Forensics Division C Answer Key

1. Powder A
   [2 pts] Chemical formula: \( C_6H_12O_6 \)
   [1 pt] Flame test: melts
   [1 pt] Solubility: soluble
   [1 pt] pH: 7

2. Powder B
   [2 pts] Chemical formula: \( NaC_2H_3O_2 \)
   [1 pt] Flame test: yellow/orange
   [1 pt] Solubility: soluble
   [1 pt] pH: 8

3. Powder C
   [2 pts] Chemical formula: \( Ca(NO_3)_2 \)
   [1 pt] Flame test: red
   [1 pt] Solubility: soluble
   [1 pt] pH: 7

4. sucrose is a nonreducing sugar [2 pts]

5. black [1 pt] | brown/yellow [1 pt]

6. 

7. 


8. 

\[
\begin{array}{c}
\text{H} \\
\text{C} \\
\text{H}
\end{array}
\begin{array}{c}
\text{CH}_3 \\
\text{C} \\
\text{C} \\
\text{O} \\
\text{O} \\
\text{CH}_3
\end{array}
\]

[2 pts]

9. polyester [2 pts]

10. linen [2 pts]

11. nylon [2 pts]

12. squirrel hair [1 pt]

13. bat hair [1 pt]

14. [3 pts]

15. \( \frac{2}{9} = 0.222 \) [2 pts]

16. \( \frac{5}{9} = 0.556 \) [2 pts]

17. \( \frac{6}{9} = 0.667 \) [2 pts]

18. sample A [1 pt]

19. [1 pt] for correct labels (solvent front, origin), [2 pts] for accurate/clear results [tiebreaker]
20.  

21. **114 g/mol** [1 pt]

22. **octane** [2 pts]

23. c) **stratified squamous epithelial** [1 pt]

24. b) **They are formed during gestation.** [1 pt]

25. plain arch, double loop whorl, tented arch, radial loop [4 pts]

26. ninhydrin and iodine fuming [1 pt]; paper is a porous surface [1 pt]

27. d) **reptilian/amphibian** [1 pt]

28. amphibian RBCs have nuclei, human RBCs do not [1 pt]; amphibian RBCs are capable of dividing on their own, human RBCs cannot [1 pt]; amphibian blood lacks platelets [1 pt]; amphibian RBCs are larger and more oval, human RBCs are smaller and circular [1 pt] [tiebreaker]

29. **B+** [2 pts]; **can receive B+, B-, O+, O-** [2 pts]

30. **III, IV** [2 pts]
31. Crime Analysis

-mention that Daisy was likely the one who committed the crime (4 pts)

-mention that Azalea was likely also involved in the crime (3 pts)

-mention that Aster and Lily are likely innocent (2 pts)

-describe the evidence and motives linked to each suspect

Suspect A: Azalea
- pen matches ink (1 pt)
- matching fingerprint (1 pt)
- motive: as neighbors, victim’s taste for heavy metal music frequently incites her migraines (1 pt)

Suspect B: Aster
-magnesium sulfate (1 pt)
-magnesium sulfate used to treat sprains (1 pt)
-would have been at the spa at the time of the murder (1 pt)

Suspect C: Lily
-no evidence linking her to crime scene (1 pt)
-no motive: gets along very well with victim (1 pt)

Suspect D: Daisy
-calcium nitrate (1 pt)
-calcium nitrate used in fertilizers, link to gardening hobby (1 pt)
-sodium bicarbonate (1 pt)
-sodium bicarbonate is baking soda, link to baking hobby (1 pt)
-squirrel hair (1 pt)
-squirrel hair linked to hobby of exploring forests (1 pt)
-matching blood type (1 pt)
-motive: bitter about not being promoted despite working alongside victim for a decade, needed money for new house (1 pt)