U.S. AIR FORCE

AFI 51-503

Aircraft Accident Investigation Board Report
KC-135E Serial No 59-1452

Date of Accident: 13 January 1999

Location of Accident: Geilenkirken, Germany

Board President: [redacted]

Volume I

Executive Summary

Date, time, and location of accident: 13 January 1999; 1939 Zulu/2039 German local time; at Geilenkirchen NATO Air Base, Germany

Mishap Aircraft: KC-135E, Tail Number 59-1452, 141st Air Refueling Wing, Washington Air National Guard, Fairchild Air Force Base, Washington

Summary of Events: The mishap aircraft, call sign ESSO 77, departed Geilenkirchen Air Base Germany at 1603Z on 13 Jan 99 with four crewmembers, 100,000 pounds of fuel, and no cargo. The mission was scheduled as a routine air refueling training mission. The mission was planned to refuel in KIM Air Refueling Area; however, due to the forecast of severe clear air turbulence, the air refueling area was changed to Air Refueling Area 7 (ARA 7). The aircraft flew to ARA 7 over the North Sea and refueled a NATO E-3A (call sign NATO 14) aircraft at Flight Level 250 (25 thousand feet). After completing the air refueling, an enroute descent was flown to Geilenkirchen AB. The mishap crew called the Geilenkirchen Command Post thirty-two minutes prior to the mishap and reported fuel offload and no aircraft maintenance problems. The crew was cleared for an ILS (Instrument Landing System) approach with a planned full stop landing on Runway 27. After a normal flare to landing and descent to a point on or near the runway, the crew attempted to go around out of the landing attitude. The mishap crew made the radio call "ESSO 77 on the go". The aircraft attained a very high pitch attitude, approaching the vertical, climbed to approximately 1300 feet AGL, stalled and impacted the ground in a nose low attitude 250 feet west and 910 feet north of departure end runway 27. The impact resulted in the death of all four crewmembers and the destruction of the aircraft.

Number of Injuries/Deaths: Four fatalities (all crew members)/no injuries.

Damage Description: The aircraft was destroyed by the impact. Non-U.S. property was confined to destroyed trees on German government and private property and potential environmental contamination from the fuel on the aircraft.

Statement of Opinion:

Under 10 U.S.C. § 2254(d), any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report may not be considered as evidence in any civil or criminal proceeding arising from an aircraft accident, nor may such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements.

I was unable to find clear and convincing evidence as to the cause of this accident. The aircraft's pitch up to a near vertical attitude and subsequent stall were the cause of the crash. However, I was unable to find proof as to the cause of the pitch up. I believe the horizontal stabilizer trim was in a 7.5 nose up trim condition during the landing flare. The pilot, realizing he was landing long and might not be able to stop in the confines of the runway, elected to go around out of the landing attitude. The upward vector from the power application in conjunction with the nose up trim setting resulted in the pitch up and stall. I believe that the cause of the nose up trim setting was either the result of an un-commanded runaway trim malfunction or the result of the pilot trimming to the landing attitude. The absence of empirical data makes it impossible to determine how the aircraft trim was moved to the 7.5 nose high attitude.

Dated this 30th day of April 1999.

[redacted]

President, Accident Investigation Board

Summary of Facts

1. AUTHORITY, PURPOSE, AND CIRCUMSTANCES

1.1. Authority: At the direction of Lieutenant General Walter S. Hogle, Vice Commander, Air Mobility Command (HQ AMC/CV Memorandum, 15 January 1999 and HQ AMC/CV Memorandum, 3 February 1999), an AFI 51-503 investigation was convened regarding the aircraft mishap involving a Washington Air National Guard (ANG) KC-135E, S/N 59-1452, which occurred at NATO Air Base Geilenkirchen, Germany (Geilenkirchen AB), on 13 January 1999 (Tab Y). The investigation began on 15 January 1999. The following individuals were appointed to investigate the mishap:

Accident Investigator: [redacted]
19 ARG/CD
255 Beale Drive
Robins AFB GA 31098

Legal Advisor: [redacted]
6 ARW/JA
8208 Hangar Loop Drive
MacDill AFB FL 33621

Technical Advisor: [redacted]
(Flight Surgeon)
319 AMDS/CC
1599 "J" Street
Grand Forks AFB ND 58205

Technical Advisor: [redacted]
(Pilot)
6 OG/DOIR
8011 Hangar Loop Drive
MacDill AFB FL 33621

Maintenance Advisor: [redacted]
22 LG/LGQ
53148 Piper Street, Suite 16
McConnell AFB KS 67221

Air National Guard Advisor: [redacted]
(Pilot)
132 ARS
103 Maran Street, Suite 518
Bangor ME 04401

1.2. Purpose: This investigation was conducted to determine the relevant facts and circumstances of the accident and to determine the cause or causes of the aircraft mishap which occurred at Geilenkirchen AB on 13 January 1999. The accident investigation has been conducted to provide concerned persons with a report of the facts and circumstances surrounding the accident, to find and preserve evidence to use in claims, litigation, disciplinary action, adverse administrative proceedings, and for all other purposes deemed appropriate by competent authority.

1.3. Circumstances: The mission was to refuel E-3A aircraft in support of the NATO Airborne Early Warning Force Component at NATO Air Base Geilenkirchen, Germany (Tab CC-8). The mishap aircraft was used to train NATO personnel air refueling procedures at various locations in Europe.

2. ACCIDENT SUMMARY

The mishap aircraft (MA), call sign [redacted] departed NATO Air Base Geilenkirchen, Germany, at 1603 ZULU Greenwich Mean Time (Z) on 13 January 1999 with four crewmembers and no cargo. 1603 Zulu is equivalent to 1703 local in Geilenkirchen. The mission was scheduled as a routine air refueling exercise and training (ETNG) mission (Tab K-3). The mission was planned to refuel in KIM Air Refueling Area; however, due to a forecast of severe clear air turbulence, the air refueling area was changed to Air Refueling Area 7 (ARA 7), which is over the North Sea (Tab AA-52). The mishap aircraft refueled a NATO E-3A (call sign NATO 14) aircraft at Flight Level 250 (25 thousand feet) (Tab K-3). After completing the air refueling, an enroute descent was flown to Geilenkirchen AB. The mishap crew called the Geilenkirchen Command Post thirty-two minutes prior to the mishap and reported offload information and that there were no aircraft maintenance problems (Tab N-3 through N-4). Due to weather conditions, the crew flew an ILS (Instrument Landing System) approach with a planned full stop landing on Runway 27 (Tab N-4 through N-5). After a normal flare to landing and descent to a point on or near the runway, the crew attempted to go around out of the landing attitude (Tab V-2, V-3, V-4, V-5 & V-11). The mishap crew made the radio call "ESSO 77 on the go" (Tab N-6). The aircraft attained a very high pitch attitude approaching the vertical, climbed to approximately 1300 feet AGL (Above Ground Level), stalled, and impacted the ground in a nose low attitude (Tab V-2, V-3, V-4, & V-11) 250 feet west and 910 feet north of departure end of the runway 27 (Tab A-3). The impact occurred at 2039 hours local and resulted in the death of all four crewmembers and the destruction of the aircraft (Tab A-3).

Non-US property damage primarily includes destroyed trees and ground vegetation on German government and private property (Tab P-3). Additionally, JP-8 jet fuel, engine and hydraulic fluids from the aircraft, as well as aqueous film forming foam (AFFF) used to fight the fire were released into the soil at the impact site, resulting in potential environmental contamination. The site is currently being studied to determine whether any environmental treatment is necessary and, if so, the appropriate methodology. 52 CES/CEV, Spangdahlem AB, Germany is the U.S. Air Force's office of primary responsibility for the environmental actions. (Tab P-5 through P-

13). NATO Air Base Geilenkirchen's Public Affairs Office fielded questions about this accident. Significant media attention was received from Germany, the Netherlands, and Spokane, Washington (V-12).

3. BACKGROUND

Geilenkirchen AB is a NATO installation made up of personnel from eleven countries. The base's mission is to fly and maintain 18 E-3A and three 707 trainer aircraft for the defense of Europe (Tab BB-39, T-42). The Air National Guard (ANG) has had a presence at Geilenkirchen since 1993 providing air refueling training to NATO aircrews (V-1, CC-8). The ANG's aerial refueling support at Geilenkirchen AB is provided under a foreign military sales (FMS) contract pursuant to a Letter of Agreement between the ANG and NATO (Tab CC-1). The tanker aircraft and crews deploy from all ANG/AFRES KC-135 units on a two-week rotational basis. There are normally two tanker aircraft and three tanker crews present except for short summer and Christmas breaks (Tab V-1). The operations tempo is normally two tanker missions per day, with crews and aircraft rotating to fill the missions. The missions consist of takeoff, refueling and a full stop landing back at Geilenkirchen. Multiple approaches and landings are not allowed at Geilenkirchen (Tab CC-8). The mishap crew departed Fairchild AFB, WA on 3 January and arrived on 4 January. They received a complete orientation briefing covering the local area procedures on arrival (Tab V-1, Tab AA-3 through AA-4). The mishap crew had flown missions on 5, 6, 8, and 12 January prior to the mishap flight (Tab T-45, T-48, T-51, & T-54). The 6 January 1999 flight was the mishap crew's only prior night landing (Tab T-51). That flight took off at 1546Z (daylight), and landed at Geilenkirchen AB at 1900Z (night). The mishap aircraft had flown on 5, 6, 8, 11 and 13 January prior to the mishap (Tab U-1 & U-2). The aircraft flew an earlier mission the day of the mishap of 3.2 hours in duration, and no maintenance discrepancies were noted.

4. SEQUENCE OF EVENTS

4.1. Mission. The mission was to refuel E-3A aircraft in support of the NATO Airborne Early Warning Force Component at NATO Air Base Geilenkirchen, Germany (Tab CC-8). The mishap KC-135 was to also provide proficiency training for the KC-135E and E-3A crews. The command authority authorizing the mission was the 141st Air Refueling Wing Commander, Fairchild AFB, Washington Air National Guard. The Flight Authorization Orders used in lieu of AMC Form 41 were signed by [redacted], WA ANG. The flight orders designated [redacted] as the commander of the aircraft (Tab T-55). All mishap crewmembers were on special orders in active duty status for the deployment (Tab T-56 through T-61).

4.2. Planning. Permanent party ANG personnel provided mission-planning materials to the crew prior to flight. These materials include Flight Plans, fuel/navigation logs and charts (Tab K-3 through K-16, Tab AA-3 through 28). The quality of these materials was excellent. Due to concerns about the weather over the scheduled refueling track, the ANG Liaison Officer first briefed the air refueling area track change to the crewmembers (Tab V-1). After receiving the weather briefing (Tab V-6), the mishap crewmembers were the only ones present for their

mission briefing. The Squadron Briefing Guide was normally used to brief all missions (Tab AA-1 through AA-2). While squadron supervisory personnel were not present for the mission briefing, earlier crew briefings were characterized as professional and complete (Tab V-1). The crew appeared prepared to fly the mission and had flown similar missions on four previous occasions during their deployment (Tab V-1, T-45, T-48, T-51, & T-54).

4.3. Preflight. The aircrew arrived at base operations 30 minutes earlier than required to complete mission planning details and work a mission change due to forecast severe clear air turbulence (Tab V-1, V-6). The weather briefing was thorough and the crew appeared very professional (Tab V-1, V-6). Base operations personnel (Tab AA-34 through AA-51) provided NOTAMS to the mishap crew. The crew arrived at the aircraft at approximately 1600 local for the scheduled 1700 local takeoff (Tab V-20). The ground crew assisted the flight crew load some personal belongings for the return trip home the next day. [redacted] accomplished the walk around inspection with the crew chief, [redacted] (Tab V-20). The ground crew testified that a complete preflight was accomplished with no discrepancies, and the mishap aircrew was unrushed and thorough (Tab V-20). The aircraft was started using the aircraft onboard Auxiliary Power Unit (APU). The aircraft was pushed back from its parking location and the tow bar was removed. [redacted] was in the left seat when the aircraft taxied out of parking (Tab V-20).

4.4. Summary of Accident. The aircraft taxi and takeoff appeared normal to all ground crew personnel (Tab V-20). Takeoff occurred at 1603Z with winds forecast at 250 degrees at 15 knots. The temperature was 4 degrees Celsius and pressure altitude was + 450 (Tab K-5). The runway was reported dry (Tab W-5). The aircraft's route of flight was over the Netherlands, English Channel and to Air Refueling Area 7 off the northeast coast of England (Tab K-3, Tab AA-52, AA-55). The aircraft leveled at 25,000 feet and proceeded to the rendezvous point. The first rendezvous with the E-3A aircraft was radar vectored by air traffic control. The first air-refueling hook up occurred at 1714Z. The weather in ARA 7 was unrestricted visibility and no significant weather. There were no abnormalities reported by the receiver aircraft crew during air refueling operations (Tab V-10). The crew made an enroute descent into Geilenkirchen AB. The weather for the landing was reported by the Air Terminal Information System (ATIS) as few clouds at 2500 feet, visibility 10 plus kilometers, light snow and rain. The winds were reported as 230 degrees at 10 knots with gusts to 16 knots, temperature 4 degrees Celsius (Tab O-7). The crew reported into the Geilenkirchen command post 32 minutes prior to the mishap at 1906Z (Tab N-3 through N-4) with the air refueling offload report. At this time, they also reported there were no maintenance problems with the aircraft (Tab N-4). Due to other air traffic, the aircraft was held at a higher altitude resulting in a less than optimum enroute descent (Tab AA-159 and BB-31). Radar plots indicate that the aircraft descended at descent rates from one to four thousand feet per minute during the enroute descent (Tab V-7, Tab AA-76 through AA-159). Air traffic control asked the crew on two occasions if they were going to be able to get down in time or did they need a longer vector for the descent (Tab N-5). Frisbee radar reported the airplane 18 miles from touchdown at nine thousand feet and asked if the crew wanted to extend a little for descent (Tab N-5). Frisbee radar next asked "traveling distance is 8 miles, you still make it?" that is, a descent in time to make the glide path (Tab N-5). The aircraft appeared to the radar controller to be on glide path for the ILS approach at two minutes and forty-eight seconds prior to the mishap (Tab N-6). The aircraft accomplished a normal flare and either touched down on the

runway (Tab V-3, V-5) or came within several feet of touching the runway (Tab V-4, V-11) when a go around was attempted. Due to the darkness and differing perspectives, some witnesses believe the aircraft touched down and others believe it was a low approach (Tab V-3, V-4, V-5, and V-11). The aircraft rounded out for landing in the first third of the runway, which is the normal landing zone (Tab V-3). The crew applied power and attempted a go around, with the co-pilot calling "ESSO 77 on the go" over approach frequency (Tab N-6). The aircraft rotated to a pitch attitude of over 40 degrees and climbed to approximately 1300 feet Above Ground Level (AGL) and stalled (Tab C-3, V-11). The engines began to compressor stall with the left outboard, left inboard first followed by the right inboard right outboard (Tab V-3, V-9). This engine compressor stalling resulted in flames shooting out of the rear of the engines (Tab V-2, V-3, V-4, V-5, V-9, V-11). The aircraft approached level flight and rolled off to the right. It next rolled to almost level flight before impacting the ground (Tab V-2, V-3, V-4, V-5, V-9, V-11).

4.5. Impact. The aircraft impacted the ground in a 23 to 30 degree nose low, 49 to 67 degree left wing low attitude (Tab J-21). The aircraft configuration was: landing gear up, flaps 30 degrees and leading edge flaps extended at the time of impact (Tab J-50). This configuration is consistent with properly accomplished go around procedures. The stabilizer trim setting was 7.0-7.5 units nose up at impact (Tab J-52). The impact location is 250 feet west and 910 feet north of the departure end of Runway 27 in a flat marshy wooded area. The time of the mishap was 1939Z, 2039 local Central European Time (Tab A-3). An explosion and fire followed the impact, with wreckage confined to a small area. The impact and subsequent fire destroyed some small trees and vegetation. Additionally, JP-8 jet fuel, engine and hydraulic fluids from the aircraft, as well as aqueous film forming foam (AFFF) used to fight the fire, were released into the soil at the impact site, resulting in potential environmental contamination (Tab P-5 through P-13). The impact area was partially on German government land with the remainder on private German property. The impact area was 165 yards from the German-Dutch border (Tab B-3).

4.6 Life Support Equipment, Egress and Survival: No defects could be determined in the survival and egress equipment. Seat rail analysis indicated that the pilot's seat had sustained impact forces, which exceeded their design capability; however, no evidence was found of any equipment failure or maintenance discrepancies prior to the mishap (Tab J-99 through J-101).

4.7 Search and Rescue: The mishap aircraft impacted the ground at 1939Z, 2039 local Central European Time, on 13 January 1999. The impact was followed by a series of explosions and fire (Tab V-2, V-3, V-4, V-5, V-9, V-11). At Geilenkirchen AB, crash response vehicles are pre-positioned on the runway to expedite the response to such mishaps (Tab V-3). One of the vehicles, Crash-6, responded within one minute, following the fence along the perimeter of the base and plowing through it to get to the crash site (Tab V-2, V-9). The Crash-6 team was joined quickly by Crash-8 and the rest of the responding base personnel (Tab V-3, V-5). In addition, between 200-300 local German and Dutch fire, police and rescue personnel responded (Tab V-2). The fires were put out quickly and recovery operations commenced. Lt Col (Dr.) Thompson led a team of local base medical and rescue personnel. Teams from Spangdahlem Air Base augmented them. A Disaster Mortuary Affairs Response Team (DMART) from Landstuhl USA

Regional Medical Center, Landstuhl, Germany assisted in the recovery operations (Tab X-5, X-11).

4.8 Recovery of Remains: The remains were recovered and transferred to Dover AFB Port Mortuary Facilities for the post mortem exams. [redacted], Armed Forces Regional Medical Examiner, signed the death certificates (Tab X-1 through X-4). A description of the recovery efforts are at X-5-6.

5. MAINTENANCE

5.1 Forms Documentation:

5.1.1 There were three open write-ups in the AFTO Form 781As (Tab H-12 through H-21).

a. Job Control Number 983550007, Red / (Deferred Maintenance Action), entered on 21 December 1998, "APU Shutdown early during preflight, automatic shutdown near generator trip time". APU (auxiliary power unit) was written up on a Red / and, according to witness testimony, was still used for aircraft start (Tab H-12).

b. No Job Control Number, "120 day ACFT wash due (Sched for 26 of January)", Red – (Deferred Inspection), entered on 28 December 1998. Its original due date was 28 December 1998, but a 30-day overfly is authorized per the 135A-6WC-3 Aircraft Wash Workcards. The wash was scheduled for 26 January 1999, after return from NATO Air Base Geilenkirchen, Germany (Tab H-12).

c. No Job Control Number, "60 hour inspection due at 14558.6", Red -, entered on 11 January 1999. " This had been partially accomplished, but was not signed off due to the Boom and ACM (air cycle machine) servicing portions not being completed. The inspection would have been due at the end of the mishap sortie; total aircraft time at take-off on the mishap sorties was 14554.7 hours (Tab H-16).

d. None of the above write-ups are considered a factor in this mishap.

5.1.2 Minor write-ups were indicated on the AFTO Form 781K (Tab H-22 through H-26): (K write-ups are "delayed discrepancies" which do not result in grounding the aircraft.)

a. Job Control Number 972520015, "Triplers missing LH + RH, F/S 600-620, Stringer 2" (awaiting depot) (Tab H-26).

b. Job Control Number 98263B057, Entered 20 September 1998, "PDI light divider seal torn" (awaiting parts) (Tab H-26).

c. Job Control Number 983220016, Entered 18 November 1998, "Four wainscoting panels cracked on left side of fuselage" (awaiting maintenance) (Tab H-26).

d. Job Control Number 983490021, Entered 15 December 1998, "#1 reserve tank center access panel O-ring leaking fuel" (awaiting parts), temp fixed (Tab H-26).

e. None of the above write-ups are considered a factor in this mishap.

5.1.3 Time Compliance Technical Orders (TCTOs) applicable to the mishap aircraft were reviewed. TCTOs are orders to modify or inspect aircraft within certain time periods.

a. All required TCTOs had been complied with. A complete listing of all TCTOs pertaining to the mishap aircraft is contained in Tab U-141 through U-159. Of the 10 open TCTOs (Tab H-30), three are held in abeyance, four are Depot level, and three have kits on order. None of the open TCTOs had reached their mandatory ground the aircraft date. All TCTOs workable by the unit had been accomplished. Due to the "nose-up" position of the horizontal stabilizer on impact, two TCTOs (1C-135-1494 and 1500) involving inspection of pitch trim components and auto pilot wiring were reviewed for relevancy. Both had been accomplished at the base level on the mishap aircraft.

b. No TCTOs were considered a factor in this mishap.

5.1.4 There were a number of aircraft form documentation errors (Tab U-164 through U-165). All were reviewed for applicability to the mishap and none was determined to be factors in the mishap.

5.2 Inspections

5.2.1 Previously scheduled maintenance included: (a) the last programmed depot maintenance at Pemco Aeroplex, Birmingham, Alabama, from 14 April 1996 through 4 September 1997, (b) unprogrammed depot maintenance by a contract field team on 15 June 1998 for repair of a crack above the nose landing gear trunion support fitting, and (c) a #2 phase inspection from 20 September 1998 through 13 October 1998 (Tab H-3). The only discrepancy of note was removal and reinstallation of the right elevator for repair of hardware corrosion discovered around the hinge support. The elevator was removed and all the corroded hardware was replaced. The elevator was reinstalled in accordance with Technical Order Job Guide 1C-135(K)A-2-8JG-17 task 7-56. The other elevator hinge support areas were also inspected with no defects noted. An in-flight functional check was entered in the AFTO Form 781A and was signed off by an aircrew on either 23 or 24 October 1998 as "Ops checked good" (Tab H-3). The aircrew on that October flight failed to enter date corrected in the corrective action block (Tab U-41). In addition, the horizontal stabilizer trim systems are checked electrically and mechanically during phase inspections. These checks found no problems on aircraft 59-1452.

5.2.2 The only special inspection in the AFTO Form 781As was "60 hour inspection due at 14558.6" (Tab H-3 through H-4). This had been partially accomplished, but was not signed off due to the Boom and ACM servicing portions not being completed. The inspection would have been due at the end of the mishap sortie; total aircraft time at take-off on the mishap sorties was 14554.7 hours (H-8).

5.3 Maintenance Procedures: The 141st Air Refueling Wing maintenance procedures were reviewed to ensure applicable regulations and technical orders are followed. Good maintenance practices are exhibited throughout the unit. Aircraft forms show very few minor write-ups, most being quickly repaired and cleared (Tab U-13 through U-169). The overall excellent condition of 141st aircraft indicates aircraft are well maintained. The unit follows applicable technical orders in performance of maintenance on the aircraft. No practices or procedural problems were noted that would indicate improper maintenance. On the contrary, the unit appears to go above and beyond in ensuring quality maintenance is performed on their aircraft. An aggressive quality assurance program quickly identifies and corrects potential problem areas. 141st Air Refueling Wing maintenance procedures were not considered factors in this mishap.

5.4 Maintenance Personnel and Supervision: The 141st Air Refueling Wing was responsible for all maintenance and servicing of the mishap aircraft. Training records of personnel performing maintenance on the mishap aircraft were reviewed to ensure qualifications. All personnel performing maintenance on the mishap aircraft were qualified to perform required maintenance. All personnel training records were properly documented and Red X-designated personnel were properly annotated on the unit's Special Certification Roster. Personnel in the 141st appear to be highly qualified and experienced. Supervisors in the unit stress quality maintenance, and the unit's quality assurance section performs follow-up inspections to ensure compliance with applicable regulations and technical orders. Aircrew members expressed a high degree of trust and admiration for maintenance performed on the aircraft (Tab V-33, V-37). Personnel and supervision were not considered factors in this mishap.

5.5 Fuel, Hydraulic, and Oil Inspection Analysis

5.5.1 Fuel samples were taken from the servicing pit (Hydrant Pit 16) and truck (Truck X-2140) that serviced the aircraft prior to the mishap flight. Analysis of these samples was completed by the Defense Energy Support Center Europe, Petroleum Laboratory and is listed in Tab J-71 through J-81. Analysis revealed both samples to be JP-8 (NATO F-34) and within the specification of MIL-T-83133. The NATO E-3A that received fuel from aircraft S/N 59-1452 during the mishap sortie was refueled prior to samples being taken but experienced no abnormalities prior to or after the mishap. Eight fuel samples were taken from the mishap aircraft during the Safety Investigation. Analyses of the samples were completed by the Defense Energy Support Center Europe, Petroleum Laboratory with results listed in Tab J-55 through J-70. Due to the small sample amounts from the mishap aircraft, only limited analysis was possible. Those areas analyzed were within specification limits for JP-8 fuel, except for sediment and water contamination consistent with the mishap/fuel recovery process.

5.5.2 Hydraulic fluid samples were taken from the tail section of aircraft S/N 59-1452, the #4 hydraulic pump and the Yaw Damper. Analysis was completed by Det 13 SA-ALC/AFTLA, Wright Patterson AFB, OH with results listed in Tab J-89 through J-91. All fluid met specifications for MIL 7808.

5.5.3 Oil samples were taken from each engine on the mishap aircraft. Samples were analyzed by the Non Destructive Inspection Laboratory at Geilenkirchen Air Base, Germany, utilizing a Spectroil Plus (E) 0304 (173) Oil Analysis Machine. The #1, 3 and 4 engines all checked within established limits. The sample from the #2 gearbox checked outside established limits; therefore, a sample was taken from the #2 engine oil tank and analyzed. The sample from the oil tank checked within established limits. Results are listed in Tab J-81 through J-88.

5.5.4 Based upon analysis of all fluid samples taken, aircraft fluids were not considered a factor in this mishap.

5.6 Unscheduled Maintenance

5.6.1 The current aircraft forms (Tab H) were reviewed along with pulled forms dating from 13 October 1998 to 31 December 1998 (Tab U). The last scheduled major inspection performed on the mishap aircraft was a #2 Phase Inspection that began 20 September 1998 and was completed on 13 October 1998 (Tab H-3). The following is a list of all discrepancies since the 13 October 1998 inspection that were considered significant:

5.6.1.1 Job Control Number A98263B064, entered 20 September 1998 during a #2 Phase Inspection, "Copilot's seat track engagement spring broken." A new spring was ordered and signed off on 26 October 1998 as "Replaced spring" (Tab U-41).

a. This write-up was looked into for the potential of inadvertent movement of one of the seats during the initial stages of the mishap, which could have impeded aircraft control.

b. Seat tracks and locking mechanisms were recovered from the mishap aircraft and forwarded to the Life Sciences Equipment Laboratory at Kelly AFB, TX for analysis. Final analysis indicated no evidence of equipment failure or discrepancies prior to the mishap (para 6.1.7 and Tab J-99 through J-101).

5.6.1.2 Job Control Number 98263B391, entered on 20 September 1998 during a #2 Phase Inspection, "Elevator system requires in-flight functional check because of removal." Signed off by an aircrew on 23 or 24 October 1998 as "Ops checked good." The crew failed to enter date corrected in the forms (Tab U-41).

a. This write-up was looked into for potential of jammed or locked control surfaces on the horizontal stabilizer.

b. Elevator, horizontal stabilizer and all associated hardware were inspected on the mishap aircraft. All components were within weight limits and all appeared to be fully functional at the time of impact. Additionally, no binding or indications of jamming were evident on control mechanisms (para 6.1.5 and Tab J-37 through J-39).

5.6.1.3 Job Control Number 983110001, entered 6 November 1998, "Clad cable bent (elevator)." Signed off as: "Straightened clad cable + assessed + eval. Cable good. No other defects noted" (Tab U-53).

a. This write-up was looked into for potential of bound or broken cables for the elevator system.

b. Cables were inspected on the mishap aircraft and those portions remaining were still attached to the flight control and in good condition (para 6.1.5 and Tab J-37 through J-39).

5.6.1.4 Based upon post mishap inspections and analysis, none of the above write-ups were considered factors in this mishap.

6. AIRCRAFT AND AIRFRAME, MISSILE OR SPACE VEHICLE SYSTEMS

6.1 **Systems**: All systems and structures that were considered possible factors in this mishap were inspected with various components sent off for further analysis. A detailed analysis of each system/component can be found in Tab J. However, due to extensive damage to the mishap aircraft resulting from the impact and fire, analysis of some components was difficult, if not impossible. The following is a breakdown of each general area and results of inspections/testing:

6.1.1 Mishap Autopilot System -- The autopilot system was analyzed for proper operation and any anomalies that could have led to an out-of-control condition in the mishap aircraft. Components were inspected by [redacted], Honeywell Defense Avionics Systems, Albuquerque, NM (Tab J-9 through J-13). The control panel, controller, flight control system processor, status test panel, aileron servo motor, aileron servo drum and bracket, elevator servo motor, elevator servo drum and bracket, horizontal position sensor and trim actuator were all recovered. Due to extensive damage, analysis was only possible on the control panel, elevator servo motor and servo drum and bracket. Analysis of the control panel revealed all switches appeared to be in proper configuration. Continuity checks performed were normal. The elevator servo motor, servo drum and bracket exhibited no apparent damage. Further testing revealed both to be fully operational (paragraph 6.1.4). Based on the system evaluations, it is determined that the autopilot system was not a factor in this mishap (Tab J-9 through J-13).

6.1.2 Mishap Propulsion System -- All portions of the propulsion system were inspected for possible anomalies affecting the mishap aircraft.

a. All four engines were inspected by [redacted], Aerospace Engineer, OC-ALC/PARR, Tinker AFB, OK (Tab J-15 through J-20). All four engines were located in the vicinity of the wreckage and were removed for teardown and further analysis. All four engines

sustained substantial impact damage, but teardown analysis indicated all four were rotating at speeds significantly above idle at the time of impact.

b. [redacted] also inspected all four engine fuel controls and all were found to be consistent in the position of the speed rack, indicating low engine speed (Tab J-53 through J-54). Exact position of the throttles could not be determined due to possible post-impact rotor spool-down influencing positioning of the speed rack.

c. Engine instrumentation was inspected by [redacted] Equipment Specialist, OC-ALC/LIINT, Tinker AFB, OK (Tab J-24 through J-25). Of all four engines, only the #2 engine instruments retained any indications or capture marks upon impact. They indicated 52 percent RPM, an exhaust gas temperature of 550 degrees C, and oil pressure of 42 PSI.

d. The throttle controls were examined by [redacted], Mechanical Systems Design, The Boeing Company, Military Programs – Wichita Division, Wichita, KS (Tab J-46). The cockpit of the aircraft and sections of the fuselage containing the throttle control cables were extensively damaged. All cable turnbuckles inspected appeared to be normal. This, coupled with the determination that all four engines were still operating at the time of the mishap, indicates no anomalies with the throttle controls.

e. All results indicate the engines were operating normally prior to the mishap sequence and were still operating at the time of impact. Witness interviews (Tab V-2, V-3, V-4, V-11) indicated that all four engines appeared to be operating at or near their maximum on the initial ascent, compressor stalling at or near the apex of the climb, most likely due to low air speed and extreme angle of the ascent. The indication of low engine speed at impact was most likely due to compressor stall recovery. It appears the engines were not a factor in this mishap.

6.1.3 Mishap Cockpit Components and Instruments -- All cockpit components and instruments recovered are listed in Tab J-29 through J-35.

a. A general cockpit component analysis was performed by [redacted] Systems Safety Engineer, The Boeing Company, Military Programs – Wichita Division, MC K86-54, Wichita, KS (Tab J-29 through J-35). Final analysis indicated the readings and settings were inconsistent with normal Dash One procedures. Instruments, control column, and throttle quadrant stab trim cutout switch were sent for further testing, as covered in following paragraphs (Paragraph 6.1.4). It is determined that these items were not a factor in the mishap (Tab J-35).

b. All cockpit instruments recovered were inspected by [redacted], Equipment Specialist, OC-ALC/LIINT (Tab J-21 through J-27). The pilot's and copilot's Attitude Director Indicators exhibited capture marks indicating a left wing down 49-67 degrees and 23-30 degrees nose down (Tab J-21). All other instruments analyzed gave no indication of instrument or instrument system failure prior to impact. It appears the cockpit instrumentation was not a factor in this mishap.

6.1.4 Mishap Flight Control Systems -- Flight Control Systems were evaluated by [redacted], Mechanical Systems Design, Senior Engineer, The Boeing Company, Military Programs – Wichita Division, Wichita, KS (Tab J-37 through J-46). Additional analysis was performed by [redacted], C/KC-135 Structural Mechanical Systems Engineer, Tinker AFB, OK

(Tab J-49 through J-52). Systems evaluated included the Elevator Control System, Stabilizer Trim System, Wing Flap Control System, Rudder and Rudder Trim Control System, Spoiler and Speed Brake Control System, Aileron Control and Trim System and Throttle Controls. Of these, the following were further analyzed:

a. Mishap Elevator Control System -- The mechanical elevator control system was inspected including the pilot's and copilot's columns, elevator cables, elevator aft quadrant, control push rods, elevator snubber, crank, push rods and torque tubes, elevators and elevator tabs.

1. The pilot's control column was analyzed by [redacted], Project Engineer, OC-ALC/TIESM, Tinker AFB, OK (Tab J-103 through J-116). Only a portion of the copilot's column was found. The control wheel was missing and all interior wiring was burned, the column was not forwarded for analysis. The column damper was found intact but damaged, and only the ends of the torque tube were found. The pilot's column had been sheared off at the base and the shaft was bent. The outer portions of the control wheel were missing. The pilot's column was disassembled and the interior wiring checked for shorts and continuity. The wiring inspection revealed no faulty items. It appears the control columns and associated hardware were operating properly at the time of the mishap.

2. Portions of the elevator control cables were inspected for breakage and proper attachment (Tab J-37 through J-38). Destruction of the elevator control cables prevented identification and inspection of the entire cable length. The portion of the cables running from the aft quadrant to approximately the main landing gear area were inspected, and all were found to be fire damaged but in otherwise good condition. All were properly attached to the aft quadrant.

3. The elevator aft quadrant was inspected and found intact. It had all the correct parts, was functional and still had the cables attached (Tab J-38).

4. The control push rods, elevator snubbers, crank, push rods and torque tubes were all inspected for proper part number, length and functionality (Tab J-38 through J-39). All were the correct parts. All parts were still attached and fully functional.

5. The left elevator was found largely intact and in good shape. It was evaluated for functionality (Tab J-39 and J-51). The elevator and associated tabs still moved freely and functioned properly through movement of the control rods. The right elevator was split at the mid-bay area due to the impact. It and the associated tabs were still attached to the control rods and functioned properly.

6. The elevator balance bay areas were opened and inspected for any binding and proper weighting (Tab J-39 through J-40 and page J-51). All weights were within limits of Technical Order 1C-135(K)A-3-1 Section 1-5, page 1-89, figure 1-31. The seals were in very good condition and all balance bay panels operated freely.

7. Based on inspections and analysis of the mechanical elevator control system, it appears it was functioning properly at the time of the mishap and was not considered a factor in the mishap.

b. Mishap Horizontal Stabilizer Trim System -- The horizontal stabilizer (also referred to as the "trim" system or "stab trim" system) was found largely intact with an aircraft nose up trim of 7.5 units (S-9). The large speed range of the KC-135 requires the use of an adjustable horizontal stabilizer. This arrangement ensures adequate longitudinal or pitch trim for all normal center of gravity locations. The horizontal stabilizer is normally positioned by an electric motor. This motor drives a jackscrew in the tail section. The jackscrew pivots the horizontal stabilizer about its aerodynamic center. The stabilizer trim movement ranges between 3.5 units of airplane nose down and 11 units airplane nose up. Each unit equals one degree deflection from zero position and each unit represents nine revolutions of the trim control wheel. Due to the trim setting on the stabilizer, the horizontal stabilizer trim system was evaluated for possible inadvertent actuation (Tab J-40 through J-42 and J-51 through J-52).

1. The trim system cables were inspected; however, the forward fuselage area was extensively damaged; therefore, inspection was limited to the aft tail area (Tab J-43). These cables inspected were still connected to the aft quadrant and, though fire damaged, were in good condition.

2. Two foreign objects were found in the tail section, a small nut and a hydraulic plug fitting (Tab J-41 and J-52). There were no visible signs that either of these had become lodged or jammed in any of the flight control components.

3. The stabilizer trim actuator, trim motor and actuator, and autopilot trim actuator were all inspected and found to be in good condition. The trim motor and autopilot trim actuator were removed, installed and tested on a KC-135E, S/N 57-1478. The trim motor passed all electrical tests prescribed in Technical Order 1C-135-2-8. The autopilot trim actuator passed all built-in tests prescribed in Technical Order 1C-135-2-8. The actuator assembly was checked for proper brake actuation. The actuator brake operated properly and exceeded the brake slippage requirements in Technical Order 1C-135-2-8. The autopilot servo motor, drum and bracket, and the trim actuator received further testing by [redacted], Electrical Engineer, OC-ALC/LIIRN, Tinker AFB, OK (Tab J-95 through J-98). The autopilot servo motor was tested and then torn down for inspection per Technical Order 5A1-2-50-42. Overall condition of the motor and drum assembly was considered excellent, and it met all test procedures/tolerances. The trim actuator was functionally tested and met all requirements of Technical Order 5A1-2-50-52. Overall condition was also found to be excellent.

4. The stab trim mechanism and drum located under the cockpit floor were evaluated (Tab J-42 through J-43) and were found damaged on impact. The position of the cable drum was consistent with the position of the horizontal stabilizer trim actuator. The chain that drives the unit was found broken but mostly intact. The control wheel was not found except for the manual trim adjustment knob, and it was in the stowed position.

5. The stabilizer trim cutout switch was located on the throttle quadrant and found in the normal (trim engaged) position. [redacted] and [redacted], Materials Integrity Branch, AFRL/MLSA, Wright-Patterson AFB, OH (Tab J-117 through J-143), completed a teardown analysis of the cutout switch. There were no witness marks to indicate the switch had been moved from the engaged position. No anomalies were found that would have affected its electrical operation.

6. The stab trim indicator mounted on the side of the throttle quadrant was found smashed with the indicator wedged in full aircraft nose down position, 3.5 units. Analysis of the trim indicator showed the indicator linkage was fractured within the quadrant (Tab J-117 through J-143). The full nose down indication is inconsistent with the actions of the aircraft and with the position of the actual stabilizer, and was most likely caused by impact and crushing of the throttle quadrant.

7. The pilot and copilot's dual trim switches were not recovered from the wreckage. The post-impact fire most likely destroyed them. Exact condition/position of these switches cannot be determined as a result. It is considered unlikely that the switches were malfunctioning based on other recoverable components that indicate neither of the two prescribed procedures for overriding a trim malfunction were implemented. These procedures include: (a) manually rotating the trim wheel knob, or (b) moving the stabilizer trim cutout switch to the cutout position. Either of these two procedures would most likely have been used to correct a stuck or shorted dual trim switch (Tab BB-49 through BB-51). Since the stabilizer trim cutout switch had not been moved to the cutout position and the manual trim wheel knob was still in the stowed position, the position of these components suggest that no attempt was made to override a trim malfunction. Additionally, both dual trim switches have separate contacts for the trim actuator clutch and motor. Both sets of contacts must fail to cause an inadvertent trim actuation.

8. Based on system inspections and analysis performed, despite the destruction of the pilot's and copilot's dual trim switches, the horizontal stabilizer trim system appeared to be functional and operating properly at the time of the mishap. However, record reviews discovered 14 documented incidences of un-commanded horizontal stabilizer trim movement in the KC-135 aircraft where the horizontal stabilizer system was activated without any pilot action.

LOCATION	DATE	TYPE ACFT	SERIAL NUMBER
Wright Patterson	6 May 81	EC-135	61-0328
Bangor	28 Dec 89	KC-135E	59-1493
Eaker AFB	12 Jan 90	KC-135R	60-0362
Kadena AB	8 Jun 92	KC-135R	57-1486
March AFB	24 Feb 94	KC-135E	59-1499
Eielson AFB	21 Oct 94	KC-135E	57-1494
Grand Forks	15 Aug 96	KC-135R	58-0047
Fairchild AFB	11 Mar 97	KC-135R	57-1451
Grissom AFB	16 Mar 97	KC-135R	62-3530
Incirlik AB	20 Jun 97	KC-135R	62-3523
Oerland, Norway	5 Nov 97	KC-135T	58-0047

McGuire AFB	3 Feb 97	KC-135E	56-3593
Travis AFB	8 Apr 98	E-6A	164387
March AFB	8 Apr 98	KC-135E	59-1509

None of these incidents resulted in the destruction of the aircraft or casualties, but they are relevant to demonstrate the possibility of an un-commanded trim movement.

9. Of the 14 horizontal stabilizer trim system incidents discovered, only four documented incidents occurred before 1994(Tab DD-6). For the first time in 1994 there were two reported incidents in a single year. But the next incident did not occur until 15 Aug 96. From that date until the date of the mishap there were 10 reported cases which includes both the 15 Aug 96 incident and this mishap. After the first five of these incidents a team was formed at the Air Logistics Center, Tinker AFB, OK. An extract of their findings and recommendations are at Tab GG-1 through 5.

10. Based on reports of alleged un-commanded KC-135 stabilizer trim incidents, a C/KC-135 Flight Control System study group was established to look into this issue. This group first met on 2 Mar 99 and their study is expected to last four to six months (Tab GG-6 through22). In addition a simulator study of runaway stabilizer trim was conducted from 12 to 15 Mar 99 at McClellan AFB, CA. The purpose of this study was to evaluate training requirements for aircrews to prepare them for un-commanded stabilizer trim situations. An extract of a copy of their findings and recommendation are at Tab GG-23 through 31. In reaching my conclusions I considered all of this information.

c. Mishap Flap System – The flap system was inspected to ascertain proper position of the flaps for landing/go around (Tab J-43 through J-44). The main flap jackscrews were measured and compared with Boeing Document D6-6218, Control Position Data – KC/C-135 Series Airplanes. Measurements concluded the main flaps were set at 30 degrees and the fillet flaps at 20 degrees. These positions are consistent with flap settings for the go around being executed by the mishap aircraft (Tab J-43 through J-44). The flap system was fully operational and not a factor in the mishap.

d. Mishap Rudder and Rudder Trim Control Systems -- The rudder and rudder trim control systems were checked for proper operation at the time of the mishap (Tab J-44 through J-45). No abnormalities were found within the rudder and rudder trim components in the tail section. The rudder controls in the cockpit area were severely damaged during the impact. Witness testimony indicated the aircraft exhibited no flight attitude changes indicative of rudder malfunctions (Tab V-11). This, coupled with no defects found in the rudder systems in the tail, indicates the system was operating normally at the time of the mishap (Tab J-45). It appears that the rudder and rudder trim system were not factors in this mishap.

e. Mishap Spoiler/Speed Brake System -- The spoiler/speed brake system was evaluated for proper operation at the time of the mishap (Tab J-45). The left wing of the aircraft was extensively damaged while the right wing was more intact. The spoiler actuators had lost all hydraulic pressure and so exact position could not be determined. Witness testimony (Tab V-11)

indicated that there were no spoilers/speed brakes extended during the landing approach. [redacted] and [redacted], Mechanical Engineers, OC-ALC/LIIRC, Tinker AFB, OK (Tab J-93 through J-94), analyzed all actuators. Of the eight spoiler actuators evaluated, five were in the near fully retracted position. One of the two right outboard actuator cylinder rods was bent approximately 60 degrees and the position of the surface corresponding to this bend would have been approximately 13.5 degrees. The two cylinder rods from the left-hand inboard actuators had been pulled out of the actuators. As the right-hand actuator was the only one exhibiting partial extension, it is believed this was due to impact damage. No abnormalities were found indicating a spoiler malfunction. It appears that the spoiler/speed brake system was not a factor in this mishap.

f. Mishap Aileron Control and Trim System -- The aileron control and trim system was evaluated to determine proper operation at the time of the mishap (Tab J-45). The ailerons and aileron trim system were extensively damaged during the impact and ensuing fire. Inspection of the remaining components found no signs of abnormalities. It appears that the aileron control and aileron trim system were not factors in this mishap.

6.1.5 Mishap Bleed Air Ducts -- The bleed air ducts were evaluated for evidence of in-flight rupture that could have bound or severed throttle cables or caused a loss of one of the hydraulic systems. Inspection of the ducts was performed by [redacted], Aerospace Structural Engineer, HQ AFSC/SEFE, Kirtland AFB, NM (Tab J-47 through J-48). The right wing leading edge bleed air ducts were found largely intact with no evidence of duct failure. The left wing was extensively damaged during the impact with almost all ducts being crushed, crumpled and torn. Tears were consistent with impact damage and there were no indications of in-flight failure under pressure. It appears that the bleed air ducts were fully functional and not a factor in this mishap.

6.1.6 Mishap Crew Seat Rails -- The pilot's and copilot's seat rails and adjustment locking mechanisms were examined for indications of possible inadvertent movement. If one of the seats had moved during the initial phase of the mishap, it could have impeded control of the aircraft. Inspection of the seat components was accomplished by [redacted], Aerospace Engineer and [redacted], Chief, Life Sciences Laboratory, HSC/YACE, Kelly AFB, TX (Tab J-99 through J-101). The copilot's seat rails were found intact while the pilot's rails were heavily buckled and broken. Fragments of the seat rail shoes were also found and analyzed. One rail-locking pin was found from each of the seats. The pilot's pin was straight and the copilot's pin was bent. The copilot's seat rails also showed signs of gouging consistent with one of the pins being forced down the rail as a result of the impact. The pilot's seat rails did not exhibit the gouging present on the copilot's seat rails. The straight condition of the pilot's seat pin was determined to be caused by seat breakup on impact, dislodging the rail pin. This was further substantiated by recovery of two other sets of rail locking pins from the instructor and navigator's seats, all in the same condition as the pilots. It appears that the seats were functional and are therefore not considered factors in this mishap.

6.2. Conclusion: -- Testing and analysis of aircraft systems, components and structures failed to identify any defects which were a contributing factor to this accident.

7. WEATHER

7.1. Forecast Weather. The weather forecast for NATO Air Base Geilenkirchen, Germany, was briefed to the mishap aircrew on 13 January 1999 at approximately 1530 Zulu time for an estimated 1730 Zulu takeoff. Forecast surface winds 250 degrees at 15 knots gusting to 25 knots, temperature 4 degrees Celsius, pressure altitude 450 feet, clouds scattered at 1500 feet, broken at 2000 feet, visibility 10 kilometers. For the mishap flight's 2030 Zulu planned arrival time back at Geilenkirchen Air Base, the forecast was winds 220 at 15 knots gusting to 25 knots, visibility 4 to 7 kilometers with light rain, clouds broken at 1000 feet, temperature 5 degrees Celsius and pressure altitude 450 feet (Tab W-5 through W-6). An updated weather forecast for NATO Air Base Geilenkirchen, Germany on 13 January 1999 at 1809 Zulu time was winds 240 degrees at 10 knots gusting to 20 knots, unrestricted visibility, clouds scattered at 2200 feet, broken at 10,000 feet. Temporary conditions at 2002 Zulu, winds 220 degrees at 12 knots gusting to 22 knots, 6 kilometers with light rain and snow, clouds scattered at 1000 feet, broken at 1800 feet. Becoming, at 0103 Zulu, winds 280 degrees at 12 knots gusting to 22 knots with unrestricted visibility, no significant weather, clouds scattered at 2000 feet. Becoming, at 0608 Zulu, winds 290 degrees at 8 knots gusting to 15 knots (Tab O-3).

7.2. Observed Weather. Geilenkirchen Air Base Airport Terminal Information Service (ATIS) message Romeo indicated: wind 230 degrees at 10 knots gusting to 16 knots. Visibility 10 plus kilometers, light snow and rain. Clouds few at 2500 feet, no significant clouds above. Temperature 4 degrees Celsius, dewpoint 2 degrees Celsius. Altimeter setting 29 decimal 74 inches. Pressure altitude plus 450 feet. Forecast becoming 7 kilometers, clouds scattered at 1200 feet, broken at 2000 feet. End of report (Tab O-7). Finally, after the mishap occurred, the observed weather for NATO Air Base Geilenkirchen, Germany on 13 January at 1950 Zulu time: winds 230 degrees at 10 knots, unrestricted visibility, light rain and drizzle, clouds scattered at 1000 feet, broken at 10,000 feet, temperature 4 degrees Celsius, dew point 2 degrees Celsius, QNH 1007, becoming 7 kilometers visibility, light rain, clouds scattered at 1200 feet, broken at 2000 feet (Tab O-3).

7.3. Space Environment. Not applicable.

7.4. Conclusions. Weather conditions may have been a factor in this mishap. Operations, however, were conducted and systems were operated within their prescribed operational weather limitations.

8. CREW QUALIFICATIONS

8.1. Training. The formal training records were reviewed for each crewmember on the mishap aircraft. No significant problems were noted (Tab T-1 through T-39). All crewmembers received the prescribed difference and continuation training for their respective crew position and duties performed on this TDY deployment and particular mission.

8.2. Experience. The mishap aircrew was a highly experienced crew with over 12,200 combined flying hours. A detailed breakdown of flying time and history can be referenced in Tabs G and T. The following paragraphs summarize the qualifications, flying time and experience levels of each individual. ANG crews must meet all requirements of active duty crews. Indeed, this crew had more experience than most active duty KC-135 crews.

8.2.1. [redacted] was a highly experienced KC-135E instructor/evaluator and aircraft commander. He was a command pilot with over 4,000 total flying hours, 2,000 of which flying the KC-135E aircraft. In the preceding 90 days, he flew 19 sorties for a total of 84.0 hours. All documentation inspected reflects that he was current and qualified in all events required for this mission (Tabs G-3 through G-6, Tab T- 1 through T-6, Tab T-25 through T-27).

8.2.2. [redacted] was a highly experienced mission pilot. He was a senior pilot with over 2,600 total flying hours in KC-135s, 100 of which flying the KC-135E aircraft. Previously on active duty, he was an aircraft commander in the KC-135A and Q model aircraft, and an instructor/evaluator pilot in the KC-135R and T model aircraft. In the preceding 90 days, he flew 28 sorties for a total of 86.1 hours. All documentation inspected reflects that he was current and qualified in all events required for this mission (Tabs G-7 through G-12, Tab T-7 though T-13, Tab T-28 through T-30).

8.2.3. [redacted] was a highly experienced KC-135E instructor/evaluator navigator. He was a master navigator with over 3,600 total flying hours, 2,200 of which flying in the KC-135E aircraft. In the preceding 90 days, he flew 16 sorties for a total of 79.6 flight hours. All documentation inspected reflects that he was current and qualified in all events required for this mission (Tabs G-13 through G-15,Tab T-14 through T-19, Tab T-31 through T-34).

8.2.4. [redacted] was a highly experienced mission boom operator. He had over 2,000 total flying hours, 1,600 of which flying in the KC-135E aircraft. In the preceding 90 days, he flew 13 sorties for a total of 55.5 flight hours. All documentation inspected reflects that he was current and qualified in all events required for this mission (Tabs G-17 through G-19, T-20 through T-24, T-35 through T-39).

9. MEDICAL

9.1. Qualifications

9.1.1. [redacted] should not have been cleared for flying duty on his last physical examination in accordance with AFI 48-123 (Tab EE-1 through EE-4). His last flying physical exam was performed on 6 December 1998 (Tab EE-1). He was noted to have a left middle ear effusion, had a bilateral hearing decrement (H3 profile) with a significant threshold shift and had asymmetry on his audiogram (Tab EE 2). [redacted] completed Tanker, Transport, Bomber (TTB) Physiological Training refresher on 11 September 1997, which did not expire until 30 September 2000 (Tab EE-4). Dental records showed [redacted] to be Dental Class I, fully qualified for duty, on 5 December 1998 (Tab EE-5). [redacted] ear condition should have

received follow-up care, and he should have been assigned Duties Not Involving Flying (DNIF) until they were resolved. Despite this, [redacted] in all likelihood, did not contribute to this mishap. He had flown the mission over to Germany and flown five times while in country prior to the mishap, apparently without difficulty.

9.1.2. [redacted] was medically qualified in accordance with AFI 48-123 for flying duty on the day of the mishap (Tab EE-6). His last flying physical exam was performed 24 July 1998 and was current through September 1999 (Tab EE-8). [redacted] completed TTB Physiological refresher training on 27 August 1998, which was to expire on 31 August 2001 (Tab EE-9). Dental records showed [redacted] to be Dental Class I on 26 August 1998 (Tab EE-10).

9.1.3. [redacted] was medically qualified in accordance with AFI 48-123 for flying duty on the day of the mishap (Tab EE-11). His last flying physical exam was performed 10 April 1998 and was current through 31 October 1999 (Tab EE-11). [redacted] completed TTB Physiological refresher training on 10 July 1997, which was to expire on 31 July 2000 (Tab EE-13). Dental records show [redacted] to be Dental Class 2, fully qualified for duty, on 14 September 1998 (Tab EE-14).

9.1.4. [redacted] was medically qualified in accordance with AFI 48-123 for flying duty on the day of the mishap. He had a waiver for hearing loss, which was valid until 28 February 2001 (Tab EE-15). His last flying physical exam was performed on 7 February 1998 and was valid through 28 February 1999 (Tab EE-17). [redacted] completed TTB Physiological refresher training 24 April 1997, which was valid through 30 April 2000 (Tab EE-18). Dental records show [redacted] to be Dental Class I, fully qualified for duty, on 7 August 1998 (Tab EE-19).

9.2. Health: Not applicable.

9.3. Pathology: The remains of all four individuals were identified and post-mortem exams were accomplished at the USAF Port Mortuary Facilities, Dover AFB, DE by [redacted], USAF, MC, FS, Chief Deputy Medical Examiner on 19 January 1999 (Tab X-1 through X-4). Death was instantaneous for all the crewmembers (Tab X-5). Cause of death was multiple blunt force injuries secondary to the KC-135E mishap. Manner of death was accident (Tab X-1 through X-4). Toxicology reports performed on the mishap crew and all personnel associated with the aircraft prior to the mishap by the Armed Forces Institute of Pathology in Washington D.C. revealed no evidence of drugs or alcohol present at the time of the crash (Tab FF- 1 through FF-16).

9.4. Lifestyle: No unusual activities, stresses, habits or behavior were noted in any of the crewmembers within the two weeks prior to the accident (Tab V-1, V-13 through V-39).

9.5. Crew Rest and Crew Duty Time: Crew rest and crew duty time appeared to be adhered to in accordance with AFI 11-401 and AFI 11-202, Volume 3 (Tab BB-9). The crew's last flight was on the morning of 12 January (Tab T-45) and the crew was observed in the Geilenkirchen AB dormitory prior to the mishap flight (Tab V-37).

10. OPERATIONS AND SUPERVISION.

10.1. Operations: Conventional DoD International Flight Plans (DD Form 1801) are not typically used by tanker aircrew flying missions which depart and return to land at Geilenkirchen. In collaboration with base operations personnel, requested flight plan routing along with other flight plan information is entered via a computer-based system at base operations. A copy of the Air Traffic Services message confirmation provided to the crew serves as a flight plan (Tab K-3). Notices to Airmen (NOTAMS) relevant to the routing, or as otherwise requested, are provided and briefed to the aircrew by base operations personnel during this process (Tab AA-34 through AA-51). A "crew resource" mission binder is assigned to each crew for the duration of their temporary duty at Geilenkirchen. This binder contains a comprehensive collection of information particular to local flying procedures and routine air refueling missions flown out of Geilenkirchen (Tab AA-3 through AA-28).

Computer-generated mission flight plans for the sortie types to be flown are provided to a tanker aircrew by the Air National Guard Liaison Officer and maintained in the individual crew mission binders. Copies of a typical mission chart and flight plan for the sortie type as well as selected applicable Flight Information Publication (FLIP) documents, which were available to the crew (Tab AA-63 through AA-71). Note that Terminal Change Notices (TCN) were not in effect for the date of the mishap.

According to other members of the 141st ARW, the deployment to NATO Air Base Geilenkirchen, Germany, was a desirable temporary duty assignment, and was sought out by ANG members (Tab V-13 through V-39). The operations tempo was not reported to be overly stressful for the personnel. It was reported that the work schedule allowed for a significant amount of personal time to relax and sightsee in the local area (Tab V-1).

10.2. Supervision: Authorizing activity for this mission was the 141st Air Refueling Wing (116 ARS), Fairchild AFB, Washington (Tab T-55). Wing, Group or Squadron supervision did not appear to have any bearing on this accident (Tab V-13 through V-39).

The deployed commander at Geilenkirchen AB was [redacted] (Tab V-30.1). The mission briefing was conducted on 13 January 1999, prior to departing Base Operations. While only the mishap crew was present for the briefing, prior briefings had been accomplished using the 141st ARW standard briefing guide (Tab AA-1). No supervisory personnel were in attendance.

11. HUMAN FACTORS ANALYSIS.

Consideration of human factors included communications, management policy decisions, servicing problems, psychosocial considerations, maintenance and repair oversights, weather and supervisory oversight. Interviews with all ANG members who were on the deployment with the mishap crew failed to reveal any areas of concern (Tab V-13 through V-39). Consideration was also given to human errors in manuals and charts, scheduling and dispatch pressures, as well as individual characteristics to include attitude, disorientation, familiarity, drugs, health, morale, psychological considerations, nutrition, alcohol, fatigue, crew rest, complacency, illusions, judgment, personality and taskload oversaturation. In this regard, toxicology results indicated that no drugs were present (Tab FF-1 through FF-4). All personnel familiar with the crewmembers indicated that the crew was prepared to fly the mission, both physically and psychologically (Tab V-1, V-13 through V-39). It appears that none of these potential human factors contributed to the mishap.

Two potential contributors to this mishap were a visual distraction on short final approach potentially caused by the sequence flashers, part of the approach lighting system (Tab BB-3 through 8, V-32), and the fact that the mishap pilot had performed a night landing only once (26 October 99) in the previous 90 days (Tab T-25).

12. GOVERNING DIRECTIVES AND PUBLICATIONS.

12.1 The following directives and publications applied to this mission:

T.O 00-20-1	Preventive Maintenance Program General Policy Requirements and Procedures
T.O. 00-20-5	Aircraft, Drone, Aircrew Training Devices, Engine, and Air-Launched Missile Inspections, Flight Reports, and Supporting Maintenance Documents
TO 1-1C-1	Basic Flight Crew Air Refueling Manual
TO 1-1C-1-3	Flight Crew Air Refueling Procedures
TO 1C-135-2-8	Maintenance Instructions, Organizational Level, Flight Controls
TO 1C-135(K)A-9	Cargo Loading Instructions
TO 1C-135(K)A-2-8JG-17	Flight Control Systems Part XVII, USAF Aircraft KC-135A and KC-135E
TO 1C-135(K)A-3-1	Structural Repair Instructions, USAF Series –135 Aircraft
TO 1C-135(K)E(II)-1	Flight Manual KC-135D/E
TO 1C-135(K)E-1-1	Flight Manual Performance Data Appendix 1
TO 1C-135-1-1-1	Fuel Savings Advisory and Cockpit Avionics System
TO 5A1-2-50-42	Intermediate Maintenance Instruction with IPB – Servo Motor Automatic Pilot

TO 5A1-2-50-52	Intermediate Maintenance Instruction with IPB – Servo Motor Automatic Pilot Trim Actuator
AFI 11-202, V1	Aircrew Training
AFI 11-202, V2	Aircrew Standardization/Evaluation Program
AFI 11-202, V3	General Flight Rules
AFI 11-2KC-135, V1	C/KC-135 Aircrew Training
AFI 11-401	Flight Management
AFI 13-201, AMC SUP 1	Air Force Air Space Management
AFI 48-123	Medical Examinations
AFI 51-503	Aircraft, Missile, Nuclear, and Space Accident Investigations
AFI 91-204	Safety Investigations and Reports
AFM 11-217, V1	Instrument Flight Procedures
AFM 11-217, V2	Instrument Flight Procedures
MCI 11-235, V1	General Information
MCI 11-235, V2	Command and Control
MCI 11-235, V3	Crew Management
MCI 11-235, V4	Aircraft Operating Restrictions
MCI 11-235, V5	Operational Procedures
MCI 11-235, V6	Aircrew Procedures
MCI 11-235, V7	Aircraft Security
MCI 11-235, V8	Operational Reports and Forms
MCI 11-235, V9	Training Policy
MCI 11-235, V11	Navigation Procedures
MCI 11-235, V13	Boom Operator Procedures
MCI 11-235, V17	Air Refueling
MCI 11-235, V19	MAJCOM Procedures
MCI 11-235, V21	Mission Planning
MCI 11-235, V25	Formation
MCI 11-235, V26	Configuration
AMCI 11-208	Tanker/Airlift Operations
ASRR	Airfield Suitability and Restriction Report 1 Nov 98
Boeing Document D6-6218	Control Position Data – KC/C-135 Series Airplanes

13. NEWS MEDIA INVOLVEMENT

Since NATO Air Base Geilenkirchen is located near the border between Germany and the Netherlands, the accident received significant media attention in both countries. Over 1000 queries were received about the mishap. A multitude of news articles were written on the accident. Three press conferences were held, the last one being a briefing by German Air Force Brigadier General Peter-Klaus Stieglitz that occurred in the NATO Air Base Geilenkirchen theater. Additionally, the mishap received significant media attention in the Spokane,

Washington, area since the mishap crew was stationed at the 141st Air Refueling Wing at Fairchild AFB, WA. The media in the Netherlands and Germany have continued to make queries regarding the mishap, primarily regarding the cause of the crash and environmental effects of the accident (Tab V-12).

14. ADDITIONAL AREAS OF CONCERN

14.1. NAVAIDS : All airfield navigational aids and lighting systems were fully functional and operating during the relevant descent and approach period of the mishap (Tab AA-56).

14.2. Facilities: Differences in the approach lighting system used at Geilenkirchen Air Base versus Fairchild Air Force Base, while potentially distracting, are not considered to be significant with respect to the pilot's ability to successfully position the airplane over the desired landing touchdown zone under the meteorological conditions existing at the time of the mishap (Tab DD-1). Geilenkirchen Air Traffic Control personnel refused to give sworn statements as to their actions and what they witnessed the night of the mishap. It is believed approach lighting to include sequence flashers were on and operating at the time of the mishap. In the absence of this testimony, it is impossible to say with certainty that the sequence flashers were on and operating. However, some non-Air Traffic Control witnesses said they saw the flashers operating at the time of the mishap (Tab V-11). Other aircrew members from the 141st ARW have indicated some concern with the brightness of the Geilenkirchen lighting (Tab V-30 and V-32).

14. 3. Horizontal Stabilizer Trim Analysis: In order to evaluate actual flight conditions as near as safety of flight concerns would allow, KC-135E crewmembers flew a similar flight profile. I was particularly interested in the trim settings during and after an attempted go around from the landing attitude. They flew a flaps 40 degree approach, with the same gross weight and center of gravity, to a landing attitude demonstration. AIB members observed the thrust settings and trim changes throughout the approach and planned go around. Weather was a clear Visual Flight Rules day. The following data was observed during the flight profile. The trim setting at go around was between 2.5 and 3 units nose up. The pilot was required to fully extend his arm and hold the control yolk full forward in order to correct the upward vector from applying normal go around thrust. In addition, he trimmed to a 1.5 nose down trim setting to get the aircraft trimmed for the climb. I believe this trim change of 4.5 units is much greater than most experienced pilots would expect. I also asked the KC-135E simulator instructors at McClellan AFB, CA to fly the profile the mishap crew had flown (Tab DD-4). Their analysis indicated that with any trim setting above 5.0 units nose up, there is no recovery possible prior to a stall. The analysis indicated there was insufficient elevator authority available to the pilot to counteract the upward vector, unless power was retarded. It appears that only two to three units of un-commanded trim actuation in the landing flare could result in an aircraft stall. Likewise, if the pilot inadvertently trimmed an additional two to three units of nose up trim, there is no recovery possible if a go around is attempted (Tab BB-60).

Statement of Opinion

DISCLAIMER

Under 10 U.S.C. 2254(d), any opinion of the accident Investigators as to the cause or causes of, or the factors Contributing to, the accident set forth in the accident Investigation report may not be considered as evidence in any civil or criminal proceeding arising from an aircraft accident, nor may such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements.

1. Cause. The ultimate cause of this accident was the severe pitch up of the aircraft during an attempted go around from the landing attitude. This pitch up resulted in the aircraft stalling and impacting the ground. I was unable to find clear and convincing evidence why this occurred. Several factors were found which could have effected this accident.

As a result of being held at a higher altitude because of other air traffic, the crew flew a steep enroute descent with Air Traffic Control asking them on two occasions if they needed additional radar vectors to give them time to descend. They declined the request. The aircraft attempted to intercept the Instrument Landing System (ILS) glide slope from above and 2.5 miles inside the published glide slope interception point which was at 5.5 miles from the runway. The steep descent was made at night through layered clouds, rain, and snow mix. The approach lighting system at Geilenkirchen is slightly different from the lighting system at Fairchild AFB. This difference could cause the pilot to sense he is closer to the runway than he is in reality. The pilot's last night landing was 26 October, although he had monitored a night approach and landing at Geilenkirchen on 6 January. The descent positioned the aircraft at five hundred feet Above Ground Level (AGL) seven-tenths to eight-tenths of a mile from the approach end of the runway. Witness testimony indicates the aircraft came near to or touched the runway about 2000 feet down. In order to accomplish this, the aircraft had to descend at descent rates approaching 1000 feet per minute and accomplish a near four-degree descent gradient to landing. This is a much steeper approach than would be recommended in these conditions. I believe this steep angle of descent could have resulted in increased airspeed and a long landing flare. The long landing flare may have been compounded by a nose up stabilizer trim condition. This nose up stabilizer trim condition could have resulted from either pilot action or a stabilizer trim malfunction. The pilot, realizing he was landing long, elected to go around and attempt another approach. I was unable to find any other logical reason for the crew to elect to abort the landing and execute a go around. The aircraft pitched up to near vertical, stalled and impacted the ground. The very steep angle of flight and aircraft stall resulted in engine compressor stalls,

which were the flames witnesses saw coming from the engines. Therefore, the flames and engine compressor stalls were the result of the steep pitch up and stall. Engine analysis found no malfunction of the engines and it is believed the engines were producing 52% revolutions per minute (RPM) at impact. This would be consistent with an engine attempting to recover from a compressor stall condition. The steep pitch up and resulting stall could have been caused by several different factors. I was unable to find definitive proof for any of these factors.

The first potential cause would be a malfunction of the aircraft horizontal stabilizer trim system. The large speed range of the KC-135 requires the use of an adjustable horizontal stabilizer. This arrangement ensures adequate longitudinal or pitch trim for all normal center of gravity locations. The horizontal stabilizer is normally positioned by an electric motor. This motor drives a jackscrew in the tail section. The jackscrew pivots the horizontal stabilizer about its aerodynamic center. The stabilizer trim movement ranges between 3.5 units of airplane nose down and 11 units airplane nose up. Each unit equals one degree deflection from zero position and each unit represents nine revolutions of the trim control wheel. The stabilizer was discovered at 7.5 units nose up after impact. The normal trim setting for flaps 40 approach speed is about 2.5 to 3 units nose up, indicating the trim was 4.5 units higher than would be expected. There is no way to determine if the aircraft was trimmed to this condition during an attempted recovery from the stall or was positioned there prior to the go around. Extensive testing of all available components of the trim system revealed no indications of malfunction. As the report indicates, every available trim component was thoroughly analyzed for indications of a malfunction. Each trim system component either met or exceeded design specifications. For the trim system to be causal, an unknown malfunction would have had to drive the trim setting nose up without the crew realizing the trim movement. There is a large wheel located next to the pilot's knee which rotates any time the trim system is in operation. The trim control wheel is located here to give the pilot warning if the trim system is inadvertently moving for any reason. If inadvertent or un-commanded movement is detected, the pilot has several options to stop the movement. The pilot can actuate the trim switch in the opposite direction. The pilot can grab the manual trim wheel and stop rotation. A third option is to use the STAB TRIM cut out switch mounted on the throttle quadrant to cut out the power to the trim system. The trim cut out switch was found in the normal position indicating no cut out was attempted. There have been several alleged incidence of un-commanded horizontal stabilizer trim movement on KC-135 aircraft. Listed below are the reported incidents of un-commanded horizontal trim movement.

LOCATION	DATE	TYPE ACFT	SERIAL NUMBER
Wright Patterson	6 May 81	EC-135	61-0328
Bangor	28 Dec 89	KC-135E	59-1493
Eaker AFB	12 Jan 90	KC-135R	60-0362
Kadena AB	8 Jun 92	KC-135R	57-1486
March AFB	24 Feb 94	KC-135E	59-1499

Eielson AFB	21 Oct 94	KC-135E	57-1494
Grand Forks	15 Aug 96	KC-135R	58-0047
Fairchild AFB	11 Mar 97	KC-135R	57-1451
Grissom AFB	16 Mar 97	KC-135R	62-3530
Incirlik AB	20 Jun 97	KC-135R	62-3523
Oerland, Norway	5 Nov 97	KC-135T	58-0047
McGuire AFB	3 Feb 97	KC-135E	56-3593
Travis AFB	8 Apr 98	E-6A	164387
March AFB	8 Apr 98	KC-135E	59-1509

With this history, it is impossible to rule out un-commanded horizontal stabilizer trim movement as a factor in this accident. The steep enroute descent and approach gradients flown by this aircraft could have placed significant aerodynamic forces on the trim system. However, intense testing of all components revealed no indication of system failure. The aircraft horizontal stabilizer trim system had been inspected in October 1998 with no discrepancies found. The approach and flare to landing appeared normal to all eyewitnesses. It would be impossible to fly a normal approach to landing flare with large nose up out of trim forces existing. Therefore, an un-commanded run away nose up trim movement would have had to occur while in the landing flare. With available data, I was unable to prove or disprove this as the cause of the severe pitch up.

A second factor, which could have resulted in the extremely high pitch attitude, is pilot disorientation. The advance of engine power near full thrust results in a pitch up moment that requires significant forward pressure on the controls by the pilot. The go around also requires the pilot to trim nose down from almost three units nose up to about 1½ units nose down in order to achieve a trimmed condition in the climb. The combination of darkness, glare and pitch up from applying the power could result in pilot disorientation and the abnormal nose high attitude and stall. Further nose up trimming in an attempt to recover from the stall and nose low condition could explain the large 7.5 nose up trim condition at impact. The crew made a very steep enroute descent to a steep final approach. This approach was made at night through broken clouds with rain and snow present. The approach lighting system has very bright sequence flashers to aid pilots in very poor visibility. These bright lights could further disorient a crew who had just broken out of an overcast deck. While none of these disorienting factors are significant alone, the combination could result in disorientation and over trimming to an excessive nose up condition. There is insufficient data to conclude the crew trimmed to this nose high attitude. However, nose high trim of just two units above the desired setting could result in the pitch up and stall. If the aircraft were inadvertently trimmed to five units nose up, there would not be sufficient elevator authority available to counteract this pitch up. The KC-135E pilot's manual warns the pilot "During approach and landing, the stabilizer trim should be used only for intended purposes of eliminating sustained elevator control forces. Do not accomplish the round out by using stabilizer trim. Use of stabilizer trim for round-out might induce a strong pitchup tendency that would be difficult to control in the event that a go-around is attempted". With available data

I was unable to prove or disprove pilot trim input resulted in the large pitch up condition and resulting stall.

A third factor examined as a potential cause for the large pitch up was a pilot seat failure. If either pilot's seat had inadvertently slid to the full aft position during the go around maneuver, it might explain the sudden pitch up. The logical reaction in this circumstance would be to grab for a handhold to regain position. If the control column were inadvertently pulled to full aft position, it would result in the sudden pitch up. Seat rail analysis was inconclusive as to the pilot's seat position. However, this possibility is extremely remote. The proper procedure in this instance would be to simply transfer aircraft control to the pilot not flying.

Another possibility examined was an extreme aft center of gravity (CG) situation. This aircraft aft center of gravity situation could result if fuel gravity drain valves were inadvertently left open or failed in the open position. Analysis of the valves indicated they were in the proper position at the time of impact.

I also examined the possibility of aircraft elevator control failure. Elevator components and elevator balance bays were examined and found to be in correct working condition. There was no evidence of jamming in the elevator or elevator trim tabs. There was no evidence of ice damage to any of the elevator components.

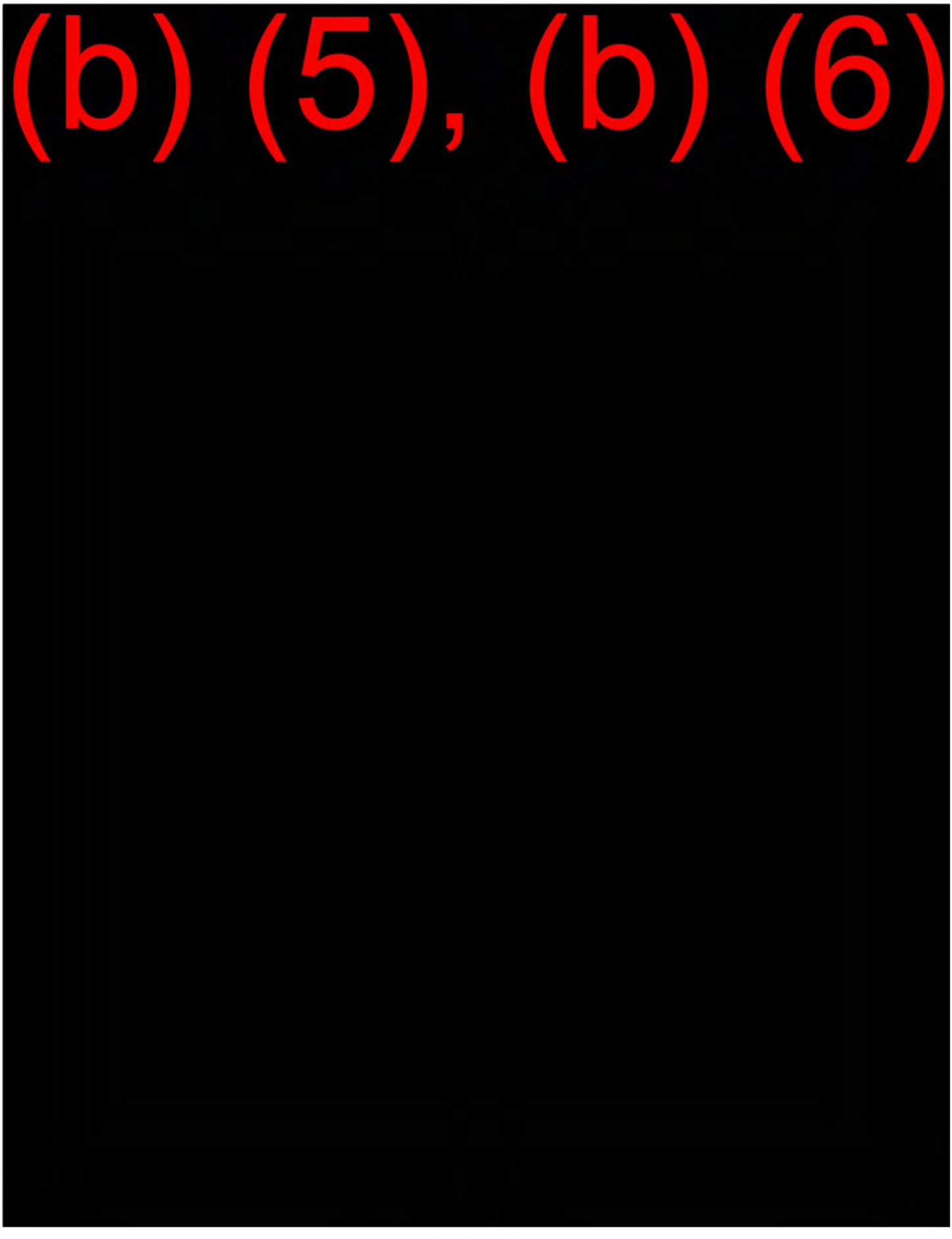
Finally, I considered the possibility of aft speed brake/spoiler actuation as a means to rotate the aircraft to the steep pitch attitude. This would require the pilot to cut out the Inboard Spoiler switch and then actuate the speed brake lever while airborne near the runway. There is no logical reason for such a maneuver. Witnesses testified they saw no panels above the wing surface at time of descent near the runway, and analysis revealed the rear speed brake panels appeared to be near the down position at impact.

The lack of direct evidence makes it impossible to conclude, by clear and convincing evidence, the cause of the aircraft steep pitch up and resulting stall.

Dated this 30th day of April 1999.

[redacted]

President, Accident Investigation Board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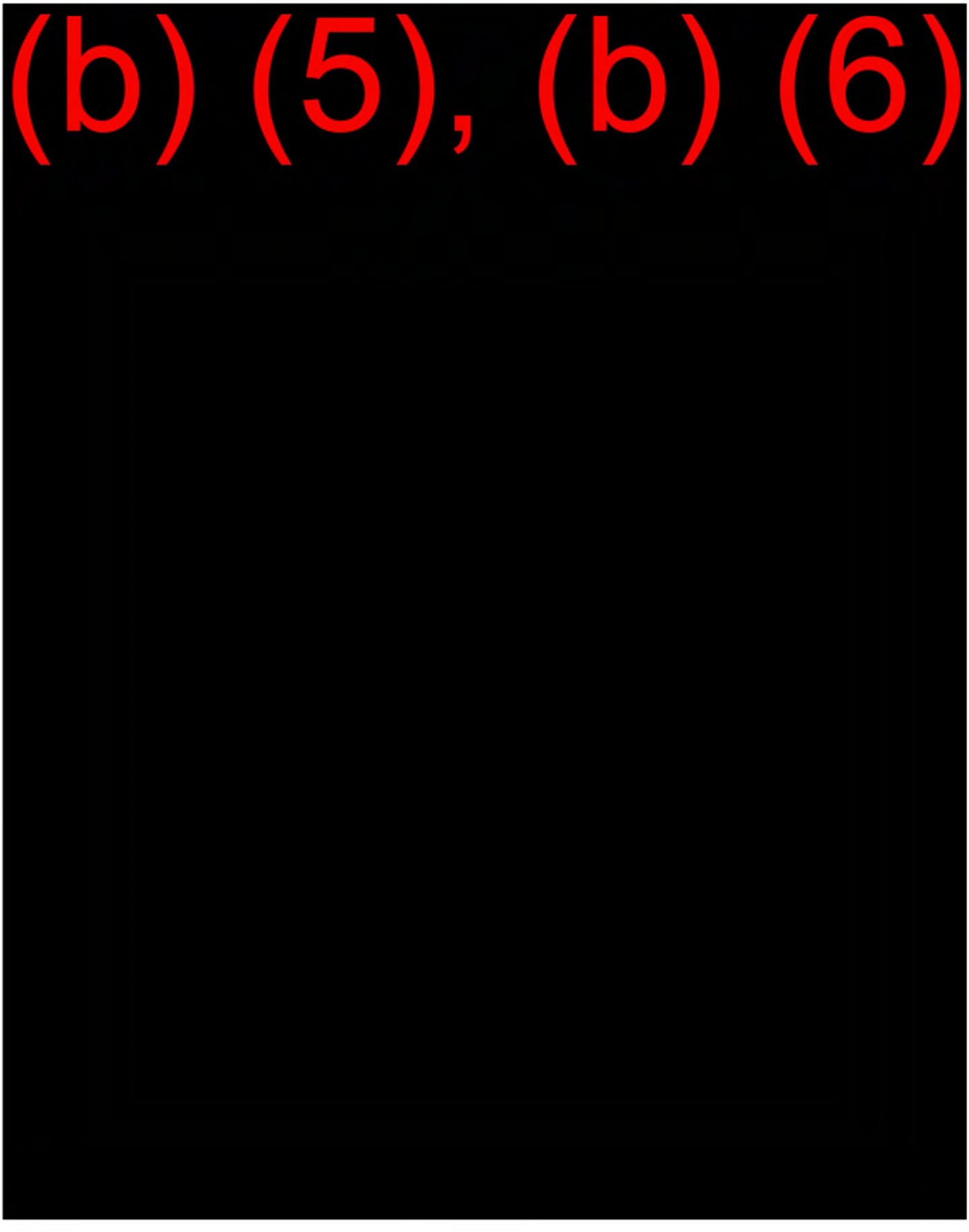
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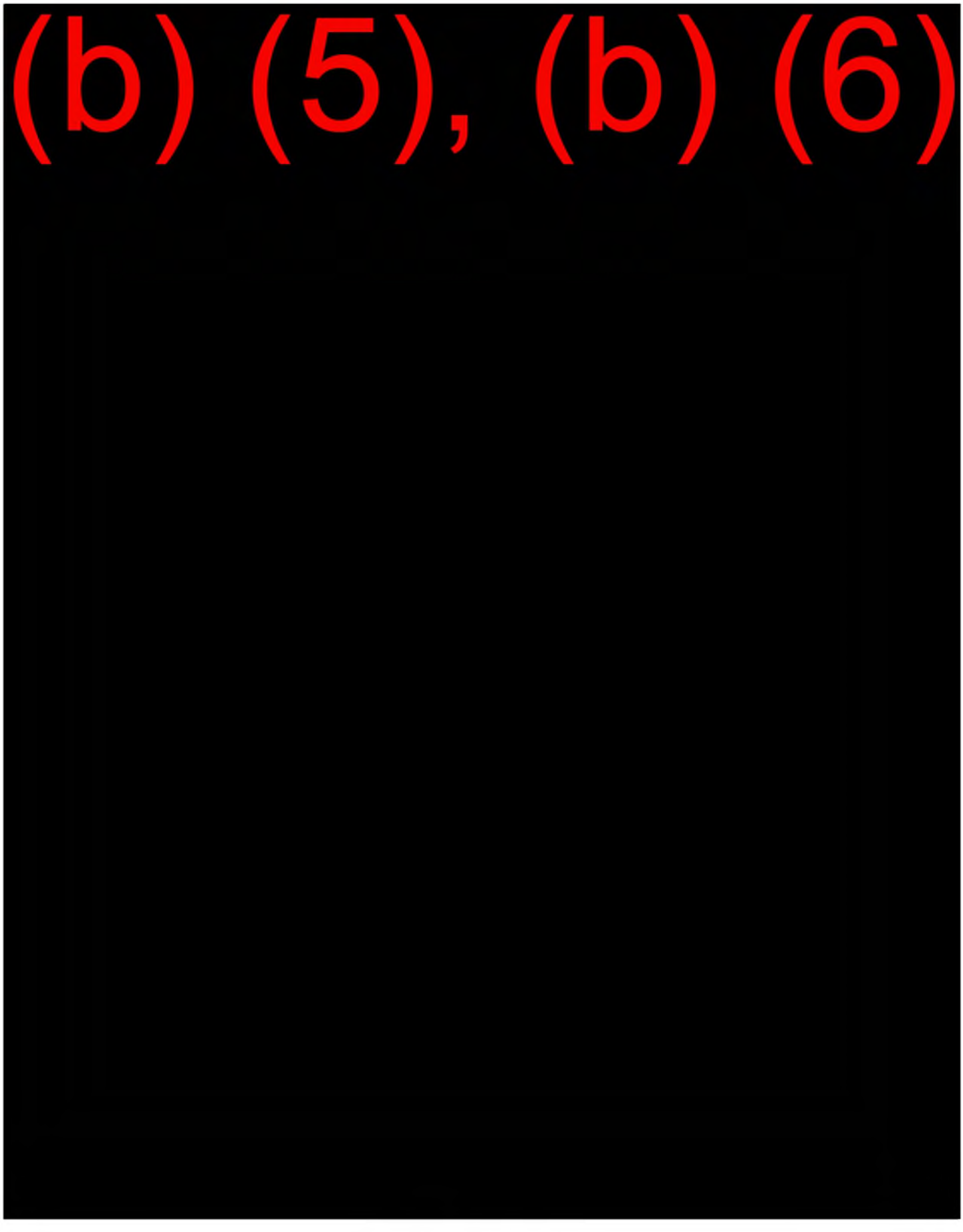
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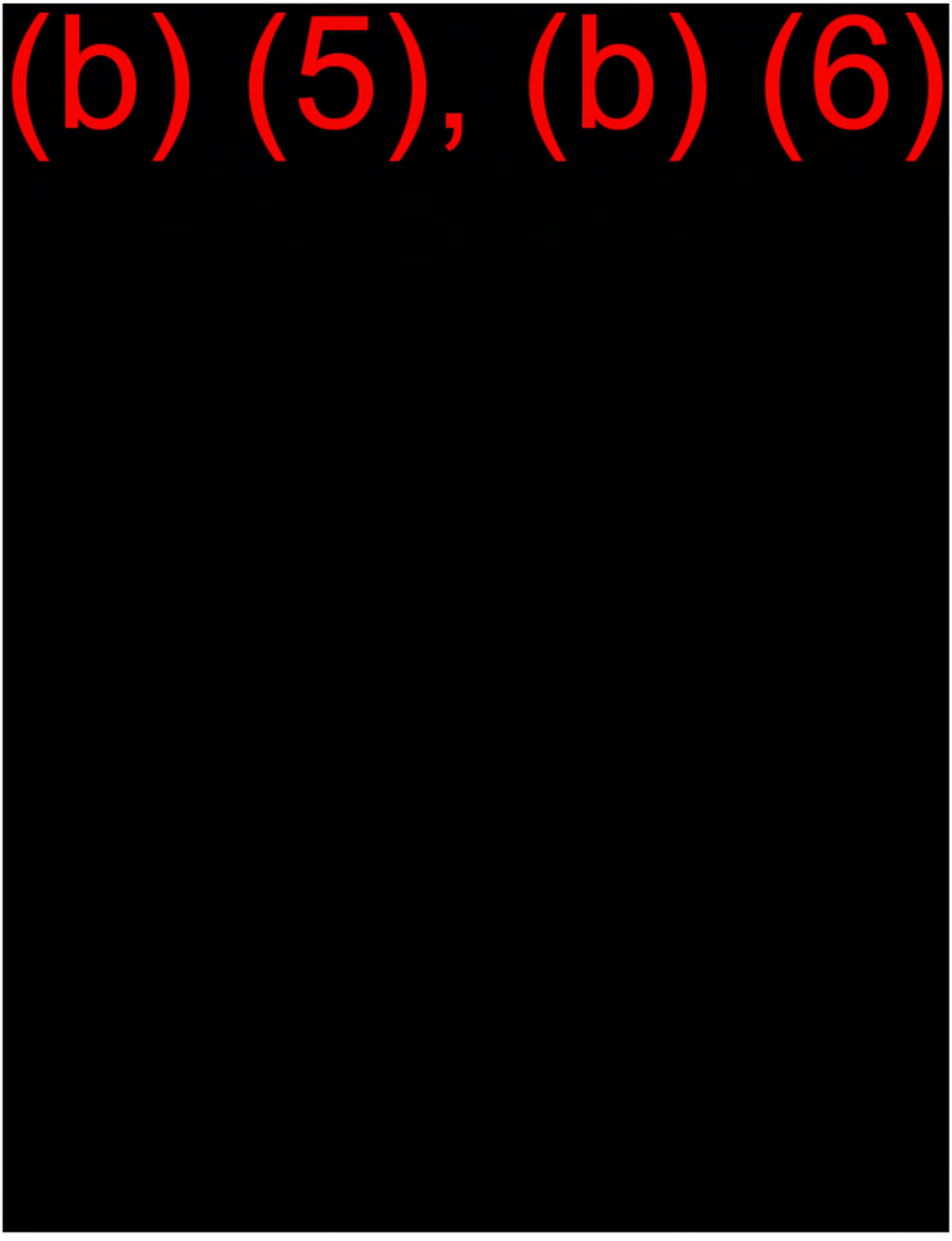
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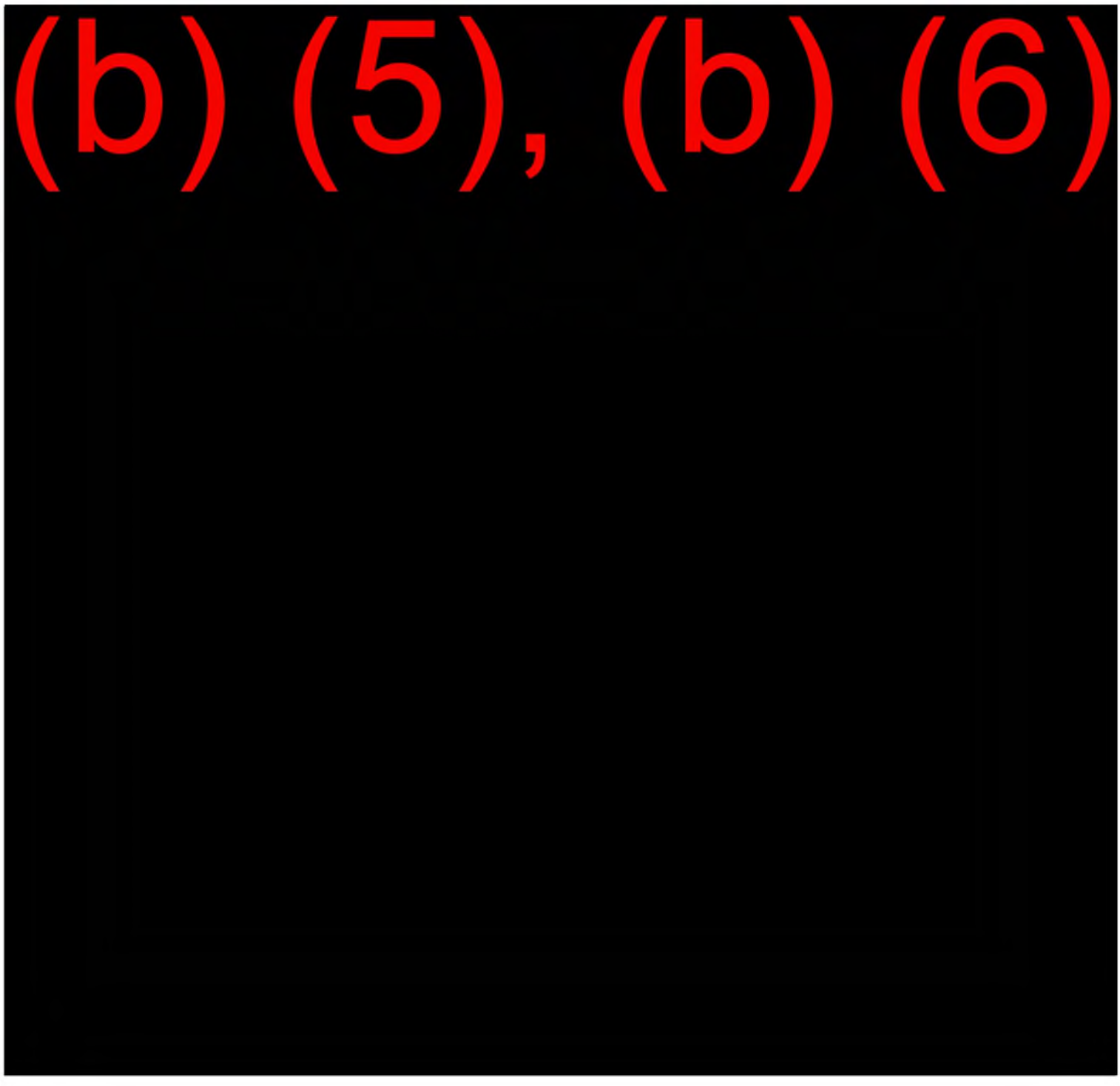
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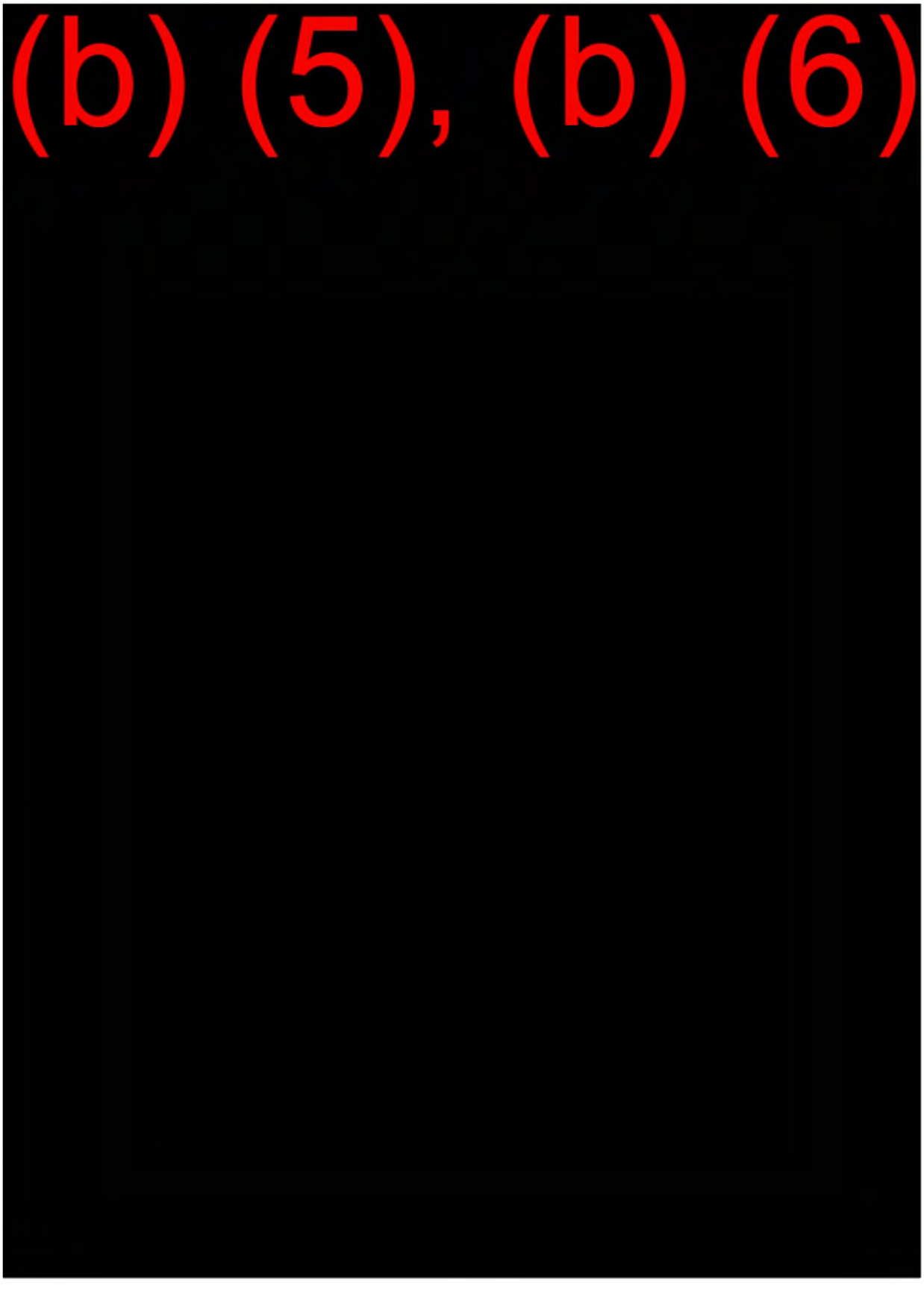
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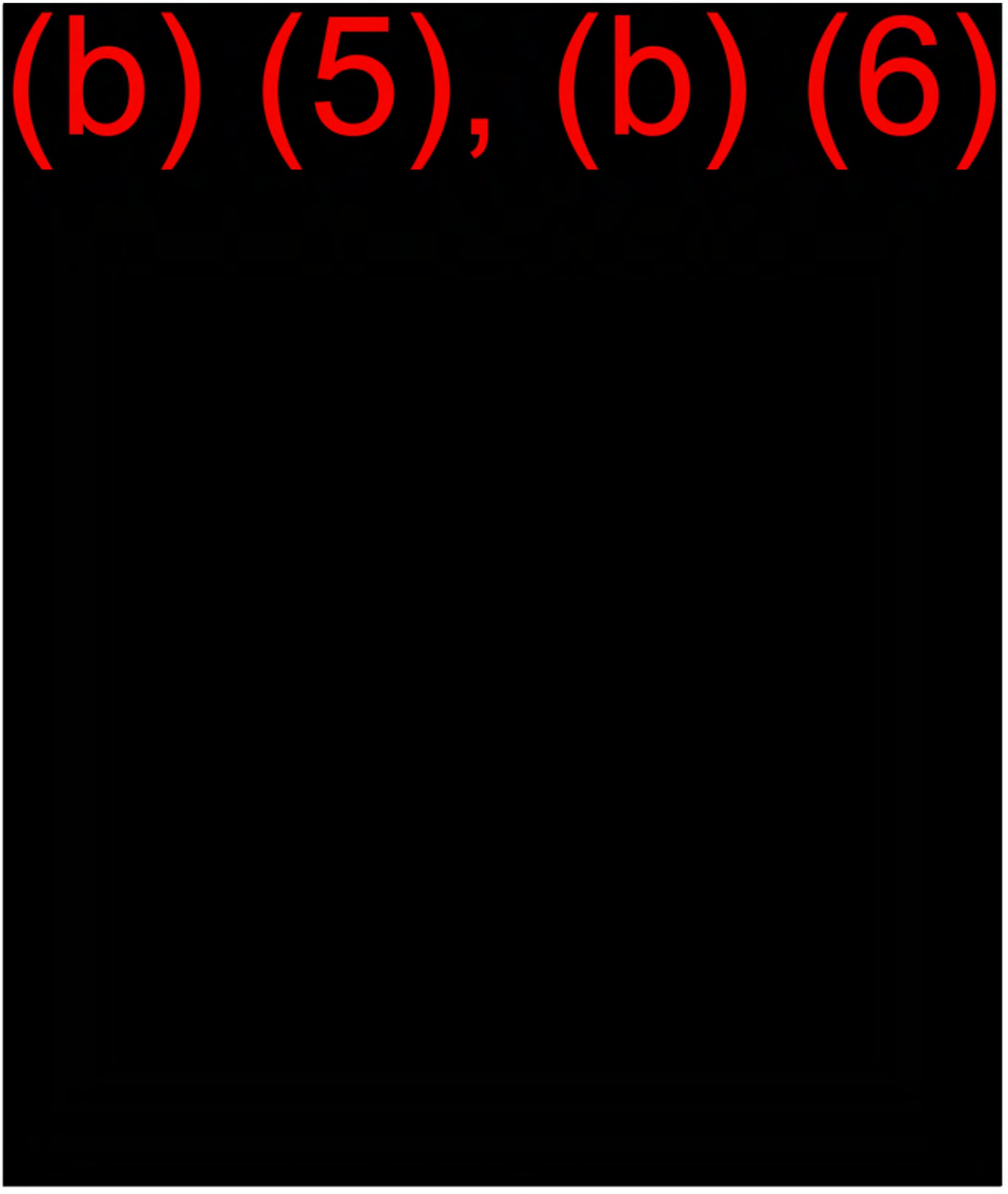
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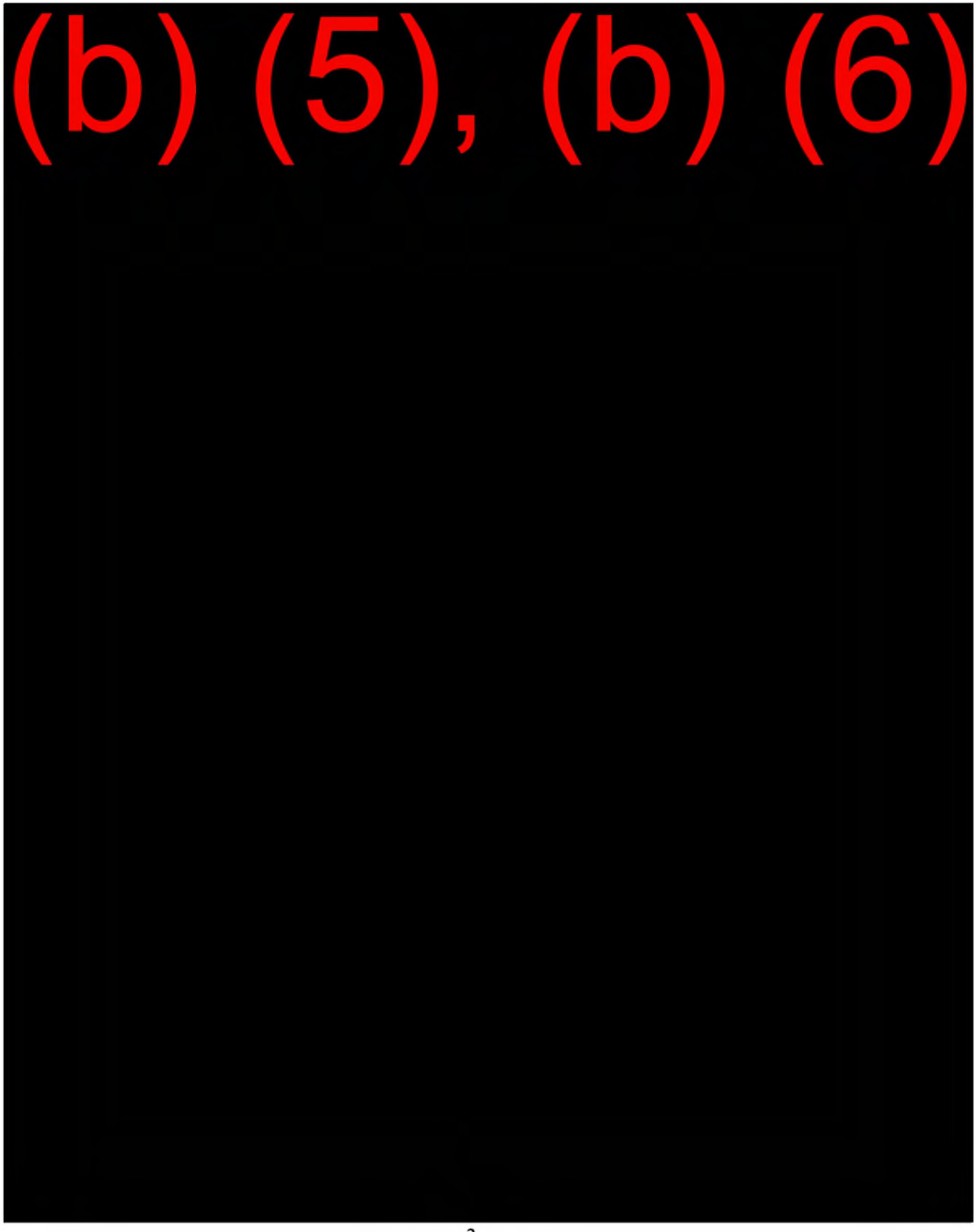

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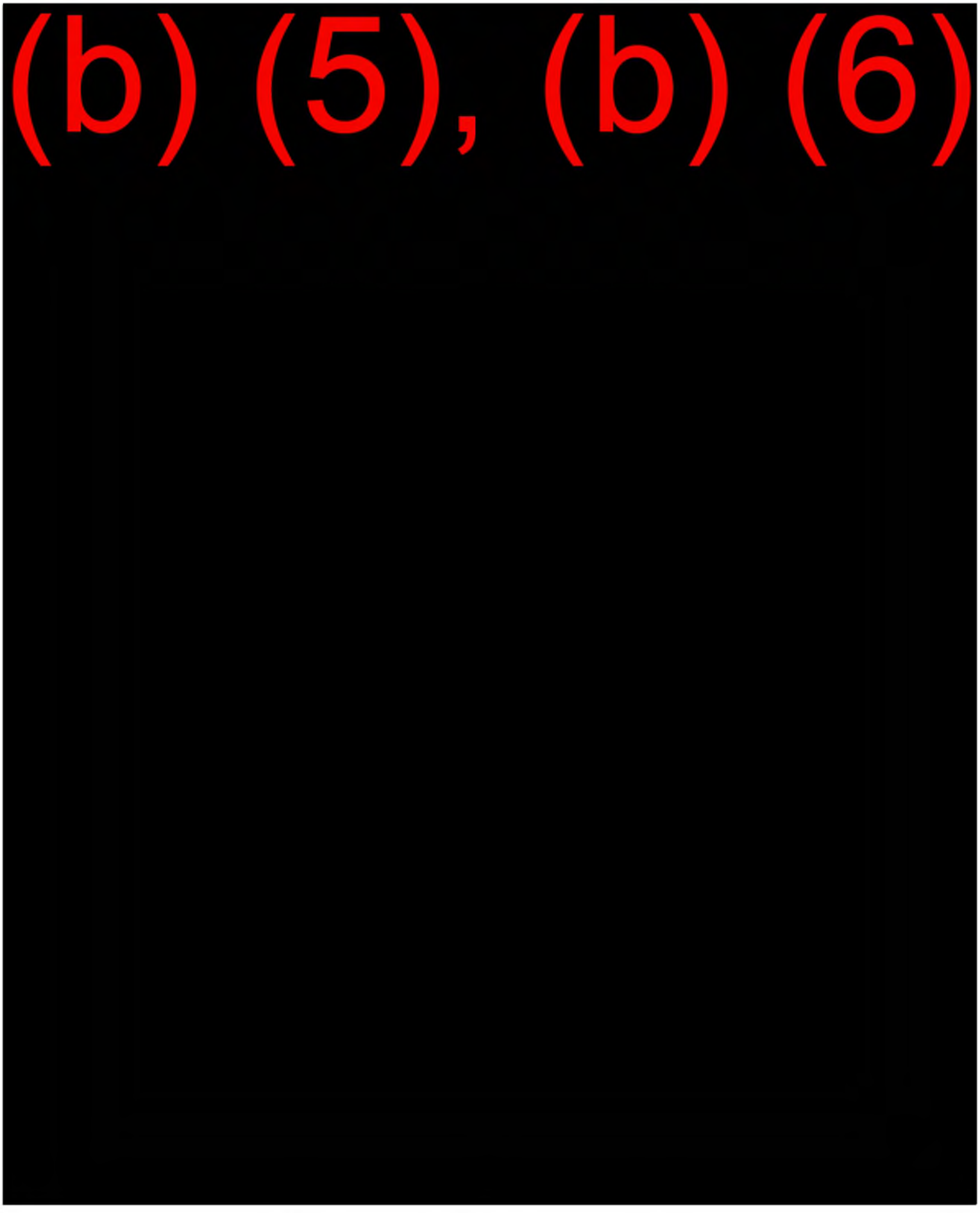
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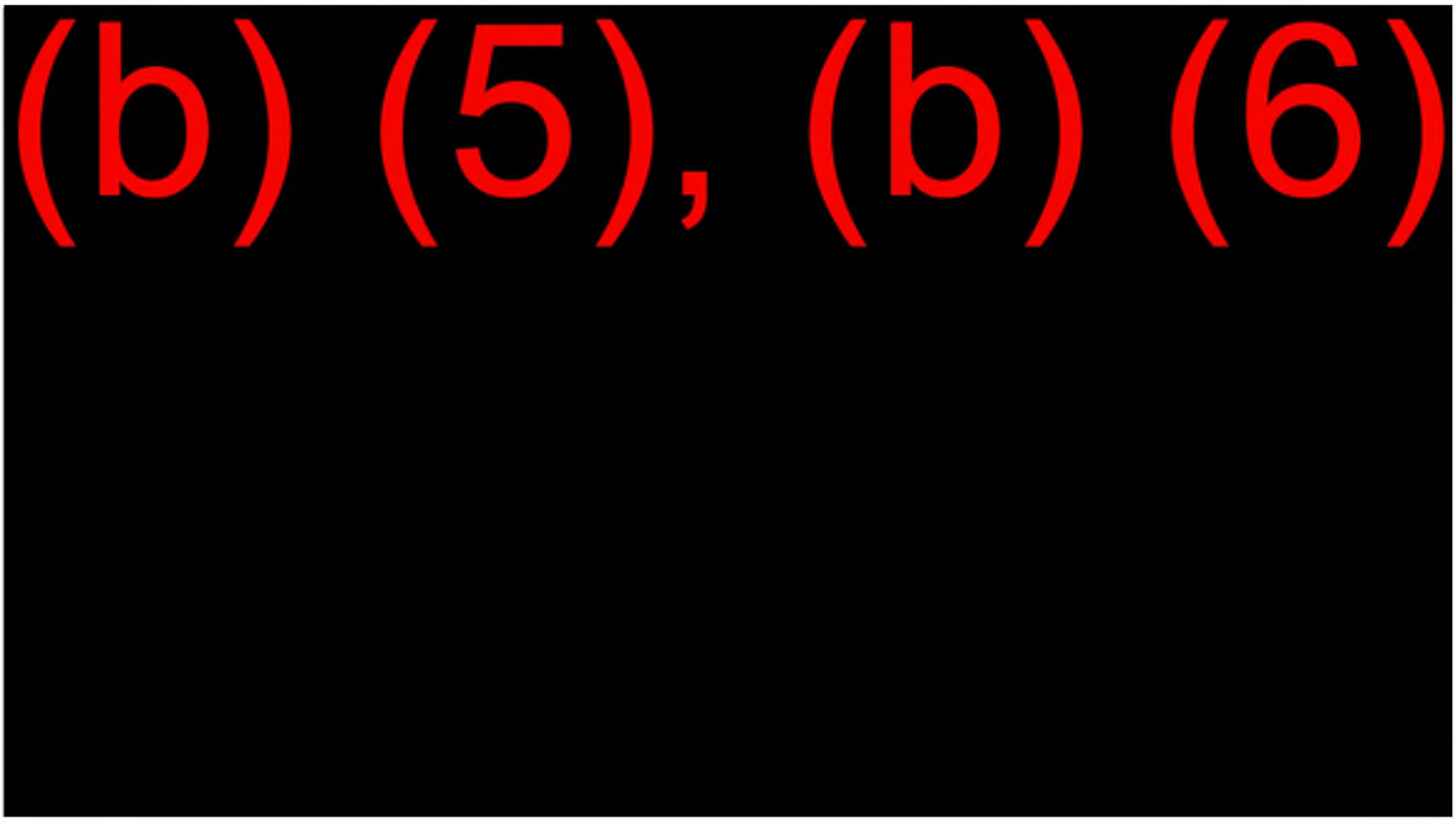
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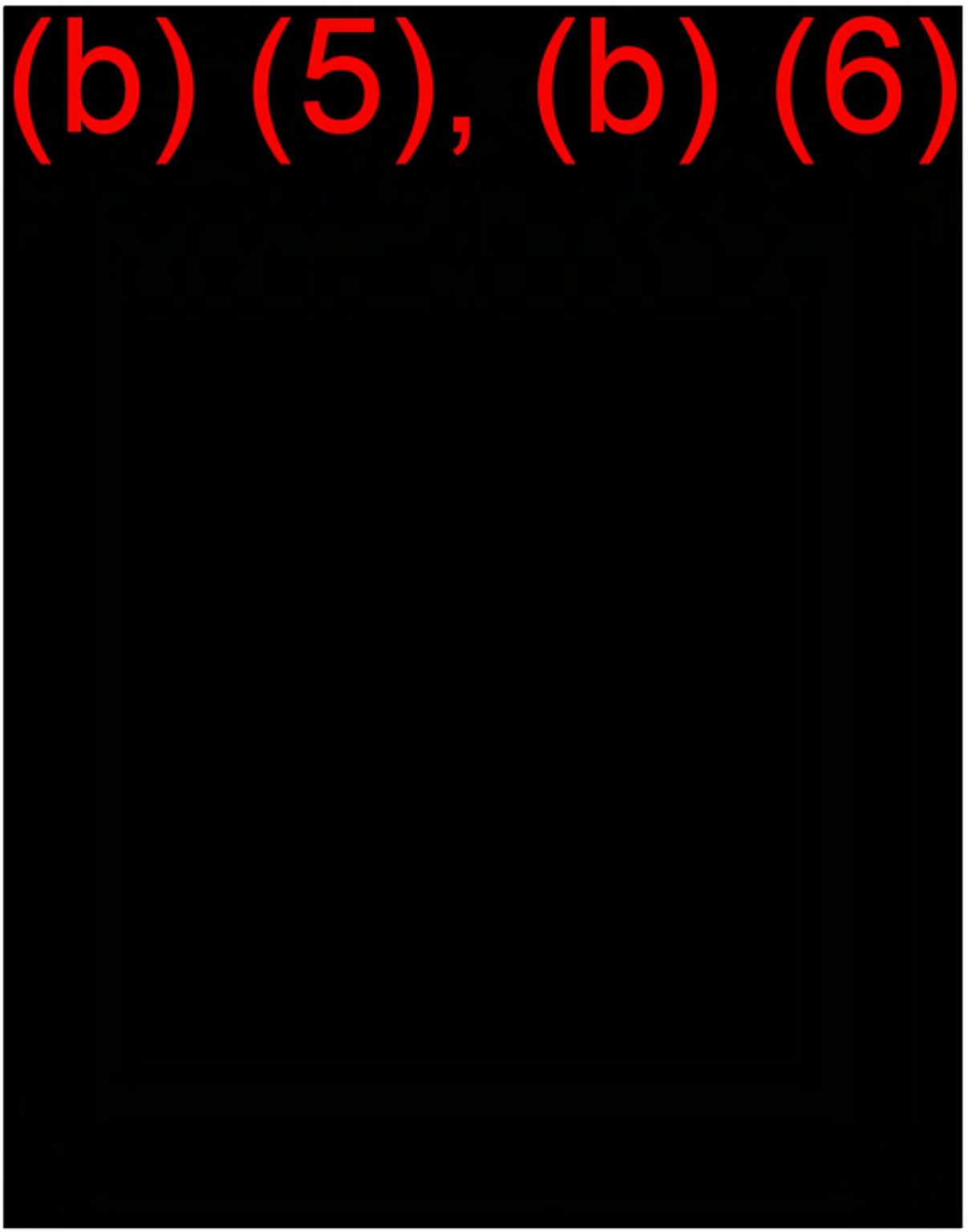
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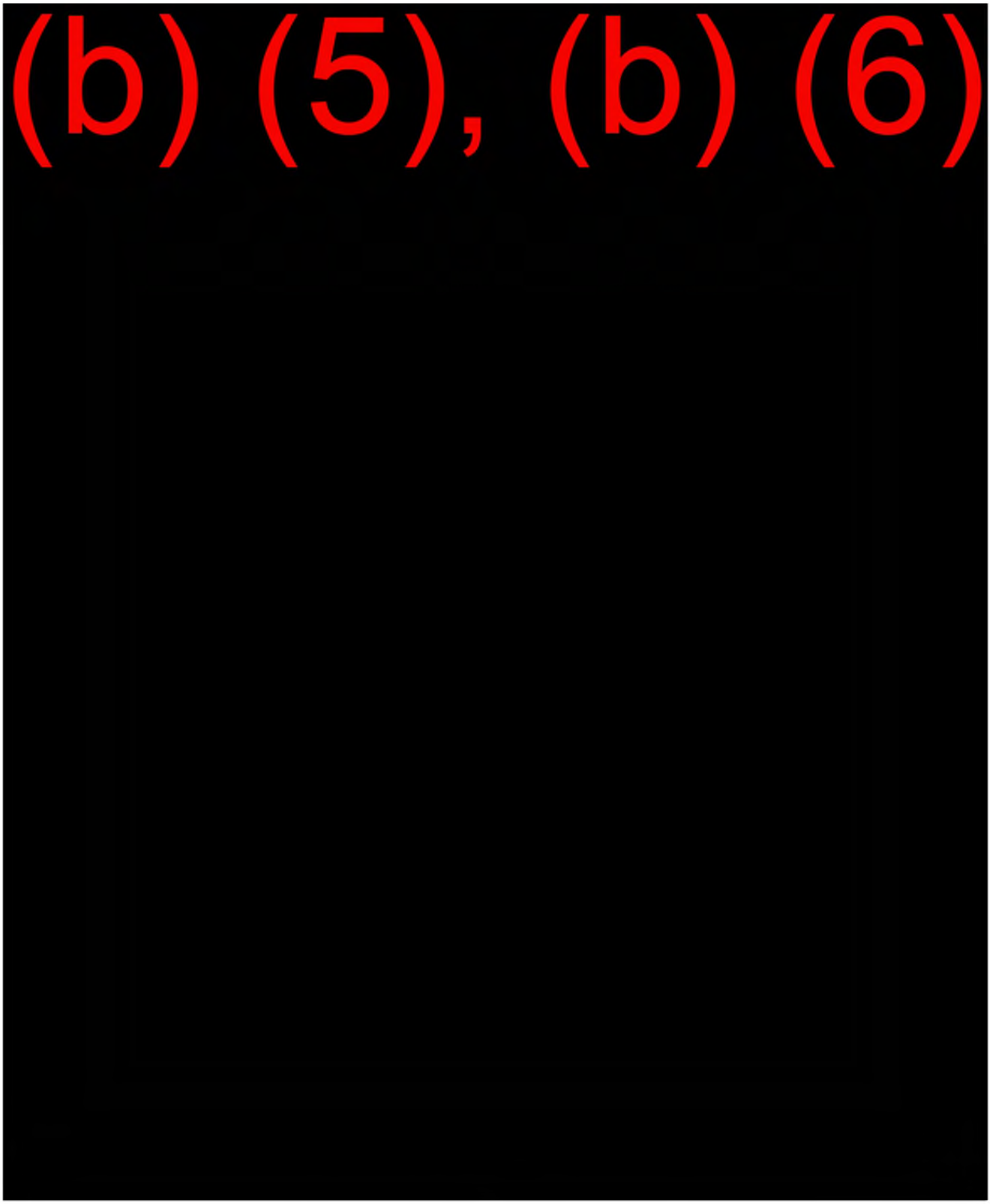
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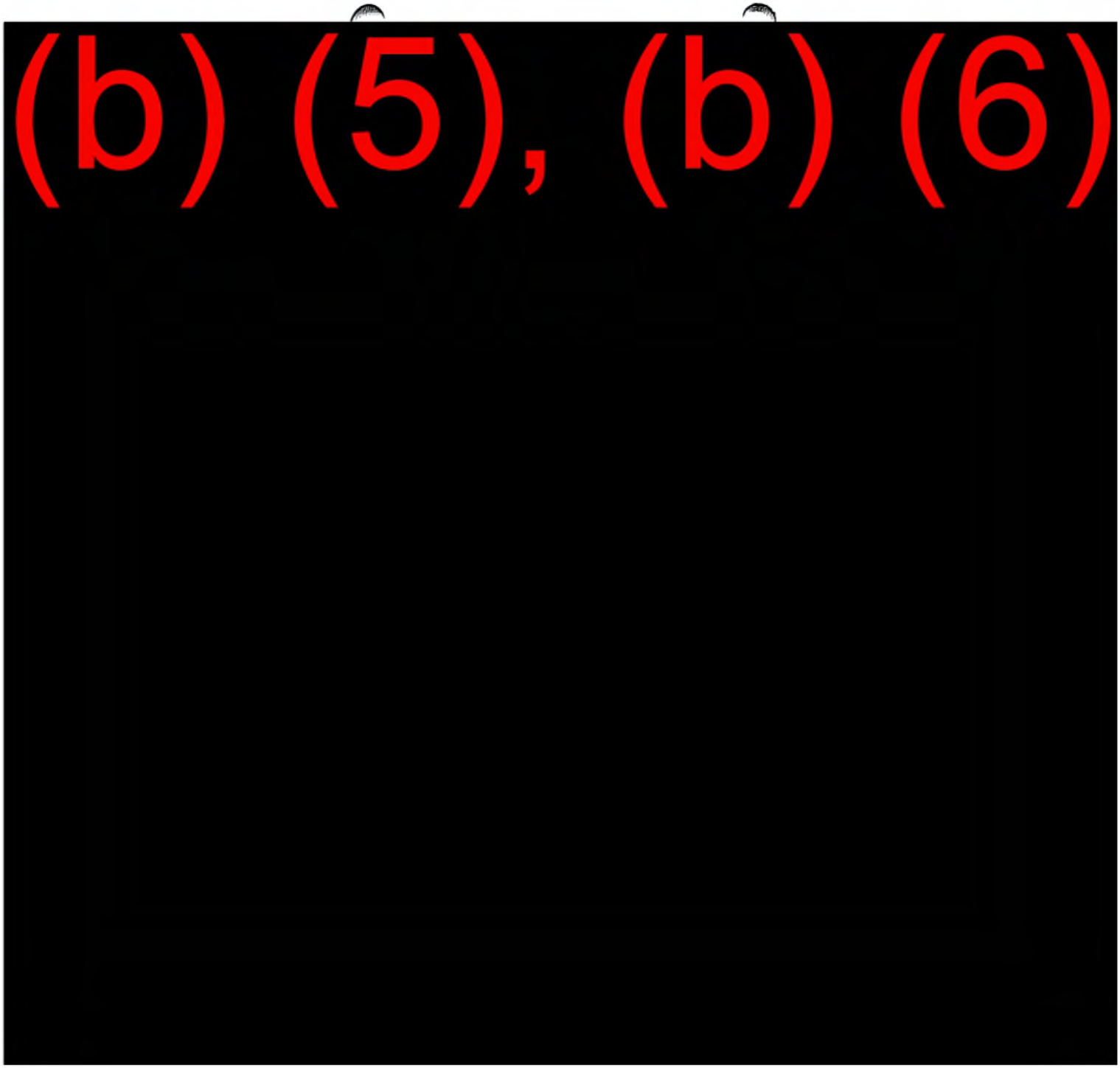
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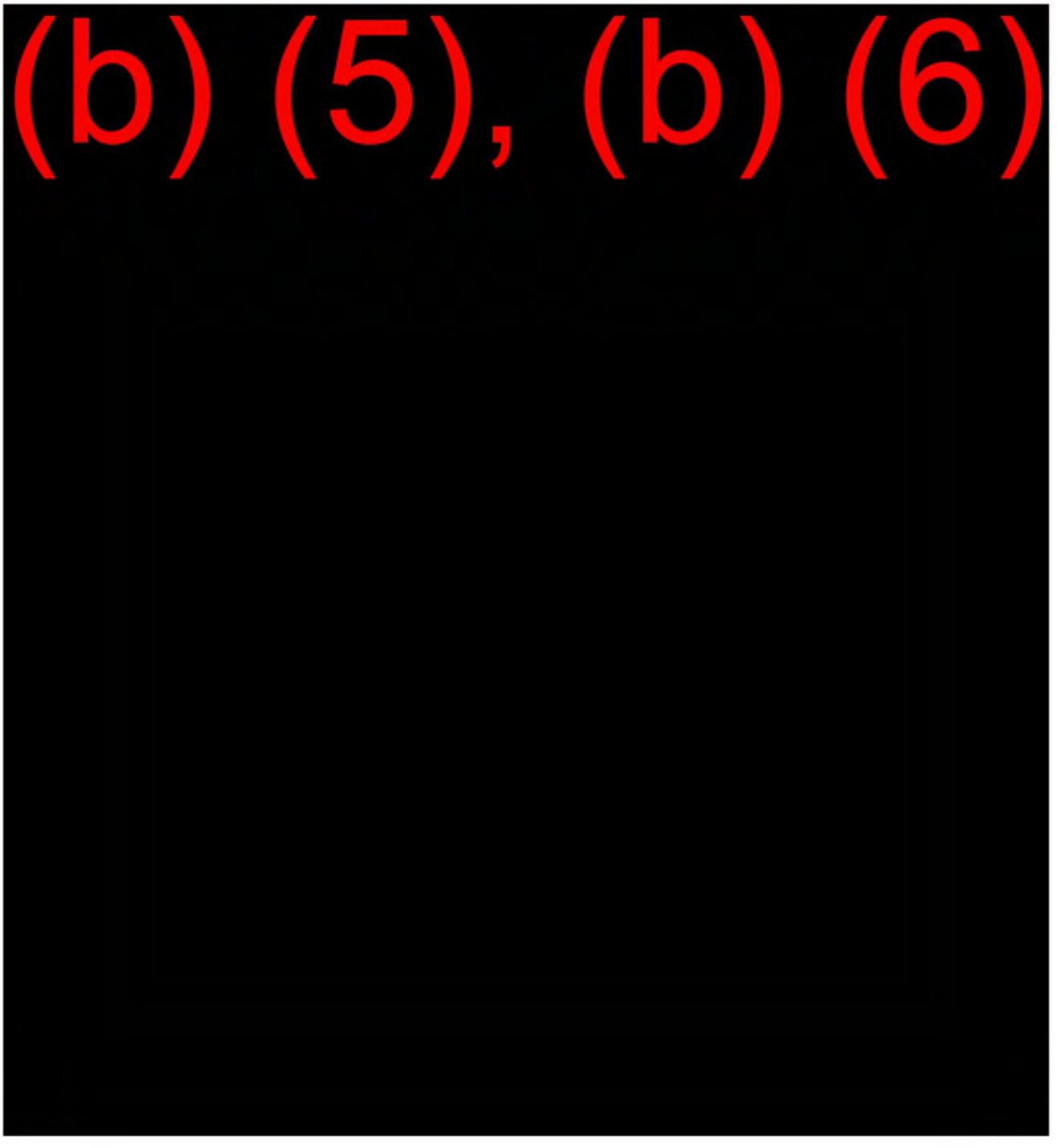
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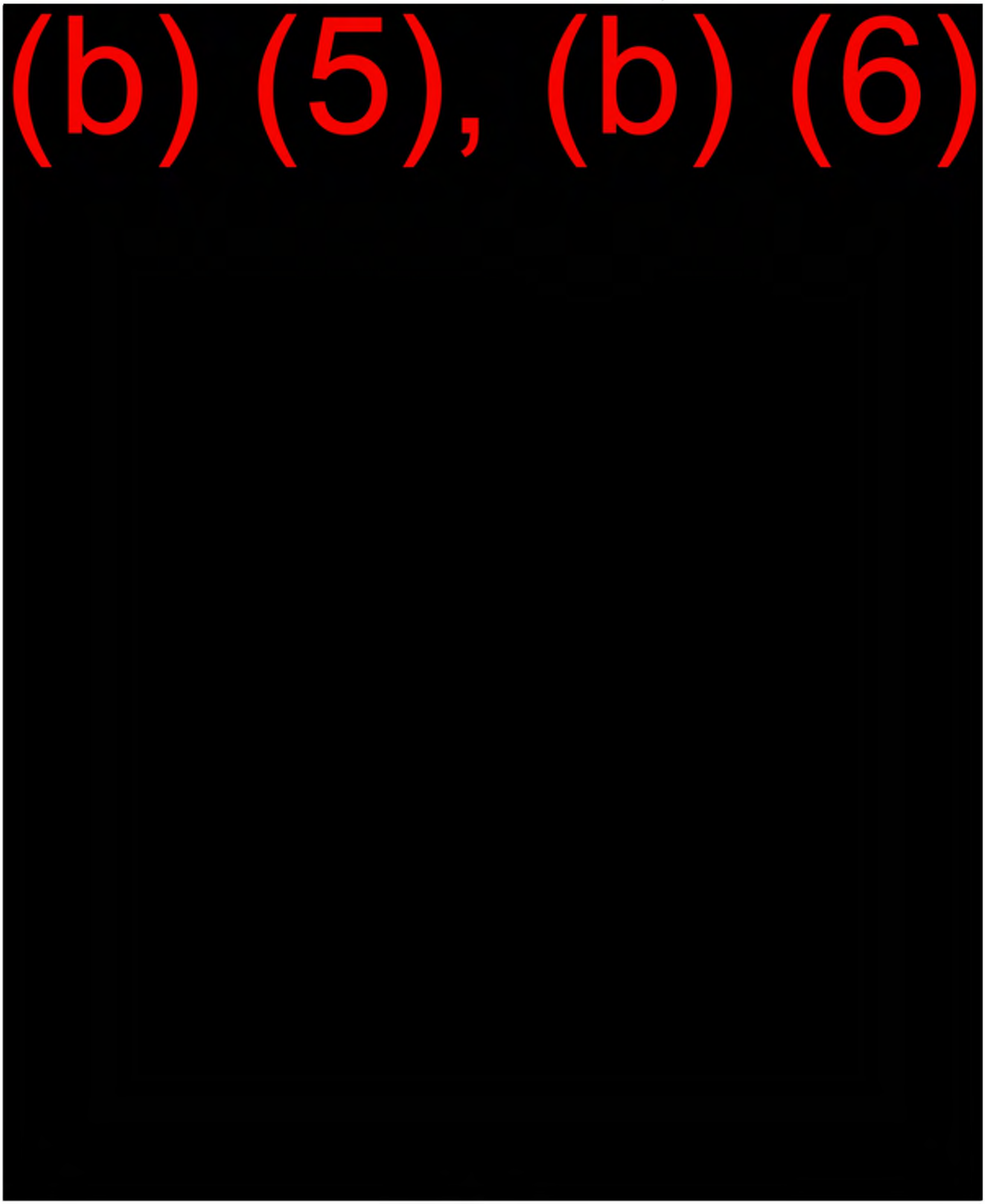

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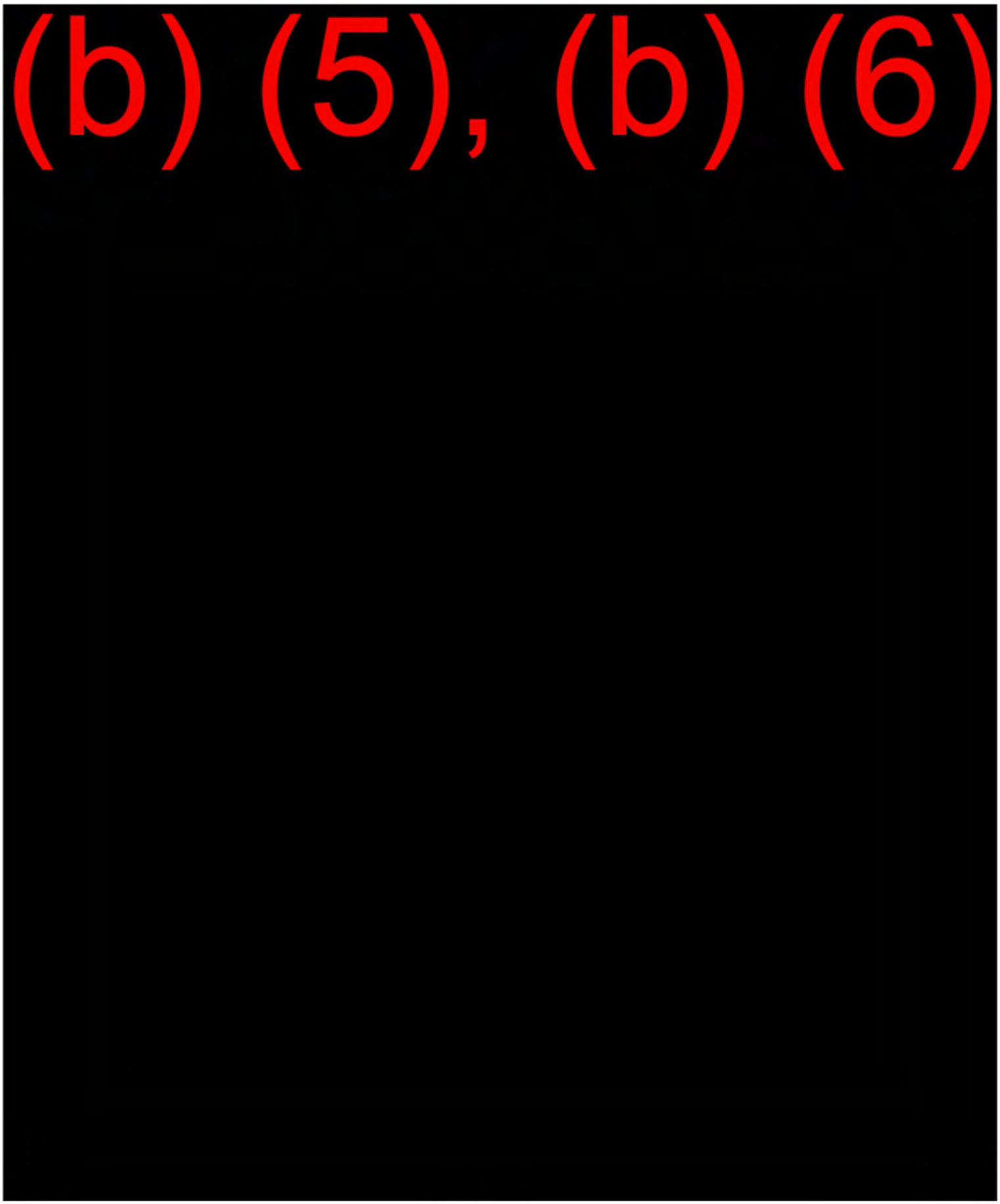
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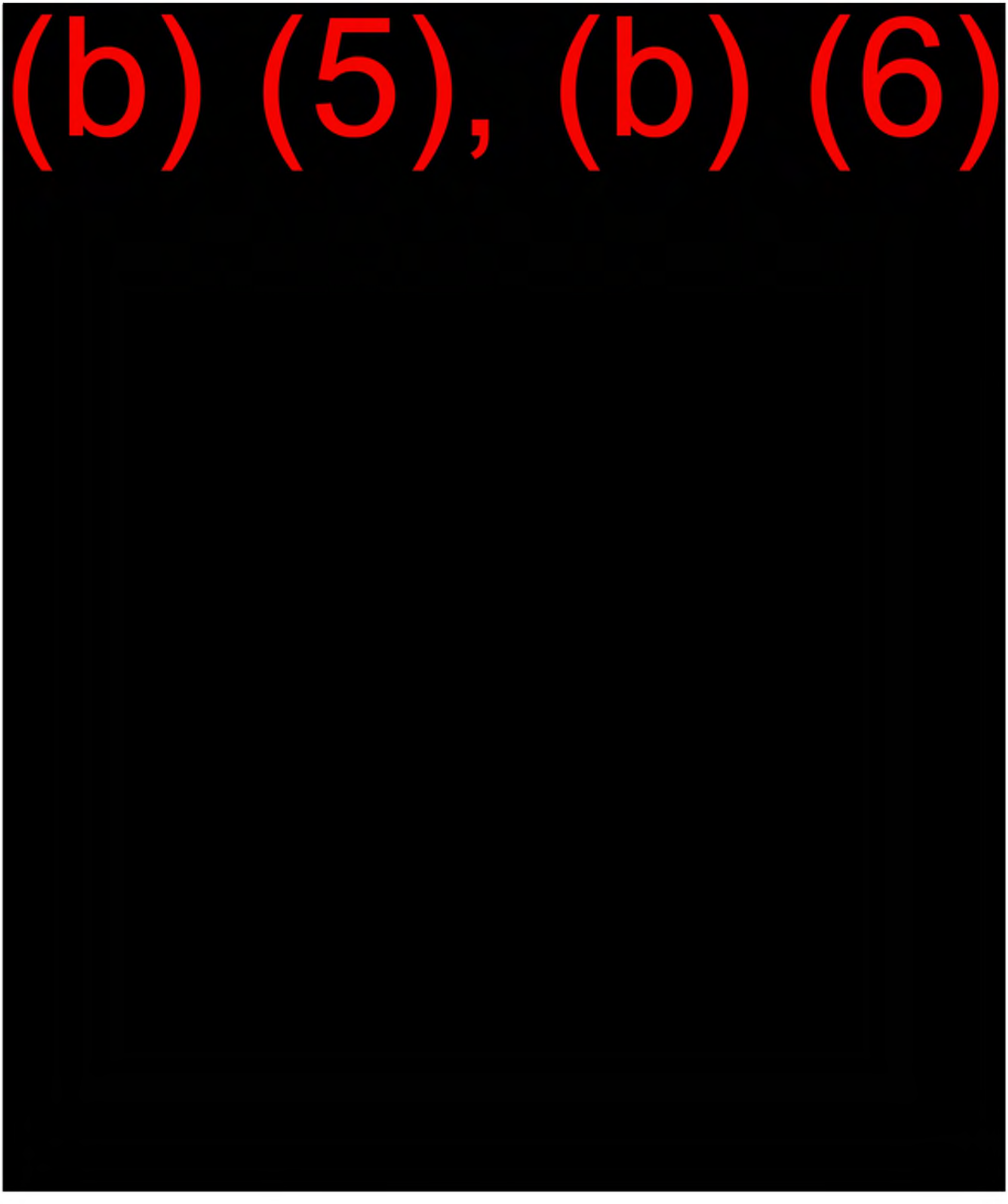
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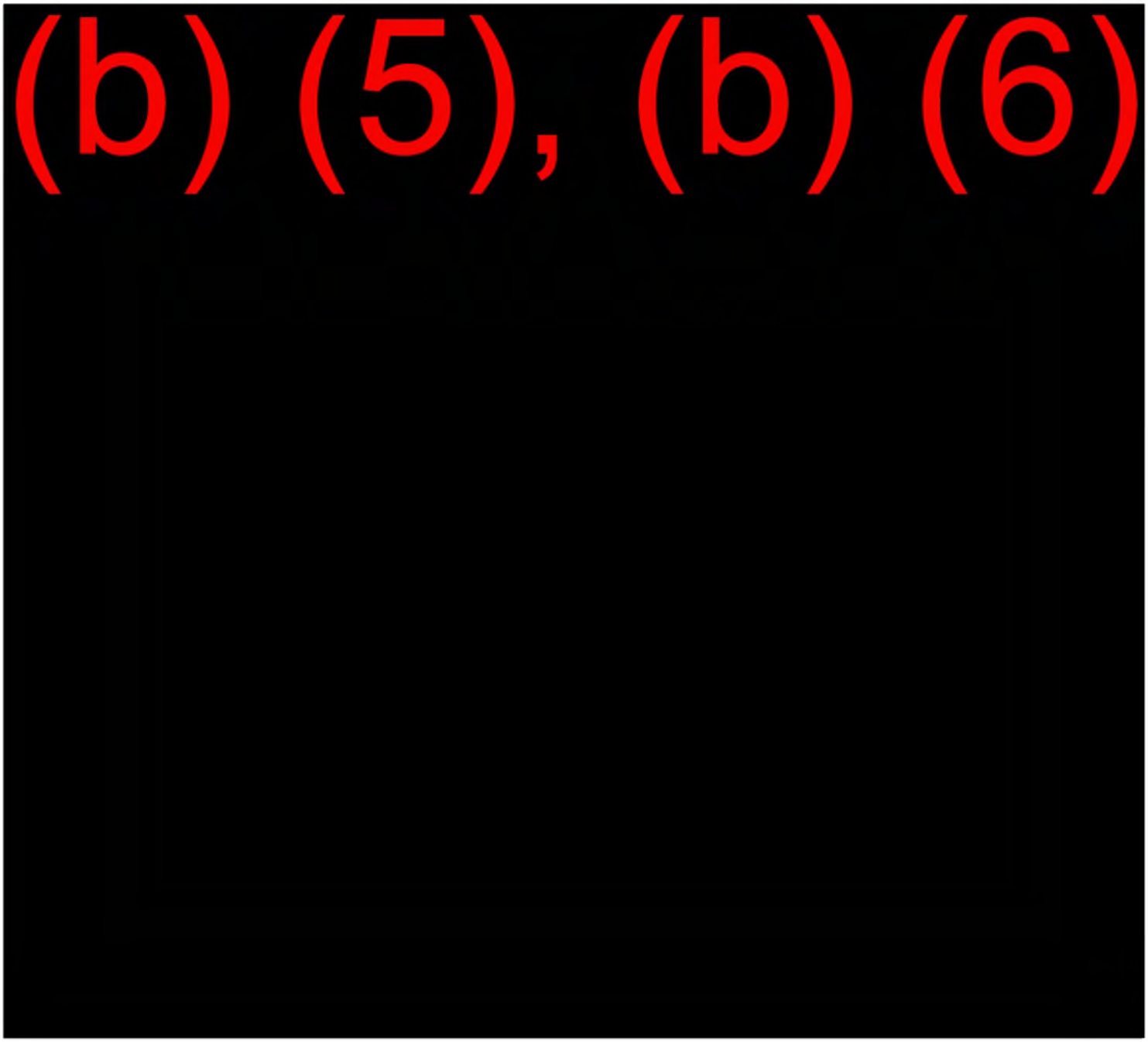

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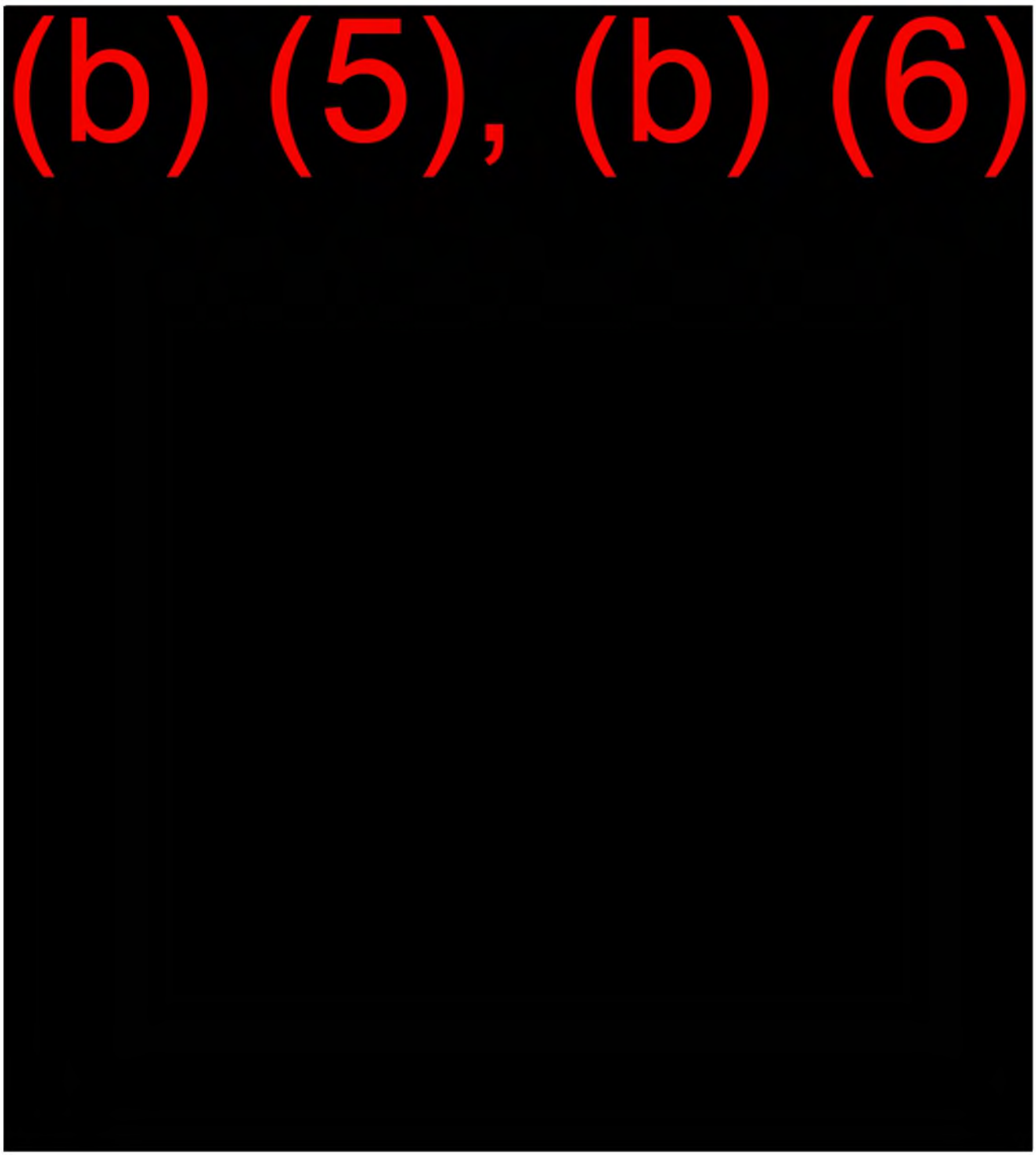

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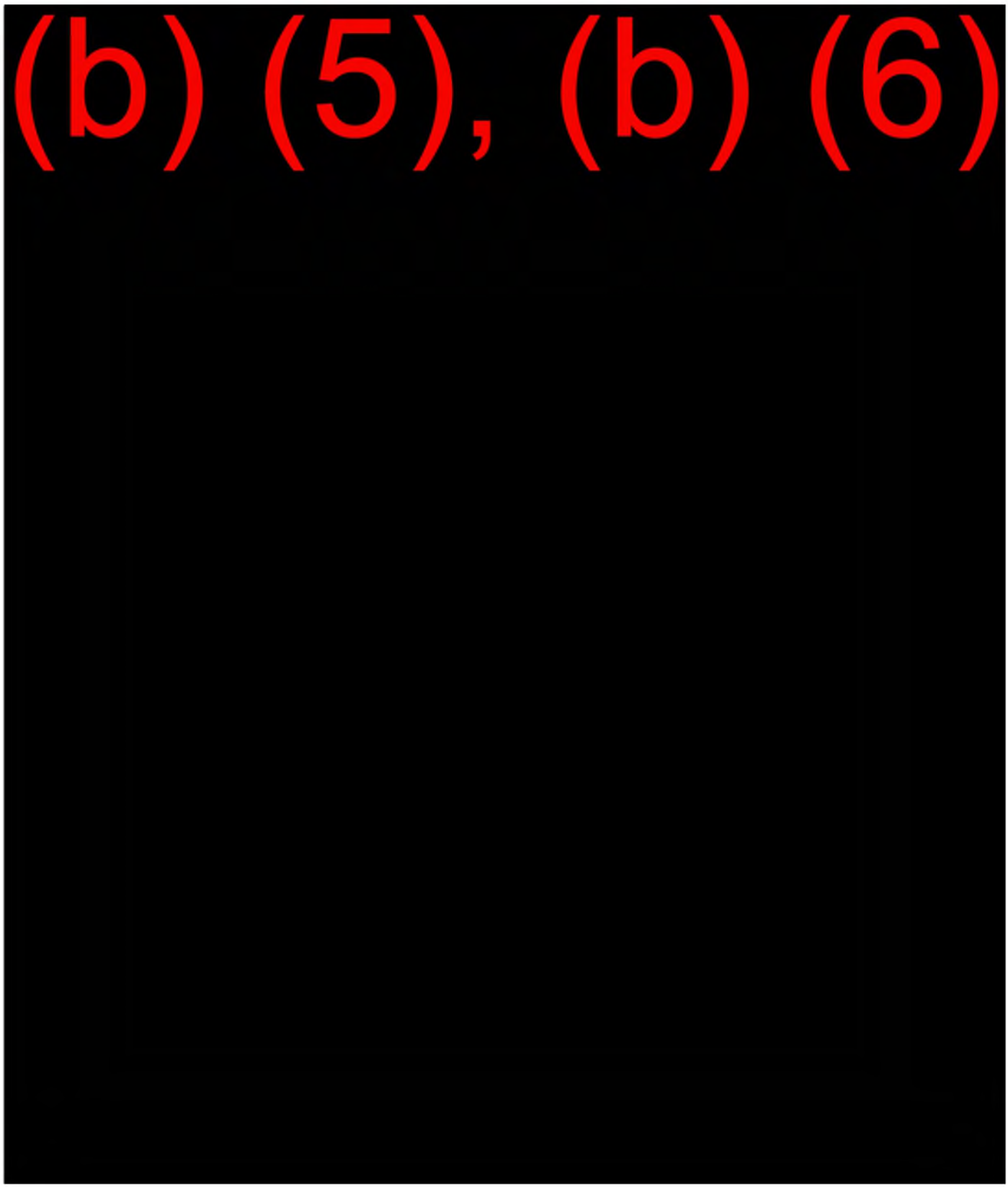

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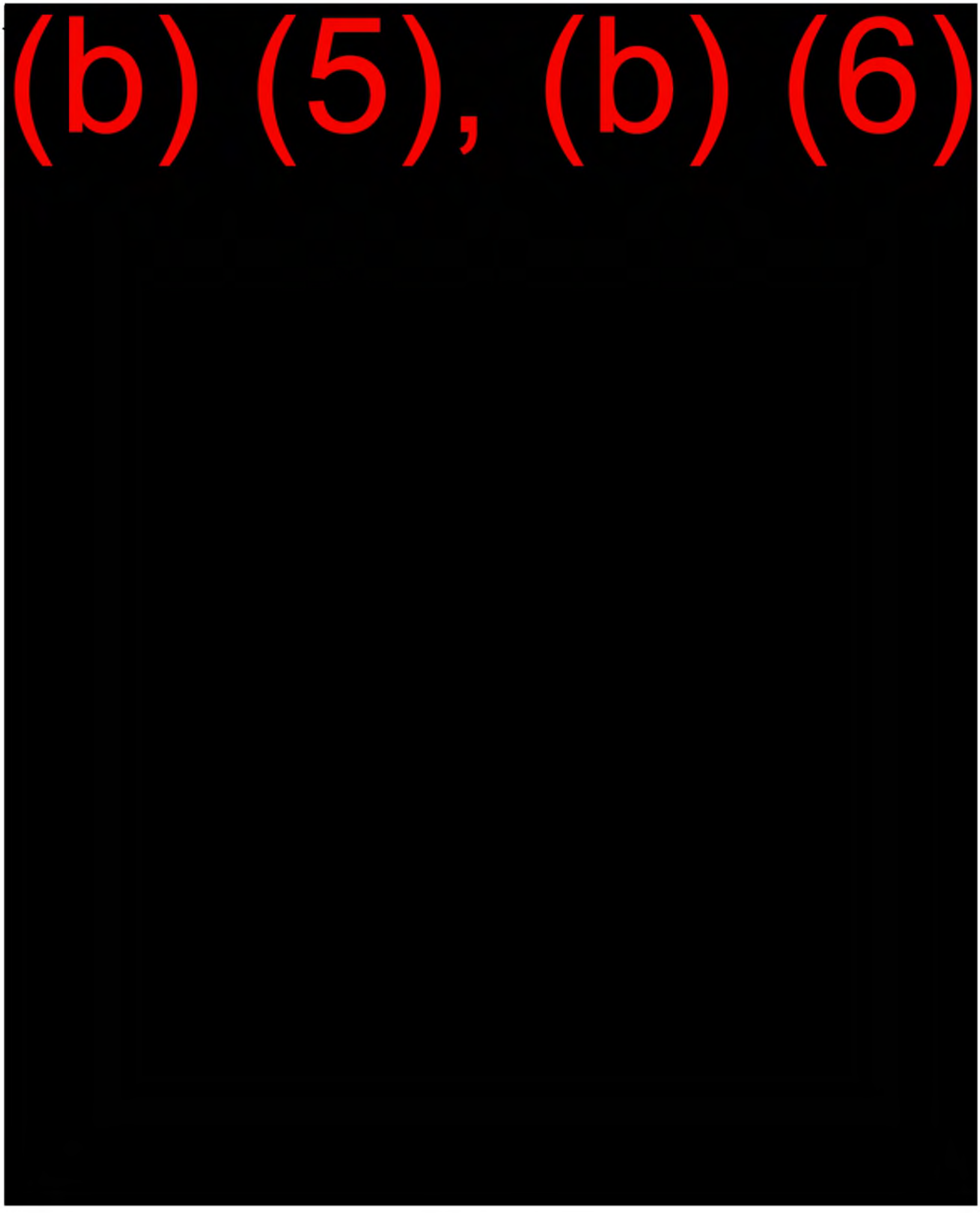
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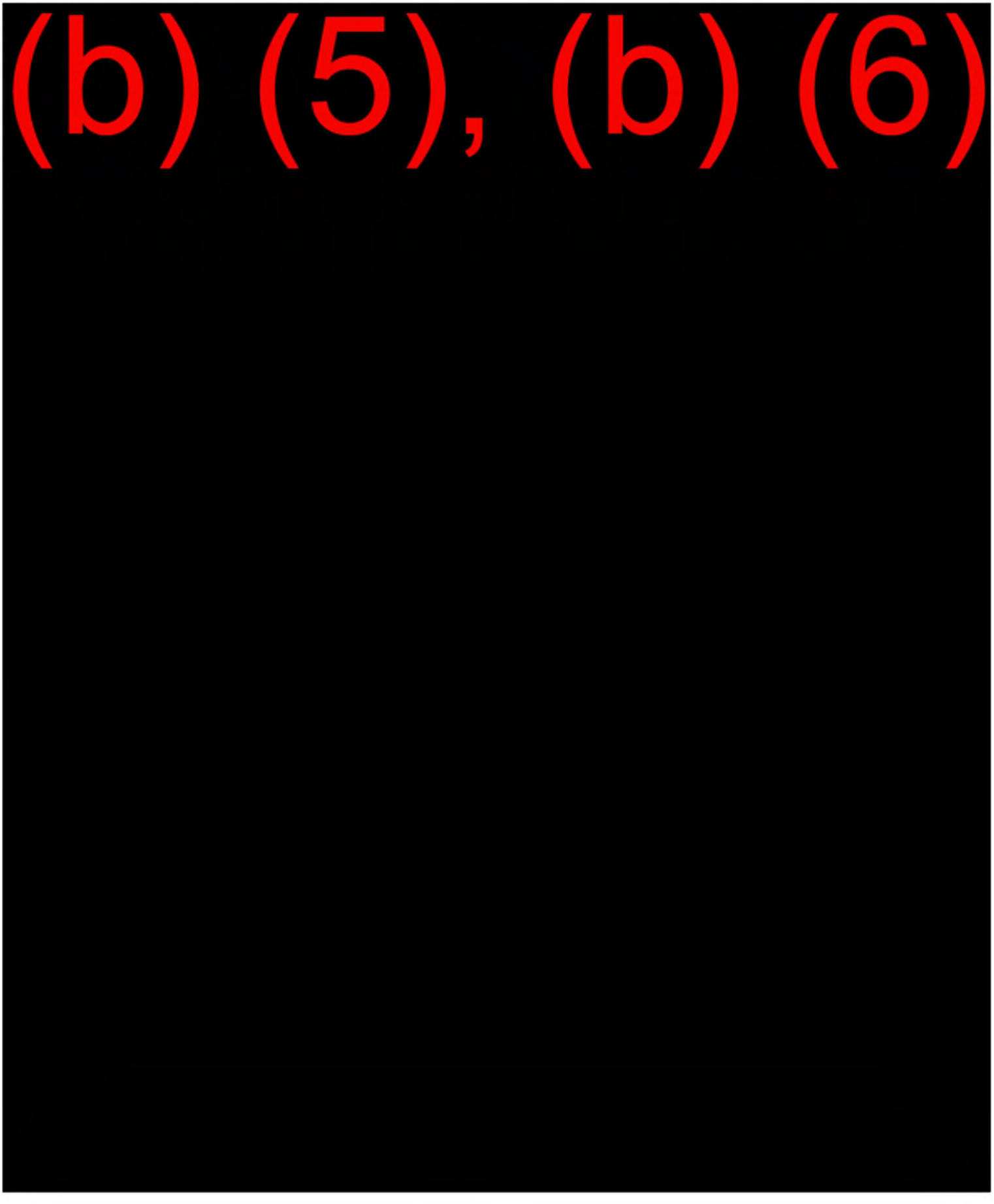
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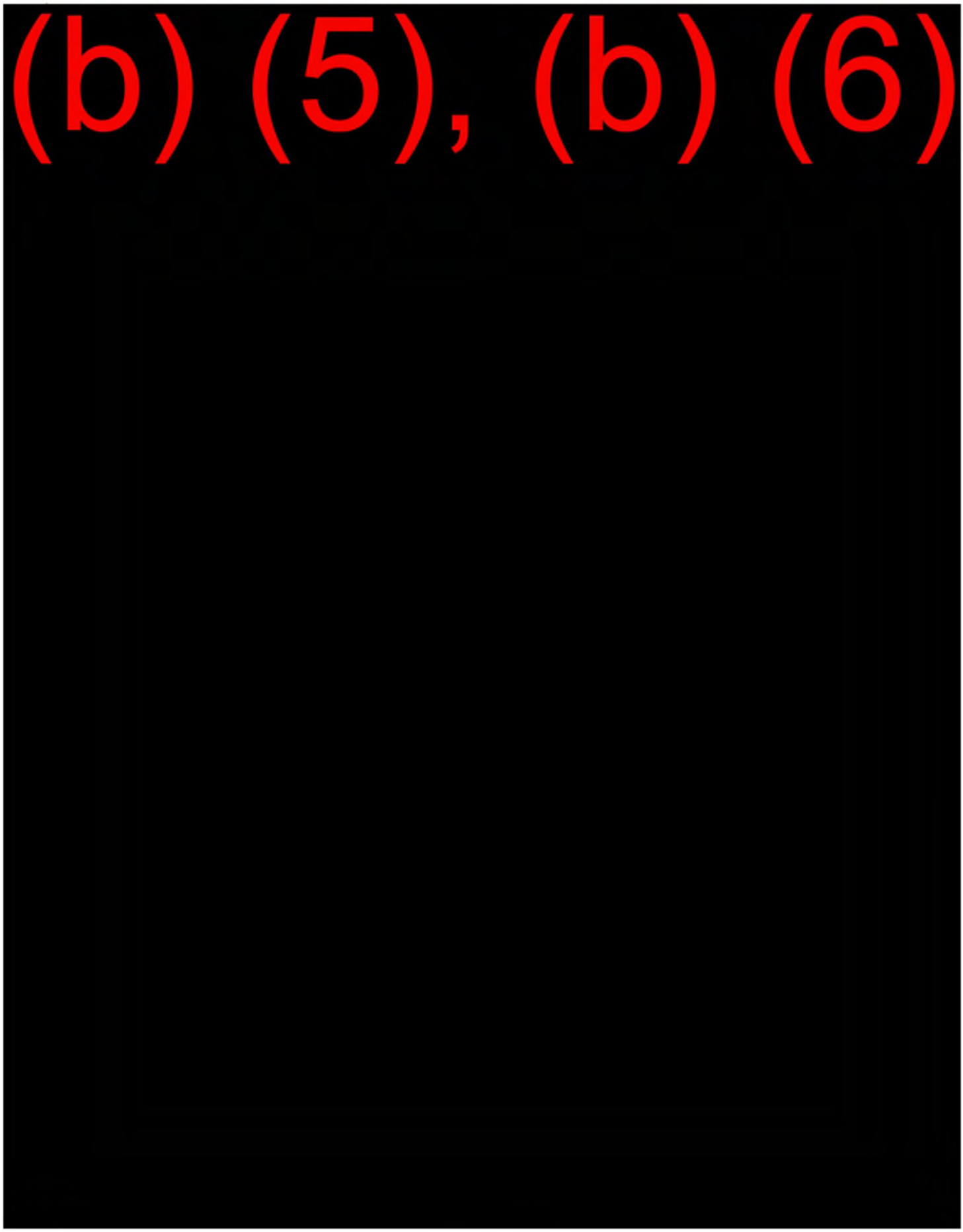
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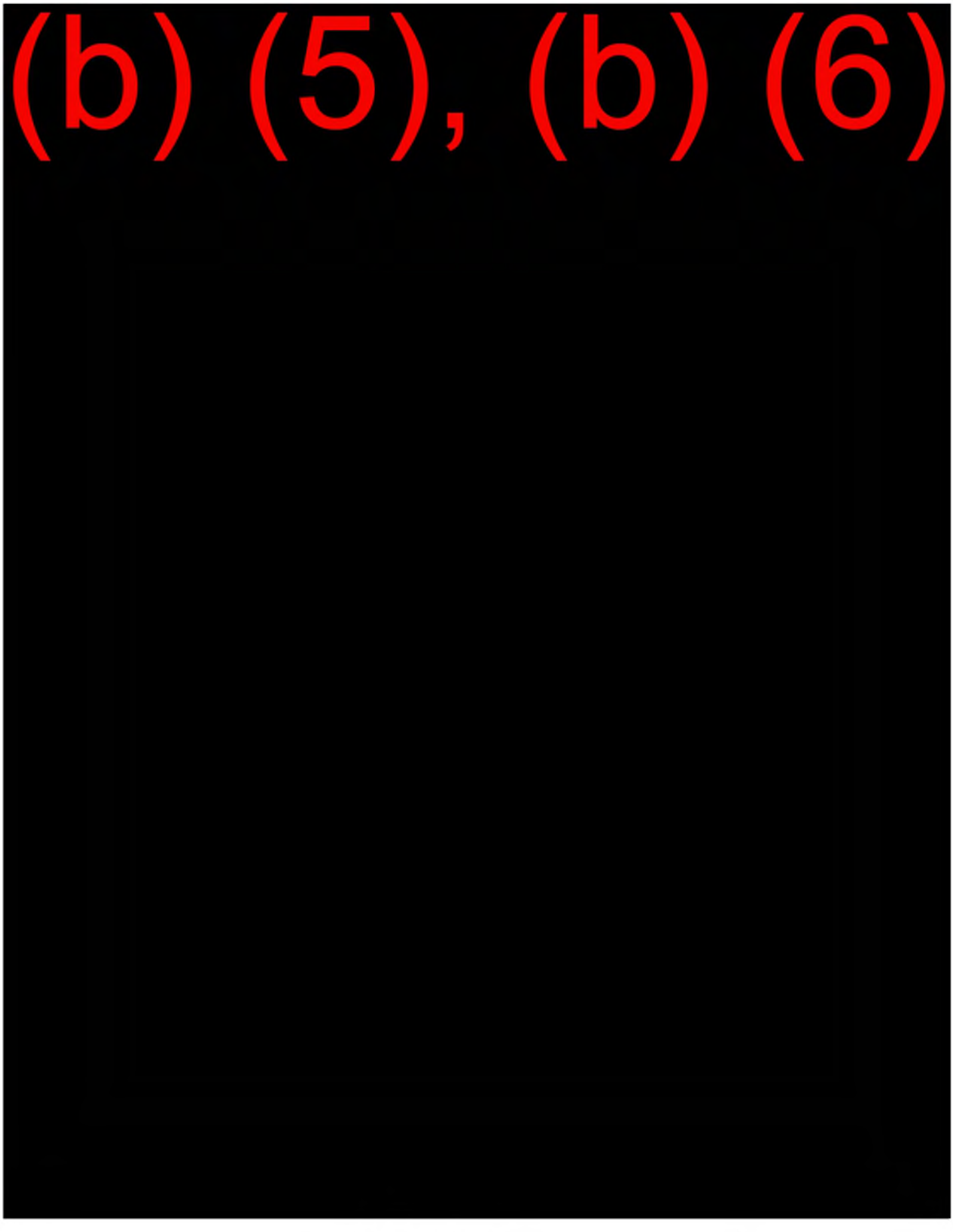
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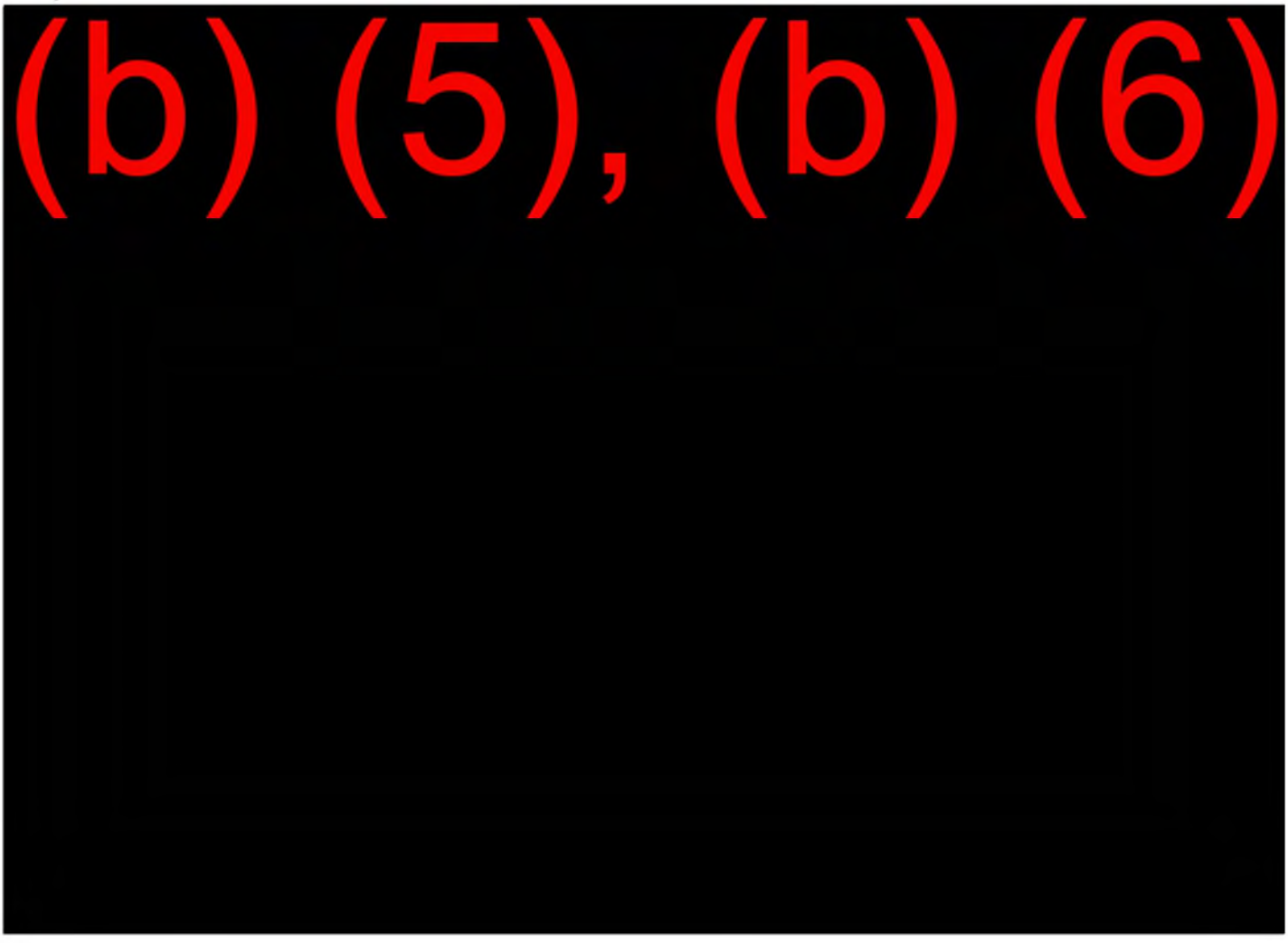
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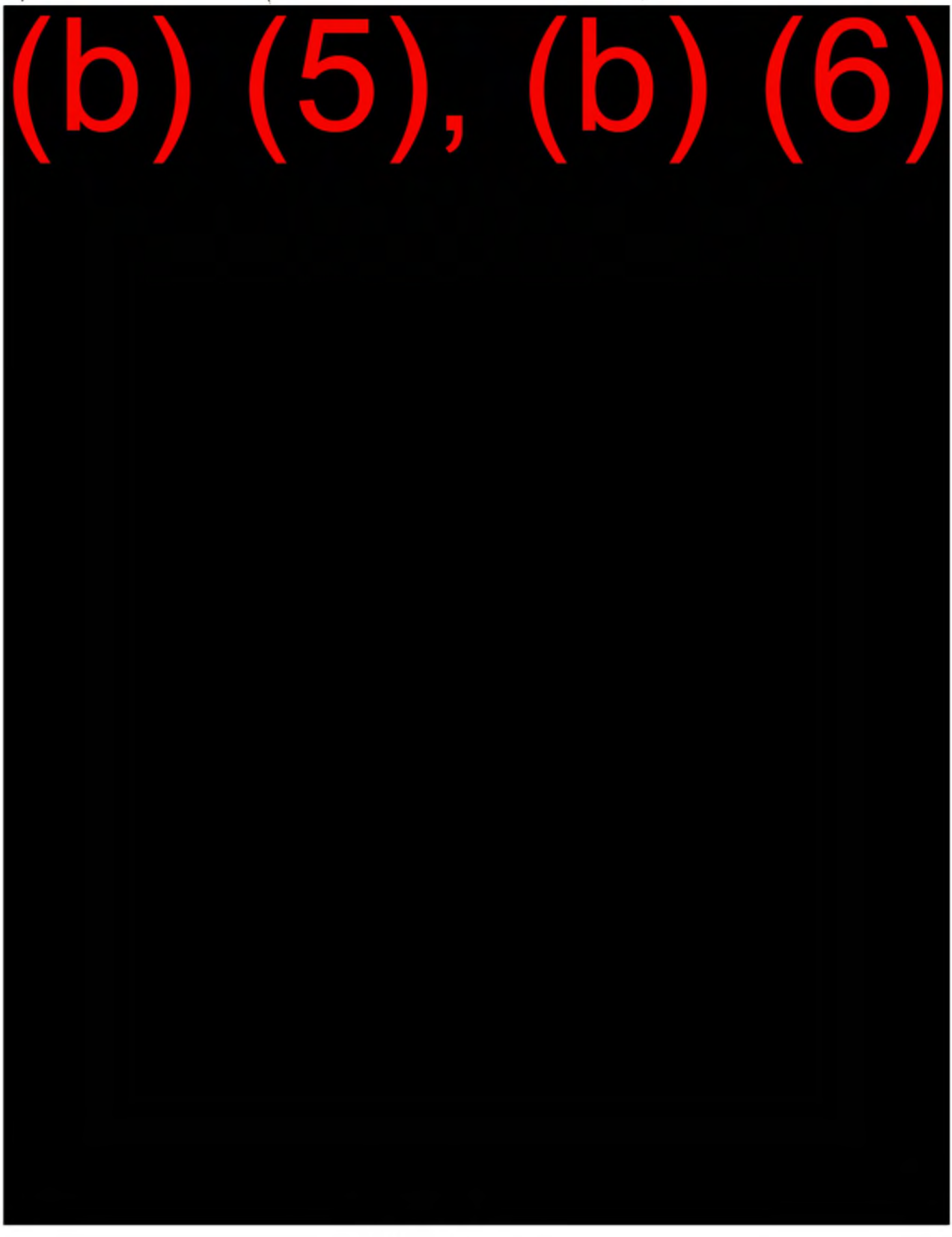
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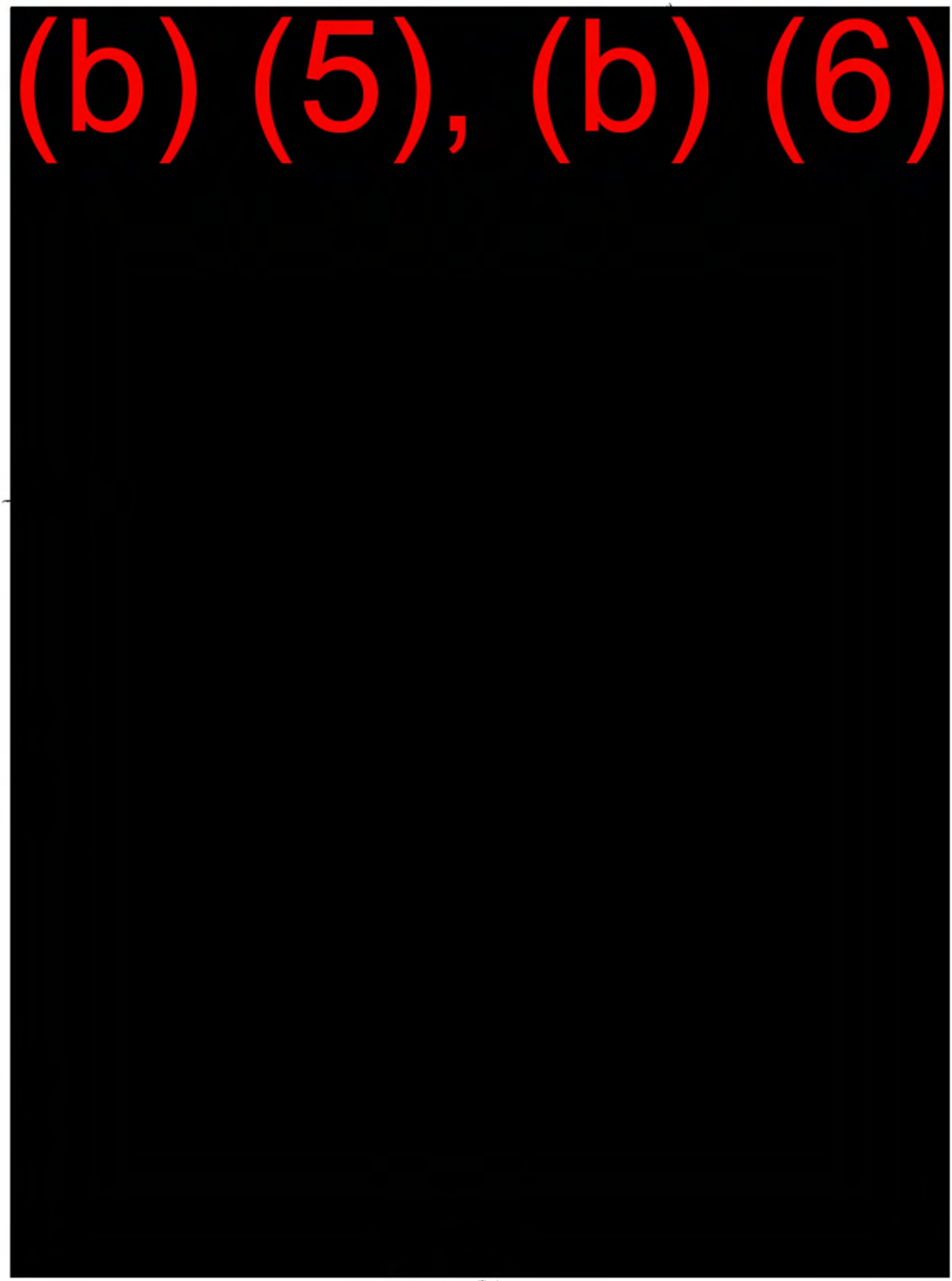
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TAB N

TRANSCRIPTS OF RECORDED COMMUNICATIONS

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COMBINED TRANSCRIPTS

Date and Time Transcript Accomplished: 20 Jan 1999.

Person Supervising Transcript Preparation: [redacted] German Air Force, Deputy Chief ATC Branch, Airfield Services Squadron, Geilenkirchen Air Base, GE.

Subject: KC-135E, S/N 59-1452, 13 January, 1999 mishap at Geilenkirchen AB Germany

Identity of Recording Facility: Geilenkirchen Tower

List of Facilities and Controller Position, and Abbreviations for Each:
Local Air Traffic Control-Dusseldorf ATC (DDF)
Radar Approach Control- Frisbee Radar (APP)
Geilenkirchen Tower- Frisbee Tower position A (TWRA)
Geilenkirchen Tower- Frisbee Tower position B (TWRB)
Fire Truck (Crash 6, Crash 8)
Military Police (IMP)
Job Control (JOB)
Command Post (OWCP)

Mishap Aircraft Call Sign: [redacted]

Frequency, Landline, or Position Being Recorded:
143.400 MHz: Radar Approach Control Officer, Tower Position A and Tower Position B
Land Line: ATC Dusseldorf, Frisbee Radar, Frisbee Tower, Medical Squadron, Command Post
Crash Phone Net: Frisbee Tower, Military Police, Fire Trucks and Job Control

Date and Time Covered by the Transcript: 13 January, 1999 / 1906Z -1940Z

Source of Time Entries: Time code embedded on all recorded tape tracks with time source from master clock at Frankfurt GE.

1. Radio transmissions
2. *Telephone conversations*
3. **Crash Phone**

19:06:48	[redacted]	Magic Command, [redacted]
19:06:50	OWCP	[redacted], Magic Command, go
19:06:51	[redacted]	We have an off-load report for you
19:06:55	OWCP	And Magic Command is ready to copy
19:06:56	[redacted]	Roger, NATO 14 was on the boom at 1714, off the boom at 1850, 20,000 pounds, off-load and [redacted] will be back at Geilenkirchen at 1940Z

19:07:15	OWCP	And that is copied and do you have a maintenance code or nothing?
19:07:20	[redacted]	No maintenance code, airplane's fine, thank you.
19:07:25	OWCP	I copy that and we'll warn your ground crew so they can pick you up.
19:07:28	[redacted]	Thank you sir
19:07:50	*Guard Mx*	*Guard, Maintenance*
19:07:51	*OWCP*	*Hey, good evening, Command Post*
19:07:53	*Guard Mx*	*Hello*
19:07:55	*OWCP*	*Just got a call from your aircraft and they will be down in approximately 25 minutes.*
19:07:59	*Guard Mx*	*Very good*
19:08:00	*OWCP*	*No maintenance codes so...*
19:08:02	*Guard Mx*	*It sounds good*
19:08:03	*OWCP*	*Sounds great huh*
19:08:05	*Guard Mx*	*OK*
19:08:06	*OWCP*	*OK, bye bye*
19:08:08	*Guard Mx*	*Thanks a bunch*
19:08:20	*TWR*	*Tower*
19:08:21	*OWCP*	*Ah, Good evening, only for your information, the tanker will be on the ground in 25 minutes.*
19:08:29	*TWR*	*25 minutes? Thank you*
19:30	*APP*	*Frisbee*
	DDF	*Dusseldorf, transfer* [redacted]
	APP	[redacted]*jou, ... ja go ahead.*
	DDF	*2 miles southeast of Bruggen, heading is one-three-zero out of ten for three for the ILS*
	APP	*Ja, he is in radar contact, switch him one-four-three-four*
	DDF	*Fox Sierra*
	APP	*Sierra Echo*
19:31	*TWR*	*Yeees?*
1931	*APP*	[redacted]*radar contact, is five miles southeast of Bruggen, ah.*
19:31	*TWR*	*Check Six.*
19:31	*APP*	*Call you six.*
19:31	*TWR*	*Jou*
19:31	*APP*	*Sierra Echo*
19:31	*TWR*	*November Sierra*
19:31:13	[redacted]	Frisbee radar, [redacted] with you passing one-zero-zero for three thousand with Romeo, ILS full stop.

19:31:21	APP	[redacted], good evening, loud and clear, position is by one-three miles northeast station, turn right to a heading of one-eight-zero
19:31:32	[redacted]	Right turn one-eight-zero, [redacted]
19:31:36	APP	And 77 just to verify: You like to have a ILS for a full stop?
19:31:40	[redacted]	That is correct, [redacted]
19:31:43	APP	Roger, so expect ILS two-seven and Romeo is correct, just to verify: altimeter is two-nine-seven-four.
19:31:51	[redacted]	Two-nine-seven-four with Romeo, [redacted]
19:31:58	APP	And 77 see you coming out of nine, you have about one-eight miles to travel to touchdown, you take a straight-in or you like to extend a little for descent?
19:32:07	[redacted]	Sir, we can take it straight in, [redacted]
19:32:10	APP	Roger that, so keep descending to two point five
19:32:14	[redacted]	Down to two point five, [redacted]
19:32:16	APP	Correct
19:32:47	APP	And 77 in case of a missed approach follow the published missed approach procedure, before getting radar vectors again.
19:32:54	[redacted]	[redacted], Wilco
19:33:10	APP	[redacted] keep descending and make it right heading two-five-zero initially.
19:33:16	[redacted]	Two-five-zero, [redacted]
19:33:19	APP	That's correct. About one-four miles to travel, heading will lead you to the ILS, report established next.
19:33:26	[redacted]	Will report established
19:34:51	APP	And [redacted], traveling distance is 8 miles, you still make it?
19:34:57	[redacted]	[redacted], Wilco
19:35:11	[redacted]	And [redacted] is established, Sir
19:35:14	APP	77 roger cleared the ILS two-seven and winds around two-one to two-five-zero degrees, ten to twelve knots, no severe gusts observed.
19:35:20	*TWR*	*Tower*
19:35:22	*APP*	[redacted] *six and a half to land*
19:35:25	[redacted]	[redacted]
19:35:27	APP	… and the flashlight system is in operation advise any time you like it off
19:35:27	*TWR*	*Cleared to land*
19:35:28	*APP*	*Sierra Echo*
19:35:29	*TWR*	*Ja*
19:35:32	[redacted]	[redacted] Wilco
19:35:36	APP	And 77 is cleared to land.

19:35:38	[redacted]	Cleared to land, [redacted]
19:36:19	*APP*	*Go ahead.*
19:36:20	*TWR*	*If you need the flashers we'd have to switch them on.*
19:36:22	APP	77 see you joining the glide-path, continue, and the wind keeps shifting between two-one and two-four-zero degrees at ten knots, no gusts.
19:36:23	*APP*	*Ok*
19:36:24	*TWR*	*Ja*
19:36:25	*APP*	*Sierra Echo*
19:36:31	[redacted]	[redacted] thank you
19:37:28	APP	No need to acknowledge: winds now between two-three and two-five-zero degrees, at ten to twelve knots.
19:38:16	APP	[redacted] when safe on the deck rolling, over to TOWER one-four-zero-zero-seven, good night.
19:38:29	[redacted]	[redacted] on the go.
19:38:35	APP	Understand "on the go" or "on the ground"
19:38:52	*APP*	*Is he going around?*
19:38:54	*TWR*	*There's fire coming out anyway...and how.*
19:38:58	*TWR*	*Where? Oh shit...Push*
19:39:00	*TWR*	*in background: 77 radar? He's crashing! Push, he's crashing! (Radio voice of the ASR controller)*
19:39:02		**Crash phone activated**
19:39:03	APP	77, Radar....?
19:39:05	*TWR*	*He's crashing*
19:39:05	**Background**	**Oh, over there somethings come down. An aircraft. Oh, we have a crash. There's a crash.**
19:39:07	*APP*	*Ja, okay*
19:39:10	APP	77, Radar...?
19:39:13	**Background**	**Oh, shit!**
19:39:14	**TWR**	**Emergency, emergency, all stations...(unreadable) to the TWR please. Aircraft crash northwest, ah, the base in the vicinity of Geilenkirchen, aircraft crashed out of an altitude fifteen hundred or two thousand feet into the woods near of Schinveld. All vehicles, more out immediately.**
19:39:29	**TWR**	**Who needs further information on this line?**
19:39:55	**IMP**	**IMP!**
19:40	**TWR**	**Die IMP, ok ahm you have to disregard short, IMP, I call you back later.**
19:40	**JOB**	**Job Control needs information on the destination of the crash.**
19:40	**TWR**	**The destination of the crash. The aircraft crashed out of an**

		altitude…Is one of our KC 35, 4 people were on board. The aircraft did a low approach and crashed out of an altitude about fifteen hundred feet. The crash position is northwest of the field about two or three kilometers.
19:40	**JOB**	**Two to three kilometers, Roger**
19:40	**TWR**	**Affirmative.**
19:40	**JOB**	**That!**
19:40	**TWR**	**Might be just outside of the base.**

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USAF MISHAP REPORT
INDEX TAB

A

A	AF Form 711 - USAF Mishap Report
B	Preliminary Message Report
C	AF Form 711B - Aircraft Flight Mishap Report
D	AF Form 711C - Aircraft Maintenance and Materiel Report
E	Blank
F	Blank
G	Flight and Personnel Records
H	AFTO Form 781 Series
I	Product Quality Deficiency Report
J	Technical or Engineering Evaluations of Materiel (DoD)
K	DD Form 175, Military Flight Plan
L	DD Form 365-4, Form F, Weight and Balance Clearance Transport/Tactical
M	Certificate of Damage
N	Transcripts of Recorded Communications
O	Additional Substantiating Data or Reports
P	Statement of Damage to Private Property
Q	Orders Appointing Safety Investigation Board
R	Diagrams
S	Photographs

T	Individual Flight Records and Orders	T
U	Aircraft Maintenance Records	U
V	Witnesses Testimony and Statements	V
W	Weather Observations	W
X	Statements of Injury or Death	X
Y	Documents Appointing Accident Investigation Officer and Technical Advisors	Y
Z	Photographs Not Included in Part 1 of Safety Mishap Report	Z
AA	Flight Documents	AA
BB	Government Documents and Regulations	BB
CC	Air National Guard Documentation	CC
DD	Evaluations and Analyses	DD
EE	Medical Clearances	EE
FF	Toxicology Reports	FF
GG	KC-135 Stabilizer Studies	GG