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## Unit Standard 30480

### PRACTICE PAPER - ANSWER BANK

**Assessors Note:**

**This answer bank should be used as the primary resource when marking students work. However, responses to some questions may be subjective and tutors are advised to exercise their professional judgement when making assessment decisions.**

## ELEMENT ONE

Demonstrate knowledge of engine cooling system operation.

### 1. Why must an internal combustion engine have a cooling system?

To remove excess heat from the engine and to maintain a constant “safe” operating temperature. The engine would be seriously damaged if the excess heat was not removed.

### 2. Ok so we have to move the heat energy. This can occur in different ways. Match up the heat transfer term with its most appropriate description:

**Conduction**

When heat energy moves along a solid object and into another solid object that is touching it.

**Convection**

When heat energy is transferred by a moving liquid or gas.

**Radiation**

When heat energy is transferred even though there is no physical contact between the heat source and the heated object.

### 3. Please circle T or F to indicate whether each of the following statements is true or false:

T  F

When heat is removed it can cause an object to become smaller

T  F

When enough heat is added to water it will begin to boil and turn to vapour. This is called a “change of state”.

T  F

Heat will always move from a cooler region to a warmer region

T  F

Heat can change the colour of metals

4. **What are the key differences between a DIRECT cooling system and an INDIRECT cooling system?**

Direct cooling systems use only air to remove excess heat from the engine and take it directly to the atmosphere. The air can be forced past the engine by a fan or blower and guided by shrouds and ducts. Some direct cooling systems rely on a draught air flow.

Indirect cooling systems use a liquid coolant to remove heat from the engine. The coolant is pumped through chambers called water-jackets inside the engine. The liquid coolant absorbs heat from the engine and is then pumped to a radiator mounted outside the engine where the heat is exposed to cooler air. The coolant then re-enters the engine to absorb more heat and continue the cycle.

5. **ON a DIRECT cooling system what is meant by the term “draught air flow”**

Draught air flow is when the air near the engine becomes hotter and naturally begins to rise as the molecules become less dense and lighter. This allows denser cooler air to come in below and continue the cycle.

6. Identify three instances of poor practice in the following scenario:

The foreman has asked David the apprentice to change the coolant in a vehicle that has just arrived in the workshop. David parks the vehicle over the storm water drain raises the bonnet and removes the drain plug at the bottom of the radiator allowing hot coolant to escape down the drain. He refits the plug and adds new coolant.

David pressure tests the cooling system and notices coolant leaking onto the workshop floor. He identifies a leaking hose where the clamp is not tight enough and tightens it. He pressure tests the system again and takes the car for a test drive with the radiator cap off.

When he returns he notices coolant splashes all over the engine bay and the engine is overheating. He quickly refits the radiator cap without saying anything to his foreman.

1. He empties the coolant into the storm water drain
2. He leaves the radiator cap off when he test drives the car
3. He does not tell his foreman that the car overheated

7. Identify two types of cooling system fans from the list that are used on indirect cooling systems.

Tick the correct two boxes

Extractor fan

Flex fan

Thermostatic fan (variable speed fan)

Electric fan

*Any two of the ticked boxes are correct*

8. Please circle T or F to indicate whether each of the following statements is true or false:

T  F

Both **direct and indirect** cooling systems can use a thermostat to control engine temperature.

T  F

An **indirect** cooling system uses cooling fins

T  F

An **indirect** cooling system uses a water pump

T  F

An **indirect** cooling system will use a fan or blower to remove heat from the engine

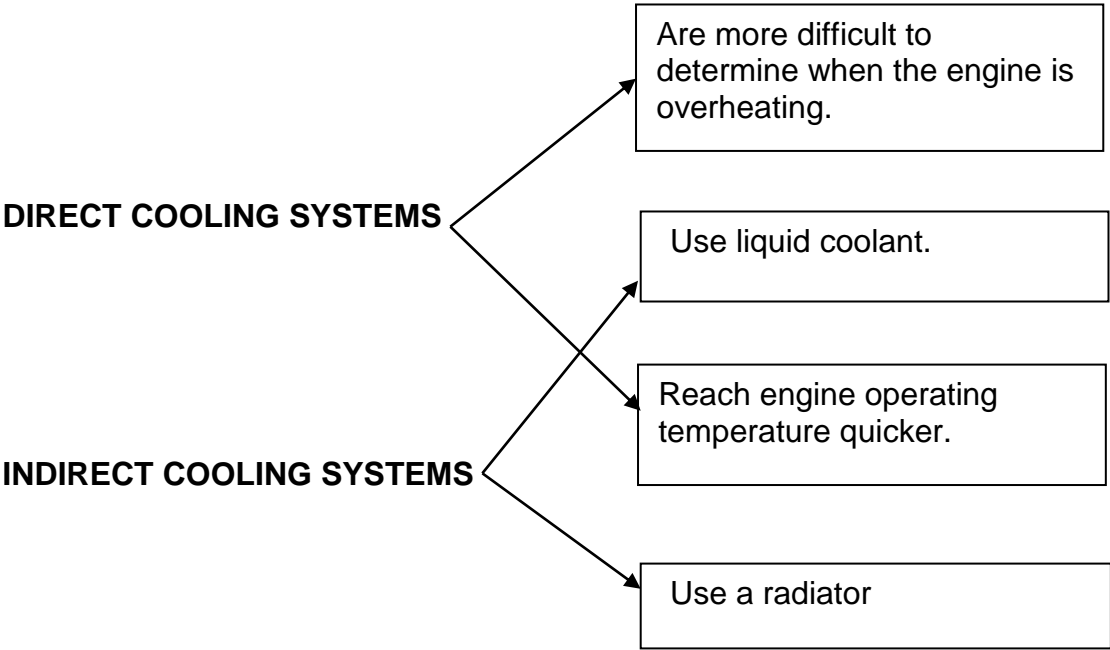
T  F

A **direct** cooling system will have frost plugs.

T  F

A **direct** cooling system will use shrouds or air ducting.

9. Draw a line to match up the cooling system with its appropriate descriptions.



10. Identify from the list each of the following indirect cooling system components and describe how it operates.

Water pump; Temperature sender unit; Coolant Reservoir; Frost plug;  
Temperature receiver unit; Thermostat

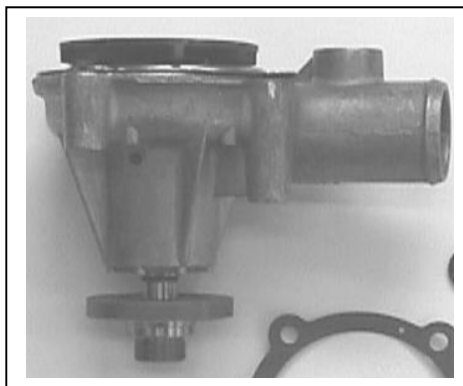


Component **Temperature receiver unit**

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Operation

**Receives an electronic signal from the temperature sender unit to show the engine temperature to the driver**



Component **Water pump**

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Operation

**To pump coolant around the engine and through the radiator**



Component **Frost plug**

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Operation

**To seal casting holes in the engine and to pop out if the coolant freezes.**

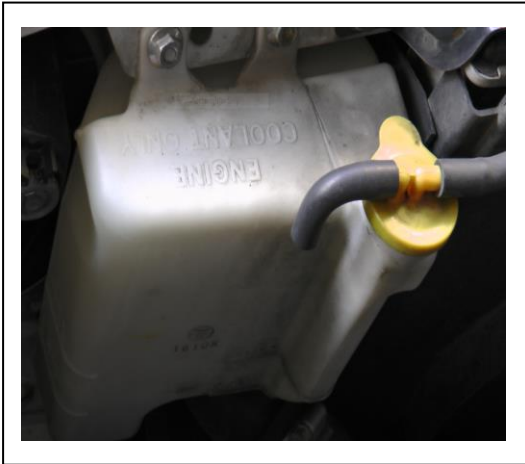


Component      **Temperature sender unit**

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Operation

**Electronically measures engine temperature and sends the information to the temperature receiver unit**

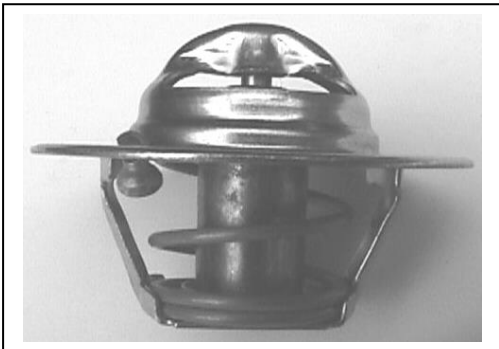


Component      **Coolant Reservoir**

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Operation

**Stores excess coolant from the radiator and allows it to be drawn back to the radiator as it cools.**



Component      **Thermostat**

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Operation

**Controls the engine temperature. It remains closed at start-up forcing the coolant to cycle inside the engine until operating temperature is reached. It then opens and allows the coolant to flow through the radiator. It then maintains a constant engine temperature.**

11. From the list below match up each cooling system component with its description: For example

**Radiator hose = Used to connect the engine and the water pump to the radiator**

Cooling fan; Anti-freeze; Water jackets; Radiator cap; Shrouds; Cooling fins; Drive belts; Radiator; Oil cooler;

<b>Radiator hose;</b>	Used to connect the engine and the water pump to the radiator
<b>Radiator cap</b>	Holds the coolant in the radiator under set pressure
<b>Cooling fan</b>	Draws air through the radiator to remove heat from the coolant
<b>Anti freeze</b>	Mixture of water and ethylene glycol
<b>Shrouds</b>	Directs air to the hottest engine components
<b>Drive belts</b>	Is driven by the crankshaft and drives the water pump and other accessories
<b>Radiator</b>	Allows hot coolant to be exposed to a cooler air flow
<b>Water jackets</b>	Chambers that allow the coolant to circulate through the engine block and cylinder head
<b>Oil cooler</b>	Used to maintain operating temperature of automatic transmission
<b>Cooling fins</b>	Dissipate heat created in a direct air cooled engine



## **ELEMENT TWO**

Demonstrate knowledge of disposing of coolant.

- 1. What is the name of the act that deals with the proper methods of disposing of workshop waste such as coolant?**

Resource management act

- 2. Describe how old coolant should be properly disposed of.**

Coolant must be stored for collection so that it can be recycled and used again or properly disposed of by qualified people.

- 3. What does testing the specific gravity of coolant tell you about the composition of the coolant?**

It measures the density of the coolant which will indicate how much antifreeze is in the coolant and whether it needs to be topped up or replaced.

- 4. “Antifreeze” usually has other properties apart from lowering the freezing point of the coolant. Describe one of these other properties.**

Any one of the following

1. “Anti-corrosion” properties will prevent rust and corrosion in the cooling system.
2. “Anti-boil” properties raise the boiling point of the coolant.