

# Forensics Cheat Sheet Science Olympiad

Water	44% Iso Alcohol	Veg Oil
10% NaCl	PS HDPE	LDPE
Saturated NaCl	PC or PMMA	FLOATS
PETE or PVC		

PS - Polyethylene terephthalate, is the most common thermoplastic polymer resin of the polyester family and is used in fibres for clothing, containers for liquids and foods, and thermoforming for manufacturing, and in combination with glass fibre for engineering resins. HDPE - High-Density Polyethylene is a polyethylene thermoplastic made from petroleum. HDPE is commonly recycled and made into composite wood or plastic lumber. is a Type 2 plastic commonly used in making containers for milk, motor oil, shampoos and conditioners, soap bottles, detergents, and bleaches. LDPE - Low-density polyethylene. This clear or translucent plastic exhibits flexibility, chemical resistance, and waterproofing capabilities. It is used in the manufacture of a wide range of products, including grocery bags, plastic wrap and film, and flexible packaging material. PC - commonly used for plastic lenses in eyewear, medical devices, automotive components, protective gear, greenhouses, Digital Disks (CDs, DVDs, and Blu-ray), and exterior lighting fixtures. PMMA - often used as a lighter, shatter-resistant

this easy-to-process, low-cost, versatile material is also used in dentures, bone implants etc. PETE - polyethylene terephthalate, the chemical name for polyester. PET is a clear, strong, and lightweight plastic that is widely used for packaging foods and beverages, especially convenience-sized soft drinks, juices and water. Forensic scientists can determine a number of things from analyzing hairs found at crime scenes. The clues that hairs reveal include what part of the body the hairs came from, the race of the person they came from, if the hairs shed naturally or were pulled from someone's head, and whether the hairs were color-treated. Medullary index (MI): width of medulla/hair width (if  $>0.5$  then it is animal hair, if  $<0.33$  then it is human hair) Medulla: the centre-most part of the hair strand Anagen phase - period of growth in the hair cycle, avg 3-5 years Cuticle - translucent outer layer of the hair shaft consisting of scales that cover the shaft. Cuticular scales always point from the proximal or root end of the hair to the distal or tip end of the hair. Cortex - the main body of the hair composed of elongated and fusiform (spindle-shaped) cells. It may contain cortical pigment granules, and/or large oval-to-round-shaped structures called ovoid bodies. Root - the part of the hair located under the skin (all previously mentioned components of the follicle are located in the shaft, which is the part sticking out of the skin) in the tube-like structure known as the follicle. It is where the hair first begins to grow, the underlying cells forming the protein keratin which composes the hair. Catagen phase: intermediate period of hair growth, 3 weeks Telogen phase: final period of hair growth resulting in hair loss, 3 months. Describe the distinguishing factors of human hair - cuticle pattern resembles that of unorganized, overlapping roof shingles. Only human hairs can possess fragmented or absent medulla. Caucasian - Shaft diameter: moderate with little variation, Cross Section: oval, Pigment granules evenly distributed African - Shaft diameter: fine to moderate with considerable variation, Cross Section: flattened, Pigment granules: clumped Asian - Shaft diameter: moderate with little variation, Cross Section: round, Pigment granules: large patchy areas Ridge - the line-like, raised formations that form the pattern that forensic scientists use to analyze and identify fingerprints. By all means, they alone with the furrows they create define the fingerprints. When they form is when a fetus gets his/her fingerprints (more notes on fingerprint formation are listed below) bifurcation - a point on a fingerprint in which a single ridge divides into two islands - formation in which the ridge is shaped like a dot enclosure - an often elliptically-shaped, bowl-like furrow surrounded by ridges loop - the most common basic pattern of the human fingerprint, formed by several sharply rising elongated-U-shaped ridges whorl - one of the basic patterns of the human fingerprint, formed by several complete circular ridges one inside another arch - one of the basic patterns of the human fingerprint, formed by several curved ridges one above the other 3 types of fingerprints - 1. Latent, 2. visible, 3. impression latent - composed of several chemicals exuded through the pores in the fingertips and are left on virtually every object touched, hard to find if possible at all, to identify a latent fingerprint, one uses chemical tests visible - relatively easy to find and photograph impression - still relatively easy to find and photograph Dusting - a method of creating a copy of fingerprint found at a crime scene which can then be taken back to the crime lab for examination. This process centers on adhering the fingerprint oils which left the ridge imprint to a certain substance (coming in the form of a fine powder, hence the term dusting) which can then be pulled up via specialized tape. This is usually then attached to a note card or object of that nature so that one is left with a mirror image of the fingerprint. 2 types of fingerprint powder - regular and magnetic powder regular powder - preferable when dusting off such surfaces as windows, televisions, kitchen counter tops, table tops, painted surfaces, cabinets and many other surfaces found in residential and commercial settings, and it is quite effective in dustings on apprehended or stolen vehicles on painted surfaces on the exterior of the vehicle and on glass. It also has the advantage of being available in different colors ranging from black to pink, which makes the fingerprint copy generally more discernible against any debris that the adhesive tape may peel off the surface as well. When utilizing this type of powder, one should use a fibreglass brush. Also, it is important to not get too much powder on it at a time, or you risk compromising the fingerprint. Lightly dapple the tip. magnetic powder - best applied to shiny surfaces, such as plastic containers. When dusting for fingerprints with magnetic powder, crime scene investigators must use a magnetic applicator which has a magnet. Magnetic powder is applied with a light hand with brushing strokes. Besides being available in the colors of black, white, silver/gray and biochromatic, magnetic powder is also available in fluorescent magnetic powder colors like red and green. These can be used when dealing with problematic background fluorescence, and they are best applied with feather duster. Chromatography - based on the principle where molecules in a mixture are smeared onto a solid or surface, and a stable phase (fluid stationary phase) separates the components of a mixture from each other while moving with the aid of a mobile phase. Chromatography can be used as an analytical tool, feeding its output into a detector that reads the contents of the mixture. It can also be used as a purification tool, separating the components of a mixture for use in other experiments or procedures. Spectroscopy - used in physical and analytical chemistry to detect, determine, or quantify the molecular and/or structural composition of a sample. Each type of molecule and atom will reflect, absorb, or emit electromagnetic radiation in its own characteristic way. Iodine Fuming - Self explanatory by its name. It was one of the earliest methods of fingerprint development. The iodine reacts with body fats and oils in prints. Ninhydrin - A chemical method that is useful for lifting latent prints on paper. It reacts with amino acids in prints and

BY HAND

alternative to glass in everything from windows, aquariums and hockey rinks. Therefore, it's hard to fathom that

medulla

cuticle

shaft

root

follicle

epidermis

dermis

hypodermis

sebaceous gland

arrector pili

hair matrix

hair bulb

hair root

hair shaft

hair tip

hair base

hair length

hair width

hair color

hair texture

hair shape

hair growth

hair loss

hair care

hair styling

hair treatment

hair product

hair salon

hair spa

hair therapy

hair transplant

hair restoration

hair removal

hair wax

hair oil

hair cream

hair gel

hair spray

hair shampoo

hair conditioner

hair mask

hair serum

hair lotion

hair mist

hair foam

hair powder

hair clay

hair pomade

hair cream

hair butter

hair oil

hair wax

hair gel

hair spray

hair shampoo

hair conditioner

hair mask

hair serum

hair lotion

hair mist

hair foam

hair powder

hair clay

hair pomade

hair cream

hair butter

hair oil

hair wax

hair gel

hair spray

hair shampoo

hair conditioner

hair mask

hair serum

hair lotion

hair mist

hair foam

hair powder

hair clay

hair pomade

hair cream

hair butter

hair oil

hair wax

hair gel

hair spray

hair shampoo

hair conditioner

hair mask

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hair spray

hair shampoo

hair conditioner

hair mask

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hair mist

hair foam

hair powder

hair clay

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hair cream

hair butter

hair oil

hair wax

hair gel

hair spray

hair shampoo

hair conditioner

hair mask

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or analyze evidence. Participants are expected to demonstrate knowledge and skills in various areas including chemistry, biology, and physics. The event typically includes analyzing fingerprints, hair, fibers, and other physical evidence, as well as understanding the legal implications involved in forensic science.

## Key Topics in Forensics

To prepare effectively for the forensics event in Science Olympiad, students should focus on the following key topics:

- **Crime Scene Investigation:** Understanding how to secure a crime scene, collect evidence, and maintain the chain of custody.
- **Evidence Types:** Familiarity with different types of evidence, such as physical, biological, and digital evidence.
- **Biological Evidence:** Knowledge of DNA, blood types, and the significance of different biological samples in forensic analysis.
- **Fingerprint Analysis:** Techniques for analyzing and comparing fingerprints, including the use of AFIS (Automated Fingerprint Identification System).
- **Trace Evidence:** Understanding how to collect and analyze trace materials like hair, fibers, and gunshot residue.
- **Forensic Toxicology:** Basics of toxic substances, their effects, and how they are analyzed in a forensic context.

## Essential Forensic Techniques

In forensics, various techniques are employed to analyze evidence. Familiarizing yourself with these techniques can enhance your understanding and performance in the Science Olympiad.

### 1. Crime Scene Processing

Processing a crime scene is crucial for ensuring that evidence is collected correctly. This involves:

1. Securing the Scene: Preventing contamination by restricting access to the area.
2. Documentation: Taking photographs, making sketches, and noting details of the scene.
3. Evidence Collection: Carefully collecting and labeling evidence, ensuring it is stored properly to maintain its integrity.

## **2. DNA Analysis**

DNA analysis is a cornerstone of forensic science. Understanding how DNA is collected, processed, and analyzed is vital. Key points include:

- Collection methods: Swabs, blood samples, or saliva.
- Techniques: PCR (Polymerase Chain Reaction), gel electrophoresis.
- Interpreting results: Understanding how to read DNA profiles and match them to suspects.

## **3. Fingerprint Examination**

Fingerprint analysis involves both physical and chemical methods to enhance and compare prints. Important techniques include:

1. Latent Print Development: Using powders, chemicals, and UV lights.
2. Comparison: Using known prints to match with collected prints.

## **Study Resources for Science Olympiad Forensics**

Utilizing various resources can significantly improve your preparedness for the forensics event. Here are

some recommended study materials:

## Books

- **Forensic Science: An Introduction to Scientific and Investigative Techniques** by Stuart H. James and Jon J. Nordby
- **Criminalistics: An Introduction to Forensic Science** by Richard Saferstein

## Online Resources

- National Institute of Justice - Offers comprehensive information on forensic science topics.
- Forensic Science Simplified - A website dedicated to making forensic science accessible to students.
- YouTube - Various channels provide tutorials on forensic techniques and case studies.

## Practice Materials

- Sample Cases: Look for online databases or textbooks that provide sample forensic cases for practice.
- Workshops: Many schools or local organizations offer workshops or camps focused on forensic science.

## Tips for Success in the Science Olympiad Forensics Event

To excel in the forensics event, consider the following tips:

### 1. Form a Study Group

Collaborating with peers can enhance your learning experience. Discussing concepts and sharing resources can provide diverse insights and deepen your understanding.

## 2. Conduct Mock Investigations

Simulate crime scene investigations with your study group. Practice collecting and analyzing evidence to gain hands-on experience.

## 3. Stay Updated on Forensic Science Trends

Forensic science is a rapidly evolving field. Keeping abreast of the latest techniques, technologies, and legal issues can give you an edge in competitions.

## 4. Manage Your Time Wisely

As the competition approaches, create a study schedule that allows you to cover all necessary topics without cramming.

## Conclusion

In summary, a **forensics cheat sheet science olympiad** is an invaluable tool for participants looking to succeed in the forensics event. By mastering key topics, familiarizing yourself with essential techniques, utilizing recommended resources, and practicing effectively, you can enhance your chances of achieving a top performance in this exciting competition. With dedication and proper preparation, you can unlock the mysteries of forensic science and make a significant impact in the Science Olympiad.

## Frequently Asked Questions

### What topics are covered in the Forensics event of the Science Olympiad?

The Forensics event covers topics such as fingerprint analysis, handwriting analysis, blood sample analysis, fiber and hair comparison, and crime scene investigation techniques.

### How can I effectively study for the Forensics event in the Science Olympiad?

To study effectively, create a study schedule, use online resources and textbooks, practice with past competition materials, and participate in hands-on activities or workshops related to forensic science.

## What types of practical skills are assessed in the Forensics Science Olympiad event?

Participants are assessed on their ability to collect and analyze evidence, perform lab tests (like chromatography), and interpret data to solve hypothetical crime scenarios.

## What resources can I use to prepare my Forensics cheat sheet for the Science Olympiad?

You can use forensic science textbooks, reputable online articles, tutorial videos, and previous Science Olympiad materials as resources to compile your cheat sheet.

## Are there any specific forensic techniques that are particularly important for the Science Olympiad?

Yes, important techniques include DNA analysis, blood typing, fingerprint comparison, and microscopy for examining fibers or other trace evidence.

## How can I ensure my Forensics cheat sheet is both comprehensive and concise?

Focus on key concepts, terminology, and essential procedures. Use bullet points, diagrams, and charts to summarize information clearly while keeping it easy to reference during the competition.

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