



STUDENT NUMBER

CENTRE NUMBER

HIGHER SCHOOL CERTIFICATE EXAMINATION

2000

# INDUSTRIAL TECHNOLOGY

2 UNIT

SECTION II

AUTOMOTIVE INDUSTRIES

OPTION—ENGINE

*Total time allowed for Sections I and II—One hour and a half  
(Plus 5 minutes reading time)*

**DIRECTIONS TO CANDIDATES**

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Where appropriate, show all working for solutions neatly and clearly.
- You may use Board-approved drawing instruments and calculators.

**Section II—Engine** (15 marks)

- Question 4 is **COMPULSORY**.
- Attempt **TWO** questions from Questions 5, 6, and 7.
- Answer the questions in the spaces provided in this paper.

**MARKER'S USE ONLY**

Question				
4				
5				
6				
7				

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## SECTION II—ENGINE OPTION

(15 Marks)

**QUESTION 4** This question is **COMPULSORY**. (5 marks)

- (a) A motorist is travelling from Sydney to Brisbane. Wishing to check the car's fuel consumption, the motorist carefully fills the tank and zeros the odometer at each service station. At the local petrol station, the tank takes 30 litres of petrol, costing 79.9 cents per litre. The car also needs 1 litre of oil, costing \$3.50.

At Nambucca Heads, the odometer reads 476 km and the tank needs 45 litres of petrol, which costs 82.9 cents per litre.

At Murwillumbah, the odometer reads 401 km and the tank needs 43 litres of petrol, which costs 83.9 cents per litre.

When the motorist arrives in Brisbane, the odometer reads 152 km and the tank needs 15 litres of petrol, which costs 79.3 cents per litre. The car also needs half a litre of oil, costing \$1.99.

Complete the summary of the travel details below.

<i>Petrol station</i>	<i>Kilometres travelled</i>	<i>Litres of petrol used</i>	<i>Petrol costs</i>	<i>Oil costs</i>	<i>Total paid</i>
Local station	0	30	\$23.97	\$3.50	\$27.47
Nambucca Heads	476	45			
Murwillumbah	401	43			
Brisbane	152	15			
Totals					

- (i) Calculate the average fuel consumption for the journey.

..... litres/100 km

- (ii) Calculate the cost per kilometre for the journey for petrol and oil.

\$..... per km

**Question 4 continues on page 4**

## QUESTION 4 (Continued)

- (b) An exploded view of a piston and connecting rod assembly for an internal combustion engine is shown in Figure 1.

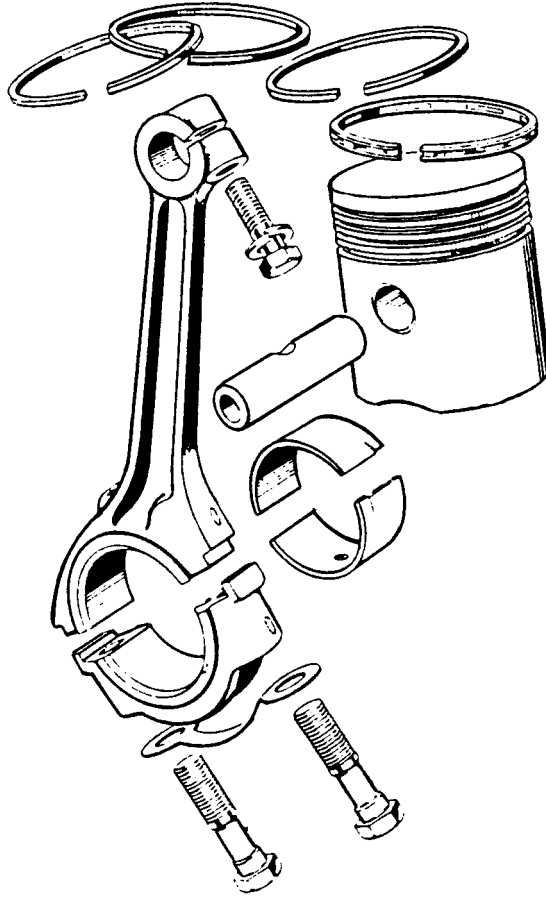


FIG. 1. PISTON AND CONNECTING ROD ASSEMBLY

## QUESTION 4 (Continued)

Part of the connecting rod is shown in Figure 2. Accurately sketch, in proportion, an assembled view of the piston assembly in the correct position. Do NOT show any hidden detail.

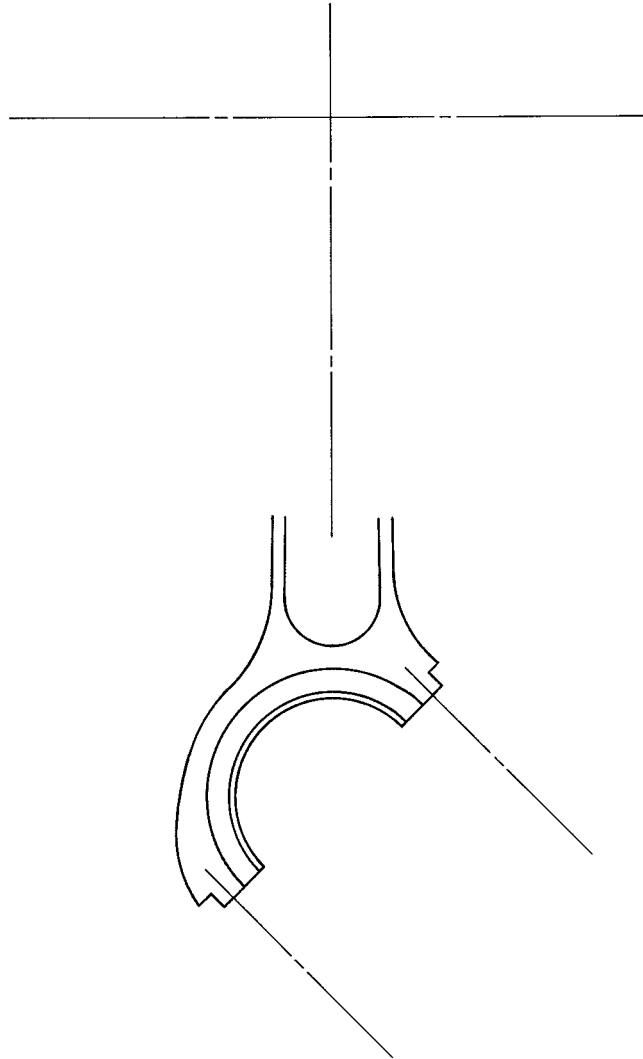


FIG. 2

**Question 4 continues on page 6**

## QUESTION 4 (Continued)

- (c) When working in the automotive industry, tradespeople deal with a variety of measurements. Complete the table for each of the items listed below.

	<i>Item</i>	<i>Name of measurement unit</i>	<i>Symbol for measurement unit</i>
(i)	Engine capacity		
(ii)	Fluid volume		
(iii)	Torque		
(iv)	Power		
(v)	Pressure		
(vi)	Temperature		

Attempt TWO questions from Questions 5, 6, and 7.

**QUESTION 5** (5 marks)

(a) Legislators and car manufacturers are very concerned with vehicle safety and emissions.

(i) Name the Commonwealth regulations that manufacturers must adhere to in vehicle production.

.....

(ii) Name and describe ONE area of engine design that has led to improved safety or reduced emissions.

Name .....

Description .....

.....

.....

.....

.....

(b) For a car to be re-registered when it is more than three years old, it needs to be inspected at an authorised inspection station to check that it is roadworthy.

Name TWO different areas of the engine that the inspector would check, and describe how each check would be made.

Name .....

Description .....

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Name .....

Description .....

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QUESTION 5 (Continued)

- (c) Use the following diagrams shown in Figure 3 to assist in explaining the operation of a four-stroke cycle engine.

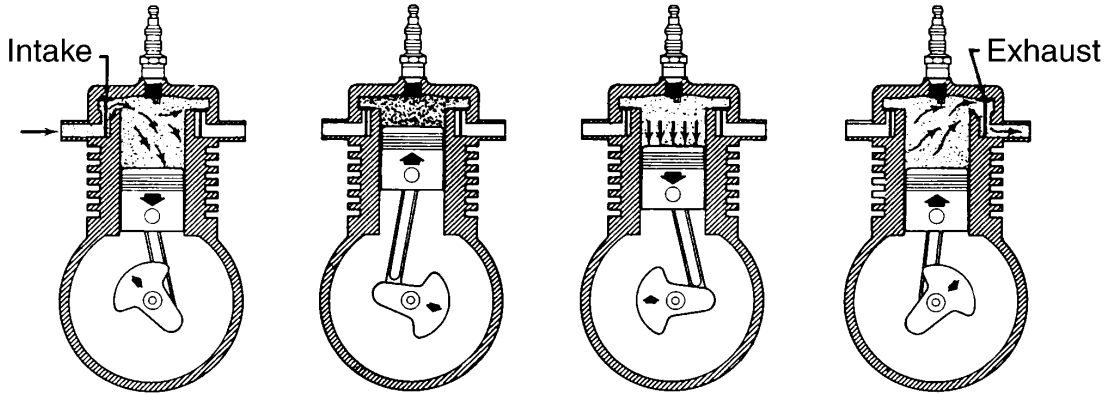


FIG. 3

Stroke 1 .....

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Stroke 2 .....

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Stroke 3 .....

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Stroke 4 .....

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## QUESTION 5 (Continued)

- (d) A vehicle has been brought in for repair. The owner has complained that the engine 'misses' at high speed.

Complete the table below to suggest possible causes of and remedies for the problem.

<i>Possible cause</i>	<i>Remedy</i>
	Clean and readjust points
	Clean out carburettor and fuel pump
Dirt or water in carburettor	
Burned or cracked distributor rotor	
Faulty coil or capacitor	Renew faulty component
Dirt in carburettor power jet	
Incorrect ignition timing	

Attempt TWO questions from Questions 5, 6, and 7.

**QUESTION 6** (5 marks)

- (a) When a car is driven for long periods, a number of methods can be used to improve vehicle economy.

Use the following headings to discuss how vehicle economy can be improved.

- (i) Tyre pressure

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- (ii) Acceleration

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- (iii) Choke

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- (iv) Tuning

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QUESTION 6 (Continued)

- (b) For the following components, suggest a suitable lubricant and describe the method of application for the lubricant.

<i>Component</i>		<i>Name of lubricant</i>	<i>Application of lubricant</i>
1	Crank shaft		..... ..... ..... .....
2	Water pump bearing		..... ..... ..... .....
3	Throttle cable		..... ..... ..... .....

**Question 6 continues on page 12**

QUESTION 6 (Continued)

(c) A car engine is sluggish, and large amounts of bluish smoke are being emitted from the car's exhaust pipe.

(i) Give ONE possible reason for the engine's poor performance.

.....

(ii) What test would a mechanic use to determine the exact nature of the problem with the engine?

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(iii) Describe how this test is carried out.

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(iv) Describe how the replacement or repair would be carried out.

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QUESTION 6 (Continued)

(d) (i) A car engine gradually overheats. Give THREE possible reasons for this fault.

Reason 1 .....

Reason 2 .....

Reason 3 .....

(ii) A car engine experiences a loss of engine coolant. Give THREE possible reasons for this fault.

Reason 1 .....

Reason 2 .....

Reason 3 .....

(iii) Most car engines have a pressurised cooling system. Give THREE possible reasons why this type of system increases the efficiency of the engine.

Reason 1 .....

.....

Reason 2 .....

.....

Reason 3 .....

.....

**Please turn over**



QUESTION 7 (Continued)

(b) Motor enthusiasts wish to increase the performance of their vehicles. For each of the following, name and describe ONE method of increasing the performance over standard.

(i) Power

Method .....

Description .....

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.....  
.....  
.....

(ii) Torque

Method .....

Description .....

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.....  
.....  
.....

(iii) Lubrication efficiency

Method .....

Description .....

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(iv) Air flow for fuel system

Method .....

Description .....

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QUESTION 7 (Continued)

(c) A mechanic is repairing a motor. The timing gear has to be removed so that repairs can be carried out.

(i) Name the tool used to remove the timing gear.

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(ii) Describe, using sketches, how the timing gear is removed. Label your sketches.

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