

# Investigatory project essay sample

[Science](#), [Chemistry](#)



The objective of the first part of the study was to find the best ratio of ink using carbon from used batteries and charcoal as pigments. The ink was evaluated on the basis of how much pigment is suspended in the mixture and their shelf life. The second part was aimed at the production of carbon paper. The best kinds of ink were tested on two mediums, coupon bond and onion skin. They were also tested for efficiency in terms of the number of coatings needed. The carbon paper was evaluated on the basis of clarity, neatness of the print and general acceptability.

The final sample made use of two coatings of the ink mixture using carbon black, with coupon bond as the medium. The pigment (carbon black) to vehicle (glycerol) ratio of 1 g : 6 mL and 1 g : 7 mL was used using carbon black as pigment with glycerol as vehicle. Although the commercial bond paper has better quality, since it uses more technologically advanced methods, the use of the experimental carbon paper was acceptable.

**INTRODUCTION** Carbon paper has many uses. It has a high demand in schools, offices and other institutions. The ink used in the production of commercial carbon paper is expensive due to its high production costs. Because of its high cost and increasing demand, there arises a need for a cheaper substitute. The study also aims to help reduce the problems in disposing used batteries by "be printed; and(5) nature of pigment. Glycerol is viscous and is easily absorbed by paper and, thus, makes it a good vehicle. Burned wood is a good source of charcoal. Batteries have black particles called black mix, which is primarily composed of carbon black, acetylene black making good use of them.

## REVIEW OF RELATED LITERATURE

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Ink is a mixture of vehicle (liquid component and solvent), pigment (coloring matter) and other substances added to impart special qualities such as a binder. Carbon is usually used as pigment because of its low oil absorption, ease of dispersion and low abrasion to plate ware. Carbon is chemically inert and infusible at atmospheric pressure, which makes it an essential part in the black pigment used in books, magazines, newspapers, carbon paper, etc. Two good sources of pigments that are carbonaceous in nature are charcoal and the black mix found in used batteries. These sources are much cheaper than the usual black pigments such as carbon black in graphite and lampblack. In order for the pigment to thoroughly dissolve with the vehicle, the pigment must be pulverized to very fine particles. The pigment affects the properties of ink such as gloss and opacity.

The vehicle on the other hand must suit the following conditions: (1) the printing system used; (2) class and speed; (3) drying press required; (4) class and texture of the surface to Coconut oil and dextrin were tested for their potential as ink binders. According to the results, coconut oil was a better binder than dextrin. METHODOLOGY Black mix was obtained by opening the protective housing of a drycell battery and exposing its carbon content. Then, the black mix was removed and ground into very fine particles using a mortar and pestle. Afterwards, it was sieved through a fine screen to obtain the finest consistency. On the other hand, charcoal was also finely pulverized. It was then mixed with water and placed in a one-litre beaker. The mixture was allowed to settle for two days inside the covered and manganese dioxide. The carbons obtained from both sources are carbonaceous in nature, making them good sources of black pigment.

After two days, the charcoal pigments were heated to allow evaporation of excess moisture. In preparing the ink, the charcoal and carbon black pigments were combined with glycerol (vehicle) and coconut oil (binder) in different proportions ranging from 1 g : 10 mL : 1 mL (pigment : vehicle : binder ratio) to 2 g : 14 mL : 2 mL. The solution was thoroughly mixed using a stirring rod until totally dispersed. Finally, the mixture was heated for five (5) minutes under medium heat and was allowed to cool down before evaluation. The best ratio using each pigment was then compared to determine which ink is more suitable for carbon paper production. The samples were

**RESULTS AND DISCUSSIONS** The onion paper appeared to be too thin to be used as a medium because it has the tendency to be torn even after one coating. The coupon bond was proven to be the better alternative. It takes five (5) minutes for a solution with a ratio of 1 gram (pigment): 6 mL (vehicle) to dry up. The solution with a ratio of 1g : 7 mL took six (6 ) minutes to dry. The sample which used two coatings was proven to be most practical.

**SUMMARY AND CONCLUSION** The experimental carbon paper is acceptable enough to be used as a substitute for commercial carbon paper. The experiment was able to prove that the pigment obtained from battery carbon is better and cheaper than those from charcoal.

Evaluated for smoothness, consistency, and absorption. The ink samples, ranging from one to four coatings, were applied on the onion skin and coupon bond. The different carbon papers were tested and observed for their drying time, firmness and clarity of print. After determining the best sample,

a survey was conducted on 20 students using the experimental carbon paper and a commercial carbon paper.

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