4----------

Q3: The normal operating frequency in a microwave oven is ---------- MHz, which correspond to the wave length of ---------- .

Q4: 1) TG in Thermal analysis is the plot of; (tick the correct answer):

1-Variation of weight versus variation of concentration ( ).

2-Variation of weight versus variation of time ( ).

3-Variation of weight versus variation of temperature / distance ( ).

4-Variation of weight versus variation of temperature/time ( ).

5-Variation of gained or lost energy versus variation of temperature/time ( )

2) - In Thermal analysis , DTA, recorded ..... (Choose the correct answer)

a- Any change in weight between sample and reference

b- Any difference in temperature between sample and reference

c- Any same in temperature between sample and reference

d- Any loss or added in energy until sample and reference are different in temperature

e- Any same loss or added in energy until sample and reference are different in temperature

Q5:Interferometer in FTIR spectrophotometer is consist of : .....

Q6- Equation of , N , is equal ($N= 4 t_R^2 \backslash w^2$) when depend on: (tick the correct answer):

* 4.4% from peak height * 50 % from peak height * 13.5% from peak height

* 60.6 % from peak height * 10 % from peak height * 80 % from peak height

Q7- A- The conductivity for 0.01M KCL solution if the resistance for KCL solution is 2171 ohm and for distilled water is 426 K ohm is .....(tick the correct answer):

a- $3.58x10^{-4}$ b- $1.58x10^{-4}$ c-$4.58x10^{-4}$ d- $5.58x10^{-4}$ e-$1.58x10^{-5}$ f- $2.58x10^{-6}$

B- Draw Potentiometric titration curve for determination of Silver ion .

Q8: Auger Emission spectroscopy occurs .....

While continuous (bremsstrahlung) x-ray occurs.....

Q9 :A)Karl Fischer titration used for determination of .....(tick the correct answer):

a- carboxylic acid b- Ketones c- Hydroxyl compounds d- Aldehydes

e- Amino acid f- Diazonium salts g- Epoxide compounds h - H_2O

m- NaOH n- HCL

B) Mie scattering is occurring when .....

Q10: In Jablonski diagram , the internal conversion occurs .....

While the vibration relaxation occurs .....

and external conversion occurs .....

University of Baghdad
College of Science
Department of Chemistry
Date: / /2017-2018

Graduate Studies Ph.D
Competitive Exam.
Subject: physical chem..
Time: 30 min

Put X or ✓ For the following sentences and correct the wrong ones

1- PV/RT)is called compression number which equal to values ≤ 1 for ideal gas and ≥ 1 for rule gas.( )

2- Photochemistry related to the chemical reaction enhanced by IR ray.( )

3-First order rate equation is($\ln C_0 / C = kt$) ,where k is the equilibrium constant.( )

4- Electro oxidation reaction occur e on anode in all electrical cell.( )

5 -Isothermal process include work in constant temperature &pressure.( )

6- The units of rate constant is $[time^{-1}][con^{n-1}]$ where n=half life time. ( )

7- Relation between rate constant & reciprocal temperature called Nernest eq .( )
Which written as.....

8- Catalysis rise the rate of reaction by increasing its activation energy barrier.( )

9- Phosphoresces is similar with fluorescence.( )

10-Michailes constant have not any relation with equilibrium constant( )

College of Science
Department of Chemistry
Date: / /2017 – 2018

Competition Examination
Subject: Advanced Biochemistry

Choose the correct answer: (20 degree)

1- Polysaccharides are:

a) Polymers.
b) Acids.
c) Proteins.
d) Oils.

2- Which of the following statements is not true about receptors?

a) Most receptors are proteins situated in the cell membrane.
b) Receptors contain a hollow or cleft on their surface which is known as a binding site.
c) Receptors bind chemical messengers such as neurotransmitters or hormones.
d) Receptors catalyze reactions on chemical messengers.

3- Which of the following statements about the oxidative decarboxylation of pyruvate is correct?

a) The oxidative decarboxylation of pyruvate formed in aerobic glycolysis occurs in the cytosol.
b) The oxidative decarboxylation of pyruvate is catalyzed by the enzyme pyruvate decarboxylase.
c) The oxidative decarboxylation of pyruvate is reversible since there is a large decrease of free energy in the reaction.
d) The oxidative decarboxylation of pyruvate forms acetyl-CoA which is fed into the citric acid cycle.

4- Identify the strongest form of intermolecular bonding that could be formed involving the residue of the amino acid serine.

a) ionic bond
b) hydrogen bond
c) van der Waals interactions
d) none of the above

5- At the end of glycolysis, each molecule of glucose has yielded 2 molecules of _____, 2 molecules of _____, and a net of 2 molecules of _____.
a) FAD; NAD+; ADP.
b) CO2; NAD+; ADP.
c) Lactic acid; ethanol; CO2.
d) Pyruvate; NADH; ATP.

6- Deamination is _____ of amino group.
a) Removal.
b) Addition.
c) Supplementation.
d) None of these.

7- A polysaccharide which is often called animal starch is
a) Starch.
b) Inulin.
c) Glycogen.
d) Dextrin.

8- Which of the following statements best describes an allosteric binding site?
a) It is a binding site containing amino acids with aliphatic side chains.
b) It is a binding site that can accept a wide variety of differently shaped molecules.
c) It is a binding site, which is separate from the active site, and affects the activity of an enzyme when it is occupied by a ligand.
d) It is a description of an active site which has undergone an induced fit.

9- Absorbance at 280nm exhibited by protein is due to
a) Aliphatic amino acids
b) All amino acids
c) Non-polar amino acids
d) Aromatic amino acids

10- What role does small nuclear RNA play in the synthesis of proteins?
a) It catalyses the process.
b) It modifies messenger RNA molecules prior to protein synthesis.
c) It provides the genetic blueprint for the protein.
d) It translates the genetic code to a specific amino acid.

Q1. In the molecules H_2O, NH_3 and CH_4.

(a) The bond angles are same.

(b) The bond distances are same.

(c) The hybridizations are same.

(d) The shapes are same.

Ans.

Q2. The pair of compounds having metals in their highest oxidation state is

a- MnO_2 , $FeCl_2$ b- $[NiCl_4]^{2-}$, $[CoCL_4]^-$ c- $[Fe(CN)_6]^{2-}$, $[Co(CN)_2]$
d- $[MnO_4]^-$, CrO_2Cl_2.

Ans.

Q3. The value of the 'spin only' magnetic moment for one of the following configurations is 2.84 BM. The correct one is :

a- d^4 (in strong ligand field) b- d^4 (in weak ligand field)

c- d^5 (in strong ligand field) d- d^3(in weak as well as in strong fields)

Ans.

Q4. Which has maximum paramagnetic character ?

a- $[Fe(CN)_6]^{4-}$ b- $[Cu(H_2O)_4]^{2+}$ c- $[Cu(NH_3)_4]^{2+}$ d- $[Mn(H_2O)_6]^{2+}$

Ans.

Q5. A solution of potassium ferrocyanate would contain ions :

a- 2 b- 3 c- 4 d- 5

Ans.

Q6. The crystal field Splitting energy for octahedral ($\Delta_{o.h}$) and tetrahedral (Δ_t) complexes is related to :

a- $(\Delta_t)= (1/2)(\Delta_{o.h})$ b- $(\Delta_t)=(4/9)(\Delta_{o.h})$ c- $(\Delta_{o.h})= 2\Delta_t$

d- $(\Delta_{o.h}) = (4/9)\Delta_t$

Ans.

Q7. Which one of the following statement is incorrect?

(a) Greater the formation of (K_f) of a complex ion, greater is its stability.

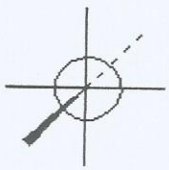
(b) Greater the positive charge on the central metal ion, greater is the stability of the complex.

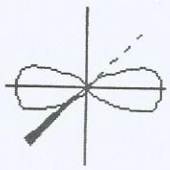
(c) Greater is the basic character of the ligand, lesser is the stability of the complex.

(d) Chelate complexes have high stability constants.

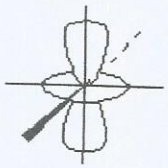
Ans.

Q8. The probability area that best represents the shape of an atomic 3p orbital is...

(a) 

(b) 

(c) 

(d) 

Ans.