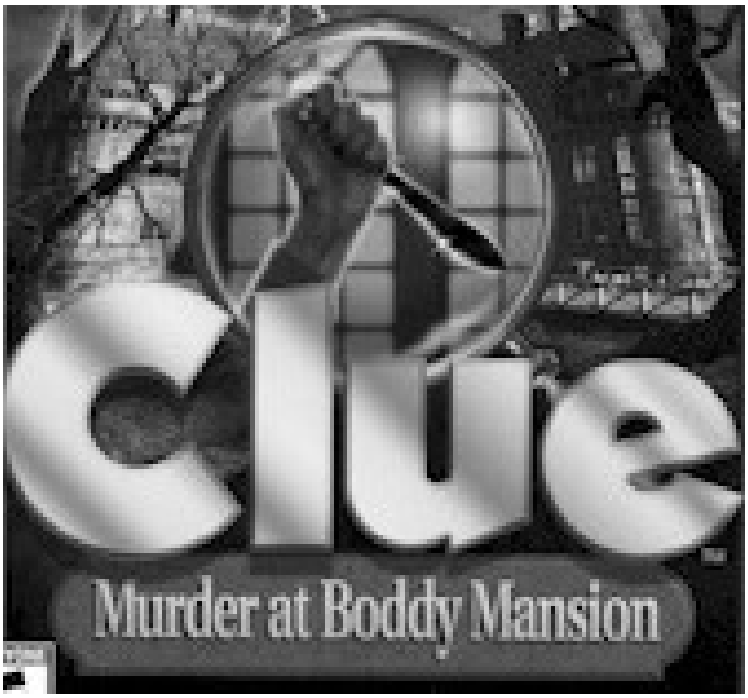


TEAM NUMBER TEAM NAME:

Last Saturday night, Professor Plum invited several guests to his mansion for a formal dinner party. The name of these guests may be familiar:

Mr. Green: A gay State Department employee assigned to coordinate the relationship between the United States and the Brazilian sugar cane farmers. Now that his bipolarity has been controlled with medicine, he has been very successful in bonding with the sugar consortium, which can be proven by the 50 pound bag of sugar he received just today. Mr. Green filled an empty peanut butter jar with some of the sugar and brought it to the dinner party as a gift to his host. Mr. Green was wearing a dapper looking twill wool sport coat with matching bowler hat the evening in question. Mr. Green has type A blood.

Mrs. Peacock: Ivanna Peacock has just been paroled from a minimum security Women's Incarceration Facility, where she was serving 3 to 5 on bribery charges, a crime that she still denies any involvement in. Prior to her being sent up the creek, she was the Store Manager of the local apothecary. Prison has taken its toll on what was once a strikingly beautiful face, and Ivanna realizes it, so she carries with her a complete assortment of cosmetics in a silly little polycarbonate case. Mrs. Peacock was wearing a somewhat dated, but extravagant polyester evening gown. Mrs. Peacock has type B Blood

Miss Scarlet: Scarlet Sachet runs the local bordello, an upscale establishment catering to the locally rich and famous uppercrust known as "high society." She takes very good care of "her girls," and keeps a fully stocked first aid kit with her at all times that includes antibiotic ointments, antacids, and even has some anti-fungal powder, all neatly packed in a Plexiglas container. She now has her sights set on Mr. Green, as she has heard that he has over a "Brazilian" farmer friends, and assumes that must be even more than a million! (She's blond!) Miss Scarlet was wearing a very tight fitting, low cut silk evening gown that left very little to the imagination. Miss Scarlet has type AB blood

Colonel Mustard: Colonel D. John Mustard is actually retired Army and now sells surplus weapons and ammunition on the black market. His latest promotion is a bazooka made from 4" plastic plumbing pipe. He and his clients constitute the majority of Miss Scarlet's client list. Colonel Mustard suffers from hyper-hydrosis, so to compensate, he dusts all of clothing down with a mix of baking soda and cornstarch, which he carries in a zip-lock bag in his pocket. Colonel Mustard arrived at the dinner party wearing a nylon shirt made from a recycled parachute. Colonel Mustard has type A blood

Mrs. White: Vanna T. White has never looked better, even though she recently lost her 4th husband due to an unknown illness. Thankfully, in his will he left her his aluminum spinning business that manufactures aircraft propellers for companies such as Lockheed-Martin and Boeing. It's a true miracle that with all of the bad luck she has had with the health of 4 different husbands that she has been able to survive. But she has not only survived, she has been able to amass a multi-million dollar fortune through generous inheritances, based on the aluminum metal spinning shop left to her by husband number 4, the bakery she now owns, compliments of husband number 3, the chemical fertilizer companies of husband #2, and the plastic pipe factory that her first husband left her. Vanna was wearing a cotton business suit, as she had just come from a board meeting. Mrs. White has type B blood.

Scenario:

As the first guest arrived at the dinner party, Professor Plum's terrier, Mr. Winkles, began barking incessantly at the visitor. Professor Plum turned to the canine and firmly said *"That's One!"* As the next guest arrived, Mr. Winkles clamped on to an ankle, drawing blood and causing the guest to let out a blood-curdling scream of pain and surprise. Professor Plum turned to the pooch and sternly barked, *"That's Two!"* As the third guest arrived, Mr. Winkles stealthily made his way over to the left leg of the guest and promptly relieved himself on the guest's pants. With that, Professor Plum, blurted out *"That's three!"* pulled out a revolver, and promptly emptied all six rounds into the small dog's body. He then excused himself, picked up the remains of the lifeless animal and disappeared in the direction of the garage. While he was gone the remaining guests arrived and the events of the evening were recounted.

It became obvious that the earlier actions of Professor Plum were looked as with disgust and outrage by the guests when Professor Plum returned and found a small, sealed envelope lying on the linen tablecloth next to his dinner plate. Inside the envelope, a hand-written note simply said "Thats One."

Not wanting to meet an early termination the same way his small pet did, he immediately cancelled the dinner party, sent the guests packing, and rushed off to his lab to begin investigating the clues left on and around the threatening note to determine which of his guests was beginning his countdown.

EVIDENCE:
Upon further examination, several key pieces of evidence were found on, next to, and under the corpse and summarized as:

- Evidence 1 – Trace White substance found inside the note envelope
- Evidence 2 – Trace White substance found on the outside of the envelope
- Evidence 3 – White substance found on the marble floor of the Foyer
- Evidence 4 – Trace White substance found under the tablecloth of the dining table
- Evidence 5 – Trace white powder found on the table cloth
- Evidence 6 – A powder found sprinkled on the potato based appetizers
- Evidence 7 - A polymeric sample of the serving bowls selected for use at the dinner party that wouldn't melt
- Evidence 8 – A small piece of a Polymer found next to Professor Plum's dinner plate that melted at 80 degrees C.
- Evidence 9 – A polymeric sample of the flatware selected for use at the dinner party that melted at 135 degrees C.
- Evidence 10 –A polymeric sample of the "china" selected for use at the dinner party that melted at 240 degrees C.
- Evidence 11 –A hair found in the note envelope
- Evidence 12 - A few strands of a material found snagged by the rough table edge, near the head of the table
- Evidence A –Ink sample taken from the note
- Evidence B – Ink sample taken from Mr. Green's pen
- Evidence C – Ink sample taken from Mrs. Peacock's pen
- Evidence D – Ink sample taken from Miss Scarlet's pen
- Evidence E – Ink sample taken from Colonel Mustard's pen
- Evidence F – Ink sample taken from Mrs. White's pen
- Evidence 13 - Partial Fingerprint found on the note, inside the envelope
- Evidence 14 - A small line of blood found on the edge of the envelope flap, possibly from a paper cut as a result of licking the envelope

Qualitative Analysis:

PART 3.a- Chemical Analysis (12 Points Each – 72 possible)

Using the Bunsen Burners and Chemical Indicators, Identify the following Powders:

- ❑ Evidence 1 Lithium Chloride or LiCl
- ❑ Evidence 2 Sodium Carbonate or $Na(CO3)_2$
- ❑ Evidence 3 Sodium Chloride or NaCl
- ❑ Evidence 4 Sucrose or table sugar
- ❑ Evidence 5 Sodium Hydrogen Carbonate
- ❑ Evidence 6 Sodium Acetate

PART 3.b- Polymer / Fiber Analysis (12 Points Each – 72 Points Possible)

Using the communal density liquids located at the front of the room, identify the following Polymers:

- ❑ Evidence 7 HDPE
- ❑ Evidence 8 PVC
- ❑ Evidence 9 PMMA
- ❑ Evidence 10 PS

Identify the following Fiber as human, dog, or cat:

- ❑ Evidence 11 Human

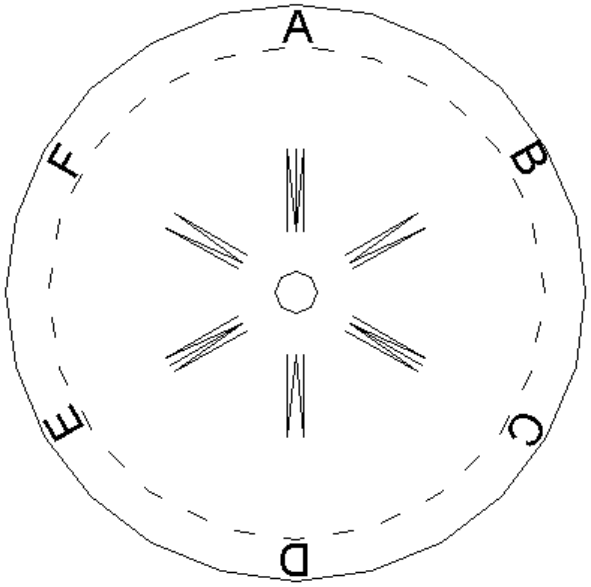
Identify the following fabric:

- ❑ Evidence 12 Linen

PART 3.c- Chromatography (40 Points Possible)

Using the chromatography disk provided, make your way around the room and request pens from each of the 5 suspects. Place the ink samples at approximately 60 degrees from each other, 1 cm from the center hole. Using an imaginary radial from the center hole through the ink sample to the outer edge, label the origins of the samples according to the following:

Note Sample	A
Mr. Green	B
Mrs. Peacock	C
Miss Scarlet	D
Colonel Mustard	E
Mrs. White	F



Next, fill the container provided approximately ¾ full with the 70% alcohol located at the communal liquids table. Using the blank filter disk, roll it into a tube and insert it into the center hole to form a wick. Now place the lower end of the wick in the eluting solution, allowing the disk to lay flat across the rim of the container. The eluting solution will rise up the "wick" and move laterally into the disk, fractionalizing the samples. Do not allow the eluting solution to reach the labels for obvious reasons. Tape your completed chromatogram above.

Which pen was used to write the note?

Mrs. White's

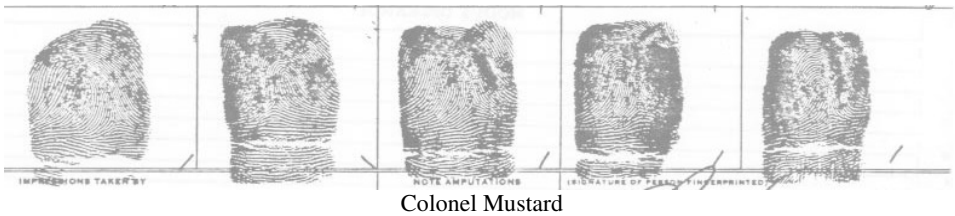
What advantage does this type of chromatography offer over the standard strip process?

Allows all tests to be subjected to the same timing

PHYSICAL EVIDENCE
PART 3.d.i – Fingerprints (15 Points)

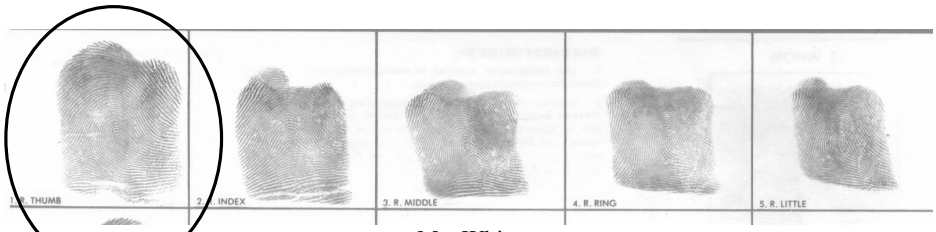
Mr. Green

Miss Scarlet



Colonel Mustard

Mrs. Peacock



Mrs.White

EVIDENCE 13
Partial Print recovered from envelope

Which Suspect matches the partial print? Mrs. White

What pattern is the evidence print? Loop

The actual print turned purple when Professor Plum was done with it. Which process did he use to identify the print?

Ninhydrin

PART 3.d.viii – Serology (15 Points)

The sealed flap of the envelope had a thin red stain along its edge. Further examination revealed that the stain was indeed blood, probably from a small paper cut to the tongue of the one that sealed the envelope. This blood was extracted from the envelope, concentrated, and placed in a dropper bottle.

What Blood type was the blood found on the note?

Type B Blood

Which Suspects does the serology test exonerate?

Mr. Green, Miss Scarlet, Colonel Mustard

Which Suspects does the serology test implicate?

Mrs. Peacock or Mrs. White

PART 3.e – Analysis of the Crime (120 Points Possible)
Now tie it all together with a written essay not to exceed this page, front only.

EVIDENCE 1, actually found inside the envelope, was Lithium Chloride which could be tied to Mr. Green's bipolar disorder or to Mrs. White's aluminum propeller factory where it would be used as the main ingredient in flux used for aluminum welding.
EVIDENCE 2, found on the outside of the note, was Sodium Hydrogen Carbonate, aka Baking Soda, could implicate either Mrs. White, due to the Bakery she owns, or Colonel Mustard, who carries it as an absorbent.
EVIDENCE 3 & 4, salt and table sugar, may implicate Mrs. White, but are common chemicals found at the kitchen table and should be discounted.
EVIDENCE 5, found on the table cloth, was Sodium Carbonate, a chemical commonly used as a water softening agent and detergent, and does not directly implicate any of the suspects. It most likely was residual chemicals left over from laundering.
EVIDENCE 6 was Sodium Acetate found on the potato chips. Sodium Acetate is the salt left over from the famous vinegar / baking soda reaction and provides the salt and vinegar chips with the vinegar flavor. This does not implicate any of the suspects.
EVIDENCE 7 (HDPE) was the primary component of the serving bowl, also known as Tuperware and implicates no one.
EVIDENCE 8 (PVC), has no logical reason for being at the table, so we must assume it is suspicious. The only suspects this could implicate are Mrs. White from her polymer factory, and Colonel Mustard from his PVC Bazookas.
EVIDENCE 9(PMMA), was the plastic spoons and forks set for the meal and implicates no one.
EVIDENCE 10(PS) was the polystyrene plate settings, and again implicates no one.
EVIDENCE 11 was a human hair, but implicates no one without DNA analysis.
EVIDENCE 12 was linen, threads left over from the table cloth.
EVIDENCE A, B, C, D, E, and F clearly indicates that Mrs. White's pen was used to write the note.
EVIDENCE 13 was a fingerprint found on the note, belonging to Mrs. White.
EVIDENCE 14 was the trace blood found on the edge of the envelope flap determined as type B. The only suspects that had type B blood were Mrs. Peacock and Mrs. White. Since no other evidence implicates Mrs. Peacock, we have to assume that Mrs. White is the guilty party.

This is a "Bonus" Section that you can use as a Study Guide for Future Competitions- 1 Point Each

DIGGING DEEPER! A FORENSIC STUDY GUIDE ON FINGERPRINTS

1. What is the name given to the 10 to 16 points of a fingerprint used to compare to a database?
   A. Bifurcations
   B. Minutiae
   C. Dots
   D. Improvisations
   ANSWER:___B___

2. The unpredictable array of fine detail found on pads of the hands and feet are called what?
   A. Friction Ridges
   B. Bifurcations
   C. Trifurcations
   D. Undulations
   ANSWER:___A___

3. The first person to classify and document fingerprints in 1892 was:
   A. Rollie Fingers
   B. The Fresh Prints of Bellaire
   C. Sir Francis Galton
   D. Sir Walter Raleigh
   ANSWER:___C___

4. A single ridge splitting into two ridges is call a:
   A. Fork
   B. Bifurcation
   C. Twinning
   D. Convergance
   ANSWER:___B___

5. Fingerprints not visible to the naked eye are called:
   A. Latex
   B. Latent
   C. Lament
   D. Invisible
   ANSWER: __B___

6. Prints on a porous surface such as paper were treated by turning them purple. The process used was probably:
   A. Cyano Acrylate Fuming
   B. Silver Nitrate Misting
   C. Iodine Fuming
   D. Ninhydrin Saturation
   ANSWER:___D___

7. Which of the following tests require heat to develop the print?
   A. Cyano Acrylate Fuming
   B. Silver Nitrate Misting
   C. Iodine Fuming
   D. Ninhydrin Saturation
   E. A & B
   F. B & C
   G. A & C
   H. A & D
   ANSWER:___H___

8. Which of the following is NOT a recognized fingerprint pattern?
   A. Loop
   B. Whorl
   C. Delta
   D. Arch
   ANSWER:___C___

9. TRUE or FALSE: It is impossible for an individual to have more than two different types of fingerprints. ANSWER:___F___

10. The common database used throughout the United States to identify fingerprints is called:
    A. CODIS
    B. AFIS
    C. APIS
    D. COFIS
    ANSWER:___B___

11. The 10-print card system developed in the early 1900s to classify fingerprints is called:
    A. The Henry System
    B. The George System
    C. The Alexander System
    D. The Fingerprint Classification System
    ANSWER: ___A___

12. A fingerprint pattern that opens to the inside of the arm is called:
    A. Radial
    B. Posterior
    C. Anterior
    D. Ulnar
    ANSWER:___A___

13. Rigor Mortise is the temporary stiffening of the joints. The typical duration of the process is:
    A: 12 hours to 24 hors after death
    B. 6 hours to 36 hours after death
    C. 3 hours to 72 hours after death
    D. 1 hour to 96 hours after death
    ANSWER:___C___

14. The science of Fingerprint Identification is also known as:
    A. Filangescopy
    B. Digitology
    C. Minutiaology
    D. Dactyloscopy
    ANSWER:___D___

15. 3-D Fingerprints left in soft material such as wax or certain greases that identify ridge depths as well as width and length are called:
    A. Dimensional
    B. Plastic
    C. Latent
    D. Basal
    ANSWER:___B___

16. Resultant Chemical from mixing vinegar and baking soda
    A. Calcium Carbonate
    B. Sodium Hydrogen Carbonate
    C. Sodium Acetate
    D. Sodium Carbonate
    ANSWER: ___C___

17. If ingested, can cause high blood pressure:
    A. Lithium Chloride
    B. Sodium Chloride
    C. Potassium Chloride
    D. Calcium Nitrate
    ANSWER:___B___

18. Primary chemical used in hand warmers and heat packs .
    A. Calcium Carbonate
    B. Sodium Hydrogen Carbonate
    C.
    D.
    C. Sodium Acetate
    D. Sodium Carbonate
    ANSWER: ___C___

19. Primary chemical used in State sanctioned lethal injections
    A. Potassium Chloride
    B. Calcium Nitrate
    C. Lithium Chloride
    D. Sodium Acetate
    ANSWER:___A___

20. One of the primary chemicals in the Oklahoma City bombing of 1995
    A. Lithium Chloride
    B. Calcium Sulfate
    C. Calcium Carbonate
    D. Calcium Nitrate
    ANSWER:___D___

21. May be found in antiseptics, athlete's foot medicines, insecticides, and jewelry cleaners
    A. Boric Acid
    B. Ammonium Chloride
    C. Magnesium Sulfate
    D. Potassium Chloride
    ANSWER:___A___

22. When mixed with water, this substance makes a non-neutonian paste called Oobleck
    A. Glucose
    B. Sucrose
    C. Cornstarch
    D. Calcium Carbonate
    ANSWER:___C___

23. Which of the following Chemicals are NOT used in the production of fertilizer?
    Potassium Chloride
    Magnesium Sulfate
    Ammonium Chloride
    Calcium Nitrate
    ANSWER:___C___

24. Which of the following is soluble in water?
    A. Calcium Carbonate
    B. Calcium Nitrate
    C. Calcium Sulfate
    D. Cornstarch
    ANSWER:___B___

25. Used in the manufacturing of flux for aluminum brazing
    A. Lithium Chloride
    B. Potassium Chloride
    C. Sodium Chloride
    D. Ammonium Chloride
    ANSWER:___A___

26. Used in Peanut Butter jars and Salad Dressing bottles
    A. PMMA
    B. PETE
    C. HDPE
    D. PS
    ANSWER___B___

27. Used in Grocery Store meat trays and football game hot chocolate cups
    A. PC
    B. PS
    C. PVC
    D. PP
    ANSWER___B___

28. Used to make plexiglass such as ice rink walls
    A. PC
    B. HDPE
    C. PETE
    D. PMMA
    ANSWER___D___

29. Used to make CDs, DVDs, and some optic lenses
    A. PC
    B. PS
    C. PVC
    D. PP
    ANSWER:___A___

30. Used to make plastic grocery bags and sandwich bags
    A. HDPE
    B. PP
    C. PS
    D. LDPE
    ANSWER:___D___

DIGGING DEEPER! A FORENSIC STUDY GUIDE ON REFRACTION

31. The Physics Law that states "$\sin(\text{theta}_1) / \sin(\text{theta}_2) = \text{constant} = n_{glass} = 1.50$" is known as:
    A. Snell's Law
    B. Smell's Law
    C. Shell's Law
    D. Spell's Law

    ANSWER:___A___

32. The angle between the light striking the glass and the perpendicular plane to the glass is called:
    A. Occipital Angle
    B. Angle of Incidence
    C. Angle of Refraction
    D. Angle of Reflection

    ANSWER:___B___

33. The angle between the light as it passes through the glass and the perpendicular plane to the glass is called:
    A. Occipital Angle
    B. Angle of Incidence
    C. Angle of Refraction
    D. Angle of Reflection

    ANSWER:___C___

34. The perpendicular plane to the glass that the above angles are measured from is known as:
    A. Angular Baseline
    B. Perpendicular Baseline
    C. Refractory Baseline
    D. Normal Plane

    ANSWER:___D___

35. TRUE or FALSE: The Refraction Index of water is always less than the Refraction Index of Glass

    ANSWER:___T___

36. Which of the following types of glass would have the higher Index of Refraction?
    A. Albite Glass
    B. Crown Glass
    C. Lanthanum Glass
    D. Flint Glass

    ANSWER:___C___

37. Eyeglasses use the refractory principle to adjust the focal lengths within the eye to correct focal irregularities, although blue light will still have a shorter focal length than red light. This is known as:
    A. Spectrum Occlusion
    B. Chromatic Aberration
    C. Ultraviolet Variation
    D. Visible Light Adjustment

    ANSWER:___B___

38. In order to understand the concept of refraction, one must know the speed of light in air is:
    A. 186,000 feet / second
    B. 186,000 miles / hour
    C. 186,000 Km / minute
    D. 186,000 miles / second

    ANSWER:___D___

39. Light that is refracted through a prism can be separated into the various colors within the spectrum. This process is called:
    A. Dispersion
    B. Fractionalization
    C. Spectral Separation
    D. Rainbowism

    ANSWER:___A___

40. If light passed through a transparent media and the entrance angle does not equal the exit angle, which of the following statements must be true?
    A. The Media must not be totally transparent
    B. The Media must have the same Refractive Index as the air surrounding it
    C. The media must be thicker on one edge than the other
    D. The Light must not be full spectrum

    ANSWER:___C___

41. The liquid used in the chromatography process is called the:
    A. Effluent
    B. Affluent
    C. Eluent
    D. Solvent
    ANSWER:__C

42. Highly volatile liquids with low boiling points are usually separated with which type of Chromatography?
    A. Thin Layer Chromatography
    B. Paper Chromatography
    C. Column Chromatography
    D. Gas Chromatography
    ANSWER:__D__

43. TRUE or FALSE: The liquid used will carry a high molecular weight component further than a low molecular weight component which is what causes the fractionalization of various colors seen on the paper
    ANSWER: __F__

44. TRUE or FALSE: Nonpolar compounds will generally be carried further than polar compounds
    ANSWER: __T__

45. The ratio of the fractionalized compound to the liquid is called the:
    A. Rf
    B. Rh
    C. Fr
    D. Fa
    ANSWER:__A__

46.. If this ratio is greater than 1, which of the following must be true?
    A. The compound is polar
    B. The compound is nonpolar
    C. The liquid is polar
    D. The liquid is nonpolar
    E. The compound is insoluble
    F. You screwed up!
    ANSWER:__F__

47. TRUE or FALSE: One way to speed up the chromatography process is to swirl the liquid in the beaker while it is wicking up the paper
    ANSWER:__F__

48. Allowing the paper strip to touch or lay against the side of the beaker will result in inaccurate results due to:
    A. Adhesion between the glass and the liquid
    B. Cohesion between the glass and the paper
    C. Surface Tension between the glass and the liquid
    D. Gravity
    ANSWER:__A__

49. The process having the liquid move up vertically through the paper is best described as:
    A. Surface Tension
    B. Capillary Action
    C. Cohesion between dissimilar materials
    D. Antigravity
    ANSWER:__B__

50. The reason that soluble compounds fractionalize on chromatography paper is:
    A. Polarity variations between compound components
    B. Reactivity variations between compound components
    C. Molecular weight differences between compound components
    D. Solubility rate differences between compound components
    E. All of the above
    F. None of the above
    G. A & C
    H. B & D
    I. A & D
    J. B & C
    ANSWER:__G__

51. Gas Chromatography results are based on which of the following:
    A. The deflection differential between lighter and heavier ions created by a magnetic field
    B. The light spectrum reflected by the different ions being analyzed
    C. The amount of energy released when bombarded with specific wavelengths
    D. The speed differential of an electron passing through an electric field.
    E. A & D above
    F. B & C above
    ANSWER:__E__

52. TRUE or FALSE: All Mass spectroscopy results are based on similar units of measure allowing data to be easily shared between researchers
    ANSWER:__F__

53. Thin layer chromatography uses which of the following as a medium?
    A. Silica Gel
    B. Cellulose
    C. Sand
    D. Paper
    ANSWER:__A__