

# ESTIMATION OF CAFFEINE CONTENT FROM SOFT AND ENERGY DRINKS OBTAINED FROM REGIONAL MARKET BY UV SPECTROSCOPY AND TLC.

SALONI DESAI

DEPARTMENT OF PHARMACEUTICAL QUALITY ASSURANCE,  
ROFEL SHRIG.M.BHILAKHIA COLLEGE OF PHARMACY

**Abstract:** This research is for to estimate the concentration of caffeine in soft drinks and energy drinks. In pure form, caffeine is a crystalline white powder moderately soluble in water and in a wide range of organic solvent such as ethanol, ethyl acetate, methanol, dichloromethane, chloroform etc. The caffeine is determined by using UV-Visible spectroscopy method using dichloromethane as an extracting solvent at 273nm wavelength. The method was found to be fast, simple, cost effective and environmental friendly for the determination of caffeine in soft drinks with satisfactory results. Caffeine is found in many beverages such as coffee, tea, energy drinks and colas, which make the drinks addictive. Caffeine content in various energy drinks and beverage varies from 10 to 50 mg of caffeine per serving; however the US Food and Drug Administration (FDA, 2006) limits the maximum amount in carbonated beverages to 6 mg/oz. Large amount of caffeine consumption can cause physiological and psychiatrically dependence. The aim of this study is to determine the concentration of caffeine in soft drinks and energy drinks brands available in India to ensure whether the caffeine concentration in the follow soft drinks & energy drinks as per FDA recommendation or not. And other purpose of this research is to find erosion property of caffeine by determining buffer capacity. This research also helps to identify purity of caffeine by TLC (By measuring Rf value of sample compared with standard caffeine).

**Keywords:** Caffeine, soft drinks & energy drinks, UV Spectroscopy, TLC.

**INTRODUCTION:** Caffeine is a frequently used ingredient of energy drinks. It is added as a flavoring agent and to make the drinks addictive. Caffeine is a bitter in taste, white crystalline xanthenes alkaloid that acts as a psychoactive stimulant drug and a mild diuretic. It is an alkaloid of methylxanthine family. The methylxanthenes caffeine (1,3,7-trimethylxanthine), theobromine (3,7-dimethylxanthine), and theophylline (1,3-dimethylxanthine) can be normally found in colanuts, coffee beans, cocoa beans, tea leaves, mate leaves and other kinds of plants. Caffeine serves as an ingredient in many carbonated soft drinks including colas, pepper-type beverages, and citrus beverages. Pure caffeine occurs as odorless, white, fleecy masses, glistening needles of powder. Caffeine has drawn more attention in the past decades due to its physiological effects beyond that of its stimulatory effect. The Food and Drug Administration (FDA) defines caffeine as a generally recognized as safe (GRAS) substance. However, FDA specifies that the maximum amount in carbonated beverages is limited to 0.02% (FDA, 2006).<sup>(1-3)</sup>

## STRUCTURE OF CAFFEINE:



Figure no.1 Structure of caffeine

# Method Estimation Caffeine In Drinks Manual

**Marcelo M. Soares, Francesco Rebelo**



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## **Table of Contents Method Estimation Caffeine In Drinks Manual**

1. Understanding the eBook Method Estimation Caffeine In Drinks Manual
  - The Rise of Digital Reading Method Estimation Caffeine In Drinks Manual
  - Advantages of eBooks Over Traditional Books
2. Identifying Method Estimation Caffeine In Drinks Manual
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Method Estimation Caffeine In Drinks Manual
  - User-Friendly Interface
4. Exploring eBook Recommendations from Method Estimation Caffeine In Drinks Manual
  - Personalized Recommendations
  - Method Estimation Caffeine In Drinks Manual User Reviews and Ratings
  - Method Estimation Caffeine In Drinks Manual and Bestseller Lists
5. Accessing Method Estimation Caffeine In Drinks Manual Free and Paid eBooks
  - Method Estimation Caffeine In Drinks Manual Public Domain eBooks
  - Method Estimation Caffeine In Drinks Manual eBook Subscription Services
  - Method Estimation Caffeine In Drinks Manual Budget-Friendly Options
6. Navigating Method Estimation Caffeine In Drinks Manual eBook Formats

- ePub, PDF, MOBI, and More
  - Method Estimation Caffeine In Drinks Manual Compatibility with Devices
  - Method Estimation Caffeine In Drinks Manual Enhanced eBook Features
7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Method Estimation Caffeine In Drinks Manual
    - Highlighting and Note-Taking Method Estimation Caffeine In Drinks Manual
    - Interactive Elements Method Estimation Caffeine In Drinks Manual
  8. Staying Engaged with Method Estimation Caffeine In Drinks Manual
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Method Estimation Caffeine In Drinks Manual
  9. Balancing eBooks and Physical Books Method Estimation Caffeine In Drinks Manual
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Method Estimation Caffeine In Drinks Manual
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Method Estimation Caffeine In Drinks Manual
    - Setting Reading Goals Method Estimation Caffeine In Drinks Manual
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Method Estimation Caffeine In Drinks Manual
    - Fact-Checking eBook Content of Method Estimation Caffeine In Drinks Manual
    - Distinguishing Credible Sources
  13. Promoting Lifelong Learning
    - Utilizing eBooks for Skill Development
    - Exploring Educational eBooks
  14. Embracing eBook Trends
    - Integration of Multimedia Elements
    - Interactive and Gamified eBooks

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web 1 use the distance formula 2 use the midpoint formula examples 1 find the distance between the points 3 7 and 4 10 2 determine whether the triangle formed by points a 2 2 b 2 1 and c 5 4 is a right triangle 3 find the midpoint of the line segment joining the points p1 6 3 and p2 4 2 teaching notes

midpoint formula analytic geometry article khan academy - Feb 09 2023

web the blue text midpoint midpoint of the points greend x 1 goldd y 1 x1 y1 and greend x 2 goldd y 2 x2 y2 is given by the following formula left greend dfrac x 1 x 2 2 goldd dfrac y 1 y 2 2 right 2x1 x2 2y1 y2 in this article we re going to derive this formula

*distance and midpoint calculator with detailed explanation* - Jul 02 2022

web how to find distance between two points to find distance between points a x a y a and b x b y b we use formula color blue

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$  example find distance between points  $A(3, 4)$  and  $B(1, 3)$  solution in this example we have  $x_1 = 3$ ,  $y_1 = 4$ ,  $x_2 = 1$ ,  $y_2 = 3$  so we have

**midpoint and distance formula online math help and learning** - Jun 01 2022

web the midpoint between the two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is the distance formula is derived from the pythagorean theorem the distance between the two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is the midpoint formula this video give the formula for finding the midpoint of two points and do one simple example to find the midpoint show step by step

**the midpoint and distance formulas worksheet onlinemath4all** - Feb 26 2022

web 1 answer write the formula  $m = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$  substitute 2 3 for  $x_1, y_1$  and 2 2 for  $x_2, y_2$   $m = \frac{2 + 2}{2}, \frac{3 + 2}{2}$   $m = 0, 1.5$  the midpoint of the line segment  $AB$  is  $(0, 1.5)$

*the distance and midpoint formulas mathplanet* - Jun 13 2023

web this method can be used to determine the distance between any two points in a coordinate plane and is summarized in the distance formula  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$  the point that is at the same distance from two points  $A(x_1, y_1)$  and  $B(x_2, y_2)$  on a line is called the midpoint you

**midpoint and distance math plane** - Mar 30 2022

web distance and midpoint review quiz answer the following questions suggestion i midpoint 1 find the midpoint between  $A(0, 1)$  and  $B(8, 3)$   $m = \frac{0 + 8}{2}, \frac{1 + 3}{2}$  and  $C(17, 7)$  and  $D(7, 6)$  2 answer the following the midpoint of  $AB$  is  $(3, 3)$  plot points and use graphs to solutions if point  $A(2, 4)$  what is point  $B$  if distance

*11 2 distance and midpoint formulas and circles* - Aug 15 2023

web feb 14 2022 use the distance formula to find the distance between the points  $(5, 3)$  and  $(7, 2)$  solution write the distance formula  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$  label the points  $x_1 = 5, y_1 = 3, x_2 = 7, y_2 = 2$  and substitute  $d = \sqrt{(7 - 5)^2 + (2 - 3)^2}$  simplify  $d = \sqrt{2^2 + (-1)^2}$   $d = \sqrt{4 + 1}$   $d = \sqrt{5}$