Skills in removing and replacing light vehicle engine units and components

Personal protective equipment

For every job you undertake, it is good practice to use personal protective equipment (PPE) as well as protecting the customer’s vehicle. Customers appreciate seeing a professional standard and are more likely to revisit if their vehicle is returned in a clean condition.

1 Find out if the following statements are true or false.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True or false?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) PPE should only be worn when you are told to wear it.</td>
<td></td>
</tr>
<tr>
<td>b) Safety shoes are not PPE.</td>
<td></td>
</tr>
<tr>
<td>c) Only protect the customer’s vehicle when replacing an engine component.</td>
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<tr>
<td>d) The customer’s vehicle should be inspected for damage before it is worked on.</td>
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<tr>
<td>e) ‘Risk’ means taking a guess at what is wrong with a car.</td>
<td></td>
</tr>
<tr>
<td>f) A ‘hazard’ is anything that can cause harm.</td>
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<tr>
<td>g) Oil is carcinogenic.</td>
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</tbody>
</table>

Specific risks

Coolant system

When working, the coolant system is extremely hot and operates under high pressure, so it is essential that you do not remove the coolant bottle cap or any other components while the engine is hot. Modern coolant systems use an electric fan for efficiency; this fan can start rotating even if the vehicle is not running and the keys have been removed.

2 Give three more safety tips for working on the coolant system.

a) ........................................................................................................................................

b) ........................................................................................................................................

c) ........................................................................................................................................
Lubrication system
Lubrication can be hot enough to burn and is harmful to the skin and the environment. Be sure to wear PPE when working with used engine oil and dispose of it in an appropriate manor.

3 Give three more safety tips for working on the lubrication system.
   a) ........................................................................................................................................
   b) ........................................................................................................................................
   c) ........................................................................................................................................

Mechanical components
Never try to lift components that are too heavy – use the lifting equipment provided. Be aware of rotating engine components and loose clothing or long hair when working on mechanical components.

4 Give three more safety tips for working on the mechanical system.
   a) ........................................................................................................................................
   b) ........................................................................................................................................
   c) ........................................................................................................................................

Source and use appropriate information
When removing and replacing engine unit components it is important to:
- select the appropriate technical data for the vehicle you are working on
- select the recommended removal and replacement procedure
- follow any legal requirements.

5 Working in a small group, find out the following information for removing and replacing the engine sump on a selected vehicle
   a) Oil type and quantity

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b) Sump plug torque setting
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c) Sump retaining bolts torque setting
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d) Sequence for tightening sump plug retaining bolts
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e) Sequence in which components should be removed
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f) Requirements for disposal of used engine oil
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g) Requirements for disposal of the sump
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h) Any new parts or materials you will require
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6 Now remove and replace the sump using the information you have found in the previous question. If you have a camera or access to a video recorder it might be fun to record the task (this evidence could be used in your portfolio). Keep any information you have obtained.

7 If you were doing a similar task, would you do it any differently? Explain how.

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Tools and equipment

It is important to use tools that are designed for the task and not to mistreat them. Can you identify common tools and equipment used for the removal and replacement of engine units and components?

Identify the tools and pieces of equipment pictured below. Research how they should be used and stored in order to answer the questions.

<table>
<thead>
<tr>
<th>Tool/equipment</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>a) What is this equipment used for?</td>
</tr>
<tr>
<td></td>
<td>b) How should it be stored?</td>
</tr>
</tbody>
</table>
| 9 | a) What is the correct name for the tool in the picture?  
   b) How should it be stored? |
|---|----------------------------------|
| 10 | a) What is this tool used for?  
   b) How should it be stored? |
| 11 | a) What would this tool be used for?  
   b) How should it be stored? |
| 12 | a) What is this tool used for?  
   b) How should it be stored? |
Removal and replacement of components

Main engine components must be removed and replaced in a methodical sequence. If it is not possible to lay them out in order, try taking pictures as you remove components for easier rebuilding. It may be some time before you are rebuilding a stripped engine.

Mechanical components

14 Preferably with an engine on a stand provided by your college or workplace, carry out a cylinder head removal following these steps:

a) Select APPE for the task.

b) Select the appropriate tools and equipment.

c) Methodically remove the cylinder head (become familiar with the names of components as you remove them using the internet or a textbook).

Lubrication system

15 Name as many components of the lubrication system as you can.

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16 Read the section on lubrication on pages 109–117 of *Hillier's Fundamentals of Motor Vehicle Technology Book 1 6th Edition* and see how many more you can name.

Cooling system

17 Working in a small group, carry out these tasks:

   a) Discuss how to remove and refit a radiator.
   b) Highlight any specific hazards.
   c) Under supervision, remove and replace a radiator, following the workshop’s rules, policies and procedures.

Record information and make recommendations

There is no point in stripping a noisy engine only to inform the customer that the repair would cost more than the value of their vehicle. Similarly, if an engine has severely overheated due to a radiator leak, you would not simply replace the radiator without checking the cylinder head and related components for damage.

18 Choose a seven-year-old car with average mileage and in average condition. Imagine this vehicle has been brought into the workshop having severely overheated due to a leaking core plug.

   a) Find out the total cost of supplying and fitting a reconditioned engine (do not forget the total labour cost).
b) Find the total cost of testing the cylinder head gasket and replacing only the core plug (the cylinder head being undamaged).

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c) Find the total cost of testing the cylinder head gasket and replacing both the core plug and cylinder head or head skim (the cylinder head being damaged).

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d) Find the value of the vehicle (websites such as Parkers or similar may be useful).

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e) What recommendations would you make to the customer?

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f) Were you surprised by the findings?

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Quick quiz

19 Complete this crossword using the clues below.

<table>
<thead>
<tr>
<th>Across</th>
<th>Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>4   Rotated by the pistons (10)</td>
<td>1  Has the ability to cause cancer (12)</td>
</tr>
<tr>
<td>8   Warns the driver of low oil pressure</td>
<td>2  This could start at any time (8,3) (With 6 Down)</td>
</tr>
<tr>
<td>(3,8,6) (With 9 and 13 Down)</td>
<td>3  Used to lift heavy engine components</td>
</tr>
<tr>
<td>10  Air-powered tools are this (9)</td>
<td>6  Stores oil (4)</td>
</tr>
<tr>
<td>12  (See 4 Down)</td>
<td>7  Encloses the top of the engine (8,4)</td>
</tr>
<tr>
<td>14  (See 7 Down)</td>
<td>9  (See 8 Across)</td>
</tr>
<tr>
<td>15  Controls the flow of coolant</td>
<td>11 (See 5 Down)</td>
</tr>
<tr>
<td>16  (See 3 Down)</td>
<td>13 (See 8 Across)</td>
</tr>
<tr>
<td>18  (See 10 Across)</td>
<td>19 (See 11 Across)</td>
</tr>
</tbody>
</table>
Are you ready for assessment?

If you can answer yes to the following questions, discuss with your tutor whether you might be ready to be assessed.

- Can you work on a coolant system safely?
- Do you know what PPE to use when dealing with used engine oil?
- Are you able to select, use and store the appropriate tools and equipment to remove and replace engine unit components?
- Can you identify the safe removal and replacement procedure for all lubrication components?
- Do you know where to find the torque setting and tightening sequence for mechanical components?
- Can you recommend a cost-effective repair?