

6th May, 2007

MISS NORA

The paper shall have been written

FRIDAY 4 MAY 2007

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KWAME NKRUMAH UNIVERSITY OF SCIENCE & TECHNOLOGY
COLLEGE OF SCIENCE
FACULTY OF PHYSICAL SCIENCES

BSc (Chemistry) Second Semester Examination, 2007
FIRST YEAR

CHEM 170

PRACTICAL CHEMISTRY II

APRIL, 2007.

TIME: 1½ hours

ATTEMPT ALL QUESTIONS

Index #:

FOR EACH QUESTION, TICK THE CORRECT OPTION ON THIS QUESTION PAPER AND
SHARE THE APPROPRIATE BOX ON THE SCANNABLE / MARK SHEET GIVEN.

1. In the titration of weak acid against strong base using the pH meter, the equivalence point occurs at a pH of
 - a) 7
 - b) above 7 ✓
 - c) 4
 - d) below 7
2. About the equivalence point in an acid-base titration, the pH of the solution is found to
 - a) change dramatically upon addition of a base
 - b) changes gradually upon addition of a base
 - c) be constant upon addition of a base
 - d) cool off upon addition of a base
3. Which of these can be used in calibration of a pH meter?
 - a) Concentrated acid
 - b) Dilute acid
 - c) Distilled water
 - d) Standard buffer solution ✓
4. For an indicator HIn the relationship between the c_{HIn} and c_{In^-} at the isobestic point is
 - a) $c_{HIn} < c_{In^-}$
 - b) $c_{HIn} > c_{In^-}$
 - c) $c_{HIn} \geq c_{In^-}$
 - d) $c_{HIn} = c_{In^-}$ ✓

Doolen

11. Calculate the crystal field splitting energy, Δ_0 , for a complex copper solution whose maximum absorbance is 0.45 and occurs at a wavelength of 550 nm.
- a) 4.5 kJ/mol
 - b) 55.0 kJ/mol
 - c) 18.1 kJ/mol
 - d) 70.0 kJ/mol
12. For a standard solution preparation 2.5 g of NH_3VO_3 was dissolved in 25 ml of distilled water and then 75 ml of 2 M H_2SO_4 was added. Assume no reaction occurred, what is the concentration of NH_3VO_3 in this standard solution?
- a) 0.022 M
 - b) 0.086 M
 - c) 0.216 M
 - d) 1.862 M
13. If a species is completely "transparent" to a certain wavelength of light, what would be its percentage transmittance?
- a) 0
 - b) 50%
 - c) 100% *hyperfine, hence lowest transmittance*
 - d) 100
14. If a species is completely "opaque" to a certain wavelength of light, what would its absorbance be?
- a) 0
 - b) 0.5
 - c) 1
 - d) 100 *hyperfine, hence highest transmittance*
15. For a reaction $A + 2B \rightarrow 3PC$ given that 0.4 mol of A react with 1.2 mol of B, which of them will be the limiting reagent?
- a) A
 - b) B
 - c) C
 - d) none
16. In the titration of weak acid against strong base using a pH meter, the equivalence point occurs at a pH of
- a) 7
 - b) above 7
 - c) 4
 - d) below 7

29. The dissociation constant for the reaction $\text{B}_2\text{O}_3 + \text{H}_2\text{O} \rightleftharpoons \text{BH}^+(\text{aq}) + \text{BO}_2^-$

- a) $[\text{OH}^+][\text{B}]/[\text{BH}^+]$
 b) $[\text{BH}^+][\text{OH}^+]/[\text{B}]$
c) $[\text{B}][\text{H}_2\text{O}]/[\text{BH}^+]$
d) $[\text{B}][\text{OH}^+]/[\text{H}_2\text{O}]$

$$K_a = \frac{[\text{BH}^+][\text{OH}^+]}{[\text{B}]}$$

✓

30. Which of the following indicators can measure pH most accurately?

- a) Methyl orange
 b) Litmus
 c) Universal indicator
d) Phenol red

31. Which of the following actions would be taken if you splashed a dilute acid onto your eyes?

- a) Get some fresh air
 b) Flush your eyes with water for 15 minutes
c) Put on your goggles immediately
d) Stand under an emergency shower

32. Which of the following is an appropriate indicator for the titration of I_2 with $\text{Na}_2\text{S}_2\text{O}_3$?

- a) Freshly prepared starch
b) Eriochrome Black T
c) Potassium chromate
d) Cyanide ions

33. Which of the following is an appropriate indicator for the titration of Ca^{2+} ions with EDTA?

- a) Freshly prepared starch
 b) Eriochrome Black T
c) Potassium chromate
d) Cyanide ions

34. Which of the following is an appropriate indicator for the titration of chloride ions with silver nitrate?

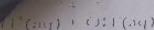
- a) Freshly prepared starch
b) Eriochrome Black T
 c) Potassium chromate
d) Cyanide ions

mostas method

✓ ✓ ✓ ✓

35. Didentate and polydentate ligands are also known as

- a) chelating agents
b) chelates
c) complex ions
d) chelated agents



36. What is the molarity of 15 ml of 4N H_2SO_4 ?

- (a) 1M
- (b) 4M
- (c) 2M
- (d) none of the above

Use this information to answer 37-40:

A sample X is known to contain Cu^{2+} ions. A 250 ml solution is prepared from 2.5 g of X. 10 ml of this solution is titrated with 0.1 M $Na_2S_2O_3$ (sodium thiosulphate), giving a titre value of 10.27 ml.

dilute acid onto

of I_2 with

Cu^{2+} ions with

chloride ions

37. Which of the following is an appropriate indicator for this titration?

- (a) Eriochrome Black T
- (b) Potassium chromate
- (c) Freshly prepared starch
- (d) Cyanide ions

38. What will be the colour of the solution at the equivalence point?

- (a) Blue
- (b) Greenish yellow
- (c) Pale yellow
- (d) Brick red

39. What is the mass of Cu^{2+} ions in the sample?

- (a) 0.01 g
- (b) 0.03 g
- (c) 0.02 g
- (d) 1.01 g

40. What is the percentage of Cu^{2+} ions in the sample?

- (a) 1.65 %
- (b) 41.2 %
- (c) 0.825 %
- (d) 0.041 %

Use this information to answer 41-44:

A 500 ml solution is prepared from 5 g of bleaching powder ($Ca(ClO)_2$). 2 g of KI and 15 ml of 4N HCl is added to 50 ml of this solution. The resultant solution is titrated with 0.1 M $Na_2S_2O_3$, giving a titre value of 19.0 ml.

41. What is the molarity of the HCl solution added?

- (a) 1 M
- (b) 2 M
- (c) 1.8 M
- (d) 8 M

42. What is the role of the HCl solution added?
- (a) To liberate chlorine from the bleaching powder
 - (b) To buffer the solution to prevent wide fluctuations in pH
 - (c) All of the above
 - (d) None of the above
43. What is the mass of available chlorine in the bleaching powder?
- (a) 0.34 g
 - (b) 0.42 g
 - (c) 0.70 g
 - (d) 0.17 g
44. What is the percentage of available chlorine in the bleaching powder?
- (a) 6.8 %
 - (b) 3.4 %
 - (c) 68.0 %
 - (d) 32.0 %
45. Which of the following methods is the most appropriate for the determination of a halide in a sample?
- (a) Volhard's method
 - (b) Molii's method
 - (c) Fajan's method
 - (d) Complexation method
46. Chelating agents are
- (a) Lewis acids
 - (b) Lewis bases
 - (c) always negatively charged
 - (d) either electron donors or electron acceptors depending on the situation
47. The following affect the boiling of a liquid except
- (a) impurities
 - (b) cohesive forces
 - (c) atmospheric pressure
 - (d) solubility
48. In a solubility test if an unknown substance is soluble in 5% NaOH, then the substance is
- (a) acid
 - (b) basic
 - (c) neutral
 - (d) none of the above

59. If a substance is soluble in 5% NaOH, but not in 5% Ba(OH)₂, the substance is

- (a) strongly acidic
- (b) weakly acidic
- (c) strongly basic
- (d) weakly basic

60. If a substance is soluble in 5% NaHCO₃, then the substance is

- (a) strongly basic
- (b) weakly basic
- (c) strongly acidic
- (d) weakly acidic

61. Sodium chloride is a salt or

- (a) a strong base and a strong acid
- (b) a strong acid and a weak base
- (c) weak acid and a weak base
- (d) strong base and weak acid

62. You are provided with a mixture containing a sodium salt and camphor. How would you separate them?

- (a) By heating
- (b) Filtering
- (c) Pickling
- (d) Dissolving in water

63. The process of forming crystals from a liquid or gas is known as

- (a) crystallite
- (b) crystallography
- (c) crystallization
- (d) crystalloids

64. A separatory funnel in use is turned upside down after shaking and the tap opened to

- (a) build pressure in the funnel
- (b) release pressure from the funnel
- (c) analyze the sample
- (d) identify cations

65. Give the full name of NMR as in spectroscopic analysis

- (a) Neo magnetic reflux
- (b) Nuclear melting resonance
- (c) Nuclear magnetic resonance
- (d) New magnetic resonance

Correct.

56. What is the simplest test you would use to differentiate between an alcohol and water?
a) heating
b) colour
c) smelling
d) titrating

57. Which of the following is a source of determinable chlorine?

- a) HCl
- b) CCl₄
- c) BaCl₂
- d) Ca(OCl)Cl ✓

58. Which of the following is the correct mole ratio of Ca²⁺ to EDTA in the determination of Ca?

- a) 2:1
- b) 1:2
- c) 1:1 ✓
- d) 1:3

59. Which of the following is true in the determination of Cl⁻ by Noda's method?

- a) Phenolphthalein is used as indicator
- b) EDTA is used as indicator
- c) Potassium Chromate is used as indicator ✓
- d) AgNO₃ is used as indicator

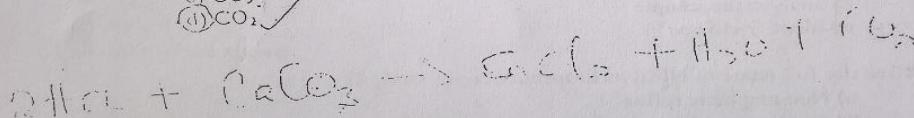
Use this information to answer questions 60 and 61.
In the determination of Ca, 2.5 g of CaCO₃ was weighed to prepare a solution of Ca in 250 ml volumetric flask.

60. How will the carbonate be removed from CaCO₃?

- a) by heating the CaCO₃
- b) by heating the solution of CaCO₃ to boil
- c) by dissolving CaCO₃ in distilled water
- d) by adding HCl to CaCO₃ ✓

61. In what form does the carbonate get eliminated from CaCO₃?

- a) CO₃²⁻
- b) CO²
- c) CO₃
- d) CO₂ ✓



62. If 20 ml of 0.1M EDTA was titrated against the 30 ml of Ca solution to the end point. What is the concentration (g) of Ca in the 250 ml of solution?

- a) 6.5×10^{-6} g/ml
- b) 6.6×10^{-6} g/ml
- c) 6.6×10^{-3} g/ml
- d) 6.67 g/ml

o.e. 167 and

and eff = o.e.

$$\frac{167}{50} \times 10^{-3}$$

o.e. 167.

$\therefore 0.0667$ g/ml

63. Calculate the percentage Ca^{2+} in the sample of CuCO_3 ?

- a) 0.0027 %
- b) 0.003 %
- c) 27 %
- d) 26.7 %

64. What is the molar concentration of Calcium in the sample?

- a) 0.830 M
- b) 0.833 M
- c) 0.804 M
- d) 0.8 M M

65. When EDTA is used in ionic determination it is used as a

- a) acid salt
- b) basic salt
- c) sodium salt
- d) disodium salt

66. The absorbance of a solution in a 1cm cuvette is 0.6. Calculate the concentration of the solution if the absorptivity is $220 \text{ M}^{-1}\text{cm}^{-1}$.

- a) 2.72×10^{-3} M
- b) 1.02M
- c) 0.220M
- d) 0.06M

67. Which of the following can be used to zero a calorimeter?

- a) Buffer solution
- b) Analyte solution
- c) Blank solution
- d) Impurity solution

Using the data below, answer questions 68 - 70.
 For a weak monoprotic acid-base titration curve, the pH at equivalence point and half-way to the equivalence point occurred at pH 8.05 and 4.75 respectively and the volume of base at the equivalence is 40 ml, if the concentration of the base used is 0.1M.

68. What is the acetic dissociation constant of this weak acid?

- a) 1.778×10^{-5}
- b) 1.523×10^{-5}
- c) 1.981×10^{-5}
- d) 1.200×10^{-5}

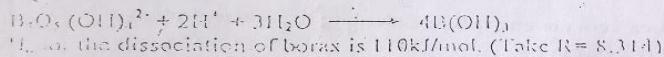
69. What is the volume at half-way the equivalence point?

- a) 10 ml
- b) 20 ml
- c) 30 ml
- d) 40 ml

70. What is the mole of the weak acid in the beaker at half-way to equivalence point if the initial volume was 5ml?

- a) 1 mmol
- b) 2 mmol
- c) 3 mmol
- d) 4 mmol

For the dissociation of borax in water the equilibrium constant is given by
 $K_{sp} = 4((\text{B}_3\text{O}_5(\text{OH})_4)^2)$; 1.26ml of 0.0×10^{-4} M HCl was required to titrate with the 5.0ml of dissolved borax solution at a temperature of 40°C according to the reaction,



Answer question 71 - 73 with the above preamble

71. What is the K_{sp} for the dissolution?

- a) 3.00×10^{-9}
- b) 5.12×10^{-9}
- c) 6.26×10^{-9}
- d) 7.50×10^{-9}

72. What is the ΔG° in the dissolution?

- a) 37.7 kJ
- b) 48.5 kJ
- c) 43.2 kJ
- d) 54.7 kJ

$$(\text{B}_3\text{O}_5(\text{OH})_4^{2-}) \cdot (1/0.5)^2 / V$$

$$(\text{B}_3\text{O}_5(\text{OH})_4^{2-}) \cdot (2.5 \times 10^{-4})^2 / V$$

Page 12 of 15

$$c(\text{HCl}) = 1 \times 10^{-4} \text{ M}$$

$$K_{sp} = 1.26 \times 10^{-9} \times 1 \times 10^{-4}$$

$$= 1.26 \times 10^{-13}$$

$$n(\text{borax}) = 6.3 \times 10^{-8} \text{ mole}$$

$$V(\text{borax}) = 5 \times 10^{-3}$$

$$6.3 \times 10^{-8}$$

$$5 \times 10^{-3}$$

$$1.26 \times 10^{-13}$$

$$K_{sp} = 4(1.26 \times 10^{-13})$$

$$K_{sp} = (R \times 8.314 \times 10^{-4}) \times (48.5 \times 10^{-3})$$

$$K_{sp} = 8.314 \times (5.2 \times 10^{-4}) \times 48.5 \times 10^{-3}$$

$$pH = pK_a + \log \frac{[A]}{[HA]}$$

$$pK_a = -\log K_a$$

73. What is the entropy change for the dissolution?
- a) 0.230 kJ/K
 - b) 0.213 kJ/K
 - c) 0.196 kJ/K
 - d) 0.176 kJ/K
74. In performing solubility analysis for an unknown compound, which of the following should be the first step to take?
- a) Addition of 5% NaOH to the sample.
 - b) Addition of 5% HCl to the sample
 - c) Addition of H_2O to the sample.
 - d) Addition of Cone. H_2SO_4 to the sample.
75. When is litmus test needed when performing solubility analysis?
- a) When the sample is insoluble in water.
 - b) When the sample is soluble in HCl.
 - c) When the sample is soluble in NaOH
 - d) When the sample is soluble in H_2O
76. If an unknown sample is a nitrogenous base, which of the following solvent will it dissolve in?
- a) NaOH
 - b) HCl ✓
 - c) $NaHCO_3$
 - d) Cone. H_2SO_4
77. A substance which possesses both acidic and basic properties is called
- a) azeotropic substance
 - b) macroscopic substance
 - c) amphoteric substance
 - d) pyrotoxic substance
78. Which of the following is commonly employed as an endpoint indicator in complexometric titrations?
- a) Methyl orange
 - b) Methyl red
 - c) Eriochrome black T ✓
 - d) Phenolphthalein
79. Ethylenediaminetetraacetic acid (EDTA) is a very versatile complexometric agent used in several quantitative and qualitative analyses. How many replaceable hydrogen ions/atoms have EDTA?
- a) 1
 - b) 2
 - c) 3
 - d) 4 ✓

80. An $8M$ H_2SO_4 solution is equivalent to _____ Mol/L H^+ solution.

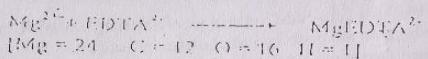
- (a) 4
- (b) 8
- (c) 16
- (d) 10

81. Which of the following titrimetric methods commonly employs an absorption indicator for visual identification of the endpoint?

- (a) Mohr's Method
- (b) Fajan's Method
- (c) Volhardt's Method
- (d) Argentometric

Use the following information to answer Q 82-84:

As part of daily routine, a Quality Control Chemist at the Coca Cola Bottling Company sets out to determine the amount of Magnesium in the water used in bottling using a standard EDTA solution ($0.1M$) as the titrant. Using a 50.0 ml aliquot of the water sample, the volume of the titrant which reacted with the Mg^{2+} in the water to the endpoint was obtained as 10.0 ml.



82. What is the amount of Mg^{2+} present in the water sample in mol/dm 3 ?

- (a) 0.002
- (b) 0.003
- (c) 0.004
- (d) 0.005

83. Express the amount of Mg^{2+} present in the water in ppm?

- (a) 0.060
- (b) 0.024
- (c) 0.096
- (d) 0.048

84. Express the concentration of Mg^{2+} in the water as ppm?

- (a) 36
- (b) 24
- (c) 96
- (d) 48

85. One of the unique characteristics of EDTA as a complexometric agent is its ability to form multiple bonds with metal ions. What is the maximum number of bonds that EDTA can form with a metal ion?

- (a) 1
- (b) 4
- (c) 6
- (d) 8

86. Which of the following reagents is commonly employed as an indicator in the estimation of the "Available Chlorine" in bleaching powder?

- (a) CaCO_3CHCl
- (b) Iodine
- (c) $\text{Na}_2\text{S}_2\text{O}_3$
- (d) Triochrome Black T

87. What is the optimum pH range for the indicators usually employed in complexometric titrations?

- (a) 2.5 - 6.0
- (b) 6.5 - 7.0
- (c) 7.0 - 11
- (d) 11 - 14

88. In the reaction of EDTA with Plutonium (Pu^{4+}) the mole ratio of the accompanying reaction should be?

- (a) 4:1
- (b) 1:4
- (c) 1:1
- (d) 1:2

89. The chemical formula of a Standard "Hypo solution" is ----

- (a) $\text{Ca(OH)}_2\text{Cl}$
- (b) $\text{Na}_2\text{S}_2\text{O}_3$
- (c) $\text{Na}_2\text{S}_2\text{O}_8$
- (d) Na_2SO_4

90. Which of the following is NOT a drying agent?

- (a) Anhydrous calcium chloride
- (b) Calcium oxide
- (c) Phosphoric oxide
- (d) Salicylic acid

REMINDER:

- o Enter your ID number on the question paper
- o Fill all particulars on the OMR scannable form
- o Tick your answers on the question paper
- o Shade your answers on the OMR scannable form
- o Submit both question papers and scannable form to invigilator

Handwritten Note: Benzene ring with substituents: -NH₂, -OH, -Cl, -CH₃
KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KNUST

DEPARTMENT OF CHEMISTRY

B.Sc. Chemistry, Second Semester Examination, 2003

FIRST YEAR

CHEM 170: PRACTICAL CHEMISTRY

JUNE, 2003.

TWO HOURS

INSTRUCTIONS:

- Write your index number on the question paper.
- Do not take the question paper away.
- Answer ALL questions.

SECTION A

Circle the correct answer on the question paper in P.M.R.

1. Using the table below, calculate the K_a for an indicator
pH

	$\log \Delta_e - \Delta H_{In}$	$\Delta H_e - \Delta H_{In}$
6.63	-1.8782 x 10 ⁻³	1.752 x 10 ⁻³
6.93	-2.0935 x 10 ⁻³	-0.7592 x 10 ⁻³
7.50	-3.5538 x 10 ⁻³	-0.1913 x 10 ⁻³
7.99	-4.2554 x 10 ⁻³	-0.1691 x 10 ⁻³
8.32	-4.6215 x 10 ⁻³	1.1130 x 10 ⁻³
8.57	-5.2429 x 10 ⁻³	1.6349 x 10 ⁻³
A. 1.9333×10^{-8}	(D) 1.8333×10^{-8}	

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$$\text{Using } \Delta H_e = \Delta H_{In} + \log \frac{A_e}{A_{In}} \text{ (A. A. Ho)}$$

$$pH = pK_a + \log \frac{A_e}{A_{In}}$$

$$- \log K_a = 4.878$$

2. At the isobasic point is the relationship between ϵ_{In} and ϵ_{HIn}

- A. $\epsilon_{In} = 2 \epsilon_{HIn}$ (B) $\epsilon_{In} = \epsilon_{HIn}$
C. $\epsilon_{In} = 4 \epsilon_{HIn}$

3. How many forms can an indicator exist in solution

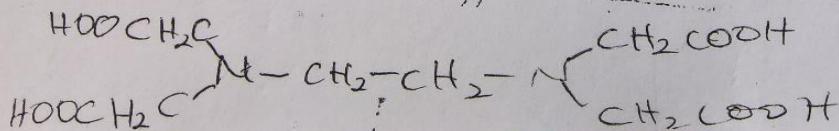
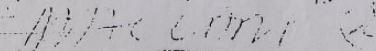
- A. 1 B/2 C. 3 D. 4

4. In the determination of acid dissociation of phenol red using a spectrophotometric method, the following were obtained: $\Delta H_{In} = 0.08$, $\Delta H_e = 2.920$ and $A = 1.054$. Calculate K_a for Phenol red if the pH of the solution containing the indicator was 7.68.

- A. 1.0904×10^{-8} B. 1.0904×10^{-9} C. 1.0904×10^{-10}
D. 1.0904×10^{-8}

Pou/S 302-03

	NaOH	H_2O
Soluble	L 10	
Insoluble	Cu ₂ O Cu	L 10



22. Which of the following properties can
- Acidic
 - basic
 - neutral
 - Amphoteric

16. The absorption of visible light by a complex ion depends on the number of d-electrons. In the following complexes (MII)O₆, which one has the maximum absorption? (A) Octahedral (B) Tetrahedral (C) Trigonal bipyramidal (D) Square planar

17. The absorption of visible light corresponds to 65% transmission. The ligand is (A) H₂O (B) NH₃ (C) Cl⁻ (D) CN⁻

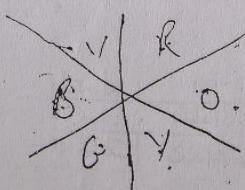
18. Arrange the following ligands (H₂O), am, gly, NH₃ in order of their capacity to cause orbital splitting.

- Solid Oxyacids
- Ammonia
- Glycine
- H₂O < NH₃ < gly < am

19. A solution containing copper ions becomes colored when hydrated.

20. A solution containing copper ions is blue because it absorbs the complementary A from white light and transmits the remaining blue light. A is :

- Yellow
 - Yellow
 - Green
 - Red
- The energy difference between two sets of d-orbital A is called
 - Spectrochemical energy
 - Energy of electronic transition
 - Coulomb field splitting energy
 - Electron energy



22. Which of the following properties can best describe VO_4^{4-} ?
A. acidic
B. basic
C. neutral
D. amphoteric
23. The anhydrous salts of CuI and CuSO_4 are in colour because the ligands are weak and do not cause a big ligand field splitting of energy levels.
A. blue B. white C. green D. violet
24. Which of the following organic compound is most likely to have the highest melting point?
A. Benzophenone
B. Sulphanilamide
C. Salicylic acid
D. Oxalic acid
25. Which of the following organic compound is most likely to react with HCl at room temperature?
A. Benzaldehyde
B. Acetophenone
C. Acrolein
D. Toluidine
26. Which of the following compounds could be formed when phenol is made to react with chloromethane in the presence of aluminium chloride?
A. p-chlorophenol B. m-cresol C. p-cresol D. m-chlorophenol
27. Consider the equation below:
$$\text{RMgBr} + \text{HClO}_4 \rightarrow \text{H}_2\text{O} \quad \text{2,2-dimethylpropan-1-ol}$$
What is the name of the alkyl group represented by the letter R?
A. ethyl B. propyl C. isopropyl D. butyl
28. An organic compound X dissociates to form a neutral weak dipole with the loss of carbon(IV) oxide. X is likely to contain
A. $\text{C}_2\text{O}_4^{2-}$ B. $\text{C}_2\text{O}_4^{2-}$

Ques 5

The process of which elements is indicated by
the production of a jet black colour when a piece of
I. Fluorine II. chlorine

5. In the titration of HCl against a strong base all the indicators below are suitable.
- Thymol blue
 - Thymolphthalein
 - Phenolphthalein
 - Methyl orange

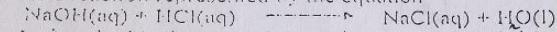
Use the following information to answer questions 6 to 8.
A 50.0ml of 0.100M HCl was titrated against 0.100M NaOH.

6. Calculate the pH when 0ml of the base had been added.
- 1.00
 - 2.00
 - 3.00
 - 4.00

7. Calculate the pH of the solution when 49ml of the base had been added.
- 4.00
 - 3.00
 - 2.00
 - 5.00

8. Calculate the pH of the solution when 50ml of the base had been added.
- 7.00
 - 8.00
 - 10.00
 - 12.00

9. The reaction represented by the equation



- is a double decomposition
- is a neutralization
- is reversible
- is usually catalysed
- attains equilibrium after a few seconds

Use the information below to answer questions 10 - 13.

Calcium chloride (A) Aqueous solution of Zinc chloride (B), Iron (III) tetroxosulphate (V) and lead (II) trioxonitrate (V) (D) are contained in four separate bottles whose labels have been lost. Only aqueous ammonia solution was used to identify the samples; draw inference for the following observations. Write the appropriate letters in the column for the inferences.

Ques. No.	Observation.	Inference
10.	White gelatinous precipitate soluble in excess aqueous NH_3 No visible reaction	A B
11.	White precipitate insoluble in excess aqueous NH_3 Reddish brown precipitate insoluble in excess aqueous NH_3	C D

None of the indicators below are suitable

- 8250596061
29. The presence of which elements is indicated by the smell of phosphine and the immediate production of a jet black colour when a piece of filter paper impregnated with AgNO_3 solution is placed over the mouth of the ignition tube in the sodium fusion test?
A. fluorine B. chlorine C. bromine D. Phosphorus
30. A student of KNUST in the Chemistry department was given a mixture of Barium Sulphate, Benzoic acid and acetonitrile; which of the following solvents would he/she use to quickly extract the benzoic acid from the mixture?
A. Di-ethyl ether
B. Concentrated sulphuric acid
C. Potassium hydroxide solution
D. Water
31. What physical observation accompanies a reaction between $\text{RCOOH}_{(\text{aq})}$ and $\text{Na}_2\text{CO}_3_{(\text{s})}$?
A. Carbon (IV) oxide is evolved
B. RCOOH dissolves
C. There is effervescence
D. RCOOH behaves as an acid
32. Which of the following combination of compounds forms an azeotropic mixture?
A. Acetone/carbon disulphide B. Acetone/chloroform C. water/nitric acid.
D. Benzene/toluene
33. Which of the following reaction is feasible in the sodium fusion test to identify the halogen?
A. $\text{Cl}_{(\text{g})} + \text{Li}_{(\text{l})} \rightarrow \text{LiCl}_{(\text{l})}$
B. $\text{I}_{(\text{g})} + \text{Li}_{(\text{l})} \rightarrow \text{LiI}_{(\text{l})}$
C. $\text{Br}_{(\text{g})} + \text{Li}_{(\text{l})} \rightarrow \text{LiBr}_{(\text{l})}$
D. $\text{F}_{(\text{g})} + \text{Li}_{(\text{l})} \rightarrow \text{LiF}_{(\text{l})}$

ANDREW J. MANN

CHEM. 170 "PRACTICAL CHEMISTRY II"

Date of Examination: JUNE, 2001 Time Allowed: 2 hrs.

Circle the correct answer. ~~ANSWER~~ ~~ANSWER~~ ~~ANSWER~~ ~~ANSWER~~ ~~ANSWER~~
Write your index number on the question paper.

~~ANSWER~~ ALL QUESTIONS

1. In the titration of ethanoic acid with NaOH solution, the equivalence point occurs at a pH of 9.5. Which of these indicators will be most suitable for this titration?
(a) methyl orange (b) Bromothymol blue
 (c) phenolphthalein (d) phenol red
2. In the titration of a 10 mL of 0.100M H_3PO_4 with 0.100M NaOH the pH at the first half way to equivalence is reached is 2.15. What is the K_a of phosphoric acid?
(a) 6.82×10^{-8} (b) 7.08×10^{-3} (c) 7.1×10^{-3} (d) 5.01×10^{-1}
3. What principal action will you take if your lab partner splashes some acid onto his hand?
(a) Immediately neutralize the acid with a dilute basic solution.
(b) Wash with plenty water.
(c) Wipe it off and later flush with water.
 (d) Apply some vaseline to burns.
4. Which of these acids is most acidic
(a) malonic acid. $K_{a1} = 1.5 \times 10^{-2}$ $K_{a2} = 2.0 \times 10^{-6}$
(b) oxalic acid. $K_{a1} = 6.5 \times 10^{-2}$ $K_{a2} = 6.1 \times 10^{-5}$
(c) monochloroacetic acid. $K_{a1} = 1.34 \times 10^{-5}$ $K_{a2} = 6.1 \times 10^{-7}$
(d) Mandelic acid. $K_{a1} = 1.8 \times 10^{-2}$
5. Which of the following best stand for EDTA
(a) ethylenediamine tetracetic acid
(b) ethylenediamine tetracetate
(c) diethylenetriamine tetracetic acid
 (d) diethylenetriamine tetracetate
6. Which indicator salt can be used in the determination of calcium ions?
 (a) Phenolphthalein
(b) Eriochrome Black T
(c) Methyl orange
(d) Cresol purple

6759828

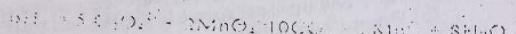
7. The following species is responsible for causing the colour change from blue to orange during the determination of calcium using EDDTA?

- (a) Ca^{2+} , (b) Mg^{2+} , (c) Al^{3+} , (d) Li^{+}

8. What action would you take if your laboratory partner splashed some of the acid-base mixture onto his goggles but did not get it into his eyes?

- (a) remove the goggles and flush the face area with running tap water for at least 15 minutes.
(b) flush the face area with a running tap water before removing the goggles for 15 minutes.
(c) report the accident to the teaching assistant.
(d) report the accident to the technician.

9. In this experiment MnO_4^- reacts with an oxidant ($\text{C}_2\text{O}_4^{2-}$) according to the equation:



10. 0.5 cm³ of 1.04×10^{-4} M KMnO_4 required 5.0 cm³ of $\text{C}_2\text{O}_4^{2-}$ for complete neutralization at 20°C. Calculate the concentration of the $\text{C}_2\text{O}_4^{2-}$.

- (a) 8.572×10^{-6} M, (b) 3.58×10^{-4} M
(c) 3.45×10^{-6} M, (d) 1.04×10^{-5} M

10. When a chemical reaction is endothermic it implies that ΔH is:

- (a) positive, (b) zero, (c) negative, (d) neutral

11. The unit of ΔS is

- (a) J mol^{-1} , (b) JK^{-1} , (c) J mol^{-1} , (d) J mol^{-1}

12. Calculate ΔS for the reaction:



- (a) ΔS is positive, (b) ΔS is negative,
(c) ΔS is zero, (d) depends on the volume of the vessels.



- (a) ΔS for the reaction is zero because all reactants and products are all gases.
(b) ΔS for the reaction is zero because the reaction is reversible.
(c) ΔS for the reaction is zero because the reaction is exothermic.
(d) ΔS for the reaction is zero because the reaction is endothermic.

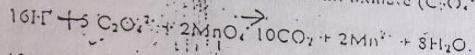
$$n(C_2O_4) = 5$$

$$C(C_{2O_4}) \times V(C_2O_4)$$

7. What single species is responsible for ensuring the colour change from wine red to blue during the determination of calcium using EDTA?
(a) Ce^{4+} , (b) Mg^{2+} , (c) Al^{3+} , (d) Li^+

8. What action would you take if your laboratory partner splashed some of the acid-base mixture onto his clothes? (in case of eye contact)
(a) Remove the goggles and flush the eyes with running tap water for at least 15 minutes.
(b) Flush the face with a running tap water without removing the glasses for 15 minutes.
(c) Report the accident to the teaching assistant.
(d) Report the accident to the technician.

9. In an experiment MnO_4^- reacts with an oxalate ($C_2O_4^{2-}$) according to the equation:



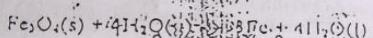
If 1.05 cm^3 of $1.04 \times 10^{-2}\text{ M KMnO}_4$ required 5.0 cm^3 of $C_2O_4^{2-}$ for complete neutralization at 20°C . Calculate the concentration of the $C_2O_4^{2-}$. (Ans.)

- (a) $6.522 \times 10^{-6}\text{ M}$, (b) $8.58 \times 10^{-6}\text{ M}$,
(c) $5.46 \times 10^{-6}\text{ M}$, (d) $1.01 \times 10^{-5}\text{ M}$

10. When a chemical reaction is endothermic it implies that ΔH is
(a) positive, (b) zero, (c) negative, (d) neutral

11. The unit of ΔS is
(a) KJmol^{-1} , (b) JK^{-1} , (c) Jmol^{-1} , (d) Jmol^{-1}

12. What is the sign of ΔS for the reaction



- (a) ΔS is positive, (b) ΔS is negative,
(c) ΔS is zero, (d) None of the above

13. $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$

ΔS for the reaction is zero because

A. The reactants are all gases.

B. the number of moles of reactant is constant

C. There is no change in the number of moles of gaseous reactants and products

D. There is no degree of freedom.

T. CUMA

In toluene and *p*-toluidine in ether can be separated by extraction with either dilute sodium hydroxide solution or dilute hydrochloric acid solution. Which of the following statements is true if dilute hydrochloric acid is used as the extraction solvent?

- (A) *p*-toluidine will be in the aqueous phase.
(B) *p*-toluidine will be in the organic phase.
(C) The chloride of *p*-toluidine will be in the aqueous phase.
(D) The chloride of *p*-toluidine will be in the organic phase.

17. Select the reagent which is not used as a drying agent for organic substances.
(A) CaSO_4 (B) Na_2SO_4 (C) NaCl (D) CaCl_2

18. A solid organic compound was found to be insoluble in water, 5% sodium hydroxide, 5% hydrochloric acid, and 5% sodium carbonate. It however dissolves in concentrated sulphuric acid. The compound is likely to be:

- (A) m-benzoquinone
(B) *p*-toluidine
(C) benzene acid
(D) benzophenone

19. The properties of a good recrystallization solvent should do all of the following except:
(A) high volatility
(B) the solvent should dissolve the solute to be recrystallised at a high temperature
(C) the solvent should be immiscible with water
(D) the solvent should have a high solvation power for impurities in the mixture.

20. 1.64 g of sodium ethanote is dissolved in 1 dm³ of 0.010M ethanoic acid at 20°C. Given that the K_a of $\text{CH}_3\text{COOH} = 1.84 \times 10^{-5}$ and the molecular mass of sodium ethanote = 82.0, calculate the pH of this solution at 20°C.
[$\text{pH} = 7.4$, (A) 5.05, (B) 5.54, (C) 6.54, (D) 7.54]

21. Which of the following species is an acid according to the Brønsted-Lowry's concept of acid using the equation below?



- (A) NH_3 (B) NH_4^+ (C) H_2O (D) OH^-

22. From the equation in the question above, which species is a Lewis acid?

- (A) H_2O (B) NH_3 (C) OH^- (D) NH_4^+

23. The following are all essential constituents of bleaching powder except:

(A) calcium hypochlorite (Ca(OCl)_2)
(B) calcium chloride (CaCl_2)
(C) calcium hydroxide monohydrate ($\text{Ca}(\text{OH})_2 \cdot \text{H}_2\text{O}$)
(D) calcium nitrate ($\text{Ca}(\text{NO}_3)_2$)

24. Which of the following expressions best describe the relationship between absolute error (A.E) and accuracy (A)?

- (A) A = A.E (B) A > A.E (C) A < A.E (D) A \leq A.E

23. The standard deviation and mean for a particular titration were 1.2712×10^{-3} g and 0.0976 g respectively. Calculate the percentage error.

- (a) 76.80%
(b) 16.55%
 (c) 1.30%

24. In the determination of calcium using the suitable indicator, the following elements do interfere except

- (a) Co
 (b) Si
(c) Ni
(d) Fe

25. Dichlorofluorescein is preferred to fluorescein as an indicator in the solution because

- (a) more concentrated than 0.005M.
(b) more dilute than 0.005M
(c) more concentrated than 0.001M.
(d) more dilute than 0.001M

26. The quantitative determination of the constituent nitrins of a mixture of iodine and iodide could be done using the following indicators separately

- (a) fluorescein and dichlorofluorescein
(b) eosin and solochrome black
(c) eosin and diliododinitroethylfluorescein
(d) phenolphthalein and methyl orange

27. The accuracy of a set of determinations is defined as

- (a) a measure of the difference between the average of the set of measurements and the true value
 (b) the difference between the measured value and the true value of the quantity measured
(c) the mean precision
(d) the difference between the true value and the measured value of the quantity determined

28. Which of the following statements is not true?

- (a) A saturated solution can dissolve more solute by increasing the temperature
(b) An unsaturated solution under certain conditions can become saturated
(c) A supersaturated solution has dissolved solute in a state of dynamic equilibrium with undissolved solute
 (d) crystallization can occur only when a solution is super saturated

29. A mixture of sodium chloride, sugar and camphor can be separated by solvent extraction. Which of the solvent systems below will be most suitable?

- (a) water-acetone-ethanol
(b) diethyl ether-benzene-chloroform
 (c) diethyl ether-ethanol-water
(d) acetone-diethylether-benzene

30. The temperature at which a liquid boils depends on which of the following

- (a) the quantity of liquid heated
(b) the nature of the vessel in which the liquid is being heated
(c) the rate at which heat is supplied to the liquid
 (d) the place on the heating surface the liquid is being heated

Impurities in a liquid normally affect the boiling point of a liquid by:

- (a) increasing the range within which the liquid boils
- (b) decreasing the boiling point of the liquid
- (c) increasing the boiling point of the liquid
- (d) increasing the temperature of the liquid

2. Recrystallization is a more efficient method purifying a solid organic substance than washing the crystals on a filter paper, because:

- (a) the crystals normally react with the filter paper
- (b) the solvent used in washing the crystals will contaminate it
- (c) insoluble impurities cannot be removed by washing
- (d) filtration is normally tedious

3. Which of the following statements is true?

- (a) 10% benzene in the boiling acetone. 100% ethanol (absolute) can be obtained only by increasing the efficiency of the distilling apparatus.
- (b) A solid organic substance soluble in distilled water will not dissolve in 5% sodium hydroxide or 5% hydrochloric acid.
- (c) Camphor and naphthalene are both organic solids. Water can be used as an extracting solvent to separate a mixture of camphor and naphthalene in ether.
- (d) A highly volatile organic compound such as ether found as an impurity in water is likely to cause an increase in the boiling point of water from 100°C to 105.5°C.

4. Which of the following statements is not true for an observation of an isobestic point during a chemical reaction?

- (a) All the spectrophotometric traces should intersect at a common point.
- (b) total concentration of reacting species is constant.
- (c) is good evidence that only two principal species are present.
- (d) the pH of the indicator is 7.8.

5. Which of the following statements is not a common precaution in the use of automatic recording spectrophotometers?

- (a) glass containing vessels covered as samples should be dust-free.
- (b) filtering the final solution through a fine filter may be necessary in critical work.
- (c) a black solution should be used to prevent damage to the instrument once and thereafter the wavelengths could be varied and absorbances measured.
- (d) keep your fingers off the electrodes.

6. When 2.5 g of ammonium metavanadate ($(\text{NH}_4)_2\text{VO}_4$) is dissolved in 25 cm³ of 2 mol dm⁻³ sodium hydroxide and stirred thoroughly and finally 2 mol dm⁻³ of sulfuric acid added, the metavanadate is converted to:

- (a) VO^{+}
- (b) VO_2^{+}
- (c) VO_3^{+}
- (d) VO_4^{4-}

7. If completely transparent to a certain wavelength of light then which one is true about the absorbance (A) and percentage transmittance (T)?

- (a) $A = 0, T = 1$
- (b) $A = 0, T > 1$
- (c) $A = 1, T = 0$
- (d) $A = 1, T = 1$

Use the above information to answer the questions.

39. What is the total moles of Fe^{3+} ions?

- (a) 4, (b) 0.5, (c) 3, (d) 1

40. What is the moles of Fe^{3+} ?

- (a) 0.1, (b) 0.2, (c) 0.3, (d) 0.4

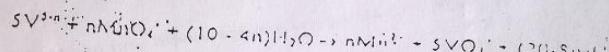
41. What is the mole of A^{3-} ?

- (a) 0.6, (b) 0.7, (c) 0.8, (d) 0.9

42. The method of continuous variation for the determination of the formula of the complex ion $[\text{Fe}(\text{SCN})_n(\text{H}_2\text{O})_{6-n}]^{3-n}$ at a selected wavelength is based on the fact that

- (a) Fe^{3+} absorbs light but SCN^- does not
(b) Fe^{3+} does not absorb light but SCN^- does.
 (c) $[\text{Fe}(\text{SCN})_n(\text{H}_2\text{O})_{6-n}]^{3-n}$ absorbs light but both SCN^- and Fe^{3+} do not
(d) Fe^{3+} , SCN^- and $[\text{Fe}(\text{SCN})_n(\text{H}_2\text{O})_{6-n}]^{3-n}$ absorb light

43. From the equation



If the mole of MnO_4^- is 3.4×10^{-3} and that of V^{3+} is 2.4×10^{-4} , then V^{3+} will exist in solution as:

- (a) VO_4^{3-} (b) VO_2^+ (c) V^{3+} (d) VO_2^+

44. The boiling of sodium sulphite with VO_2^+ solution reduces the VO_2^+ into

- (a) VO_2^+ (b) VO_2^+ (c) VO^{2+} (d) VO_2^+

45. When a solution of VO_2^+ is acidified and boiled with sodium sulphite there is evolution of

- (a) CO_2 (b) VO_2^+ (c) VO_2^+ (d) SO_2

46. The slope of the plot of $\ln K_m$ versus $1/T$ can provide sufficient information which will allow the calculation of

- (a) ΔS°

- (b) ΔG°

- (c) ΔH°

- (d) Concentration of the species

17. In the dissolution of borax in water, increasing the temperature increases dissolution which of the following statements is not true.

- (a) Reaction is endothermic
- (b) the entropy of the reaction is positive
- (c) the products are less dispersed than the reactant
- (d) ΔG° is positive means reaction is disfavoured

18. Sodium tetraborate decahydrate (borax) dissociates in water to form sodium and borate ions and water. The stoichiometric equation is $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}(\text{s}) \rightarrow 2\text{Na}^+(\text{aq}) + \text{B}_4\text{O}_7^{4-}(\text{aq}) + 10\text{H}_2\text{O}(\text{l})$

The solubility product for the expression is:

- (a) $K_{sp} = [\text{Na}^+]^2[\text{B}_4\text{O}_7^{4-}]^2$
- (b) $K_{sp} = [\text{Na}^+][\text{B}_4\text{O}_7^{4-}]^2$
- (c) $K_{sp} = [\text{Na}^+][\text{B}_4\text{O}_7(\text{OH})_4]^{2-}$
- (d) $K_{sp} = [\text{B}_4\text{O}_7(\text{OH})_4]^{2-}$

19. When handling substances that have strong odour, one should

- (a) open the laboratory doors
- (b) wear neoprene gloves
- (c) use a surgical mask
- (d) use the chemicals in the hand

20. What laboratory apparatus would you use to dispense accurately 20 ml of a solution?

- (a) Pipette
- (b) Volumetric flask
- (c) Measuring cylinder
- (d) beaker

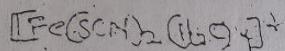
Second Semester Examination, 2002
Chemistry

INORGANIC CHEMISTRY II

Two hours

Indicate your answer

Give the oxidation state of the metal in the following compound



- (A) 2
B 3
C 4

Which of the following ions is not expected to become coloured when hydrated

- (A) Cu²⁺
(B) Cr³⁺
(C) Zn²⁺
(D) Cl⁻

- V (C)
V(H₂O)₆Cl³⁺
V(OH)₂Cl²⁺
V(H₂O)₅Cl²⁺
(E) VCl₃

The value of absorbance corresponds to 45% T

- (A) 0.540
(B) 0.47
C 0.635
D 1.653

$$\Delta = 2 - \log T$$

$$= 2 - \frac{\log T}{2}$$

A sample in a 1.0 cm cell is determined with a UV spectrometer. It transmits 80% light at a certain wavelength. If the absorptivity of this substance in this wavelength is 2.00. What is the concentration of the substance?

- (A) 0.10 g/l
(B) 1.25 g/l
(C) 0.80 g/l
(D) 0.05 g/l

$$\mu K_{\text{m}} = \frac{\sum x_i \sum y_i - \sum x_i \sum y_i}{n \cdot \sum x_i^2 - (\sum x_i)^2}$$

$$n = \epsilon L C$$

$$C = \frac{\Delta}{\epsilon L} = \frac{\log 2}{\epsilon L}$$

In which of the following processes do the entropy of the system decrease?

- (i) The dissolution of table salt
- (ii) The dissolution of glucose
- (iii) Deposition of water from damp clothes

Which of the following statements is false about the enthalpy of a system?

- (i) The enthalpy of a system is equal to the heat it absorbs at constant pressure.
- (ii) The enthalpy of a system is equal to the heat it evolves at constant pressure.
- (iii) The enthalpy of a system is not a state property.
- (iv) The enthalpy difference in the internal energy by the amount of work that a system must do in the course of a change of state.

The standard free energy of formation of benzene from its constituents is $+124 \text{ kJ/mol}$ at 25°C . Which of the following inferences can be made from the preamble above.

- (i) The synthesis is not spontaneous under conditions of 25% and at 1 atm.
- (ii) The synthesis is spontaneous under standard conditions.

This inference can be made from the preamble given.

Which of the following descriptions below best suits a reaction that leads to a spontaneously visible compound?

- (i) An exothermic reaction accompanied by an increase in entropy.
- (ii) An endothermic reaction accompanied by a decrease in entropy.
- (iii) An endothermic reaction accompanied by an increase in entropy.
- (iv) An exothermic reaction accompanied by an increase in temperature.
- (v) (i) and (ii)
- (vi) (i) and (iii)
- (vii) (i), (ii) and (iii)

quin is a derivative of salicylic acid, for which $K_a = 1.1 \times 10^{-3}$. Calculate the ratio of the concentrations of its conjugate base to salicylic acid in a solution having a pH adjusted to 2.30.

Q&A

2.989

2.595

0.346

$$\frac{[Q^-]}{[H_2O]} = P.K_a = 10^{-3} \times 10^{-2.30}$$

"Hypo" is the standard detergent for bleach analysis. What is the chemical formula?

- Na₂SO₄
 Na₂S₂O₃ ✓
 Na₂SiO₃
 Na₂PO₄

A 0.684g of a powdered bleach is analysed according to the procedure. A volume of 31.7ml of 0.100M "hypo" is required to reach the endpoint. Use this information to answer the next two questions.

Q1: All the bleach is used in one expt.

How many moles of it did the powdered bleach produce?

- 3.17 x 10⁻³ mol
 3.17 x 10⁻⁴ mol
 1.89 x 10⁻³ mol
 1.89 x 10⁻⁴ mol

What is the percentage chlorine content in the bleach (Cl = 35.5)?

- 32.3%
 33.8%
 34.2%
 35.2%

Which of the following substances cannot be used in the determination of chlorine?

- Phenylhydrazine
 Phenylhydrazine hydrochloride
 Phenylhydrazine bromide
 Phenylhydrazine
 Magnesium I

A 0.875g sample of limestone was dissolved in HCl and diluted to 0.100L. A 25.00ml aliquot of 0.010M Na₂EDTA solution required 16.25ml of 0.100M Hg²⁺ solution to reach the endpoint. Use this information to answer the next two questions.

How many moles of calcium present in the sample?

- 2.3 x 10⁻³ mol
 2.8 x 10⁻⁴ mol
 3.62 x 10⁻³ mol
 3.62 x 10⁻⁴ mol

What is the percentage of calcium carbonate in the sample?

- 33.3%
 36.6%
 44.4%
 52.2%

the magnitude of the energy gap Δ between the t_{1g} and e_g levels depend on
all the following factors except

- (a) the nature of the ligands
(b) splitting of the nucleus of the metal ion
(c) the charge on the metal ion
(d) whether the metal is in the 1st, 2nd or 3rd row of the s.p. block

18. The common ligands can be arranged in order of strength of field as

- (a) Spectrochemical series
CFSE series

Electrostatic spectrum of complexes

Transition series

arrange the following in order of their capacity to cause field splitting
increasing order of strength: EDTA, H₂O, NH₃, CN⁻

- (a) EDTA, H₂O, NH₃, CN⁻
(b) EDTA, H₂O, NH₃, CN⁻
(c) NH₃, H₂O, EDTA, CN⁻
(d) H₂O, NH₃, CN⁻, EDTA

20.5. 1983

Which of the following properties can best be used to identify?

- (a) Acidic
(b) Basic
(c) Amphoteric
(d) Neutral

19. The molecule responsible for light absorption is called

- (a) Transition
(b) Chromophore
(c) bathochromic
(d) hypochromic

Phenol acts as an indicator with $K_{a} = 1.2 \times 10^{-8}$. Calculate the ratio of the
concentrations of the conjugate base to phenolized in a solution having a pH of

- (a) 0.789
(b) 7.2589
(c) 0.008
(d) 7.89

24 Which of the following statements does not appropriately fit the occurrence of a Job's point?

- (i) It is a wavelength at which the absorbance spectra cross each other.
- (ii) The appearance of isobestic points in a solution is evidence that there are only two components present.
- (iii) The appearance of isobestic points in a solution is evidenced that there are multiple components present.
- (iv) The total concentration of components present is constant.

25 Four of the following statements are necessary precautions in an experiment involving the use of a spectrophotometer to determine the dissociation constant of a species.

- (i) Solutions should be covered to keep it dust free.
- (ii) Covers must be wiped clean off fingerprints.
- (iii) Blank solutions are used to subtract instrumental variations.
- (iv) Solutions must be diluted to 0.1M.

(X) All of the above

- (i) and (ii)
- (ii) and (iv)
- (iii) and (iv)
- (i), (ii) and (iii).

26 In an experiment to determine the dissociation constant of an unknown organic acid, the pH at half its maximum titration point was obtained.

The dissociation constant is

$$1.8 \times 10^{-5}$$

$$4.1 \times 10^{-8}$$

$$2.06 \times 10^{-10}$$

$$6.3 \times 10^{-8}$$

27 In an experiment involving the titration of a strong acid and a strong base, which of the following would be best suited to indicate the equivalence point? (i) methyl orange (ii) phenolphthalein (iii) bromocresol green (iv) litmus

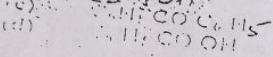
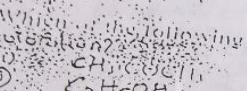
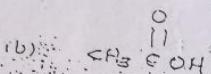
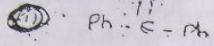
(X) (i) and (ii)

(C) (i), (ii) and (iii)

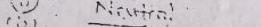
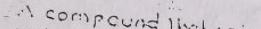
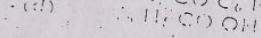
(C) (i), (ii), (iii) and (iv)

All of the following except _____ can be used for purification of organic compounds EXCEPT
(a) Diethyl ether
(b) Ethyl acetate
(c) Lead chloride
(d) Acetone

Which of the following compounds is an example of an acidic organic compound, which is insoluble in water?



Which of the following reacts with Iron (III) chloride to produce a violet coloration?



A compound that is insoluble in water, H_2O , and CH_3Cl should be considered

(a) Neutral

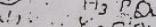
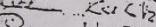
(b) Acidic

(c) Strongly Acidic

(d) Basic

JEE
level

Which of the following drying agents is restricted to drying ethers, halo-
geno carbonyl compounds?



3. 4

2. 17

8. 24

5

2. 24

5

2. 24

5

2. 24

5