

# 2019 HSC Automotive Vehicle Body Marking Guidelines

## Section I

### Multiple-choice Answer Key

Question	Answer
1	D
2	B
3	A
4	C
5	C
6	B
7	A
8	D
9	B
10	A
11	D
12	C
13	C
14	B
15	D

## Section II

### Question 16 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Outlines THREE hazards associated with the task using correct industry terminology</li> </ul>	3
<ul style="list-style-type: none"> <li>• Outlines TWO hazards associated with the task using some industry terminology</li> </ul>	2
<ul style="list-style-type: none"> <li>• Outlines ONE hazard associated with the task</li> </ul>	1

**Sample answer:**

Identify the safe working load (SWL) of lifting equipment to ensure equipment is not overloaded. Identify trip hazards on the floor. Identify any objects that could impede movement across the workshop.

**Answers could include:**

- Selecting the most appropriate lifting and supporting equipment
- Identify unsafe working areas eg slip hazard resulting from spills from engine/transmission assembly
- Congested or overcrowded work areas.

## Question 16 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a detailed description to safely move an engine and transmission assembly using industry best practice</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides a sound description to safely move an engine and transmission assembly using industry best practice</li> </ul>	3
<ul style="list-style-type: none"> <li>Provides a basic description to safely move an engine and transmission assembly using industry best practice</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

### **Sample answer:**

Identify the area the engine and transmission assembly needs to be moved to and ensure a clear pathway to the destination. Notify other workers of intentions and gain assistance where required.

Identify appropriate lifting equipment needed to carry out the task. Move the equipment to the designated area and safely lower into position.

### **Answers could include:**

- Use appropriate personal protective equipment
- Select appropriate equipment observing safe working load. This could include: a forklift, engine crane, pallet and pallet jack, slings, chains and engine stabiliser bars
- Ensure assembly is not lifted too high causing instability
- Lift assembly to safe working height observing hazards such as cables and obstacles
- Load assembly onto appropriate supporting equipment such as pallet or crane
- Ensure all fluids have been drained or secured
- Ensure pathway is clear from trip hazards
- Ensure staff are informed
- Slowly and safely move assembly.

### Question 17 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Identifies THREE possible causes of a vehicle pulling to the left while driving</li> </ul>	3
<ul style="list-style-type: none"> <li>Identifies TWO possible causes of a vehicle pulling to the left while driving</li> </ul>	2
<ul style="list-style-type: none"> <li>Identifies ONE possible cause of a vehicle pulling to the left while driving</li> </ul>	1

**Sample answer:**

Possible causes for a vehicle pulling left are as follows. Tyres are worn on one side. Wheel alignment setting is incorrect and suspension or steering components are bent or worn.

**Answers could include:**

- Worn or damaged suspension components and bushes
- Inconsistent tyre pressures
- Worn or damaged wheel bearings
- Inconsistent road surface
- Climatic conditions such as high wind.

### Question 17 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a comprehensive description of the troubleshooting processes that can be used to test the steering and suspension components</li> <li>Uses industry terminology</li> </ul>	5
<ul style="list-style-type: none"> <li>Provides a sound description of the troubleshooting processes that can be used to test the steering and suspension components</li> <li>Uses some industry terminology</li> </ul>	3–4
<ul style="list-style-type: none"> <li>Provides some description of the troubleshooting processes that can be used to test the steering and/or suspension components</li> <li>Uses limited industry terminology</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Road test vehicle and check for excessive steering wheel play, appraise for noise indicating excessive wear or damage.

Visually check steering and suspension components for wear or damage such as loose rack and pinion or worn mounting bushes and torn ball joints dust boots. Test shock absorbers for excessive bounce and rebound and for leaks. Test suspension bushes for excessive wear or play, visually inspect tyres for uneven wear pattern. Test tyre pressures for consistency. Test for excessive wheel bearing play.

### Question 18 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Correctly identifies what needs to be done to protect the electrical system</li> </ul>	1

**Sample answer:**

Battery terminals should be disconnected.

**Answers could include:**

- Disconnection or removal of Electronic Control Unit
- Isolation or relocation of any components or wiring in the area of the repair
- Fitting of surge protector.

### Question 18 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a thorough description of the problems that could be caused by not refitting an earth cable</li> <li>Uses correct industry terminology</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides a sound description of the problems that could be caused by not refitting an earth cable</li> <li>Uses sound industry terminology</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides a basic description of the problems that could be caused by not refitting an earth cable</li> </ul>	1

**Sample answer:**

Problems that could be caused by not refitting a sturdy earth cable include the engine may not start; electrical current may pass through other components causing parts failure; static through the audio system; dimming of headlights; battery not sufficiently charging.

### Question 19 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Identifies how primer should be applied to a repair area</li> </ul>	1

**Sample answer:**

A spray method should be used to apply primer to the repair area.

### Question 19 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a thorough explanation of the benefits of a well-applied primer to a finished repair</li> <li>Uses correct industry terminology</li> </ul>	5
<ul style="list-style-type: none"> <li>Provides a sound explanation of the benefits of a well-applied primer to a finished repair</li> <li>Uses industry terminology</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides some explanation of the benefits of a well-applied primer to a finished repair</li> <li>Uses some industry terminology</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides a basic explanation</li> </ul>	1

**Sample answer:**

A well-applied primer will ensure the longevity of the paint application. This is achieved by sealing the metal from corrosion. Once applied, it can be sanded to a very flat surface allowing a better finish and adhesion of topcoats. This also provides a durable finish of the topcoat.

### Question 20 (a)

Criteria	Marks
• Identifies TWO steps that could be taken to remove the surface charge	2
• Identifies ONE step that could be taken to remove the surface charge	1

**Sample answer:**

Apply a load to the battery for a short period of time and read the voltage. This could include cranking the starter motor or externally load testing the battery.

**Answers could include:**

- Turn the headlights on for a few minutes and use a multi-meter to obtain the open circuit voltage.

### Question 20 (b)

Criteria	Marks
• Provides a sound description of a process that can be used to determine the operating voltage of a tail-light	3
• Provides some description of a process that can be used to determine the operating voltage of a tail-light	2
• Provides a basic description of a process that can be used to determine the operating voltage of a tail-light	1

**Sample answer:**

Measure voltage at the battery for reference. Gain access to the vehicle tail-light wiring connector using the correct repair manual or wiring diagram. Measure voltage at the tail-light. Back probe the appropriate connector and refer to the original reference voltage.

**Answers could include:**

- To determine the correct operational voltage of the tail-light, subtract the reference voltage from the measured tail-light voltage to determine voltage drop and compare to manufacturer's specifications.
- Measure voltage drop across wiring between battery and tail-light using a multi-meter and extended multi-meter leads.

### Question 20 (c)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a thorough explanation of how to test the vehicle to identify the fault</li> <li>Uses correct industry terminology</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides a sound explanation of how to test the vehicle to identify the fault</li> <li>Uses some industry terminology</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides a basic explanation of how to test the vehicle to identify the fault</li> <li>Uses basic industry terminology</li> </ul>	1

**Sample answer:**

Test and check the battery condition for sufficient charge. Test voltage under load conditions at the battery and starter motor. This will enable the technician to determine correct voltage drop. This should not be below 0.6 volts. If the engine is still cranking slowly, it will be necessary to test the current draw with an inductive clamp meter and reference to manufacturer's specifications. However, the technician should ensure the engine's mechanical condition by checking that it spins freely by hand.

## Section III

### Question 21 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a sound description of how automotive fluids should be handled when disassembling a vehicle</li> <li>Uses sound industry terminology</li> </ul>	3
<ul style="list-style-type: none"> <li>Provides some description of how automotive fluids should be handled when disassembling a vehicle</li> <li>Uses some industry terminology</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides a basic description of how automotive fluids should be handled when disassembling a vehicle</li> </ul>	1

**Sample answer:**

A vehicle's fluids should be drained into a separate sealed container prior to disassembly. These fluids can then be recycled. The work area should be kept clean before, during and after disassembly. Any and all spills are contained and cleaned in accordance with Work Health Safety. Ensure that no contamination of the immediate environment and waterways occurs. This process should comply with legislated environmental standards.

### Question 21 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a thorough description of the processes in cleaning a vehicle in preparation for paint repairs</li> <li>Uses correct industry terminology</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides a sound description of the processes in cleaning a vehicle in preparation for paint repairs</li> <li>Uses some industry terminology</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides a basic description of the processes in cleaning a vehicle in preparation for paint repairs</li> <li>Uses limited industry terminology</li> </ul>	1

**Sample answer:**

Prior to paint repairs the vehicle should be cleaned inside the door jams, under the bonnet and the boot and drain passages. This ensures a lower chance of contaminants and air-borne volatile organic compounds while spraying.

Vehicle is then wiped with cleaner to remove waxes and greases to ensure silicones and polishes do not cause issues to the paint being applied. While carrying out the cleaning process, a visual inspection ensures all areas are fully prepared and good adhesion of protective coverings and masking is achieved.

### Question 21 (c)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a comprehensive explanation of the process of masking a vehicle to ensure a quality paint repair</li> <li>Uses correct industry terminology</li> </ul>	7–8
<ul style="list-style-type: none"> <li>Provides a substantial explanation of the process of masking a vehicle to ensure a quality paint repair</li> <li>Uses correct industry terminology</li> </ul>	5–6
<ul style="list-style-type: none"> <li>Provides a sound explanation of the process of masking a vehicle to ensure a quality paint repair</li> <li>Uses some industry terminology</li> </ul>	3–4
<ul style="list-style-type: none"> <li>Provides a basic explanation of the process of masking a vehicle to ensure a quality paint repair</li> </ul>	1–2

**Answers could include:**

- Vehicle needs to be smooth clean and dry.
- Removal of trim and small components.
- Wheels and tyres are protected from overspray.
- Areas to be protected are clean to allow tape adhesion.
- Tape is applied smooth and flat.
- Visual inspection to ensure areas to be protected are identified.
- Tape is applied to surrounding areas.
- Tape is applied to allow smooth blending (reverse masking).
- Vehicle is protected from overspray by masking film.
- Surrounding areas that need protection.

## Section IV

### Question 22

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a comprehensive explanation of the implications of the statement on the automotive industry</li> <li>Provides clear links to technician safety and social impacts</li> <li>Provides a logical and cohesive response</li> <li>Uses specific industry terminology</li> </ul>	13–15
<ul style="list-style-type: none"> <li>Provides a detailed explanation of the implications of the statement on the automotive industry</li> <li>Provides links to technician safety and/or social impacts</li> <li>Provides a logical and cohesive response</li> <li>Uses specific industry terminology</li> </ul>	10–12
<ul style="list-style-type: none"> <li>Provides a sound explanation of the implications of the statement on the automotive industry</li> <li>Provides some links to technician safety and/or social impacts</li> <li>Provides a logical and/or cohesive response</li> <li>Uses industry terminology</li> </ul>	7–9
<ul style="list-style-type: none"> <li>Provides some explanation of the implications of the statement on the automotive industry</li> <li>Provides some basic links to technician safety, and/or social impacts</li> <li>Provides a logical response</li> <li>Uses some industry terminology</li> </ul>	4–6
<ul style="list-style-type: none"> <li>Provides general information regarding diesel engines</li> </ul>	1–3

**Answers could include:**

- Diesel engines are a safe, reliable and proven technology, which provide significant torque for vehicles such as buses and trucks. However, they sustain high emissions. These emissions are significant and can cause health issues for the general population and also cause increased unsustainable greenhouse emissions. To cater for future transport needs, new engines need to be emission free, reliable and affordable.
- These systems will also need to provide sufficient torque for large vehicles.
- The use of alternative fuels will need to be implemented to overcome the issues caused by diesel emissions.
- Electric engines/motors can provide a significant increase in torque without the need of a transmission. Diesel/electric trains and some trucks use electric motors to drive these types of large vehicles and are a proven and reliable means of propulsion. The means of storing and using this energy is the main issue in replacing the diesel component.
- Hydrogen is best suited to use in fuel cell technology. This converts hydrogen into electric energy and is stored in batteries, similar to the way in which hybrid vehicles store kinetic energy. The limitations of this is that hydrogen can only be stored as a gas under very high pressure.
- Hydrogen needs to be stored in expensive and bulky vessels and these systems are currently used in California by some manufacturers with success. Hydrogen filling stations are plentiful in high-density areas such as the USA and Europe, catering to local needs as vehicles using hydrogen of sold in larger numbers and accepted by the general

population. A huge advantage of hydrogen is that it is extracted from water and uses sustainable electrical generation such as wind, solar and hydro which create zero emissions. However, in Australia significant investment in infrastructure will be required to allow for mass transport needs.

- Electric vehicles are also an alternative, as they produce zero emissions. However, battery technology will need to be made more efficient and affordable especially in Australia where large distances such as Perth to Adelaide do not allow for sufficient or fast charging of cars and trucks. Once again significant investment into solar charging stations would need to occur. Electric engines do provide operating characteristics superior to diesel engines and also are more reliable and cheaper to maintain.
- The issues of safety, environment and social impacts are immense. Safety issues include battery dangers such as overheating and explosions if not handled correctly.
- High voltages (direct current) are many times more dangerous than household voltages used in domestic situations. Insufficient awareness of the potential danger may cause deaths as this technology is many times more dangerous than diesel technology. If modifications are attempted by unqualified people, this may result in accidents and death.
- Specific training and accreditation will need to be created and legislated to keep repairers safe. Mechanical workshops will need to change the way they conduct service and repairs. Vehicles will also require less servicing. Therefore, less personnel will need to be employed in the industry if electric vehicles become the vehicle of choice.
- Governments will need to allow or compensate for less revenue from fuel excise. Alternative methods of tax revenue will need to be considered, such as pay per kilometer tax or increased registration costs.

# 2019 HSC Automotive Vehicle Body Mapping Grid

## Section I

Question	Marks	HSC content – focus area
1	1	(Mandatory) Sustainability – environmental issues and sustainability – page 33
2	1	(Stream) Vehicle Body – operation of automotive tools and equipment – page 59–60
3	1	(Stream) Vehicle Body – electrical fundamentals – page 57
4	1	(Stream) Vehicle Body – dismantling and removing components – page 61
5	1	(Stream) Vehicle Body – work tasks – pre-repair vehicle body operations and paint repairs preparation – page 60
6	1	(Stream) Vehicle Body – operation of automotive tools and equipment – page 59–60
7	1	(Mandatory) Safety – risk management – page 29
8	1	(Stream) Vehicle body – surface preparation for paint repairs – page 62
9	1	(Stream) Vehicle body – tools and equipment – page 59
10	1	(Mandatory) Troubleshooting and problem-solving – fault or problem resolution – page 36–37
11	1	(Mandatory) Working in the automotive industry and workplace – employment – page 40–41
12	1	(Stream) Vehicle body – surface preparation for paint repairs – page 62
13	1	(Stream) Vehicle body – application of primers – page 63
14	1	(Stream) Vehicle body – testing electrical circuits, wiring systems and components – page 58
15	1	(Mandatory) Troubleshooting and problem-solving – troubleshooting processes – page 36

## Section II

Question	Marks	HSC content – focus area
16 (a)	3	(Mandatory) Safety – safe work procedures and practices – page 29-30
16 (b)	4	(Mandatory) Safety – safe work procedures and practices – page 29-30
17 (a)	3	(Mandatory) Troubleshooting and problem solving – troubleshooting processes – page 36
17 (b)	5	(Mandatory) Troubleshooting and problem solving – troubleshooting processes – page 36
18 (a)	1	(Stream) Vehicle Body – work tasks – pre-repair vehicle body operations and paint repairs preparation – page 60-61
18 (b)	4	(Stream) Vehicle Body – electrical fundamentals – page 57–58
19 (a)	1	(Stream) Vehicle Body – application of primers – page 63
19 (b)	5	(Stream) Vehicle Body – surface preparation for paint repairs – page 62
20 (a)	2	(Stream) Vehicle Body – electrical fundamentals – page 57–58
20 (b)	3	(Stream) Vehicle Body – electrical fundamentals – page 57–58
20 (c)	4	(Stream) Vehicle Body – electrical fundamentals – page 57–58

**Section III**

Question	Marks	HSC content – focus area
21 (a)	3	(Stream) Vehicle Body – work tasks – pre-repair vehicle body operations and paint repairs preparation – page 60–61
21 (b)	4	(Stream) Vehicle Body – work tasks – pre-repair vehicle body operations and paint repairs preparation – page 60–61
21 (c)	8	(Stream) Vehicle Body – work tasks – pre-repair vehicle body operations and paint repairs preparation – page 60–61

**Section IV**

Question	Marks	HSC content – focus area
22	15	(Mandatory) Safety – safe work procedures and practices – page 29–30 (Mandatory) Sustainability – environmental compliance – page 33–34 (Mandatory) Working in the automotive industry and workplace – automotive worker – page 41–42