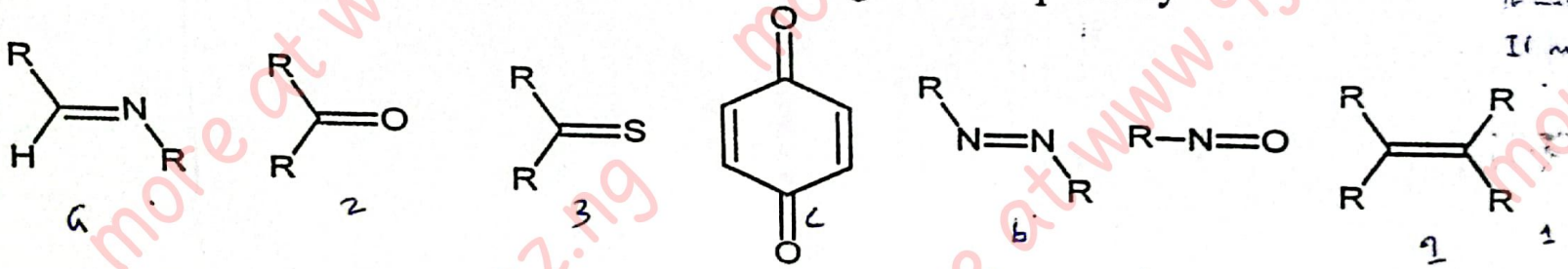
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
B. Sc. DEGREE MID-SEMESTER EXAMINATION 2021/2022 SESSION
ICH 206: CHEMISTRY OF DYESTUFF AND PIGMENTS

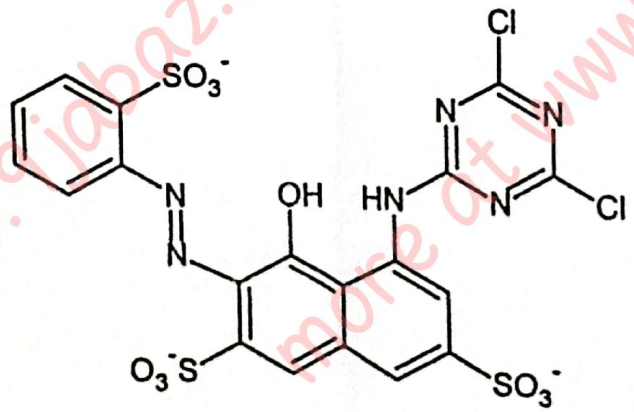
1a Mention three structural properties an organic compound should have for it to possess colour

b. Arrange the following chromophores in increasing order of potency



2a. Using chemical equations only, show how the following dyes interact with wool fibre
(i) Basic dye (ii) Acid dye

b. Shown below is the structure of Reactive red 1 dye. Copy the structure and identify the following
(i) Chromophore (ii) Bridge (iii) Reactive group (iv) Solubilizing group (v) Auxochrome



OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA.
DEPARTMENT OF CHEMISTRY.
B.Sc DEGREE MID-RAIN SEMESTER EXAMINATION 2021/2022 ACADEMIC SESSION
ICH 206: CHEMISTRY OF DYESTUFF AND PIGMENTS

ANSWER ALL QUESTIONS **TIME ALLOWED: 45 minutes**

Instructions: Write your Name, Registration Number and append your signature on your answer scripts.

Brief and Precise answers are required

1a.i. Two materials from the same source and of the same size displayed similar colours which were from the two major colour imparting agents were accidentally subjected to flame. How can this process be used in identifying the particular colour imparting agent used in each of them? Give reasons for your answer.

ii. With diagrammatic representations, show what is responsible for the difference in the energy displayed by the d-orbitals despite being known to exhibit similar energies. Give reasons for your answers.

iii. Briefly explain why organic pigments exhibit pure colours while the inorganic exhibit compound colours. In what form are organic pigments obtained?

iv. Samples **A** and **B** were left in the sun for weeks and different stages of colour changes were observed in each of them. Name the processes involved in their discolouration briefly explaining the processes and giving reasons for your answers.

b.i. *Showing the energy diagram, calculate the crystal field stabilization energy in KJmol^{-1} for $[Co(NH_3)_6]Cl_3$ if the complex ion absorbs at 470nm (h = 6.626 x 10^{-34}J/s; c = 3 x 10^8 m/s; λ = photon wavelength).*

If the dissociation energy -(C=C-)_n is 176KJ/mol, predict or estimate the energy required to trigger photodegradation in a polyethylene-based polymer.

ii. Differentiate and identify with reasons what is observed when light rays are focused on:
(a) a diamond stone and (b) a glass sphere. What is responsible for the differences observed?

Why are the octahedral complexes of Ni^{2+} more stable than their tetrahedral counterparts? Which of these two is meant to be more colour fast and of higher intensity? Give reasons for your answer.

iii. Sample **C** is Prof. Soriyan's picture forwarded to your class group on the 2nd of May, 2023 and discussed in class on the same day with over 87% of you in attendance. Using the sample,

a. Identify the four major colours considered for discussion.
b. Which of these colours would appear the same based on the colours absorbed when light rays, paints and dyes are considered? Give reason(s) for your answer.
c. Arrange the colours in an increasing order of: • the amount of opacity causing agent • amount of pigments present • susceptibility to photodegradation • penetrating power • level of absorption