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1: Gas Chromatography - Chemistry LibreTexts

Although the thermal analysis of clay minerals is also well documented because of its importance to ceramic research, Chapter gives an updated account of thermal techniques. Many new surface analytical methods, such as atomic force microscopy (AFM), are not included in this chapter because of space limitations.

A stationary phase of polydimethyl siloxane, in which all the â€”R groups are methyl groups, â€”CH3, is nonpolar and often makes a good first choice for a new separation. The order of elution when using polydimethyl siloxane usually follows the boiling points of the solutes, with lower boiling solutes eluting first. Increasing polarity is provided by substituting trifluoropropyl, â€”C3H6CF, and cyanopropyl, â€”C3H6CN, functional groups, or by using a stationary phase of polyethylene glycol Figure General structures of common stationary phases: An important problem with all liquid stationary phases is their tendency to elute, or bleed from the column when it is heated. The temperature limits in Table Capillary columns with bonded or cross-linked stationary phases provide superior stability. Cross-linking, which is done after the stationary phase is in the capillary column, links together separate polymer chains, providing greater stability. Another important consideration is the thickness of the stationary phase. The most common thickness is 0. Thinner films are used when separating low volatility solutes, such as steroids. A few stationary phases take advantage of chemical selectivity. The most notable are stationary phases containing chiral functional groups, which can be used for separating enantiomers. Second, the analytes must be present at an appropriate concentration. Finally, the physical process of injecting the sample must not degrade the separation. Preparing a Volatile Sample Not every sample can be injected directly into a gas chromatograph. A solute of low volatility may be retained by the column and continue to elute during the analysis of subsequent samples. A liquidâ€”liquid extraction of analytes from an aqueous matrix into methylene chloride or another organic solvent is a common choice. An attractive approach to isolating analytes is a solid-phase microextraction SPME. In one approach, which is illustrated in Figure The fiber, which is coated with a thin film of an adsorbent, such as polydimethyl siloxane, is lowered into the sample by depressing a plunger and is exposed to the sample for a predetermined time. After withdrawing the fiber into the needle, it is transferred to the gas chromatograph for analysis. Two additional methods for isolating volatile analytes are a purge-and-trap and headspace sampling. In a purge-and-trap see Figure 7. These compounds are carried by the purge gas through a trap containing an absorbent material, such as Tenax, where they are retained. Heating the trap and back-flushing with carrier gas transfers the volatile compounds to the gas chromatograph. In headspace sampling we place the sample in a closed vial with an overlying air space. After allowing time for the volatile analytes to equilibrate between the sample and the overlying air, we use a syringe to extract a portion of the vapor phase and inject it into the gas chromatograph. Alternatively, we can sample the headspace with an SPME. Thermal desorption is a useful method for releasing volatile analytes from solids. We place a portion of the solid in a glass-lined, stainless steel tube. After purging with carrier gas to remove any O2 that might be present, we heat the sample. Volatile analytes are swept from the tube by an inert gas and carried to the GC. Because volatilization is not a rapid process, the volatile analytes are often concentrated at the top of the column by cooling the column inlet below room temperature, a process known as cryogenic focusing. Once the volatilization is complete, the column inlet is rapidly heated, releasing the analytes to travel through the column. The reason for removing O2 is to prevent the sample from undergoing an oxidation reaction when it is heated. To analyze a nonvolatile analyte we must chemically convert it to a volatile form. For example, amino acids are not sufficiently volatile to analyze directly by gas chromatography. Reacting an amino acid with 1-butanol and acetyl chloride produces an esterfied amino acid. A side benefit of many extraction methods is that they often concentrate the analytes. If an analyte is too concentrated it is easy to overload the column, resulting in peak fronting see Figure Injecting less sample or diluting the sample with a volatile solvent, such as methylene chloride, are two possible solutions to this problem. Injecting the Sample In Section We also introduce an additional source of band broadening if we fail to inject the sample into the minimum possible volume of mobile phase. There are two principal sources of this precolumn band broadening: An example of a simple injection port for a packed

column is shown in Figure The top of the column fits within a heated injector block, with carrier gas entering from the bottom. The sample is injected through a rubber septum using a microliter syringe such as the one shown in Figure Injecting the sample directly into the column minimizes band broadening by mixing the sample with the smallest possible amount of carrier gas. The needle pierces a rubber septum and enters into the top of the column, which is located within a heater block. The needle pierces a rubber septum and enters into a glass liner, which is located within a heater block. In a split injection the split vent is open; the split vent is closed for a splitless injection. In a split injection we inject the sample through a rubber septum using a microliter syringe. Instead of injecting the sample directly into the column, it is injected into a glass liner where it mixes with the carrier gas. At the split point, a small fraction of the carrier gas and sample enters the capillary column with the remainder exiting through the split vent. By controlling the flow rate of the carrier gas entering the injector, and the flow rates through the septum purge and the split vent, we can control what fraction of the sample enters the capillary column, typically 0. In a splitless injection, which is useful for trace analysis, we close the split vent and allow all the carrier gas passing through the glass liner to enter the columnâ€”this allows virtually all the sample to enters the column. Because the flow rate through the injector is low, significant precolumn band broadening is a problem. For samples that decompose easily, an on-column injection may be necessary. In this method the sample is injected directly into the column without heating. The column temperature is then increased, volatilizing the sample with as low a temperature as is practical. For this reason the column is placed inside a thermostated oven see Figure In an isothermal separation we maintain the column at a constant temperature. To increase the interaction between the solutes and the stationary phase, the temperature usually is set slightly below that of the lowest-boiling solute. One difficulty with an isothermal separation is that a temperature favoring the separation of a low-boiling solute may lead to an unacceptably long retention time for a higher-boiling solute. Temperature programming provide a solution to this problem. As the separation progresses, we slowly increase the temperature at either a uniform rate or in a series of steps. You may recall that we called this the general elution problem see Figure The ideal detector has several desirable features, including: As the mobile phase exits the column it passes over a tungsten-rhenium wire filament see Figure Because of its high thermal conductivity, helium is the mobile phase of choice when using a thermal conductivity detector TCD. This is one cell of a matched pair. The sample cell takes the carrier gas as it elutes from the column. A source of carrier gas that bypasses the column passes through a reference cell. When a solute elutes from the column, the thermal conductivity of the mobile phase in the TCD cell decreases and the temperature of the wire filament, and thus it resistance, increases. The detector also is non-destructive, allowing us to isolate analytes using a postdetector cold trap. One significant disadvantage of the TCD detector is its poor detection limit for most analytes. Applying a potential of approximately volts across the flame creates a small current of roughly 10â€”9 to 10â€”12 amps. When amplified, this current provides a useful analytical signal. This is the basis of the popular flame ionization detector, a schematic diagram of which is shown in Figure The eluent from the column mixes with H2 and is burned in the presence of excess air. Applying a potential between the flame tip and the collector, a current that is proportional to the concentration of cations in the flame. Most carbon atomsâ€”except those in carbonyl and carboxylic groupsâ€”generate a signal, which makes the FID an almost universal detector for organic compounds. Most inorganic compounds and many gases, such as H2O and CO2, are not detected, which makes the FID detector a useful detector for the analysis of atmospheric and aqueous environmental samples. Advantages of the FID include a detection limit that is approximately two to three orders of magnitude smaller than that for a thermal conductivity detector, and a linear response over â€” orders of magnitude in the amount of analyte injected. The sample, of course, is destroyed when using a flame ionization detector. As shown in Figure The emitted electrons ionize the mobile phase, which is usually N2, generating a standing current between a pair of electrodes. When a solute with a high affinity for capturing electrons elutes from the column, the current decreases. This decrease in current serves as the signal. The ECD is highly selective toward solutes with electronegative functional groups, such as halogens and nitro groups, and is relatively insensitive to amines, alcohols, and hydrocarbons. Although its detection limit is excellent, its linear range extends over only about two orders of magnitude. Mass Spectrometer MS A mass spectrometer is an

instrument that ionizes a gaseous molecule using enough energy that the resulting ion breaks apart into smaller ions. Because these ions have different mass-to-charge ratios, it is possible to separate them using a magnetic field or an electrical field. The resulting mass spectrum contains both quantitative and qualitative information about the analyte. A mass spectrum provides both quantitative and qualitative information: In the ionization chamber the remaining moleculesâ€”a mixture of carrier gas, solvent, and solutesâ€”undergo ionization and fragmentation. A detector counts the ions and displays the mass spectrum. A three component mixture enters the GC.

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2: How to Improve Analytical Skills: 12 Steps (with Pictures)

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This article throws light upon the twelve types of chromatographic techniques used in biochemistry. The twelve types are: There are different kinds of chromatographic techniques and these are classified according to the shape of bed, physical state of mobile phase, separation mechanisms. Apart from these there are certain modified forms of these chromatographic techniques involving different mechanisms and are hence categorized as modified or specialized chromatographic techniques. It is the preparative application of chromatography. It is used to obtain pure chemical compounds from a mixture of compounds on a scale from micrograms up to kilograms using large industrial columns. The classical preparative chromatography column is a glass tube with a diameter from 5 to 50 mm and a height of 50 cm to 1 m with a tap at the bottom. Slurry is prepared of the eluent with the stationary phase powder and then carefully poured into the column. Care must be taken to avoid air bubbles. A solution of the organic material is pipetted on top of the stationary phase. This layer is usually topped with a small layer of sand or with cotton or glass wool to protect the shape of the organic layer from the velocity of newly added eluent. Eluent is slowly passed through the column to advance the organic material. Often a spherical eluent reservoir or an eluent-filled and stoppered separating funnel is put on top of the column. The individual components are retained by the stationary phase differently and separate from each other while they are running at different speeds through the column with the eluent. At the end of the column they elute one at a time. During the entire chromatography process the eluent is collected in a series of fractions. The composition of the eluent flow can be monitored and each fraction is analyzed for dissolved compounds, e. Coloured compounds or fluorescent compounds with the aid of an UV lamp can be seen through the glass wall as moving bands. The stationary phase or adsorbent in column chromatography is a solid. The most common stationary phase for column chromatography is â€”C18H37, followed by alumina. Cellulose powder has often been used in the past. Also possible are ion exchange chromatography, reversed-phase chromatography RP , affinity chromatography or expanded bed adsorption EBA. The mobile phase or eluent is either a pure solvent or a mixture of different solvents. It is chosen so that the retention factor value of the compound of interest is roughly around 0. The eluent has also been chosen so that the different compounds can be separated effectively. The eluent is optimized in small scale pretests, often using thin layer chromatography TLC with the same stationary phase. A faster flow rate of the eluent minimizes the time required to run a column and thereby minimizes diffusion, resulting in a better separation. A simple laboratory column runs by gravity flow. The flow rate of such a column can be increased by extending the fresh eluent filled column above the top of the stationary phase or decreased by the tap controls. Better flow rates can be achieved by using a pump or by using compressed gas e. Automated flash chromatography systems attempt to minimize human involvement in the purification process. Automated systems may include components normally found on HPLC systems gradient pump, sample injection apparatus, UV detector and a fraction collector to collect the eluent. The software controlling an automated system will coordinate the components and help the user to find the resulting purified material within the fraction collector. The software will also store results from the process for archival or later recall purposes. It is an analytical technique for separating and identifying mixtures that are or can be coloured, especially pigments. This can also be used in secondary or primary schools in ink experiments. This method has been largely replaced by thin layer chromatography; however it is still a powerful teaching tool. This is useful for separating complex mixtures of similar compounds, for example, amino acids. A small, ideally concentrated spot of solution that contains the sample is applied to a strip of chromatography paper about 1 cm from the base, usually using a capillary tube for maximum precision. This sample is absorbed onto the paper and may form interactions with it. Any substance that reacts or bonds with the paper cannot be measured using -Solvent front technique. The solvent moves up the paper by capillary action, which occurs as a result of the attraction of the solvent molecules to the paper and to one another. As the solvent rises through the paper it meets and

dissolves the sample mixture, which will then travel up the paper with the solvent. Different compounds in the sample mixture travel at different rates due to differences in solubility in the solvent, and due to differences in their attraction to the fibers in the paper. Paper chromatography takes anywhere from several minutes to several hours. In some cases, paper chromatography does not separate pigments completely; this occurs when two substances appear to have the same values in a particular solvent. In these cases, two-way chromatography is used to separate the multiple-pigment spots. The chromatogram is turned by ninety degrees, and placed in a different solvent in the same way as before; some spots separate in the presence of more than one pigment. As before, the value is calculated, and the two pigments are identified. The Rf value retention factor is the distance travelled by a particular component from the origin where the sample was originally spotted as a ratio to the distance travelled by the solvent front from the origin. Rf values for each substance will be unique, and can be used to identify components. A particular component will have the same Rf value if it is separated under identical conditions. After development, the spots corresponding to different compounds may be located by their colour, ultraviolet light, ninhydrin Triketohydrindane hydrate or by treatment with iodine vapours. The final chromatogram can be compared with other known mixture chromatograms to identify sample mixture using the Rn value. As in most other forms of chromatography, paper chromatography uses Rn values to help identify compounds. Rf values are calculated by dividing the distance the pigment travels up the paper by the distance the solvent travels the solvent front. Because Rf values are standard for a given compound, known Rn values can be used to aid in the identification of an unknown substance in an experiment. Thin-layer chromatography TLC is a chromatographic technique that is useful for separating organic compounds. It involves a stationary phase consisting of a thin layer of adsorbent material, usually silica gel, aluminium oxide, or cellulose immobilized onto a flat, inert carrier sheet. A liquid phase consisting of the solution to be separated dissolved in an appropriate solvent is drawn through the plate via capillary action, separating the experimental solution. When the solvent front reaches the other edge of the stationary phase, the plate is removed from the solvent reservoir. The separated spots are visualized with ultraviolet light or by placing the plate in iodine vapour. The different components in the mixture move up the plate at different rates due to differences in their portioning behavior between the mobile liquid phase and the stationary phase. It can be used to determine the pigments a plant contains, to detect pesticides or insecticides in food, in forensics to analyze the dye composition of fibers, or to identify compounds present in a given substance, among other uses. It is a quick, generic method for organic reaction monitoring. TLC plates are made by mixing the adsorbent, such as silica gel, with a small amount of inert binder like calcium sulphate gypsum and water. The thickness of the adsorbent layer is typically around 0. Every type of chromatography contains a mobile phase and a stationary phase. The process is similar to paper chromatography with the advantage of faster runs, better separations, and the choice between different stationary phases. Because of its simplicity and speed TLC is often used for monitoring chemical reactions and for the qualitative analysis of reaction products. A small spot of solution containing the sample is applied to a plate, about one centimetre from the base. The plate is then dipped into a suitable solvent, such as ethanol or water, and placed in a sealed container. The solvent moves up the plate by capillary action and meets the sample mixture, which is dissolved and is carried up the plate by the solvent. Different compounds in the sample mixture travel at different rates due to differences in solubility in the solvent, and due to differences in their attraction to the stationary phase. Results also vary depending on the solvent used. For example, if the solvent were a This means that when analyzing the TLC, the non-polar parts will have moved further up the plate. The polar compounds, in contrast, will not have moved as much. The reverse is true when using a solvent that is more polar than non-polar With these solvents, the polar compounds will move higher up the plate, while the non-polar compounds will not move as much. If polar solvent is used to dissolve the sample and spot is applied over polar stationary phase of TLC, the sample spot will grow radially due to capillary action, which is not advisable as one spot may mix with the other. As the chemicals being separated may be colourless, several methods exist to visualize the spots: Often a small amount of a fluorescent compound, usually Manganese-activated Zinc Silicate, is added to the adsorbent that allows the visualization of spots under a black-light UV The adsorbent layer will thus fluoresce light green by itself, but spots of analyte quench this

fluorescence. Iodine vapours are a general unspecific colour reagent 3. Specific colour reagents exist into which the TLC plate is dipped or which are sprayed onto the plate Once visible, the Rf value of each spot can be determined by dividing the distance travelled by the product by the total distance travelled by the solvent the solvent front. These values depend on the solvent used, and the type of TLC plate, and are not physical constants. In organic chemistry, reactions are qualitatively monitored with TLC. A small 3 by 7 cm TLC plate takes a couple of minutes to run. The analysis is qualitative, and it will show if starting material has disappeared, product has appeared, and how many products are generated. It is a type of chromatography in which the mobile phase is a carrier gas, usually an inert gas such as helium or an unreactive gas such as nitrogen, and the stationary phase is a microscopic layer of liquid or polymer on an inert solid support, inside glass or metal tubing, called a column. A gas chromatograph is a chemical analysis instrument for separating chemicals in a complex sample. The function of the stationary phase in the column is to separate different components, causing each one to exit the column at a different time retention time. Other parameters that can be used to alter the order or time of retention are the carrier gas flow rate, and the temperature. As the carrier gas sweeps the analyte molecules through the column, this motion is inhibited by the adsorption of the analyte molecules either onto the column walls or onto packing materials in the column. The rate at which the molecules progress along the column depends on the strength of adsorption, which in turn depends on the type of molecule and on the stationary phase materials. Since each type of molecule has a different rate of progression, the various components of the analyte mixture are separated as they progress along the column and reach the end of the column at different times retention time. A detector is used to monitor the outlet stream from the column; thus, the time at which each component reaches the outlet and the amount of that component can be determined. Generally, substances are identified qualitatively by the order in which they emerge elute from the column and by the retention time of the analyte in the column.

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3: Top 12 Techniques of Value Analysis

Before we look at the methods and techniques of data analysis, lets first define what data analysis is. Data analysis is the collecting and organizing of data so that a researcher can come to a.

Retrieve Value Given a set of specific cases, find attributes of those cases. What is the value of aggregation function F over a given set S of data cases? What is the sorted order of a set S of data cases according to their value of attribute A? What is the range of values of attribute A in a set S of data cases? What is the distribution of values of attribute A in a set S of data cases? What is the correlation between attributes X and Y over a given set S of data cases? Barriers to effective analysis[edit] Barriers to effective analysis may exist among the analysts performing the data analysis or among the audience. Distinguishing fact from opinion, cognitive biases, and innumeracy are all challenges to sound data analysis. Confusing fact and opinion[edit] You are entitled to your own opinion, but you are not entitled to your own facts. Daniel Patrick Moynihan Effective analysis requires obtaining relevant facts to answer questions, support a conclusion or formal opinion , or test hypotheses. Facts by definition are irrefutable, meaning that any person involved in the analysis should be able to agree upon them. This makes it a fact. Whether persons agree or disagree with the CBO is their own opinion. As another example, the auditor of a public company must arrive at a formal opinion on whether financial statements of publicly traded corporations are "fairly stated, in all material respects. When making the leap from facts to opinions, there is always the possibility that the opinion is erroneous. Cognitive biases[edit] There are a variety of cognitive biases that can adversely affect analysis. In addition, individuals may discredit information that does not support their views. Analysts may be trained specifically to be aware of these biases and how to overcome them. In his book Psychology of Intelligence Analysis, retired CIA analyst Richards Heuer wrote that analysts should clearly delineate their assumptions and chains of inference and specify the degree and source of the uncertainty involved in the conclusions. He emphasized procedures to help surface and debate alternative points of view. However, audiences may not have such literacy with numbers or numeracy ; they are said to be innumerate. Persons communicating the data may also be attempting to mislead or misinform, deliberately using bad numerical techniques. More important may be the number relative to another number, such as the size of government revenue or spending relative to the size of the economy GDP or the amount of cost relative to revenue in corporate financial statements. This numerical technique is referred to as normalization [7] or common-sizing. There are many such techniques employed by analysts, whether adjusting for inflation i. Analysts apply a variety of techniques to address the various quantitative messages described in the section above. Analysts may also analyze data under different assumptions or scenarios. For example, when analysts perform financial statement analysis , they will often recast the financial statements under different assumptions to help arrive at an estimate of future cash flow, which they then discount to present value based on some interest rate, to determine the valuation of the company or its stock. Smart buildings[edit] A data analytics approach can be used in order to predict energy consumption in buildings. Analytics and business intelligence[edit] Main article: Analytics Analytics is the "extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions. Initial data analysis[edit] The most important distinction between the initial data analysis phase and the main analysis phase, is that during initial data analysis one refrains from any analysis that is aimed at answering the original research question. The initial data analysis phase is guided by the following four questions: Data quality can be assessed in several ways, using different types of analysis: Test for common-method variance. The choice of analyses to assess the data quality during the initial data analysis phase depends on the analyses that will be conducted in the main analysis phase. One should check whether structure of measurement instruments corresponds to structure reported in the literature. There are two ways to assess measurement: If the study did not need or use a randomization procedure, one should check the success of the non-random sampling, for instance by checking whether all subgroups of the population of interest are represented in sample. Other possible data distortions that should be checked are: It is especially important to exactly determine the structure of the sample and specifically the size of the

subgroups when subgroup analyses will be performed during the main analysis phase. The characteristics of the data sample can be assessed by looking at: Basic statistics of important variables Scatter plots Cross-tabulations [31] Final stage of the initial data analysis[edit] During the final stage, the findings of the initial data analysis are documented, and necessary, preferable, and possible corrective actions are taken. Also, the original plan for the main data analyses can and should be specified in more detail or rewritten. In order to do this, several decisions about the main data analyses can and should be made: In the case of non- normals: In the case of missing data: In the case of outliers: In case items do not fit the scale: In the case of too small subgroups: In case the randomization procedure seems to be defective:

4: - Summary Table for Statistical Techniques | STAT

7. An important measure of the risk associated with a stock is the standard deviation, or variance, of the stock's price movements. A financial analyst wants to test the one-tailed hypothesis that stock A has a greater risk (larger variance of price) than stock B.

The best way of tackling such a situation is to be very specific and not to make a vague statement. People at the top will be influenced by the specific proposal and it is possible that the right manufacturing process may be developed after careful examination. Hence, avoid generalities because they serve only to prevent changes and protect the status quo. Obtain All Available Costs: Information about all available costs should be obtained. It is possible that specific method may slightly increase cost in one department but may lead to substantial reduction in costs in other departments, resulting in an overall reduction of cost. Value analysis is mainly concerned with comparing costs. Therefore, relevant costs for each function as may be required for the analysis should be obtained; and if costs are not readily available, these should be developed as accurately as possible. Seek Information from the most Authentic Source: Information on any aspect of cost, methods of manufacture, finishing, packing etc. To get the correct information a questionnaire should be developed. While collecting information, the particular questions that the value analyst is to ask are: How important is this function? Is the cost proportionate with its utility? Is it not possible to eliminate a part or a component without reducing its use value or esteem value? Will a change in the design of the product lead to lower cost? Evaluate Function by Comparison: What is their cost? Will the value of the function be reduced by eliminating unnecessary costs? Discuss with Specialists and take Advantage of their Expertise Knowledge: Now-a- days, technology is advancing so rapidly that it is almost not possible for engineer and others working in an organisation to keep abreast of the latest developments. It, therefore, pays to be in touch with a specialist suitable for the specific problem and get his specialised knowledge. Without such expertise knowledge status quo will be continued and opportunity of improving value and reducing cost will be lost. Value analysis involves a creative approach for finding out unnecessary costs. The human mind is capable of developing new ideas which lead to cost reduction and performance improvement. Creative thinking can be helpful in cost reduction by simplifying the existing part or item to do the same function. Consult your Suppliers for New Ideas: As your suppliers are dealing with many others who are in the same line of business, their ideas and suggestions will be of great help to you. Use Standard Parts whenever Possible: Standard parts are interchangeable and cheaper than specially made parts because standard parts are generally made by mass production methods leading to reduced costs. Specially made non-standard parts should be used only when is is unavoidable to do so. Identify and Overcome all Road-Blocks: The resistance to change to new methods and techniques is principally from ignorance and it can be overcome with patience, tact and carefully explaining the proposed method or technique to the individual concerned who is opposed to change. Get the maximum cooperation from your colleagues in other departments with whom you have to deal. The value analyst should be polite and friendly with every one so that he may get the fullest cooperation.

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5: Free e-courses on analytical techniques like HPLC, GC, AAS etc.

analytical methods The purpose of this chapter is to describe the analytical methods that are available for detecting, and/or measuring, and/or monitoring used mineral-based crankcase oil, its metabolites, and other biomarkers.

Refer to the Summary Table for Statistical Techniques on the previous page; the following numbering scheme corresponds to the numbering in the table. You also need to specify whether to use pooled t-procedure or nonpooled t-procedure. You also need to specify whether to use pooled t-test or nonpooled t-test. Estimate the difference of two means in a paired comparison study using a t-statistic. Test to compare two means in a paired comparison study using a t-statistic. Test the dependence of two categorical variables using a Chi-square test of independence. Finding the best fitting line to a set of data with a quantitative explanatory variable X and a quantitative response variable Y and examining the slope of the regression line. Test to compare several population means. Choose the Right Technique for the Given Problems From the list of types of statistical techniques above, choose method s that is suitable for the given problems given below: There is no need to work out the following problems. This is simply an exercise to help you select the appropriate statistical method given the description of a research context. Research Context Compare Your Answer! A survey of National Federation of Independence Business NFIB indicates that small businesses intended to increase their hiring as well as their capital expenditures during as compared with A random sample of 30 small businesses taken at the end of shows an average of 5. It is known that the average stay of tourists in Hong Kong hotels has been 3. A tourism industry analyst wanted to test whether recent changes in the nature of tourism to Hong Kong have changed from this past average. The analyst obtained the following random sample of the number of nights spent by tourists in Hong Kong hotels: Conduct the test using the 0. There are banks involved in certain international transactions. An independent agency wants to test this claim. Can the claim be rejected? General Motors Corporation hopes to reduce anticipated production costs of its Saturn Model by instituting an assembly schedule that will reduce average production time to about 40 hours per car. In a test run of the new assembly line, 40 cars are built at a sample average time per car of A test run of 38 cars using the old assembly schedule results in a sample of mean of Is there proof that the new assembly schedule reduces the average production time per car? What is the p-value? A telephone company wants to estimate the average length of long-distance calls during weekends. Several companies have been developing electronic guidance systems for cars. Out of trials of the Motorola model, were successful; and out of tests of the Blaupunkt model, were successful. Is there evidence to conclude that the Motorola electronic guidance system is superior to the German competitor? A financial analyst wants to test the one-tailed hypothesis that stock A has a greater risk larger variance of price than stock B. A company is interested in offering its employees one of two employee benefit packages. The order of presentation of each of the two plans is randomly selected for each person in the sample. The paired data are: Analysis of variance has long been used in providing evidence of the effectiveness of pharmaceutical drugs. Such evidence is required before the FDA will allow a drug to be marketed. In a recent test of the effectiveness of a new sleeping pill, three groups of 25 patients each were given the following treatments. One group was given the drug, the second group was given a placebo, and the third group was given no treatment at all. The results are as follows. Drug group 12, 17, 34, 11, 5, 42, 18, 27, 2, 37, 50, 32, 12, 27, 21, 10, 4, 33, 63, 22, 41, 19, 28, 29, 8 Placebo group 44, 32, 28, 30, 22, 12, 3, 12, 42, 13, 27, 54, 56, 32, 37, 28, 22, 22, 24, 9, 20, 4, 13, 42, 67 No-treatment group 32, 33, 21, 12, 15, 14, 55, 67, 72, 1, 44, 60, 36, 38, 49, 66, 89, 63, 23, 6, 9, 56, 58, 39, 59 Use a computer to determine whether or not the drug is effective. What about the placebo? Give differences in average effectiveness, if any exist. The maker of portable exercise equipment, designed for the health-conscious people who travel too frequently to use a regular athletic club, wants to estimate the proportion of traveling business people who may be interested in the product. A random sample of traveling business people indicates that 28 of them may be interested in purchasing the portable fitness equipment. When new paperback novels are promoted at bookstores, a display is often arranged with copies of the same book with differently colored covers. A publishing house wanted to find out whether there is a dependence between the place where the book is sold and the color of its cover. For

one of its latest novels, the publisher sent displays and a supply of copies of the novels to large bookstores in five major cities. The resulting sales of the novel for each city-color combination are as follows. Numbers are in thousands of copies sold over a three-month period.

6: Data analysis - Wikipedia

This is a laboratory course supplemented by lectures that focus on selected analytical facilities that are commonly used to determine the mineralogy, elemental abundance and isotopic ratios of Sr and Pb in rocks, soils, sediments and water.

7: Twelfth Grade (Grade 12) Analytical Methods Questions for Tests and Worksheets

Structural Group Analysis Physical Property Methods Spectroscopic Methods DOWNSTREAM - Analytical Methods And Techniques Applied To Crude Oil And.

8: - Choose the Statistical Technique for Given Problems | STAT

Chemical Analysis of Food: Techniques and Applications reviews new technology and challenges in food analysis from multiple perspectives: a review of novel technologies being used in food analysis, an in-depth analysis of several specific approaches, and an examination of the most innovative applications and future trends.

9: How to Write an Analytical Essay - wikiHow

How to Improve Analytical Skills. In this Article: Article Summary Using Active Approaches Using Passive Techniques Putting Your Skills to Work Community Q&A Analytical skills describe our ability to understand and solve problems using the information we have available.

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