



STUDENT NUMBER

CENTRE NUMBER

HIGHER SCHOOL CERTIFICATE EXAMINATION

1997

INDUSTRIAL TECHNOLOGY

2 UNIT

SECTION III—AUTOMOTIVE

*Total time allowed for Sections I, II, and III—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 working for solutions neatly and clearly.
- You may use Board-approved drawing instruments and calculators.

Section III—Automotive

- Attempt ALL questions.
- Answer questions in the spaces provided in this paper.

EXAMINER'S USE ONLY

Question			
13			
14			
15			

QUESTION 13. (5 marks)

EXAMINER'S
USE ONLY



- (a) An exploded view of a service tool used to remove a flywheel from a lawnmower to service the magneto is given below in Figure 1.

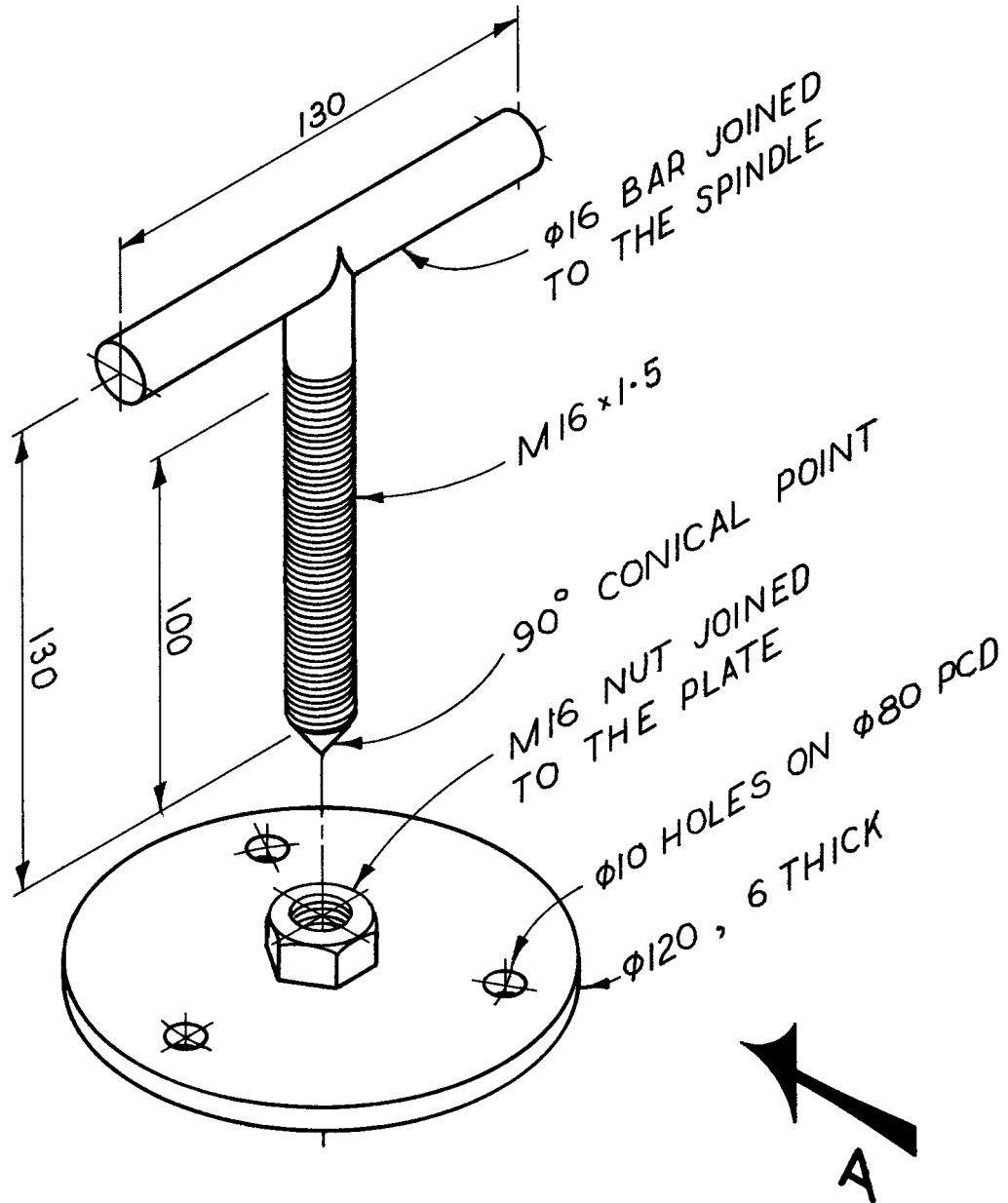


FIG. 1

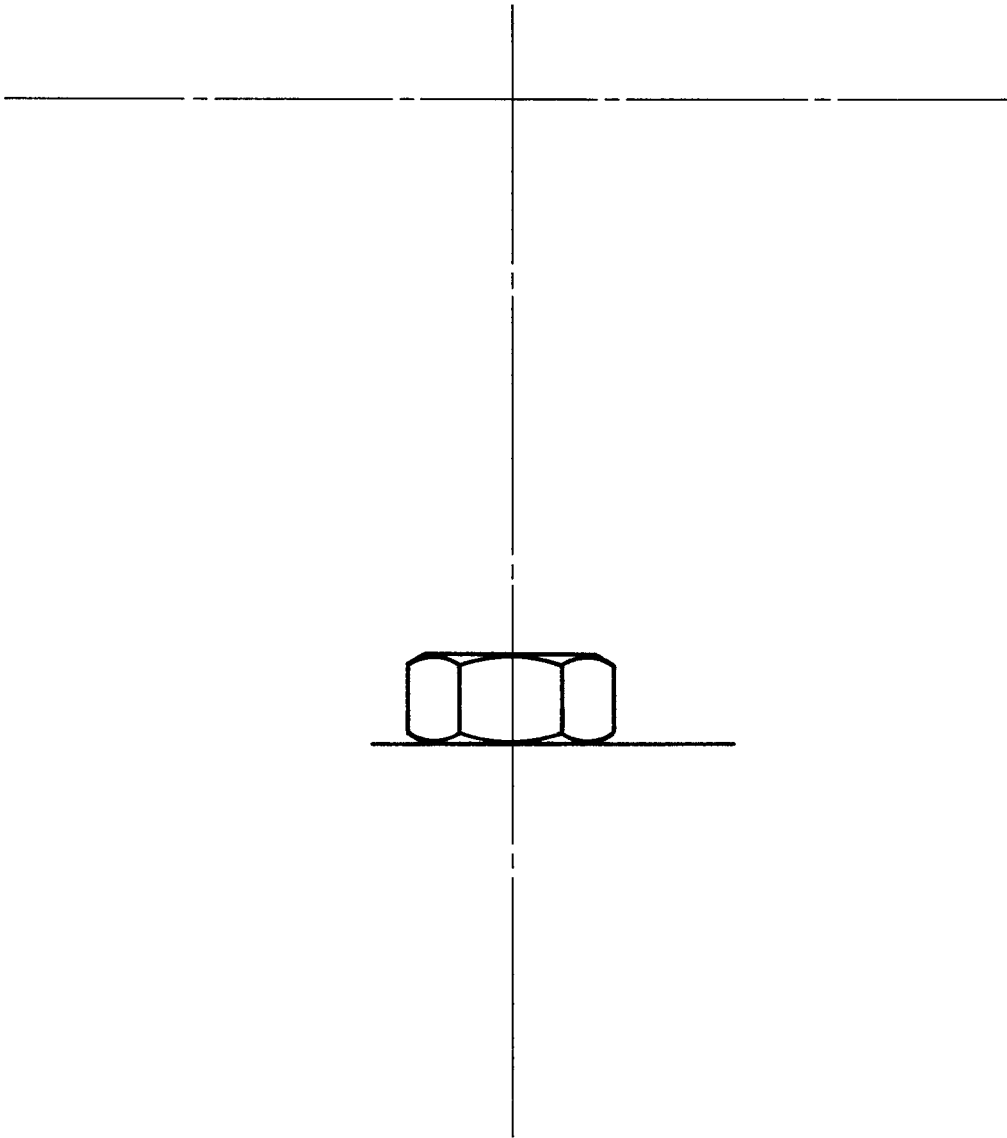
QUESTION 13. (Continued)

EXAMINER'S
USE ONLY

- (i) Using the centre lines and nut provided, draw a *front view*, in the direction of *A*, of the parts assembled.

Scale – Full Size

- (ii) Include TWO dimensions:
- thickness of the plate;
 - diameter of the bar.



QUESTION 13. (Continued)

EXAMINER'S
USE ONLY

(b) A dismantled view of a magneto assembly is given below.

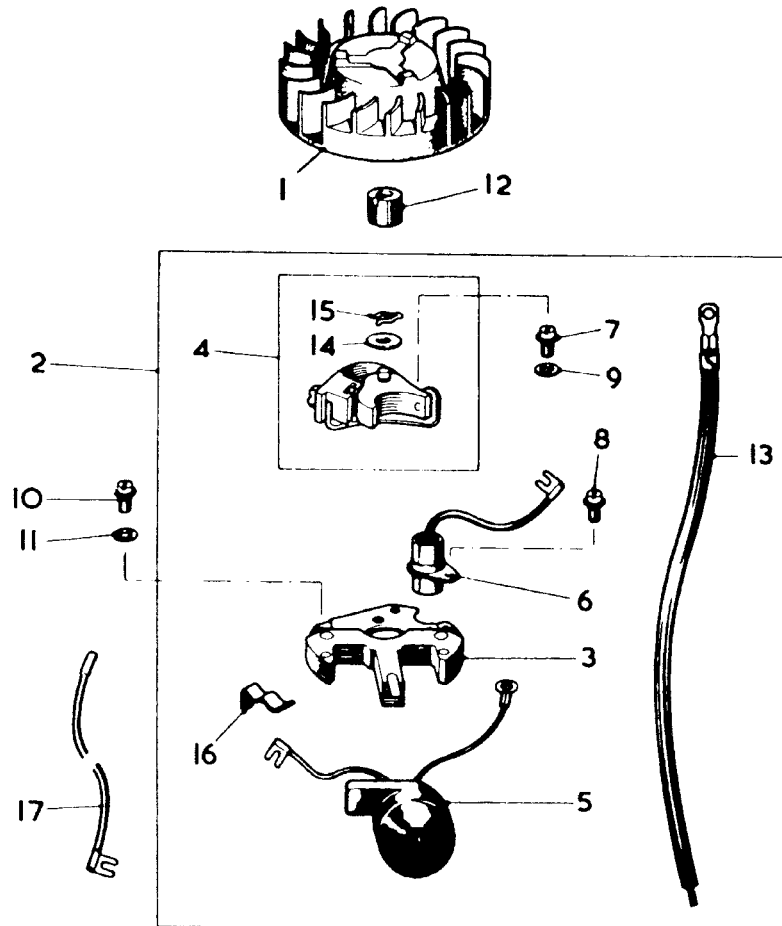


FIG. 2. DISMANTLED VIEW OF MAGNETO ASSEMBLY

'Victa Rotary Mowers', Gregory's Scientific Publications No 220 1984 p27. Courtesy Universal Press.

KEY

- | | |
|------------------------------------|-----------------------|
| 1 Flywheel cover | 9 Washer |
| 2 Stator plate assembly | 10 Screw—stator plate |
| 3 Stator plate and E core assembly | 11 Washer |
| 4 Breaker point assembly | 12 Cam |
| 5 Coil assembly | 13 High tension lead |
| 6 Condenser | 14 Washer |
| 7 Screw—breaker point | 15 Spring clip |
| 8 Screw—condenser | 16 Coil wedge |
| | 17 Cut-out lead |

QUESTION 13. (Continued)

EXAMINER'S
USE ONLY

- (i) Briefly explain how the magneto system generates a spark at the spark plug.

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

- (ii) Explain the purpose of the condenser in a simple flywheel magneto system.

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

- (c) (i) Calculate the total displacement of a six-cylinder engine, given the following data.

- Bore diameter 96 mm
- Stroke 86 mm.

Total displacement =

QUESTION 13. (Continued)

EXAMINER'S
USE ONLY

(ii) For each of the specifications given below, name the tool(s) necessary to measure the specification, and briefly describe how the tool(s) are used.

1. Crankshaft pulley bolt—325 N m

Tool(s)

Use

.....

2. Crankshaft end float, taken at No. 2 main bearing

Tool(s)

Use

.....

3. Maximum ovality in cylinder block 0.010 mm

Tool(s)

Use

.....

QUESTION 14. (5 marks)

EXAMINER'S
USE ONLY



(a) Explain TWO possible safety hazards that are avoided by removing battery connections before working on a car engine.

(i)
.....

(ii)
.....

(b) A car was found to be overheating during normal operation. List FOUR possible causes.

(i)

(ii)

(iii)

(iv)

(c) Maintenance is an important factor in the reliable operation of engines. Outline a weekly, and a 10 000 km, maintenance schedule for a fuel injected, four-cylinder car engine. (Do NOT include brake systems, cooling, etc.)

Weekly

.....

.....

10 000 km

.....

.....

.....

.....

.....

QUESTION 14. (Continued)

EXAMINER'S
USE ONLY

(d) A schematic diagram of an engine-management system is shown in Figure 3.

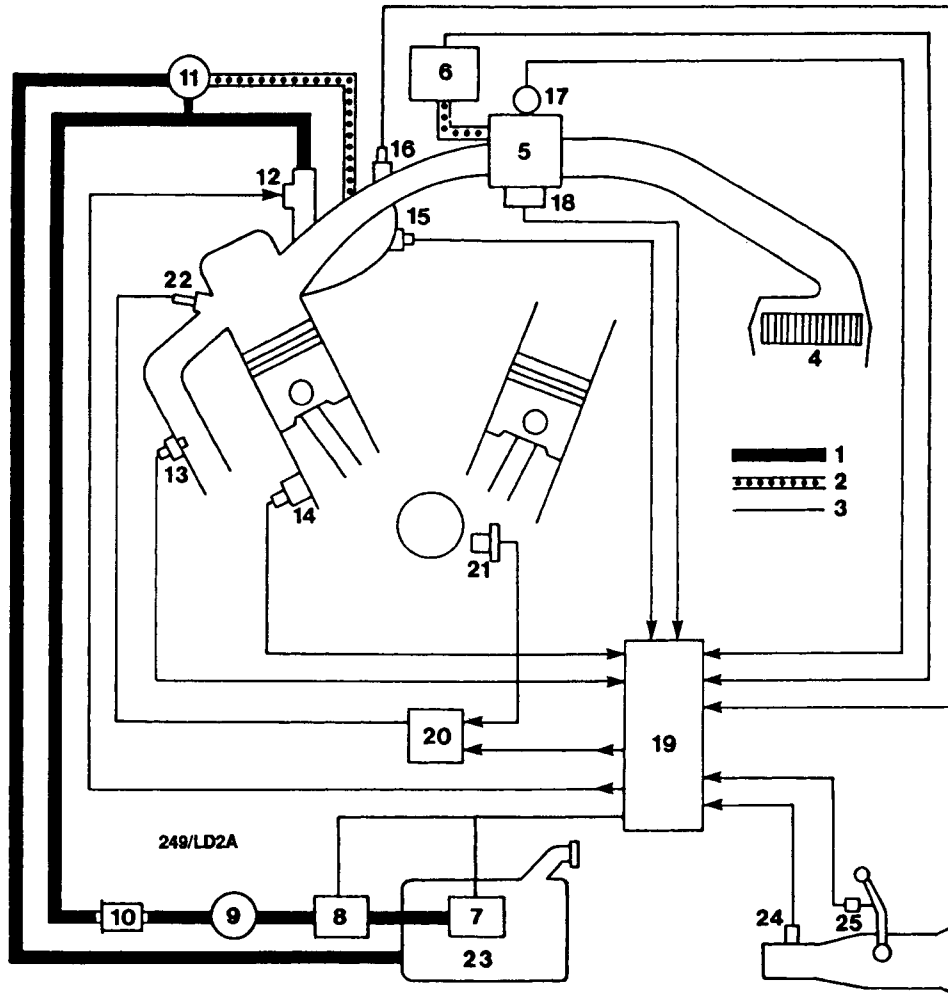


FIG. 3

'Commodore Lexcen V6 1988-91', Gregory's Scientific Publications No 249 1993 p87. Courtesy Universal Press.

KEY

1 Fuel line	8 High pressure fuel pump	16 Manifold air temperature (MAT) sensor
2 Vacuum line	(Long range fuel tank)	17 Idle air control (IAC) valve
3 Electrical circuit	9 Fuel damper (Long range fuel tank)	18 Throttle position sensor
4 Air cleaner element	10 Fuel filter	19 Control unit
5 Throttle body	11 Pressure regulator	20 Ignition control module
6 Manifold absolute pressure (MAP) sensor	12 Fuel injector	21 Crankshaft sensor
7 High pressure fuel pump (Standard fuel tank)	13 Oxygen sensor	22 Spark plug
7 Low pressure fuel pump (Long range fuel tank)	14 Detonation sensor	23 Fuel tank
	15 Coolant temperature sensor	24 Vehicle speed sensor
		25 Neutral safety switch

QUESTION 14. (Continued)

EXAMINER'S
USE ONLY

(i) Briefly explain the function/operation of the following components.

1. Control unit (Part 19)

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

2. Crankshaft sensor (Part 21)

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

3. Neutral safety switch (Part 25)

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

4. Fuel injector (Part 12)

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

(ii) Name TWO components that would be replaced during a routine service.

Component 1

Component 2

QUESTION 14. (Continued)

EXAMINER'S
USE ONLY

(e) A front-wheel hub assembly is shown below in Figure 4.

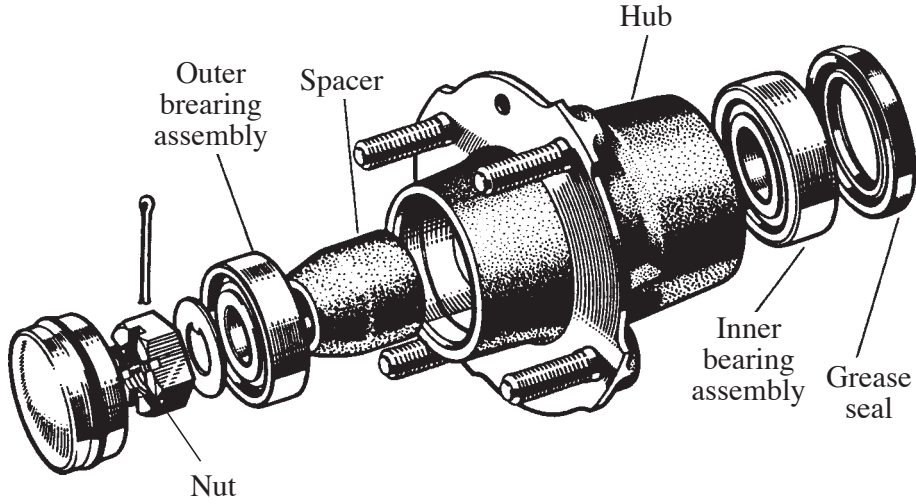


FIG. 4

"Power mechanics", Longmans Industrial Arts 1969.

(i) State TWO signs that may indicate a worn wheel bearing.

Sign 1

Sign 2

(ii) What is the purpose of the grease seal?

.....
.....

(iii) List the sequence of steps required to remove and replace a worn outer bearing.

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

(iv) Why is the specially shaped nut used as part of this assembly?

.....
.....

QUESTION 15. (5 marks)

EXAMINER'S
USE ONLY



(a) The designers of motor vehicles are constantly striving to develop vehicles that are easy to operate.

(i) List FOUR hand-operated components that should be readily accessible to the driver.

- 1.
- 2.
- 3.
- 4.

(ii) Select ONE of the components listed above, and discuss TWO important considerations in positioning the component.

Component selected

Consideration 1

.....
.....

Consideration 2

.....
.....

(b) Rust is a significant problem in motor vehicle bodies.

(i) What is rust?

.....

(ii) Briefly describe TWO ways to design cars so that rust is minimised.

1.

2.

(c) Briefly describe the purpose of the following terms.

(i) VIN.....

Purpose

(ii) Compliance plate.....

Purpose

QUESTION 15. (Continued)

EXAMINER'S
USE ONLY

- (d) The Australian Design Rules (ADR) govern the construction techniques and components used in motor vehicles.

Name THREE vehicle components subject to ADR requirements.

- (i)
- (ii)
- (iii)

- (e) Trouble shooting is a vital skill required by an automotive mechanic. Describe a procedure that may be used to prove each of the following faults.

- (i) Blocked fuel filter

Description

.....

.....

- (ii) Damaged rear wheel bearing

Description

.....

.....

- (iii) Worn, noisy water pump

Description

.....

.....

QUESTION 15. (Continued)

EXAMINER'S
USE ONLY

- (f) (i) Petrol-driven lawnmowers have traditionally used two and four-stroke motors.

Complete the table below by giving THREE advantages for each type of engine.

<i>Two stroke</i>	<i>Four stroke</i>
1.	1.
2.	2.
3.	3.

- (ii) Name and briefly describe the advantages of an alternative power source for a lawnmower.

Power source

Advantages

.....

.....

BLANK PAGE

BLANK PAGE

BLANK PAGE