



INSTITUTE
OF THE MOTOR
INDUSTRY

IMI QUALIFICATION



Qualification Assessment Criteria for

IMI Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance

I.D NO: 500/7055/1

IMI Level 3 Award in Hybrid Electric Vehicle Repair and Replacement

I.D NO: 500/7150/6

***Note: This guidance document is supported by a
Candidate Practical Assessment and a Candidate
Assessment Summary***

CENTRE INFORMATION

Please be aware that any **legislation** referred to in this qualification may be subject to amendment/s during the life of this qualification. Therefore IMI Approved Centres must ensure they are aware of and comply with any amendments, e.g. to health and safety legislation and employment practices.

Please be aware that **vehicle technologies** referred to in this qualification reflect current practice, but may be subject to amendment/s, updates and replacements during the life of this qualification. Therefore IMI Approved Centres must ensure they are aware of the latest developments and emerging technologies to ensure the currency of this qualification.

Please note: the relevance of the information contained in the **unit content** will vary depending upon the vehicle types being worked upon. The unit content is for guidance only and is not meant to be prescriptive.

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Requests should be made in writing and addressed to:
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Fanshaws, Brickendon, Hertford SG13 8PQ



CONTACT SHEET

Learner Name:	
Learner Registration No:	
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Please complete as appropriate:	
Witness Name:	Witness Name:
Witness Job Title:	Witness Job Title:
Witness Signature:	Witness Signature:
Witness Name:	Witness Name:
Witness Job Title:	Witness Job Title:
Witness Signature:	Witness Signature:
Assessor Name:	Assessor Name:
Assessor Signature:	Assessor Signature:
Assessor Name:	
Assessor Signature:	
Internal Verifier Name:	Internal Verifier Name:
Internal Verifier Signature:	Internal Verifier Signature:



IMI Qualifications for Hybrid Electric Vehicles

IMI Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance

Mandatory Units

Unit Ref:	Unit Title and I.D number	GLH	Unit Level	Credit Value
HT2	Automotive Internal Combustion and Electric Hybrid Technology Components and Operation (L/600/3397)	20	2	2

IMI Level 3 Award in Hybrid Electric Vehicle Repair and Replacement

Mandatory Units

Unit Ref:	Unit Title and I.D number	GLH	Unit Level	Credit Value
HT2	Automotive Internal Combustion and Electric Hybrid Technology Components and Operation (L/600/3397)	20	2	2
HT3	Automotive Internal Combustion and Electric Hybrid System Repair and Replacement (Y/600/3399)	30	3	3



UNIT REF: HT2	UNIT TITLE: AUTOMOTIVE INTERNAL COMBUSTION AND ELECTRIC HYBRID TECHNOLOGY COMPONENTS AND OPERATION
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Level: 2	Route: Knowledge
Credit Value: 2	
Guided Learning Hours: 20 hours	
Rationale: This unit introduces learners to hybrid vehicle technology including, and in particular, the safety requirements of working on vehicles fitted with high voltage hybrid technology.	

<p>LEARNING OUTCOMES</p> <p>The learner will:</p> <ol style="list-style-type: none"> 1. Know hybrid system components and operation 2. Know how to work safely on hybrid and related vehicle systems 3. Know how to carry out maintenance and repair activities when working on hybrid vehicles

LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Know hybrid system components and operation	1.1 Identify the components that make up the hybrid system 1.2 Describe the construction and function of battery modules 1.3 Describe the construction and function of hybrid motors 1.4 Describe the construction and function of associated hybrid components
2. Know how to work safely on hybrid and related vehicle systems	2.1 State safety precautions to be taken before carrying out routine maintenance 2.2 State safety precautions to be taken before carrying out any repair procedures on hybrid vehicles 2.3 Identify high voltage cabling and associated components 2.4 Describe the precautions required when working with hybrid components



Qualification Assessment Criteria

<p>3. Know how to carry out maintenance and repair activities when working on hybrid vehicles</p>	<p>3.1 Identify the possibility of the hybrid system affecting repairs on other vehicle systems</p> <p>3.2 Describe the procedures required to make safe the hybrid system before carrying out repair activities</p> <p>3.3 Describe the precautions taken prior to removing and replacing high voltage components</p> <p>3.4 Describe appropriate methods to re-instate vehicles after repairs affecting hybrid systems</p> <p>3.5 Identify additional tools and equipment required to carry out work on hybrid vehicles</p> <p>3.6 Describe how to connect an additional 12 volt power source to a hybrid vehicle</p>
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Content:

1.1.1 Identification of the components that make up the hybrid system could include:

- a. batteries
- b. motors
- c. cabling
- d. control units
- e. circuit protection

1.2.1 The construction and function of battery modules could include:

- a. types
- b. capacities
- c. housings
- d. materials
- e. connections
- f. charging process

1.3.1 The construction and function of hybrid motors could include:

- a. types
- b. connections
- c. power rating
- d. materials
- e. armatures
- f. windings

1.4.1 The construction and function of associated hybrid components could include:

- a. cabling
- b. circuit protection
- c. control units
- d. distribution units

Content:

- 2.1.1 Safety precautions to be taken before carrying out any maintenance and repair procedures on hybrid vehicles could include:
- overalls
 - gloves
 - protective footwear
 - goggles
 - precautions when using electrical equipment
 - disposal of waste materials
 - dealing with leakage
 - isolation of high voltage electrical system
- 2.2.1 Safety precautions to be taken before carrying out any repair procedures on hybrid vehicles could include:
- overalls
 - gloves
 - protective footwear
 - goggles
 - precautions when using electrical equipment
 - disposal of waste materials
 - dealing with leakage
 - isolation of high voltage electrical system
- 2.3.1 The identification of high voltage cabling and associated components could include:
- using wiring diagrams
 - wiring colour
 - wiring size
 - warning signs
 - using voltmeters correctly
- 2.4.1 The precautions required when working with hybrid components:
- awareness of highly magnetic components
 - medical conditions that may be affected by high voltage or magnetic fields
 - checking voltage prior to working near or on high voltage systems
- 3.1.1 The possibility of the hybrid system affecting repairs on other vehicle systems could include:
- connections to other systems
 - electro-magnetic interference
- 3.2.1 The procedures required to make safe the hybrid system before carrying out repair activities could include:
- identification of isolation switches
 - preparing vehicle for isolation
 - following set procedures
- 3.3.1 The precautions taken prior to removing and replacing high voltage components could include:
- check system is made safe
 - check voltage prior to starting work
 - make others aware of work being carried out
- 3.4.1 Appropriate methods to re-instate vehicles after repairs affecting hybrid systems could include:
- use of fault code readers
 - on board displays



Content: contd

3.5.1 Additional tools and equipment required to carry out work on hybrid vehicles could include

- a. hand tools
- b. code readers
- c. specialist tools
- d. electrical meters e.g voltmeter

3.6.1 How to connect an additional 12 volt power source to a hybrid vehicle could include:

- a. identification of connections
- b. correct connection methods
- c. awareness of current draw capability of vehicle
- d. use of correct cables



UNIT REF: HT3	UNIT TITLE: AUTOMOTIVE INTERNAL COMBUSTION AND ELECTRIC HYBRID SYSTEM REPAIR AND REPLACEMENT
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Level: 3	Route: Knowledge and Skills
Credit Value: 3	
Guided Learning Hours: 30	
Rationale: This unit enables learners to demonstrate, in a practical way, their knowledge of hybrid vehicle technology and repair procedures. The unit also ensures that the learner is aware of the affect that hybrid technology has on other vehicle systems.	

LEARNING OUTCOMES The learner will: <ol style="list-style-type: none"> 1. Be able to work safely 2. Be able to use information to carry out the task 3. Be able to use appropriate tools and equipment 4. Know how to carry out hybrid system repairs 5. Be able to demonstrate hybrid system repairs 6. Be able to record information and make suitable recommendations
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LEARNING OUTCOMES	ASSESSMENT CRITERIA
The Learner will:	The Learner can:
1. Be able to work safely	1.1 Use suitable personal protective equipment throughout all vehicle inspection activities. 1.2 Demonstrate that they work in a way which minimises the risk of damage to the vehicle and its systems, other people and their property
2. Be able to use information to carry out the task	2.1 Select suitable sources of technical information to support hybrid vehicle repair activities. 2.2 Use suitable sources of technical information to support hybrid vehicle repair activities.



Qualification Assessment Criteria

3. Be able to use appropriate tools and equipment	3.1 Select appropriate tools and equipment to carry out hybrid vehicle repairs 3.2 Demonstrate that equipment has been calibrated to meet manufacturers' requirements. 3.3 Use the correct tools and equipment in the correct way
4. Know how to carry out hybrid system repairs	4.1 Explain the correct procedures required when removing and replacing hybrid system vehicle components 4.2 Explain how to disconnect high voltage supplies correctly e.g batteries, capacitors
5. Be able to demonstrate hybrid system repairs	5.1 Demonstrate the correct procedures to disconnect and reconnect a high voltage battery pack 5.2 Demonstrate the correct procedures to remove and refit a hybrid system component 5.3 Demonstrate appropriate procedures to confirm repairs successfully carried out 5.4 Demonstrate the correct methods to reset vehicle systems post-repair e.g clear fault codes
6. Be able to record information and make suitable recommendations	6.1 Complete records accurately, in the format required. 6.2 Compare inspection and test results with suitable data 6.3 Make suitable recommendations based upon the results of carrying out the replacement activities.

Content:

- 1.1.1 Personal protective equipment could include:
 - a. overalls
 - b. gloves
 - c. protective footwear
 - d. goggles

- 1.2.1 Methods to minimise the risk of damage to the vehicle and its systems, other people and their property could include:
 - a. vehicle protection
 - b. precautions when using electrical equipment
 - c. disposal of waste materials
 - d. awareness of actions to others

- 2.1.1 Suitable sources of technical information to support hybrid vehicle repair activities could include:
 - a. manufacturer data
 - b. third party data
 - c. paper based
 - d. electronic
 - e. on vehicle data/warnings

- 2.2.1 The use of technical information to support hybrid vehicle repair activities could include:
 - a. wiring diagrams
 - b. repair instructions
 - c. bulletins
 - d. verbal instruction
 - e. on vehicle data/warnings

- 3.1.1 Appropriate tools and equipment to carry out hybrid vehicle repairs could include:
 - a. hand tools
 - b. code readers
 - c. specialist tools
 - d. electrical meters e.g voltmeter

- 3.2.1 Equipment that may be calibrated to meet manufacturers' requirements could include:
 - a. multimeters
 - b. torque wrenches
 - c. measuring equipment
 - d. manufacturers specialist tools

- 3.3.1 The correct use of tools and equipment could include:
 - a. following manufacturer instructions
 - b. following workplace procedures
 - c. appropriate use of hand tools
 - d. appropriate use of electrical tools
 - e. appropriate use of specialist tools

- 4.1.1 The correct procedures required when removing and replacing hybrid system vehicle components could include:
 - a. observation of H & S
 - b. correct use of PPE
 - c. correct use of tools and equipment
 - d. correct use of tools and equipment
 - e. following repair procedures
 - f. following workplace procedures

Content:

- 4.2.1 The knowledge of disconnecting high voltage supplies correctly could include:
 - a. batteries
 - b. motors
 - c. cabling
 - d. control units
 - e. relays
 - f. switches
 - g. charging system
 - h. circuit protection
 - i. associated connectors

- 5.1.1 Components that must be disconnected to include:
 - a. high voltage battery pack

- 5.2.1 Components that must be disconnected could include:
 - a. control units
 - b. motors associated with hybrid operation
 - c. associated cabling

- 5.3.1 Appropriate procedures to confirm repairs successfully carried out could include:
 - a. on vehicle testing
 - b. checking fault codes
 - c. voltage checks
 - d. use of specialist equipment

- 5.4.1 Demonstrate the correct methods to reset vehicle systems post-repair could include:
 - a. use of scan tools
 - b. on board diagnostics
 - c. use of specialist equipment

- 6.1.1 Records to be completed accurately, in the format required could include:
 - a. job cards
 - b. warranty records
 - c. on line data transfer

- 6.2.1 Comparison of inspection and test results with suitable data could include:
 - a. wiring diagrams
 - b. repair instructions
 - c. bulletins
 - d. torque settings
 - e. technical data

- 6.3.1 Suitable recommendations based upon the results of carrying out the replacement activities could include:
 - a. recommendations for further repairs
 - b. recommendations for further replacement
 - c. no further action required
 - d. recommendations for customer