The Strange Case of Mole Airlines Flight 1023[1]

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Scene of the Crash

At 6:02 a.m. you and your team of medical examiners are called to the scene of a plane crash. You find evidence of a pre-crash explosion. At the site of the explosion a material has been found. Subsequent chemical analysis shows:

C	37.01%	H	2.22%
N	18.5%	O	42.27%

The mangled passengers are found in and around the crash. They must be identified by the substances found in their belongings or in their bodies, since they are not recognizable and their dental records are not available. Upon further investigation one passenger was suspected of having been murdered before the crash: the time of death was approximated at one hour prior to the crash.

Table 1. Percent Composition Data of the Compounds Found in or with the Passengers' Bodies

Passenger	Compound Analysis (%)				Location
	C	H	N	O	
1	67.31	6.98	4.62	21.10	Blood
2	63.15	5.30	—	31.55	Face
	46.66	4.48	31.1	17.76	Stomach
3	72.15	7.08	4.68	16.03	Pockets (2000 tablets)
4	15.87	2.22	18.15	63.41	Blood and pockets
5	75.42	6.63	8.38	9.57	Blood
	37.01	2.22	18.5	42.27	Pockets
6	57.14	6.16	9.52	27.18	Pockets
7	80.48	7.45	9.39	2.68	Pockets
	81.58	8.90	9.52	—	Pockets
8	60.00	4.48	—	35.53	Pocket
	63.56	6.00	9.27	21.17	Pocket

Table 2. Possible Compounds

Identity	Formula	Notes
Codeine	$C_{18}H_{21}NO_3$	Painkiller, prescription-controlled
Cocaine	$C_{17}H_{21}NO_4$	Narcotic, illegal
Aspirin	$C_9H_8O_4$	Pain killer
Aspartame	$C_{14}H_{18}N_2O_5$	Artificial sweetener
Vanilla	$C_8H_8O_3$	Flavoring
Trinitrotoluene	$C_7H_5N_3O_6$	Explosive (TNT - dynamite)
Nitroglycerine	$C_3H_5N_3O_9$	Explosive, heart medication
Curare	$C_{40}H_{44}N_4O$	Poison
Thiobromine	$C_7H_8N_4O_2$	Chocolate (flavoring)
Strychnine	$C_{21}H_{22}N_2O_2$	Rat poison
Dimetacrine	$C_{10}H_{13}N$[a]	Prescription drug, antidepressant
Acetaminophen	$C_8H_9NO_2$	Painkiller (Tylenol)

[a]The empirical formula rather than the actual formula is used.

Table 3. Personal Data

Passengers and Crew	Notes
Amadeo Oldere	Has a heart condition
Connie Majors	Pharmacist
Jim LeClaire	Baker
Archie Starr	Teacher, addicted to sugar-free drinks
Bob (Reno) Henderson	Professional athlete, just suspended for drug violations
Lisa Johnson	Environmental engineer, severely depressed
Bill (Cadillac) Jackson	Suspected drug dealer
Norm Anderson	Suspected leader of a terrorist organization

Your Job

1. Use the percent composition data in Table 1 to determine formulas for the compounds found with or in the passengers. Match these formulas with the identity of each compound listed Table 2. Be certain to use the number of significant figures in the analysis to determine the number of significant figures you need to use from the periodic table. For example, if four significant figures are given in the data, use four significant figures from the periodic table.
2. Use the personal data in Table 3 to make a probable identification of each passenger. Record the identifications on the Worksheet. The solution to the puzzle is in every case the one that the evidence points to by logical deduction. Do not insert ideas not supported by the evidence.
3. Using the Worksheet below, figure out who was murdered and who is the most probable murderer.

Note

1. Reprinted and adapted with permission of *The reACTant* newsletter of the Associated Chemistry Teachers of Texas (ACT_2).

Worksheet

Passenger	Most Probable Identity
1	
2	
3	
4	
5	
6	
7	
8	

_____ was murdered by _____.

Certified by_____ Date_____

Answers

1: Bob Henderson; 2: Jim LeClaire; 3: Bill Jackson; 4: Amadeo Oldere; 5: Norm Anderson; 6: Archie Starr; 7: Lisa Johnson; 8: Connie Majors. Norm Anderson was murdered by Lisa Johnson.