



Australian Government

Assessment Requirements for MSL975041

Perform fire assay techniques

Release: 1

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Modification History

Release	Comments
Release 1	This version was released in <i>MSL Laboratory Operations Training Package Release 2.0</i>. Supersedes and equivalent to MSL975010 Perform fire assay techniques. Conditional/optional prerequisite removed – code retained. Foundation skill information added. Range of conditions removed. Assessment requirements amended.

Performance Evidence

There must be evidence the candidate has completed the tasks outlined in the elements and performance criteria of this unit, and:

- safely performed fire assay techniques to extract a range of precious metals from 3 different host matrices in readiness for analysis, including:
 - maintaining sequential control of samples through all recovery stages
 - optimising work flow to ensure efficiency of recovery for multiple client samples
 - recognising and identifying the cause of non-acceptable received and fused samples, buttons and prills
 - keeping accurate and complete records, including:
 - pour sheets (date, time, client, pour number and preparation method)
 - number of pots, positions of sample, blank and check in rack
 - adjustments made to standard preparation methods for specific samples
 - analytical method
 - assay data.

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- chemical and physical principles relating to:
 - fusion of mineral ores
 - cupellation
 - parting and digestion processes
- expected physical and chemical properties of materials at each recovery stage

- standard methods for the fire assay of a range of precious metal ores relevant to job role
- criteria for an 'acceptable' button, including:
 - one piece, mass >20g and <50g
 - malleable
 - separates cleanly from slag
 - free of undecomposed ore, matte and speiss
- causes of contamination, including:
 - poorly made cupels
 - base metals (copper (Cu), nickel (Ni), zinc (Zn) and bismuth (Bi))
 - arsenic (As), sulphur (S), antimony (Sb), selenium (Se), tellurium (Te) and chromium (Cr)
 - scoria
 - sprouting
- indicators of potential loss and the corrective actions, including:
 - viscous slag (check furnace temperature, adjust flux and lower charge weight)
 - lead shotting (adjust flux and lower charge weight to compensate for high oxides, silicates and chromites)
 - sulphides (adjust fusion time and adjust sample weight and/or flux)
 - matte, speiss (adjust sample weight and flux)
 - incomplete fusion (adjust sample weight and/or flux)
 - unacceptable button (adjust sample weight and/or flux)
 - inquartation (add 3 parts silver (Ag) to prill, wrap in lead foil and re-cupel)
- typical samples:
 - solids, such as rocks, minerals, soils, sands and stream sediments
 - core and other drill samples, such as rotary air blast (RAB), reverse circulation (RC) and aircore
 - slurries, powder concentrates and metallurgical solutions
 - dump samples and grab samples
- common fluxes:
 - bulk fluxes containing PbO, borax, soda ash, silica, silver nitrate and flour
 - non-standard flux additives such as:
 - flour (oxidising samples)
 - nitre (reducing samples, sulphides)
 - silica (basic ores)
 - PbO (siliceous ores)
 - exotic additives, such as calcium fluoride (CaF₂) (refractory ores)
 - nickel sulphide (NiS), nickel carbonate (NiCO₃), sulphur, borax and soda ash
- methods to sequence pots in a rack:
 - addition of silver wire
 - addition of coloured salts, such as copper (Cu)

- position of reagent blanks, standards and check samples
- common waste produced through recovery
- principles and purpose of test methods implemented (why they are used and what they demonstrate)
- technological advances that include automation
- awareness of environmental sustainability issues as they relate to the work task
- legal, ethical and work health and safety (WHS) requirements specific to the work task including traceability, confidentiality and security requirements of all client information, and laboratory data and records.

Assessment Conditions

Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions and contingencies. The following conditions must be met for this unit:

- use of suitable facilities, equipment and resources, including:
 - client requests/documentation, including client profile, sample identification, sample receipt, storage and analyses, and required preparation method
 - a variety of precious metal ore samples
 - fire assay methods, examples of assay records, equipment, materials and reagents
 - assay equipment, including:
 - mixing equipment and balances
 - fusion and muffle furnaces and associated spares
 - temperature sensors and hotplates
 - compressed air service, extraction systems and fuel supply lines
 - pots, cupels, pouring equipment, pot loader, trolleys, moulds, tongs and hammers
 - safety equipment and workplace safety procedures.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

Links

Training Package Companion Volumes -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5c63a03b-4a6b-4ae5-9560-1e3c5f462baa>