



Australian Government

MEM48011 Apply basic chemical principles to metallurgy

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MSATCM406A Apply basic chemical principles to metallurgy.

Application

This unit of competency defines the general chemical knowledge for basic metallurgy operations. It applies to metallurgists working in industrial environments such as foundries, steel plants and smelters and in areas of work such as die casting, fabrication and welding. The unit provides a basic understanding of chemical principles as applied to basic metallurgy operations.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Metallurgy

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Apply basic chemical concepts relevant to metallurgical processes	1.1 Determine the properties of elements from the periodic table of elements 1.2 Use Boyle's and Charles' laws to determine the relationship between volume, temperature and pressure for a gas 1.3 Define and provide examples of elements, compounds and mixtures 1.4 Use chemical formulae 1.5 Identify the relationship between temperature and the kinetic energy of particles
2. Contrast the physical properties of crystalline solids	2.1 Categorise solids from their physical properties 2.2 Relate the physical properties of crystalline solids to the nature of the forces between particles

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
3. Identify the key chemical properties of metals	3.1 Determine the activity of metals and other key properties in terms of their position on the Periodic Table 3.2 Determine the importance of first ionisation energy in determining the relative reactivity of metals
4. Define the key chemical properties of acids and bases	4.1 Identify acids and bases 4.2 Apply the pH scale 4.3 Define relationship between an acid and its conjugate base and a base and its conjugate acid 4.4 Identify salts which form acidic, basic or neutral solutions and explain their acidic, neutral or basic nature 4.5 Define and identify strong and weak acids and bases
5. Analyse chemical reactions	5.1 Determine chemical reactions using appropriate balanced chemical equations 5.2 Determine chemical reactions between elements and compounds in terms of atomic structures and periodicity 5.3 Determine the heat of reaction in chemical reactions 5.4 Define the factors affecting reaction rate including concentration, surface area, pressure, temperature and catalysis 5.5 Use the stoichiometry of a reaction to determine the amounts of reactants consumed or products made

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Industrial environments include one or more of the following:	• foundries • steel plants • smelters • die casting • fabrication • welding.
Crystalline solids include:	• molecular • metallic • ionic • extended covalent solids.
Physical properties of crystalline solids include one or more of the following:	• boiling point • melting point • solubility in polar or non-polar solvents • conductivity • ductility • brittleness • hardness.
Key properties of metals in terms of their position on the periodic table includes:	• electrical conductivity • ionisation energy • atomic radius • melting point • boiling point • combining power (valency) • electronegativity • reactivity.
Definitions of acids and bases include:	• Arrhenius definition • Bronsted-Lowry definition.
Strong acids include one or more of the following:	• hydrochloric acid • nitric acid • sulfuric acid • hydrobromic acid • hydroiodic acid • perchloric acid • chloric acid.
Weak acids include one or more of the following:	• formic acid • acetic acid • benzoic acid • hydrofluoric acid • phosphoric acid • sulfurous acid

	• carbonic acid • nitrous acid • hydrocyanic acid • hydrosulfuric acid • citric acid.
Strong bases include one or more of the following:	• lithium hydroxide • sodium hydroxide • potassium hydroxide • calcium hydroxide • rubidium hydroxide • strontium hydroxide • cesium hydroxide • barium hydroxide.
Weak bases include one or more of the following:	• ammonium hydroxide • aniline • ammonia • methylamine • ethylamine • aluminum hydroxide • magnesium hydroxide • pyridine • sodium bicarbonate.

Unit Mapping Information

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Links

Companion Volume implementation guides are found in VETNet - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>