BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI (RAJASTHAN)
COMPREHENSIVE EXAMINATION, I SEMESTER 2023-24
Chemistry Laboratory CHEM F110   Quiz (Close Book)   **Marks: 60**
Time: 11:00-11:50 AM   **Date: December 3, 2023**

Instructions: I. There are 30 questions in all. II. Attempt all the questions. III. Write the answers (**in capital letters A, B, C or D only**) in the box provided besides each question. IV. Each correct answer carries two marks; For every wrong answer: -0.5 marks will be deducted. V. Change of answer must be endorsed by invigilator's signature. IV. Mobile phone is not allowed during examination.

Important data: Atomic weight (g/mol): C=12, O=16, S=32, Cl=35.5, K=39, Cu=63.5

Name: _____ ; **ID:**_____ ; **Sec:** ___; **Instructor:**_____

Q1. By the pH meter, the pH variation of a medium is recorded. This pH variation is observed because of
(A) the exchange of the protons in the medium with the silver ion of Ag/AgCl electrode
(B) the exchange of the protons in the medium with the metal ions from the surface of glass membrane
(C) the exchange of the hydroxide ions in the medium with the chloride ions of Ag/AgCl electrode
(D) the exchange of the hydroxide ions in the medium with the silicate ions from the surface of glass membrane

Q2. Which of the following is **incorrect** statement about the experiment on standardizing sodium thiosulfate solution using copper sulfate solution?
(A) Copper sulfate solution was kept in the conical flask.
(B) I_2 is liberated after the addition of KI.
(C) Starch was added at the beginning of the titration.
(D) At the endpoint, the blue color disappeared.

Q3. What is the structure of the compound that results from the reaction of 1-naphthol with alcoholic solution of $FeCl_3$?
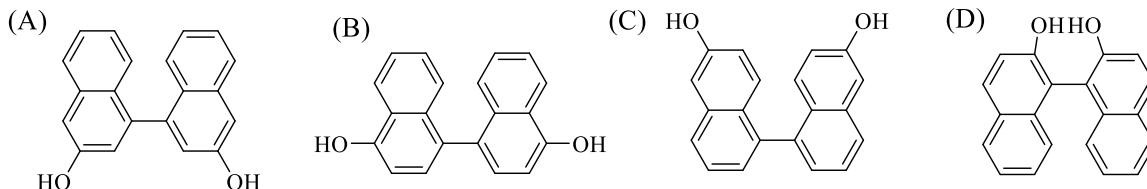
Q4. 8 mL of 0.01 M EDTA is required to titrate 50 mL of water. Given that the density of water is 1g/mL, hardness of the water in ppm is
(A) 160   (B) 1600   (C) 80   (D) 320

Q5. Which of the following is a **correct** expression according to Oswald's dilution law?
(A) $\alpha = \sqrt{K_\alpha}/C$ (B) $K_c = C\alpha^2/(1-\alpha)$ (C) $K_c = C\alpha/(1-\alpha^2)$ (D) $\alpha = \sqrt{CV/K_c}$

Q6. Which of the following statement is **true** about the saponification value of oil?
(A) The shorter the chain of a fatty acid, the higher the saponification value
(B) The longer the chain of a fatty acid, the higher the saponification value
(C) The higher the saturation in the chain of a fatty acid, the lower the saponification value
(D) The lower the saturation in the chain of a fatty acid, the higher the saponification value

Q7. The colour of the copper sulfate solution after the addition of excess KI is
(A) Brown   (B) Blue   (C) Pale yellow   (D) White

Q8. Four different $K_2Cr_2O_7$ solutions (P, Q, R and S) have been prepared by using the following table:

|	$K_2Cr_2O_7$	Distilled water added		$K_2Cr_2O_7$	Distilled water added
P	2 mL of 0.05 M $K_2Cr_2O_7$	8 mL	R	6 mL of 0.30 M $K_2Cr_2O_7$	4 mL
Q	5 mL of 0.10 M $K_2Cr_2O_7$	5 mL	S	1 mL of 1.0 M $K_2Cr_2O_7$	9 mL

What would be the expected Absorbance vs concentration of $K_2Cr_2O_7$ plot?

(A)

(B)

(C)

(D)
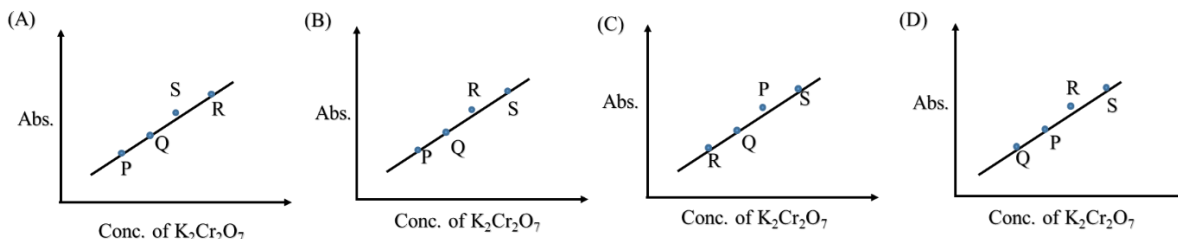
Q9. Monochromatic light is passed through a 0.06 molar solution in a cell of 2 cm length. The intensity of the transmitted light is 45 % of the incident light. Calculate the molar extinction coefficient.
(A) 2.9×10^{-4} L mol^{-1}cm^{-1} (B) 2.9×10^{-3} L g.equ^{-1} cm^{-1}
(C) 2.9 L mol^{-1}cm^{-1} (D) 2.9 L mol cm^{-1}

Q10. Identify the Schiff's base ligand (**X**) for the following chemical reaction.

(A)   (B)   (C)   (D)
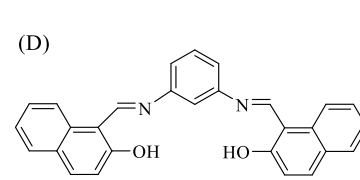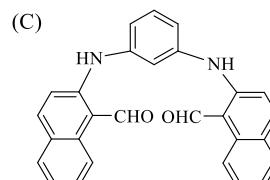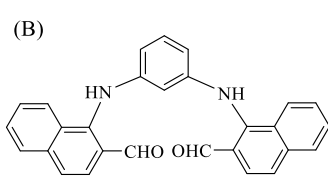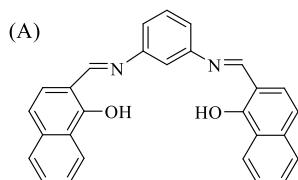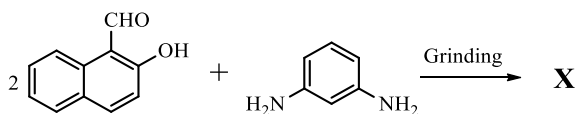
Q11. If the percentage yield of the reaction for dibenzalacetone synthesis is 75 %, how much benzaldehyde is required to prepare 3.0 g of dibenzalacetone?
(A) 1.36 g   (B) 1.81 g   (C) 0.905 g   (D) 0.78 g

Q12. While preparing a dilute acidic (e.g., HCl) solution, which of the following statement is **correct** during dilution?
(A) Acid should be added to water   (B) Water should be added in acid
(C) Both should be added together   (D) Base should be added to a concentrated HCl

Q13. The molar conductivities of KCl, NaCl, and KNO$_3$ are 152, 128, and 111 S cm^2 mol^{-1} respectively. What will be the molar conductivity of NaNO$_3$?
(A) 101 S cm^2 mol^{-1} (B) 56 S cm^2 mol^{-1} (C) 87 S cm^2 mol^{-1} (D) 391 S cm^2 mol^{-1}

Q14. The number of moles of monobasic fatty acid anions released on complete saponification of one mole of a fat (Ester derived from glycerol) sample is
(A) 6   (B) 5   (C) 4   (D) 3

Q15. What are the **correct** name for the glass wares shown below?

(I)   (II)   (III)
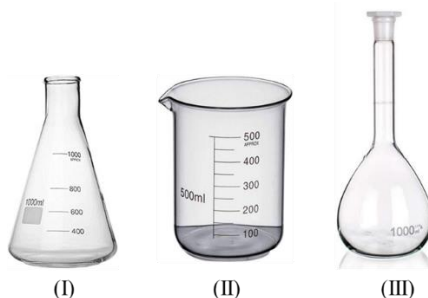
(A) (I): Beaker; (II) Erlenmeyer Flask; (III) Round Bottom Flask
(B) (I) Volumetric Flask; (II) Measuring cylinder; (III) Round Bottom Flask
(C) (I): Erlenmeyer Flask; (II) Beaker; (III) Volumetric Flask
(D) (I) Volumetric Flask; (II) Beaker; (III) Erlenmeyer Flask

Q16. Which of the following statement(s) is/are **true** regarding Molisch test?
(I) Oxidation of carbohydrates results in this test
(II) Dehydration of carbohydrates takes place during this test
(III) Condensation reaction results in the formation of purple coloured ring in this test
(A) (I) only   (B) (II) only   (C) (I) and (II) only   (D) (II) and (III) only

Q17. 2.5 g oil is saponified by 25 mL of 1M alcoholic KOH solution. 34 mL of 0.5 M HCl solution is required to neutralize the KOH of the solution. 50 mL of 0.5M HCl is required to titrate the blank solution (without oil). Calculate the saponification value of the oil.
(A) 179   (B) 358   (C) 280   (D)100

Q18. You would like to prepare 100 mL of 0.1 N copper sulphate solution (using reagents from the chemistry laboratory) for iodometric titration. The required weight (in g) of copper sulphate is
(A) 1.25   (B) 1.60   (C) 0.80   (D) 2.50

Q19. Calculate the percentage yield when 0.037 g of Cu(II) acetate monohydrate (molar mass = 199.65 g/mol) was taken to prepare 0.045 g of Cu-complex (molar mass of Cu-complex = 253 g/mol)?
(A) 91.89   (B) 89.34   (C) 96.15   (D) 85.98

Q20. What kind of substances in a chemistry laboratory can be identified using the following symbols?

(A) Harmful and oxidizing   (B) Toxic and corrosive
(C) Explosive and flammable   (D)Harmful and toxic

Q21. Which of the following set of reactants can be used for Claisen-Schmidt condensation?
(A) Acetaldehyde and benzaldehyde   (B) Benzaldehyde and formaldehyde
(C) 2,2-Dimethylpropanal and benzaldehyde   (D) Benzaldehyde and 2,2,4,4-tetramethylpentan-3-one

Q22. In the pH titration, butanoic acid is titrated with sodium hydroxide. The dissociation constant for the butanoic acid is 1.51 x 10^{-5}. What is the pH of solution at half-neutralization point?
(A) 4.5   (B) 4.8   (C) 3.7   (D) 5.2

Q23. Which of the following **correctly** represents dibenzalacetone?
(A) 3,3-diphenyl-1,4-pentadien-3-one   (B) 2,4-diphenylpenta-1,4-dien-3-one
(C) 1,5-diphenyl-1,4-pentadien-3-one   (D) 1,4-diphenylpenta-1,4-dien-3-one

Q24. Which is the **correct** conductometric titration curve of an equimolar mixture of HCl and CH_3COOH with NaOH?
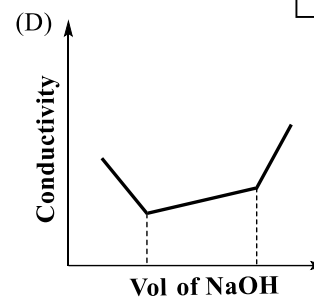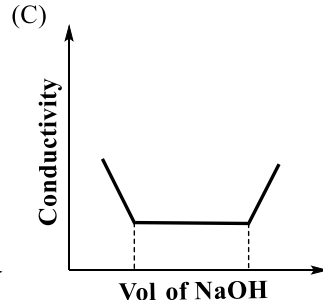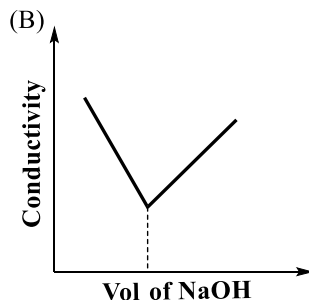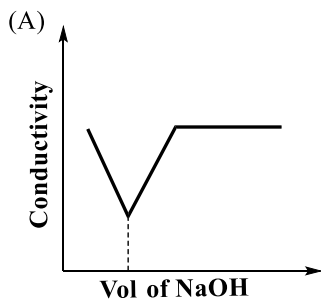
Q25. A dye solution containing 2 g per 100 mL does transmit 60% of the incident light. What percentage of light would be absorbed by a solution containing 6 g per 100 mL of the solution in same cell?
(A) 28   (B) 78   (C) 22   (D) 73

Q26. Which of the following statement(s) is/are true regarding Tollen's reagent?
(I) It is a reducing agent
(II) It is ammoniacal $AgNO_3$ solution
(III) Tartaric acid and sucrose both will give silver mirror with it
(A) (I) only   (B) (II) only   (C) (I) and (III) only   (D) (I) and (II) only

Q27. What is the pH of 0.1 M solution of acetic acid ($K_a = 1.5$ x 10^{-5})?
(A) 3.59   (B) 3.31   (C) 2.91   (D) 2.15

Q28. Which of the following compound **cannot** be used as a primary standard?
(A) Calcium carbonate   (B) Copper sulfate   (C) EDTA   (D) Oxalic acid

Q29. In the mechanochemical synthesis of a Schiff's base ligand and its copper(II) complex experiment performed by you in the lab, the color of bare Schiff's base and the Cu-complex are……and……., respectively.
(A) Green and dark yellow   (B) Orange and blue
(C)Yellow and light blue   (D) Yellow and green

Q30. The red and blue colors observed during the titration of $CaCO_3$ against EDTA are respectively attributable to ….
(A) Ca-EDTA complex and free indicator   (B) Ca-indicator complex and the free indicator
(C) EDTA-indicator complex and aqueous Ca(II)   (D) aqueous Ca(II) and EDTA-indicator complex

END