Assiut University | **September 2022**
Faculty of Science | **Time allowed: 3 h**
Chemistry Department | **Summer Semester**

Physical Chemistry II Examination (C-232) For 2nd Level Students

Answer ALL the following questions: (50 Marks)

Q1: *Shade (T) for True or (F) for False statements:* (25 Marks; 1 mark each)

1. At triple point, no variable can be altered without disturbing the equilibrium.
2. The freezing point curve is known as liquids curve.
3. The eutectic component can be regarded as compound.
4. The horizonal portion in colling curve indicates the co-existence of three phases.
5. Points inside binodal curve represent one phase and outside the curve the system is two phases.
6. The ternary system *n-butyl alcohol – ethyl acetate – water* shows the formation of "*binodal band*" at lower temperature.
7. All melting points are eutectic points.
8. The lowest temperature attained of salt – water system is the eutectic point.
9. At peritectic point E (234 °C) in phase diagram of Na_2SO_4 – water system, the rhombic Na_2SO_4 changes into monoclinic form and the system is univariant.
10. Dialysis is a process of removing a dissolved substance from a colloidal solution by means of diffusion through a suitable membrane.
11. Gold number is the number of milligrams of protective colloid which prevents the coagulation of 10 c.c. of a given gold sol.
12. Electrolysis is the process in which electrical energy is used to cause a spontaneous chemical reaction to occur.
13. The primary batteries are rechargeable, such as leclanché cell
14. The charges on colloidal particles are due to the adsorption of some ions from solution.
15. Colloidal dispersion of starch, portions and gelatin are multimolecular colloids.
16. Coagulation is the process of breaking up of colloidal solution resulting in the precipitation of the particles of a dispersed phase.
17. Alkaline fuel cells use an alkaline electrolyte such as KOH in H_2O and are generally fueled with pure hydrogen.
18. When a strong beam of light is concentrated on a colloidal solution, the path of the beam is illuminated by a bluish light and becomes visible when observed from the side.
19. Emulsion is a solid-liquid dispersion that is small drops of one liquid dispersed in another one.
20. In the electrolytic cells, the electrons are supplied to the cell from an external battery.
21. At STP, an 835 mL of H_2 is evolved when 2 A is passed through a water electrolysis for one hour.
22. The movement of the dispersion medium under the influence of electrical field is known as cataphoresis.

23. Multimolecular colloids is formed when large number of atoms or smaller molecules of a substance aggregate together to form species having size in the colloidal range (1–1000 nm).
24. The process used for reducing the number of impurities to a requisite minimum is known as purification of colloidal solution.
25. Ultrafiltration is the process of separating the colloidal particles from the solvent and soluble solutes present in the colloidal solution by specially prepared filters, which are permeable to all substances except the colloidal particles.

Q2: *Shade the correct* answer: *a, b, c or d:* (25 Marks; 1 Mark each)

26. The phase equation can be expressed by .....
(a) F + P = C + 2 (b) F = C + P + 2 (c) P = F – C + 2 (d) All of these

27. The term eutectic means easy ....
(a) Cooling (b) Freezing (c) Melting (d) Boiling

28. When a single phase is present in a two component, the degree of freedom is .....
(a) Zero (b) One (c) Two (d) Three

29. $FeCl_3$-water system at any of its ..... points is invariant (pressure constant).
(a) Freezing (b) Congruent (c) Cryohydric (d) All of these

30. Except ice number ..... all other forms of ice can co-exist in equilibrium with liquid water
(a) I (b) II (c) III (d) IV

31. An aqueous solution of glucose has the number of phases and degrees of freedom equal to ..... and ..... respectively.
(a) 1 and 1 (b) 1 and 2 (c) 1 and 3 (d) 2 and 2

32. The lowest temperature is reached using freezing mixture .....
(a) $FeCl_3$ + ice (b) KI + ice (c) NaCl + ice (d) Na_2SO_4 + ice

33. The system *Na_2SO_4 – NaCl – water* at 25 °C gives the formation of .....
(a) Hydrae $Na_2SO_4 \cdot 10H_2O$ (b) Anhydrous Na_2SO_4
(c) Both a and b (d) None of these

34. Which of the following properties of colloids does not depend on the charge on particles?
(a) Coagulation (b) Electro-osmosis (c) Electrophoresis (d) Tyndall effect

35. The diameter of particles in colloidal system is .....
(a) 10^{-9} m to 10^{-6} m (b) 10^{-10} m to 10^{-4} m (c) 10^{-12} m to 10^{-9} m (d) 10^{-7} m to 10^{-5} m

36. In a concentration cell, the electrode kept in contact with a solution of lower concentration act as .....
(a) Anode (b) Cathode (c) Both anode and cathode (d) None of these

37. Which of the following statements is true for the following reaction:
$2Fe^{3+}(aq) + 2Br^{-}(aq) = 2Fe^{2+}(aq) + Br_2(l)$ ($E^{\circ}\ Fe^{3+}/Fe^{2+}$ =+0.77 v, $E^{\circ}\ Br^{-}/Br_2$ = +1.07 v)
(a) E° = -1.83 V and it is not spontaneous (b) E° = -0.30 V and it is not spontaneous
(c) E° = +0.30 V and it is spontaneous (d) E° = +1.83 V and it is spontaneous.

38. If the direction of flow of electrons in electrochemical cell is right to left, then the cell reaction is .....
(a) Spontaneous (b) Non-spontaneous (c) Reversible (d) Irreversible

39. The following equation has an equilibrium constant K_{eq} of 6×10^{-25}. Which of the following correctly describes the standard electrode potential, E°, and the standard Gibbs free energy change, ΔG°?

$$Zn^{2+}(aq) + H_2(g) \rightarrow Zn\ (s) + 2H^+(aq)$$

(a) Both ΔG° and E° are zero
(b) Both ΔG° and E° have the same sign
(c) ΔG° is negative, and E° is positive
(d) ΔG° is positive, and E° is negative.

40. What is the potential of the following reaction that has a ΔG° of -165 kJ/mol?

$$2Na + Cl_2 = 2NaCl \qquad (F = 96485)$$

(a) 2.73 (b) 0.85 (c) 1.37 (d) −2.73

41. What is the pH of the unknown acidic solution in the following cell?

$$H_2(1\ atm)|Pt(s)|H^+(x\ M)\|Cu^{2+}\ (1M)|Cu(s),$$
$$E_{cell} = 0.56\ V\ at\ 25\ °C, \qquad E^\circ_{Cu^{2+}/Cu} = 0.34\ V$$

(a) 1.7 (b) 2 (c) 3.7 (d) 4

42. What is K for the following balanced reaction?

$$3Zn(s) + 2Cr^{3+}(aq) \rightarrow 3Zn^{2+}(aq) + 2Cr(s) \qquad E^\circ = 0.0218\ V$$

(a) 1.3×10^{-3} (b) 5.5 (c) 162.3 (d) 12.8

43. The principal function of a fuel cell is to .....

(a) Produce fuel
(b) Electrolyze fuel
(c) Produce hydrogen
(d) Produce electricity

44. Which substance is the reducing agent in the following reaction?

$$4H^+(aq) + 2Cl^-(aq) + MnO_2(s) \rightarrow Cl_2(g) + Mn^{2+}(aq) + 2H_2O(l)$$

(a) $H^+(aq)$ (b) $Cl^-(aq)$ (c) $MnO_2(s)$ (d) $Mn^{2+}(aq)$

45. Which of the following preparation method does not belong to the condensation methods of colloids preparation?

(a) Reduction method
(b) Ionic equilibrium method
(c) Hydrolysis method
(d) Peptization method

46. A current is passed through a $Ga(NO_3)_3$ solution for 1.5 hours, and after this time period the mass of metal produced was 6.5 grams. What is the current, in amperes, that is required to produce such an amount of gallium? (Ga = 69.723 g/mol)

(a) 1.7 A (b) 5.0 A (c) 100 A (d) 300 A

47. Fog is an example of which type of colloidal system?

(a) solid in liquid (b) Gas in gas (c) Liquid in gas (d) None of these

48. The term used to determine the protecting power of a lyophilic colloid is .....

(a) oxidation number
(b) coagulation value
(c) gold number
(d) critical micelle concentration

49. Which of the following is an associated colloid?

(a) Soap (b) Sol of gold (c) Proteins (d) Starch

50. Which of the following expressions correctly shows the calculation of ΔG° in kJ/mol for a Voltaic cell with the half reactions shown below?

$$Ag^+(aq) + e^- \rightarrow Ag(s)\ E^\circ = +0.80V;\ Zn^{2+}(aq) + 2e^- \rightarrow Zn(s),\ E^\circ = -0.76V$$

(a) 2.69×10^{-4} (b) –232.21 (c) – 301.03 (d) 3.86

Oral *examination*

Q3: *Shade (T) for True or (F) for False statements*: (10 Marks; 1 mark each)

51. There are two invariant triple points in NaCl – water system.
52. An example of system yielding one pair of partially miscible liquids is *acetic acid – $CHCl_3$ – water.*
53. At normal melting point of ice (0.0 °C, 1 atmospheric pressure), only ice and vapor exist together.
54. The transformation of S_R to S_M is accompanied by an increase in volume.
55. The E°_{cell} of Al-air battery is 2.73 V and it involves a 12-electron process. The free energy of the battery in kJ is 305 kJ
56. The oxidation state of oxygen in H_2O_2 is +1
57. The standard calomel electrode is used as primary reference electrode for the measurement of the single electrode
58. Colloidal particles are larger than suspension particles.
59. Suspensions exhibit Brownian motion.
60. Lyophilic sols are solvent colloidal systems

Good Luck

Examiners: Prof. Maher M. A. Hamed, Dr. Mohamed N. Abd El-Hamed

Assiut University
Faculty of Science
Chemistry Department

Sep. 2022
Time : 2 hours

Final Exam. for (211C)(Student not Chemistry , Summery Term)

Write the name of all compounds.

Answer for the following questions:

1) *A- What mining by* (give examples):- (**5 only**)---------- (**10** Marks):

1- Oxime 2-Phenone. 3- Cis / Trance 4- TFA
5- Sec. (2°)alchol . 6- TNB 7- DMS

B- Compound (A) its molecular formula ($C_5H_{11}Cl$). Draw the structural isomers of this compound.

2) *A-Give examples for the following reactions* (**Three only**)-(**10** Marks):
1- polymerisation reaction. 2- Oxidition; Reduction reaction.
3- Fridel – Crafts alkylation. 4- Nuclophilic Sub. reaction (SN^1).

B- Write one method to prepare the following compounds (**Three only**):
o- xylene* Benzoic anhydride * *p*- bromoaniline *Benzylchloride.

3) *A- How do you convert* : (**Three only**)---------- (**10** Marks):
1- Formaldehyde ⟶ Pry.(1°) alchol by Grinuard reagent.
2- Tolune ⟶ Saccharin. 3- Acetophenone ⟶ Iodoform.
4- Ethyl alchol ⟶ Acetic anhydride.

B-Write on **Three only**:
1- Anti- Markownikoffs rule 2-Sandmeyer reaction
3- Gabrile reaction. 4- Elecrophilic addition of HBr to 1, 3 butadiene

********** أنظر خلفة **********

4)- *A- complete the following equations* (**Four only**)---------- (**20** Marks)

1- Fractoze + 5. Acetic anhydride $\longrightarrow$ a + b

2- 1-Pentene + O_3 $\longrightarrow$ a + H_2O $\longrightarrow$ b + c

3- Benzoic acid + PCl_5 $\longrightarrow$ a + b + c

4- Toluene + Cl_2 / dark (Fe) $\longrightarrow$ a + b

5- Aniline + $HNO_2(NaNO_2 / HCl)$ $\longrightarrow$ a + β –naphthol $\longrightarrow$ b + c

B- Write the name of the following compounds .

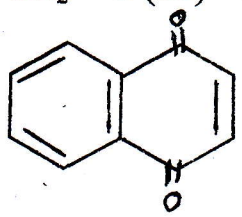
1) $CH_3 - S - C_4H_9$

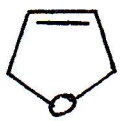
2) $CH_3 - C \equiv C - C_3H_7$

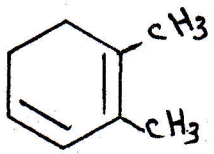
3) NH_2-CH_2-COOH

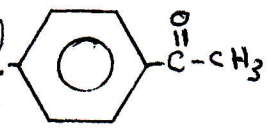
4) $CH_2 = C(Br) - CH_2 - C(Cl) = CH_2$

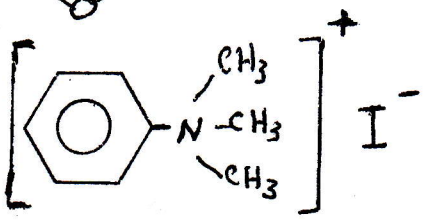
5) $-(CH_2-CH_2)_n-$

6) 

7) 

8) 

9) 

10) 

*C- Draw the structural formula of (**5 only**)from the following compounds:*

1-Chloro-cyclohexadiene * Benzanilide * Ter. Butylchloride

Sodium salcylate * *p* – cresole * Succinemide

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Good Luke

Prof. Dr Osama Shehata Moustafa

Sep.2022

Assiut University
Faculty of Science
Chemistry Department

Date: 15 / 9 / 2022
Time: 3 hours

Final Examination of Organic Chemistry II (212C) for Credited Hours Students

يتم طمس (تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

Answer the following questions:

Part I:

Q1: Choose (T) for true sentence or (F) for false sentence: (1 Mark/each) (50 marks):

1. The anisole structure contains hydroxyl group attached to benzene ring. (T/F)
2. Reaction of benzene with acetyl chloride and anhydrous $AlCl_3$ gave toluene. (T/F)
3. Phenyl diazonium chloride reacts with water to give phenol. (T/F)
4. Aniline reacts with conc. nitric acid to give *p*-nitroaniline. (T/F)
5. Phenyl diazonium chloride reacts with CuCl to give benzene. (T/F)
6. Oxidation of ethyl benzene with $KMnO_4$ produces benzoic acid. (T/F)
7. Decarboxylation of benzoic acid produces benzaldehyde. (T/F)
8. Benzene is electron enrich so it reacts as electrophile. (T/F)
9. Reaction of bromine with toluene in the presence of $AlBr_3$ gave benzyl bromide. (T/F)
10. Oxidation of benzene using vanadium oxide gave maleic anhydride. (T/F)
11. Nitro group is deactivating group and directing *meta* in the benzene reactions. (T/F)
12. NH_2 is the deactivating group and directing *o* and *p* in the benzene reactions. (T/F)
13. Fusion of benzene with pyridine at C2/C3 gave Quinoline structure. (T/F)
14. The lone pair of nitrogen electrons in pyridine involved in aromatic bonding. (T/F)
15. Reduction of nitrobenzene using Sn/HCl gives aniline. (T/F)
16. Synthesis of pyrrole works only if the methylene group of the second component is activated to enable the desired condensation it's called Paal-Knorr
17. 1,4-Dicarbonyl compounds can be reacted with P_2S_5 to give thiophene.
18. The Numbering of heterocyclic compounds generally start at heteroatom.
19. Oxazole compound would not be expected an aromatic compound.
20. Bromination of aniline gave *p*-bromoaniline.
21. The formylation reagent of the reactive heterocyclic compounds is DMSO/HCl.
22. Reaction of haloketone with thioamide gives thiazole.
23. An example of 1,2-diazole is: A-Pyrazole B-Thiazole C-Imidazole D-Pyrimidine
24. Sulphonic group in benzenesulphonic acid directs towards meta positions. (T / F)
25. Benzene was oxidized by vanadium pentaoxide at high temeprature to give phenol. (T / F)
26. Benzene oxidized by ozone to give maleic anhydride.(T / F)
27. Decarboxylation of toluic acid gave toluene. (T / F)
28. Acylation of Pyrrole with Ac_2O at 200°C leads to form 2-acetylpyrrole. (T / F)
29. The deactivating group is group that can donate electron density to the aromatic ring. (T / F)
30. TNT can be oxidized by $Na_2Cr_2O_7/H_2SO_4$ to give trinitrobenzoic acid. (T / F)
31. Picric acid can be reacted with PCl_5 to give picryl chloride.(T / F)
32. Hydrogenation of nitrobenzene gives nitroaniline. (T / F)
33. Diphenyl amine is type of tertiary amines. (T / F)

34. Nitrosation of secondary aromatic amine gave electrophilic substitution at para position of aromatic ring. (T / F)
35. Nitrosation of primary aromatic amine gave *N*-nitroso compound. (T / F)
36. Reaction of aniline with benzaldehyde to give Schif's base is called condensation reaction. (T / F)
37. Hydogenation of toluene gives cyclohexane. (T / F)
38. Conc. Nitric acid is used for the nitration of pyrrole. (T / F)
39. The compound to be aromatic must apply 4n+1 π rule. (T / F)
40. Synthesis of pyridine by condensation of β-dicarbonyl compounds and aldehydes in presence of NH_3 it's called Hantzsch synthesis (T / F)
41. Pyrrole is one of 1,3-diazole compounds. (T / F)
42. Indole system produces from fusion of benzene with pyrrole. (T / F)
43. Isoxazole is 1,2-oxazole type where imidazole is 1,3-diazole type. (T / F)
44. Isoquinoline comes from fusion of pyridine with benzene ring at C3/C4 . (T / F)
45. The nitrogen atom of quinoline can be protonated and does not disturb aromaticity. (T / F)
46. Tetrazole is a six membered ring bearing four nitrogen heteroatoms. (T / F)
47. Pyrazole is one of 1,2-diazole type. (T / F)
48.1,3-Dicarbonyl compound reacts with thiourea to give pyrimidine-2-thione. (T / F)
49. The five membered ring can react with electrophile at the heteroatom (T / F)
50. The order of basicity is : Imidazole > Thiazole > Oxazole. (T / F)

Part II. Others:

Q2: Choose the correct answer A, B, C, or D: (1 Mark/each) (10 marks)

51. ..... is the activating group and directing *o-p* in the monosubstituted benzene reactions:
A- Br. B- NH_2. C- NO_2. D- SO_3H.

52. ..... is deactivating group and directing *o* and *p* in the monosubstituted benzene reactions.
A- Br B- OH C- NH_2. D- CN.

53. Nomenclature of heterocyclic compounds having five membered ring suffixes is:
A- –ine B- –ole C- -epine D- -olidin.

54. The electrophilic substitution reactions of indole occurs mainly at:
A- C_2 B- –NH C- C_3 D- Aromatic ring.

55. Direct acetylation of thiophene with acetyl chloride gives:
A- 2-Acetylthiophene B- 3-Acetylthiophene C- A and B D- None of them.

56. Formylation reaction of reactive heterocyclic compounds by using DMF/$POCl_3$ in acidic media it's called: A- Chichibabin B- Vilsmeir C- Knorr D- Paal-Knorr .

57. Pyridine is: A-Moderately acidic. B-Moderately basic C-Acidic. D-Basic.

58. Reduction of acetophenone using Zn(Hg)/HCl gave: A- Ethyl benzoate. B. Ethyl benzene. C- Benzene. D- Benzoic acid.

59. *N,N*-Dimethyl amine is type of: A- Secondary amine. B- Primary amine. C- Tertiary amine. D- Quaternary salt.

60. An example for 1,2-diazine is: A- Imidazole. B- Pyrimidine. C- Pyrazine. D- Pyridazine.

Good Luck

Dr. Ahmed Abdou Omar

Assiut university
Faculty of science
Chemistry department

Date: 4 / 9 / 2022
Time allowed: 3 hours

Final Examination of Organic Chemistry I (210C) for Credited Hours Students

يتم طمس (تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

Answer the following questions:

Part I : (50 marks):

Q1: Choose (T) for true sentence or (F) for the false: (1 Mark/each)

1. Carboanion stabilized by alkyl substituent by inductive effect and hyperconjugation (T/F)
2. In heterolytic fission, both of the shared electrons are given entirely to one of the atom. (T/F)
3. Alkenes reactions mostly nucleophilic addition reactions. (T/F)
4. Homolytic fission has to give free radical not ions. (T/F)
5. Reaction of benzaldehyde and acetaldehyde in presence of NaOH is called Claisen reaction. (T/F)
6. Trichloroacetic acid is more acidic than trifluoroacetic acid. (T/F)
7. Colline oxidation is oxidation of primary alcohol to aldehyde in presence of PCC/CH_2Cl_2. (T/F)
8. Chloro acetic acid is more acidic than acetic acid. (T/F)
9. ١,٣-Dithiane can be used for preparing only ketones . (T/F)
10. Carboxylic acids are more acidic than alcohol. (T/F)
11. Intermediates are the final compounds of the reactions (products). (T/F)
12. Acetal is used to protect ketones from reacting with strong bases and nucleophile. (T/F)
13. Carbocations like free radicals have six electrons. (T/F)
14. Isopropyl cations are more stable than ethyl cations. (T/F)
15. carbocations are destabilized by alkyl substituent. (T/F)
16. Carbenes are neutral species and react as neucleophiles. (T/F)
17. $LiAlH_4$ reagent can reduce a carbonyl compounds to alcohols. (T/F)
18. α,β-Unsatureted carbonyls reacted with conjugated diene in Aldol condensation. (T/F)
19. The reaction of 2-propanone with ethylene glycol in acidic medium gives hemiacetal. (T/F)
20. The electrophilic reagents are electron loving species (like Lewis acids). (T/F)
21. $AlCl_3$ and hydrogen proton are electrophiles. (T/F)
22. A nucleophile is a reagent having at least one unshared pair valence electrons. (T/F)
23. Ethers and alcohols are nucleophils. (T/F)
24. Aldehyde reacts with Grignard reagent to give alcohols. (T/F)
25. An elimination reaction is one where starting material loses or be added a small molecule. (T/F)
26. Zaitsev rule tells the reaction gives the most highly substituted (high energy) alkene as the major product. (T/F)
27. The carbonyl carbon is sp2 hybridized. (T/F)
28. The nucleophiles attack oxygen atom from either top or bottom of carbonyl group. (T/F)
29. A ketone has two alkyl (or aryl) groups bonded to the carbonyl carbon. (T/F)
30. The carbonyl double bond is shorter and stronger. (T/F)
31. Jones oxidation is oxidation of secondary alcohols to ketones by chromic acid. (T/F)
32. Collins reagent is Pyridine- CrO3 while Dess-Martin reagent is triacetoxyperiodinane. (T/F)
33. Dithiane has relatively acidic hydrogens located between the two sulfur atoms. (T/F)
34. The dithiane anion can react as a nucleophile. (T/F)

35. Benzene reacts with acetyl chloride to give acetophenone using Friedal-Crafts reaction. (T/F)
36. Gattermann-Koch synthesis is the method for preparing of benzaldehyde. (T/F)
37. Ketones are more reactive than aldehydes due to Steric effect. (T/F)
38. Alcohols can react with ketones to form acetals. (T/F)
39. When aldehyde reacted with ethylene glycol it gave cyclic acetal. (T/F)
40. Primary amines (and ammonia) react with ketones or aldehydes to generate imines. (T/F)
41. hydroxylamines are reacted with aldehydes and ketones to give oximes. (T/F)
42. Thiosemicarbazones are formed from reaction with thiosemicarbazides with alcohols. (T/F)
43. Hydrazones are produced through reaction of hydrazines with ketones. (T/F)
44. Aldehydes and ketones reacted with tertiary amines to give enamine compounds. (T/F)
45. Catalytic hydrogenation Pt / H_2 is highly selective reducing agent. (T/F)
46. Ketones and aldehydes can be oxidized easily to carboxylic acids. (T/F)
47. Cyclopentanone is reduced to give cyclopentane using Wolff-Kishner reaction. (T/F)
48. $CH_3CH_2CH_2CH_2CH_2COOH$ is named pentanoic acid. (T/F)
49. The electronegative elements increase the acidity properties in carboxylic acids. (T/F)
50. Formic acid is more acidic than acetic acid. (T/F)

Part II. Others: (10 marks)

Q2: Choose the correct answer A, B, C, or D: (1 Mark/each)

51. Which of the following is *not* a nucleophile?
A. H_2O B. CH_3OH C. Cl^+ D. CN^-
52. Alkenes can be reacted by O_3 followed by reduction to generate RCHO and /or RCOR through: A. Oxidation B. Ozonolysis C. Hydrolysis. D. Elimination.
53. Triacetoxyperiodinane able to oxidize alcohol to RCOR is performed in:
A. CH_2Cl_2/r.t. B. DMSO/$(COCl)_2$ C. $KMnO_4/H^+$
54. Deoxygenation of a carbonyl group to methylene group in excess of NH_2NH_2, then heating with KOH called: A. Wolff-Kishner reaction. B. Canizzaro reaction.
C. Diels-Alder Reaction. D. Clemennson Reaction
55. Hydrolysis of 1-chloro-3-methy-2-butene gives: A. Primary alcohol only.
B. Tertiary alcohol only. C. Primary alcohol as minor product and tertiary alcohol as major. D. Primary alcohol as major and tertiary alcohol as minor.
56. Aldehydes react with Grignard reagent to give:
A. Acids. B. Alcohols. C. Amides. D. Phenols.
57. Which combination of carbonyl compounds gives $PhCO-CH=CH_2$:
A. $PhCOCH_3$+HCHO B. PhCHO+CH_3CHO C. PhCHO+HCHO
58. The major product from heating a mixture of CH_3CHO and NaOH is:
A. $CH_3CH=CHCHO$ B. $CH_3CH_2CH=CHCHO$ C. $(CH_3)_2C=CHCHO$
59. The reaction of PhMgBr with propanal, followed by hydrolysis gives:
A. 2-Phenylpropanol B. 1-Phenyl-2-propanol C. 1-Phenylpropanol
60. The product of reaction of 2-propanone with ethylene glycol in acidic medium are:
A. Hemiacetal. B. Acetal. C. Cyclic acetal.

Good Luck

Dr. Ahmed Abdou O. Abeed

Assiut University
Faculty of Science
Chemistry Department

10 Spetmber 2022
Time: 2 hrs

Final Examination of the Summer Semester for 2nd Year Students
Physical and Inorganic Chemistry (C-250)

Section # 1

Answer Only Five from the Following Questions: **(25 Marks)**

a) Discuss the temperature dependence of entropy.

b) Determine the heat needed to raise 100 gm of Pb from 0 to 500 °C, given its specific heats to be 0.031 (solid) and 0.038 (liquid). Its heat of fusion is 5.9 cal/g, its melting point is 330°C.

c) The density of ice at 0°C is 0.9g cm^{-3} and has entropy of 38 cal mol^{-1} deg^{-1}. The density of liquid water at this temperature is 1 g cm^{-3} and has entropy of 60 cal mol^{-1} deg^{-1}. Given the date, calculate ΔS, ΔH and ΔE for the conversion of 36 gm of ice to liquid water at the normal melting point. (M.wt. of H_2O=18 g $mole^{-1}$)

d) Calculate the enthalpy change when 540 g of water freezes at constant pressure and a temperature of -30°C. At 0°C, ΔH is -1435 cal $mole^{-1}$, and C_p is 18 and 8.8 cal $mol^{-1}deg^{-1}$ for water and ice , respectively.

e) Given, for acetic acid that ΔE_{fus}=2600 cal mol^{-1} at its melting point 17°C and ΔH_{vap}=6000 cal mol^{-1} at its boiling point 120°C. Calculate the change in entropy that takes place when 120 gm of solid acetic acid is melted at its melting point and vaporized at its boiling point , all under constant pressure taken as 1 atm. Assume that molar heat capacity of acetic acid is 27.6 cal deg^{-1} mol^{-1}.(M.wt of acetic acid=60g/mole)

f) Derive an expression for the efficiency of Carnot's engine working between two temperature T_1 and T_2.

g) At 760 mm/Hg , 100gm of benzene is vaporized at its boiling point of 80°C. Calculate:
a) W_{rev} b) q c) ΔH d) ΔE
(Heat of vaporization is 7.6 K cal/mol , M.wt of benzene =78 gm/mol)

Section # 2

Answer the Following Questions: **(25 Marks)**

1. What are the differences between the following pairs?
   a) Ortho and para hydrogen
   b) Water gas and producer gas
   c) Diamond and graphite
2. Give the reason for three only of the following:
   a) Elements at the end of group (IIIA) show oxidation state of (+I)
   b) CO is toxic to the human.
   c) Freons causes damage to the ozone layer.
   d) Addition of glycerol during the titration of H_3BO_3 and NaOH.
3. How can you obtain three only of the following?
   a) Urea b) Producer gas c) CO_2 d) NH_3
4. Write the structure of three only of the following:
   a) Freons b) Pyroposphorous acid c) Orthophosphoric acid d) Superphosphate

Examiners: Prof.Dr A.El-Awad & Dr. Mohamed Abdel megeed