Specification of Competency Standards
for the Automotive
Unit of Competency

Functional Area - Vehicle Servicing

Title	Analyze the emission test results of spark ignition internal combustion engines
Code	111771L5
Range	This unit of competency is applicable to vehicle service and inspection workshops and test laboratories. Practitioners should be able to master the combustion theory of spark ignition internal combustion engines, the constituents of exhaust emissions and their relationships with engine operating conditions for determining the acceptance of emission quality in compliance with statutory requirements and identifying the faulty components of the system.
Level	5
Credit	6 *(For Reference Only)*
Competency	**Performance Requirements** 1. Knowledge (combustion theory, natures of pollutants, emission-related engine components and the legislative requirements on exhaust emission control) • Explain the combustion theory of spark ignition internal combustion engines, their characteristics and effects on exhaust emissions. • Master the air induction and fuel metering control of spark ignition internal combustion engines and their effects on exhaust emission quality. • Master the operation, characteristics and effectiveness of various emission control components for spark ignition internal combustion engines, such as oxygen sensors, air-fuel ratio sensors (wide-band oxygen sensors), exhaust recirculating control, exhaust gas temperature and pressure sensors, lean oxides of nitrogen (NOx) catalysts, two-way and three-way catalytic converters, etc. • Master the oxygen concentration, lambda ratio and the pollutants generated during the normal or abnormal fuel oxidation process, and the relationship among them under various working and operating conditions of the engine. • Comprehend the legislative requirements on the exhaust emission standards of various exhaust pollutants set by the local authority concerned, such as the Environmental Protection Department, Transport Department, etc.

	2. Performance (exhaust emission data interpretation, faulty component identification) • Identify the correct application and maintenance of exhaust emission test equipment under defined measurement procedures. • Determine the acceptance of pollutant concentrations with respect to the pre-defined exhaust emission limits of the testing vehicle. • Interpret the exhaust emission test result and traces of pollutant concentrations, including lambda ratio (λ), concentrations of oxygen (O2), carbon monoxide (CO2), carbon dioxide (CO), hydrocarbon (HC) and oxides of nitrogen (NOx), resulting from standard emission test conditions, and draw a comprehensive conclusion of the analysis. • Identify the faulty/ageing engine and emission control components with reference to the conclusion of emission data analysis, and propose the rectification plan. • Review the exhaust emission quality after rectification for the conformity to respective emission standards, and formulate the maintenance plan for the systems concerned.
Assessment Criteria	The integrated outcome requirements of this unit of competency are that the practitioner being assessed shall prove that he/she is: • Capable of deeply understanding the operation and combustion process of spark-ignition engines, their effects on exhaust emissions, and the legislative requirements on the emission limits of various pollutant concentrations; • Capable of justifying the acceptance of the exhaust emission level of testing vehicles in accordance with the respective legislative requirements; • Capable of interpreting the exhaust emission test data and traces of pollutant concentrations for determining the faulty/ageing engine and emission control components; and • Capable of compiling the test report covering the concluded emission test result, the faulty components leading to excessive emissions and the formulated maintenance plan for improving the system reliability.
Remark	The credit value of this competency unit assumes that the practitioner has already masterly possessed extensive knowledge of automotive engine combustion and emission control technology, the legislative requirements on exhaust emissions, and the operation of spark ignition engines and associated systems.