



**U.S. Department of Energy
Technical Qualification Program**

***OAK RIDGE OPERATIONS OFFICE
DEFENSE NUCLEAR FACILITIES***

Study Guide

Review Exercise

**Developed by the
OAK RIDGE OPERATIONS OFFICE
TRAINING AND DEVELOPMENT DIVISION**

**AUGUST 1997
REVISION 0**

ATTACHMENT — Review Exercise

The reader is encouraged to use this review tool and refer to the guide as needed to determine the correctness of responses. A review key may be obtained by contacting ORO Training and Development Division.

Y-12 — Oak Ridge, Tennessee

1.1 List the ten programmatic elements that utilize the Y-12 defense nuclear facilities and together support national Defense Program missions. (5 points)

1.2 Place the appropriate letter in each blank to match the five Y-12 functional organizations with their corresponding organizational missions. (5.0 points)

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|--|----|---|
| ___ Disassembly and Storage Organization | a. | Advanced development, process development, and process support for the nuclear weapons complex. |
| ___ Depleted Uranium Operations | b. | Salvage and recycle lithium including wet chemistry processes, metal production, powder production, parts production, machining, and storage for weapon production. |
| ___ Enriched Uranium Operations | c. | The production, special production, test assemblies, disassembly, material verification/accountability, and container refurbishment and storage. |
| ___ Special Materials | d. | Manufacture weapon components from depleted uranium, depleted uranium alloys, and non-uranium metals such as steel and aluminum. |
| ___ Development Operations | e. | Process highly enriched uranium safely into usable uranium products or into forms suitable for storage. |

1.3 Describe the Chip Processing Operation performed in EUO (1.5 point).

1.4 Explain the three major categories for safety risks to workers and the public resulting from operations at Y-12 EUO facilities. (3.0 points)

Senior Technical Safety Managers only

1.5 List six Y-12 waste treatment facilities used to process Y-12 waste. (1.5 points)

East Tennessee Technology Park — Oak Ridge, Tennessee

1.1 Name the seven ETP defense nuclear facilities. (3.5 points)

1.2 Describe the types of materials stored in the HEU facilities at ETP. (2.0 points)

1.3 The safety risks to ETTP workers from the storage of radioactive materials comes from what three groups of material? (1.5 points)

1.4 List the three primary safety systems and features used in UF₆ storage yards for preventing or mitigating operational accidents. (1.5 points)

Senior Technical Safety Managers only

- 1.5 Characterize the waste streams from ETP Decontamination Facility K-1420. (2.0 points)

Oak Ridge National Laboratory — Oak Ridge, Tennessee

1.1 List the ORNL defense nuclear facilities and their corresponding mission(s). (3.0 points)

1.2 List the primary safety systems and features of the MVSTs for preventing or mitigating operational accidents. (1.5 point)

1.3 Sketch and label the process flow path for the MVSTs. (5.0 points)

Senior Technical Safety Managers only

- 1.4 Characterize the waste processed by the LLLW Solidification Facility (Building 7877) and the function of the process facility operations. (2.0 points)

Paducah Gaseous Diffusion Plant — Paducah, Kentucky

- 1.1 Complete the following: The PGDP defense nuclear facilities consist of _____ yards (0.5 point) and _____ and _____ storage building (0.5 point).
- 1.2 Other than cylinder storage, list four operations performed PGDP in the storage yards (1.0 point).

1.3 Explain the major safety risks to workers and the public resulting from UF_6 at gaseous diffusion plants (2.5 points).

1.4 The _____ is designed to detect gamma radiation levels that would result from the minimum criticality accidents of concern at PGDP (1.0 point).

Senior Technical Safety Managers only

- 1.5 Select from the list below DOE's largest LLW contributor at PGDP. (1.0 point)
- a. Operation of the gaseous diffusion plant and ancillary systems.
 - b. Abandoned-in-place equipment no longer critical to the site's mission.
 - c. Construction/ demolition rubble such as dirt, concrete, and gravel generated primarily by environmental restoration and D&D activities.
 - d. Legacy waste from operation of the Paducah molten metal reactor.

Portsmouth Gaseous Diffusion Plant — Portsmouth, Ohio

1.1 Place the appropriate letter in each blank to match the seven PORTS defense nuclear facilities with their corresponding facility mission. (3.5 points)

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|-----|---|----|--|
| ___ | Storage Cage X-326L | a. | Houses areas for the storage of SNM containers, handling, sampling, and weighing of in-process Category I SNM, a high-assay sampling area (inactive), and ancillary areas. |
| ___ | Special Nuclear Material Storage X-345 | b. | Storage for contaminated cascade trapping materials (alumina and sodium fluoride), contaminated solid scrap [metals, oil absorbent (Sorbol) from the process buildings], and uranium oxide and nitrates (from the X-705 decontamination processes and off-site sources). |
| ___ | Oxide Conversion Area X-705E | c. | Store miscellaneous equipment and materials, including various hazardous or contaminated materials in drums, crates, cars, trailers, and mobile tankers. |
| ___ | Bulk Non-UESA Storage Building X744G | d. | RCRA waste storage facility and includes areas for unloading, sampling, and staging areas for wastes prior to shipping. |
| ___ | UF ₆ Cylinder Storage Yards X-745-C, E | e. | Storage unit for hazardous waste such as high-assay uranium-bearing materials, asphyxiants, mixed wastes, technetium-bearing material, asbestos, and PCBs. |
| ___ | Recycle and Assembly Building X-7725 | f. | Temporary and long-term storage of cylinders filled with solid UF ₆ . |
| ___ | Recycle/Assembly Storage Yard X-7745R | g. | Served as an oxide conversion facility from 1967 until 1978. |

- 1.2 Fill in the blanks. Concerning PORTS downblending activities, the HEU feed rate is controlled to ensure that there is no more than _____ kg of ^{235}U in _____ wt % ^{235}U enriched uranium in _____ components of the system during routine operations. (2.0 points)
- 1.3 Describe three material access area (MAA) access controls used to protect workers and safeguard SNM at PORTS. (1.5 point)

- 1.4 Complete the following: CAAS detects _____, provides a distinctive, _____ signal that will alert personnel to _____ the areas that are potentially affected, and provide sufficient information to a central remote location for initiation of emergency response activities.

Senior Technical Safety Managers only

1.5 List the three principal sources of low-assay LLW generated at PORTS. (1.5 points)

1.6 Match the following wastes to the PORTS originating source. **Not all** originating sources on the right necessarily apply. (1.5 points)

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|---|---|
| ___ Waste contaminated with ^{99}Tc / greater-than-class C LLW | a. Generated at PORTS by fabrication and maintenance activities, major equipment repair, metal machining, welding, instrument repair, field maintenance, and environmental restoration. |
| ___ Mixed hazardous wastes | b. Coolant from high temperature gas-cooled reactor |
| ___ Liquid mixed radioactive wastes | c. Spent ion exchange resins |
| | d. Spent solvents, sludges, discarded commercial chemicals, PCB-contaminated wastes, and metal machining and cutting fluids from fabrication, maintenance operations, and chemical operations |
| | e. Nitric acid and aluminum nitrate aqueous streams from the EU recovery operations in the 9212 complex |

1.7 List the six major sources of hazardous wastes are generated at PORTS (3.0 points)