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& Scientific Research
University of Baghdad
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وزارة التعليم العالي والبحث العلمي
جامعة بغداد
كلية العلوم
قسم الكيمياء

Ref:

Date:

٧/١٤/٢٠١٧

العدد: ٦٤٦ / ٤
التاريخ: ١٢ / ٧ / ٢٠١٧

٧٢١٩ / ٢٠١٧
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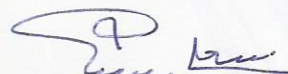
السيد معاون العميد للشؤون العلمية والدراسات العليا المحترم

م / اجابة

تحية طيبة

أشارة الى كتابكم المرقم ع/2012 بتاريخ 2017/7/5 المتضمن اسئلة الامتحان التنافسي المتقدمين للعام الدراسي 2017-2018. نرسل لكم رفقاً اسئلة الامتحان التنافسي للطلبة المتقدمين لدراسة الماجستير والدكتوراه بنسخة ورقية فقط وذلك لعدم وجود نسخة الالكترونية للاسئلة.

مع التقدير


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2017/7/12

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Q1) For each questions, put circle at the correct answer. (70 marks)

- 1- The most detectors used in Absorbance spectrophotometer are:
A) Thermal conductivity
B) densitometer
C) Photomultiplier cell
D) Argon detector
- 2- ----- is The physical entrainment of soluble impurities in a growing crystal.
A) Occlusion
B) Co-precipitation
C) Diffusion
D) None of the above
- 3- 20mL of aqueous solution of A [0.1M] was shaken with 10mL of ether. After separation it was found that 0.025M of A is the remaining concentration in aqueous solution, the value of D will be:
A) 30.0
B) 26.0
C) 6.0
D) 75.0
- 4- Electrophoresis is a:
A) Separation method depends on move of charged species under an electric field
B) Separation method depends on the size and shape of species
C) Separation method depends on distribution of solute between mobile and stationary phases
D) None of above
- 5- In any of the following state of titration types that have no suitable indicator:
A) Strong acid and strong base titration
B) Oxidation-Reduction titration
C) Weak acid and weak base titration
D) Strong base and weak acid titration
- 6- Benzene (b.p 80.1°C) and Cyclohexane(b.p 80.8°C) could be separated using the following technique:
A) Distillation
B) Gel Chromatography
C) TLC
D) GC
- 7- In titration curves of strong acid and strong base, the pH value at the equivalent point will be:
A) More than 7
B) Equal 7
C) Less than 7
D) None of the above
- 8- One of the following indicators is used in Fajan's titration:
A) Methyl Orange
B) Eosin
C) Bromocresol Green
D) Fluorescein
- 9- Which of the following detectors are used in HPLC:
A) NMR
B) Electron Capture detector
C) Flame ionization
D) UV-detector
- 10- The flameless AAS are used for determination of :
A) Mercuric ion
B) Sodium ion
C) Ferric ion
D) All the above

11-In partition chromatography, the mechanism of separation depends on:

- A) Adsorption
- B) Solubility
- C) Ionic exchange
- D) None of the above

12-Kjeldahl analysis is a standard method for determination of:

- A) Oxygen in organic compounds
- B) Nitrogen in organic compounds
- C) Carbon in organic compounds
- D) All of above

13- -----is a source used in atomic spectroscopy that emits sharp lines for a single element or sometimes for several elements.

- A) Hydrogen lamp
- B) Hallow cathode lamp
- C) Xenon lamp
- D) None of the above

14- The compounds of $-I^-$, $-Br^-$, $-NO_2$ are:

- A) increase the intensity of Fluorescence
- B) decrease the intensity of Fluorescence
- C) Do not effect on the intensity of Fluorescence
- D) Quenching groups

Q2) Explain the principles, the schematic diagram and the applications of Gas chromatography
(15Marks)

Q3) Compare between the Flame and Electrothermal atomizers in AAS:

(15Marks)

Multiple Choices:

1. What is the most common monosaccharide?

- a. cellulose b. glucose c. triglycerides d. starches

2. What structures are found in steroid molecules?

- a. molecular rings b. proteins. c. waxes. d. double helixes.

3. A drug contains one ionizable group, a weak base with a pKa of 9.0. The drug enters cells via free diffusion through the membrane in its uncharged form. This will occur most readily at which of the following pH values? a. 3.5 b. 5.5 c. 7.0 d. 9.2

4. What monomers make up proteins?

- a. starches b. enzymes. c. nucleic acids d. amino acids

5. A major driving force for protein folding is the hydrophobic effect, in which hydrophobic amino acid side chains tend to cluster together, usually in the core of globular proteins. This occurs primarily due to which of the following?

- a. Increasing hydrogen bond formation. b. Increasing the entropy of water.
c. Increasing disulfide bond formation. d. Minimizing van der Waals interactions.

6. Where do substrates attach to an enzyme?

- a. peptide bond. b. ring binding site. c. active site. d. enzymatic site

7. The isolation of nascent Okazaki fragments during DNA replication led to the surprising discovery of uracil in the fragment. The uracil is present due to which of the following?

- a. The need for a primer. b. Deamination of cytosine
c. Chemical modification of thymine. d. An error in DNA polymerase

8. Which of the following are found in nucleotides of DNA and RNA respectively?

- a. deoxyribose and ribose b. proteins and enzymes. c. fats and oils d. sugars and starches

9. After eating a meal containing carbohydrates, the monosaccharides must be absorbed from the intestinal lumen. This transport is dependent on which of the following enzymes?

- a. Glucose-6-phosphate dehydrogenase. b. Na⁺, K⁺ ATPase. c. Hexokinase d. Chloride transporter.

10. What is the function of ATP, adenosine triphosphate?

- a. message carrier b. store and transport energy c. make proteins d. breakdown sugars

11. Metabolism is determined by the:

- a. activity of enzymes produced in the nucleus. b. availability of amino acids
c. proteins formed as dictated by the genetic material. d. size of proteins in the cell.

- 12.** The initial rate of an enzyme catalysed reaction depends on:
- the concentration of the enzyme
 - the concentration of the substrate
 - the affinity of the enzyme for its substrate.
 - all of the above.
- 13.** Anaerobic metabolism refers to the generation of ATP:
- without the involvement of ADP .
 - without the use of glycogen
 - without the use of oxygen.
 - by the conversion of lactate to pyruvate.
- 14.** The conversion of one molecule of glucose to two molecules of pyruvate results in the net formation of:
- six molecules of water.
 - two molecules of ATP .
 - three molecules of ATP.
 - thirty-nine molecules of ATP.
- 15.** Aerobic resynthesis of ATP occurs:
- in the mitochondria in a process called glycogenolysis .
 - in the sarcoplasmic reticulum
 - in the mitochondria in a process called oxidative phosphorylation.
 - in the cytosol
- 16.** The β -oxidation of a molecule of palmitic acid, $\text{CH}_3(\text{CH}_2)_{14}\text{CO}_2\text{H}$ yields:
- 8 molecules of acetyl-CoA .
 - carbon dioxide and water only.
 - uses more ATP than it generates
 - 16 molecules of acetyl-CoA only
- 17.** Pairs of electrons carried in the form, FADH_2 and $\text{NADH}+\text{H}$, collectively contain enough free energy to rephosphorylate:
- 7 ATP.
 - 5 ATP.
 - 4 ATP.
 - 3 ATP .
- 18.** HDL is synthesized and secreted from: a.Pancreas. b. Liver. c. Kidney. d. Muscle.
- 19.** Proteins contain:
- Only L- α - amino acids.
 - Only D-amino acids.
 - DL-Amino acids.
 - Both a and b. a.
- 20.** The useful reagent for detection of amino acids is:
- Molisch reagent.
 - Dichlorophenol Indophenol.
 - Ninhydrin.
 - Biuret
- 21.** An example of lipid soluble vitamin is: a.Vitamin B1. b. Vitamin B12. c. Vitamin E. d.Vitamin B6
- 22.** Codons are composed of:
- triplet sequences of nucleotide bases in DNA.
 - triplet sequences of nucleotide bases in mRNA .
 - triplet sequences of amino acids in polypeptide chains
 - triplet sequences of deoxyribose sugars in DNA
- 23.** The most of the ultraviolet absorption of proteins above 240 nm is due to their content of
- Aspartate.
 - Tryptophan.
 - Glutamate.
 - Alanine.
- 24.** The major end product of protein nitrogen metabolism in man
- Glycine .
 - Uric acid.
 - Urea.
 - NH_3 .
- 25.** From the Lineweaver-Burk plot of Michaelis-Menten equation, K_m and V_{max} can be determined when V is the reaction velocity at substrate concentration S , the X-axis experimental data are expressed as :
- $1/V$.
 - $1/S$
 - S .
 - V .



Q1) Choose the correct answer for the following: (60 marks)

1- Which can be regarded as ideal with $C_p = 22.2 \text{ J K}^{-1} \text{ mol}^{-1}$ at 273 K . it is
 $C_v = \text{-----} \text{ J K}^{-1} \text{ mol}^{-1}$ (a- 13.9 b- 30.5 c- 22.1)

2-Predict the signs of the entropy changes in the following reaction
 $\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (a- $\Delta S < 0$ b- $\Delta S > 0$ c- $\Delta S = 0$)

3- ----- = 0 for an isothermal process only when the gas is an Ideal Gas.
(a- ΔH b- ΔG c- ΔS)

4- Vaporization of liquid water at 100°C and 1 bar pressure ΔG -----.
(a- $\Delta G < 0$ b- $\Delta G > 0$ c- $\Delta G = 0$)

5-The ionic strengths of 0.1 M solutions of $\text{ZnSO}_4 = \text{-----}$.
(a- 0.1M b- 0.3 M c- 0.4 M)

6-For light of 325 nm wavelength. The wave number $\equiv \text{-----cm}^{-1}$
(a- 3.08×10^4 b- 3.08×10^{-3} c- 3.08×10^6)

7- In order to determine the partial pressure of O_2 in a mixture of several
gases , a student should use ----- law.
(a- Raoult's b- Charle's c- Dalton's)

8-In the reaction $\text{A} + 4\text{B} \rightarrow 2\text{C}$, the concentration of C is found to 0.002M
in 20S . the rate of A = ----- in M/S (a- 1×10^{-4} b- 0.5×10^{-4} c- 2×10^{-4}).



Q2- Determine ΔG° at 298K for the reaction $O_2 + 2H_2 \rightarrow 2H_2O$ using the value of - 242 KJ/mol for ΔH°_f (H₂O)g and - 94 J/K.mol for ΔS° the reaction ? (10 marks)

Q3- Find the wave length of light that is emitted when an atom loses an amount of energy equal to 5×10^{-19} J? (10 marks)

Q4- A constant current was passed through a solution of cupric sulfate CuSO₄, for 1 hr, and 0.04 g of copper was deposited. Calculate the current (Cu = 63.5 g mol⁻¹)? (10 marks)

Q5- What concentrations of the following have the same ionic strength as 0.1 M NaCl . Na₃PO₄ , Ni(NO₃)₂ ? (10 marks)

Organic Chemistry

Q1: For each of the questions 1-10 choose the set of reagents which best accomplishes the desired conversion.

1. 1-octene \longrightarrow 1-octanol

- a) Sulfuric acid, water
- b) 1. Hydrogen peroxide, water 2. potassium hydroxide
- c) potassium permanganate, potassium hydroxide, water
- d) 1. diborane 2. hydrogen peroxide, water, potassium hydroxide
- e) 1. diborane 2. water

2. cyclohexanol \longrightarrow cyclohexyl 2-butyl ether

- a) 1. 2-butanol, potassium hydroxide 2. lithium aluminum hydride
- b) 1. Sodium hydride 2. bromobutane
- c) 1. Phosphorus tribromide 2. 2-butanol
- d) 1. 2-butanol, mercuric trifluoroacetate 2. sodium borohydride
- e) 1. 2-butene, mercuric trifluoroacetate 2. sodium borohydride

3. 2-phenylethanol \longrightarrow phenylacetaldehyde

- a) potassium permanganate
- b) chromic anhydride, sulfuric acid
- c) DCC, DMSO
- d) osmium tetroxide
- e) ozone, potassium hydroxide

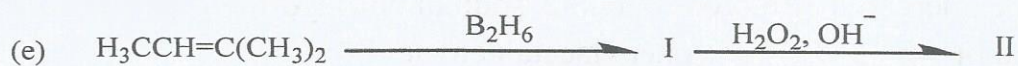
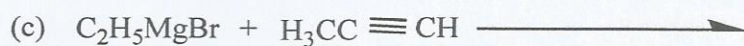
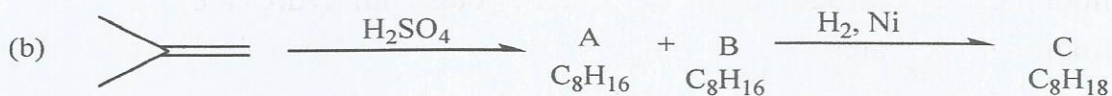
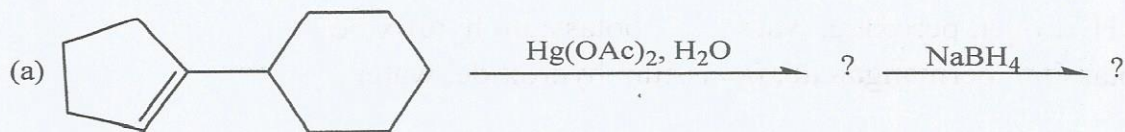
4. 3-methyl-2-butanone \longrightarrow isobutyric acid

- a) hydrogen peroxide, potassium hydroxide, water
- b) 1. Lithium aluminum hydride 2. potassium hydroxide
- c) phosphorus tribromide, bromine
- d) 1. hydrogen peroxide 2. sulfuric acid, water
- e) bromine, potassium hydroxide

5. benzyl phenyl ether + hydrogen bromide \longrightarrow

- a) benzyl bromide + bromobenzene
- b) benzyl alcohol + bromobenzene
- c) benzyl bromide + phenol
- d) benzyl bromide + o-dibromobenzene
- e) benzyl bromide + 1,2-dibromocyclohexane

Q2: Give the major organic products of each of the following reaction. Specify isomers where appropriate. If a reaction gives a significant yield of more than one product it must be stated and all structures given. If no reaction is expected it should be so stated. Assume usual work – up conditions in all cases.





Q1: Give the correct answer of each of the following. (20 degree)

- 1-The most stable oxidation state of Cr element is (+1, +3, +5, +4).
- 2-The structure of PCl_5 molecule is (tetrahedral, octahedral, square planar or trigonal pyramid).
- 3-The inversion center is found in (H_2S , SBr_6 , CO , BH_2F).
- 4- $^1\text{S}_0$ is the term symbol for Ni^{2+} , Co^{2+} , Cu^+ , Mn^{5+} in the ground state.
- 5-The hybridization of the Cobalt ion in $\text{K}_3[\text{Co}(\text{Cl})_6]$ is (SP^3d^2 , dSP^2 , d^2SP^3).
- 6- NH_3 , NO_3^- , ClO_4^- are (soft acids, hard bases, soft bases, hard acids).
- 7-The metal with inert $n\text{S}^2$ electron is (Sn, Ge, P, Bi).
- 8- D_{3h} is a point group of (C_2F_6 staggered, CCl_4 , PH_5).
- 9-The point group of H_2O molecule is (C_{3v} , C_{2h} , C_{2v}).
- 10-The electronic configuration of $_{78}\text{Pt}$ is ($[\text{Xe}]4\text{f}^{14}5\text{d}^86\text{S}^2$, $[\text{Xe}]4\text{f}^{14}5\text{d}^96\text{S}^1$, $[\text{Xe}]4\text{f}^{14}5\text{d}^{10}6\text{S}^0$)

Q2: Answer by "True" or "False". (20 degree)

- 1-The four quantum numbers of the valance electron of Cr element are $n=4$ $l=1$ $ml=0$ $ms=+1/2$
- 2-The hybridization of I_3^- ion is SP^3d^2 .
- 3-There are two π -bonds in the structure of H_2SO_4 molecule.
- 4- $[\text{PtCl}_4]^{2-}$ is a tetrahedral species.
- 5- The value of Z_{eff} of the valance electron for ($_{23}\text{V}$) element is equal to 4.3.

Q3: Arrange the following according to specified orders. (20 degree) .

- 1- SiO_2 , PbO_2 , SnO_2 , GeO_2 , CO_2 (increased basic properties).
- 2- AsCl_3 , NCl_3 , PCl_3 , BiCl_3 (increased ionic character).
- 3-N, Cs, F, Sr, P (increased electronegativity).
- 4- NO_3^- , NO_2^+ , NO_2^- (increased bond angle).
- 5- $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Ir}(\text{NH}_3)_6]^{3+}$, $[\text{Ni}(\text{NH}_3)_6]^{2+}$ (increased absorption energy).

Q4: Choose the right answer for the following. (20 degree)

- 1-The metal with inert ns^2 electrons is (Te, P, Bi, Sb)
- 2-The antiferromagnetic oxide is (Fe_3O_4 , Na_2O , MnO , SrO)
- 3- D_{3h} is appoint group of (C_2H_6 staggert, PCl_5 , CH_4 , H_2S)
- 4-The color of $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ is (red, blue, colorless, green)

Q5: Find the possible term symbols of the energy states for $_{26}\text{Fe}^{+3}$ ion and give the most stable energy state symbol. (20 degree)

Good Luck