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HS-803 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES
IN THE UNITED STATES
Second Series - Report No. 4
1976 Chevrolet 85 CID (I. 4 Liters), IV

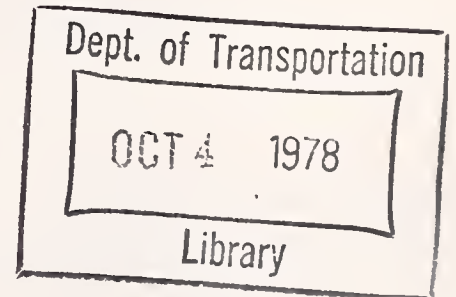
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MAY 1978

INTERIM REPORT



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VIRGINIA 22161

Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Washington DC 20590

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16. Abstract Experimental data were obtained in dynamometer tests of a 1976 Chevrolet 85 CID engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady-state engine-operating modes. The objective of the program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.					
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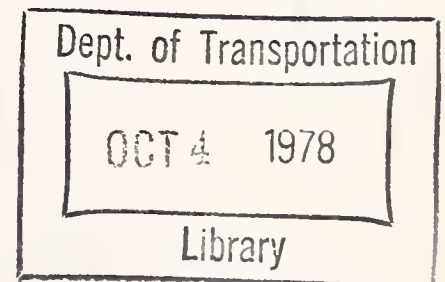
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PREFACE

This report, prepared by the U.S. Department of Energy, Bartlesville Energy Research Center, for the U.S. Department of Transportation, Transportation Systems Center, Energy Technology Branch, Cambridge MA, presents results of experimental work to obtain information on performance characteristics of an engine used in automobiles sold in the U.S. The engine used in this work is one of a series of 10 engines to be tested in the current program. This is the fourth of the reports to be published covering work with those engines.

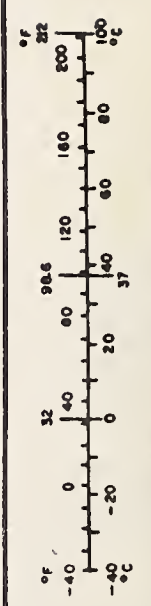
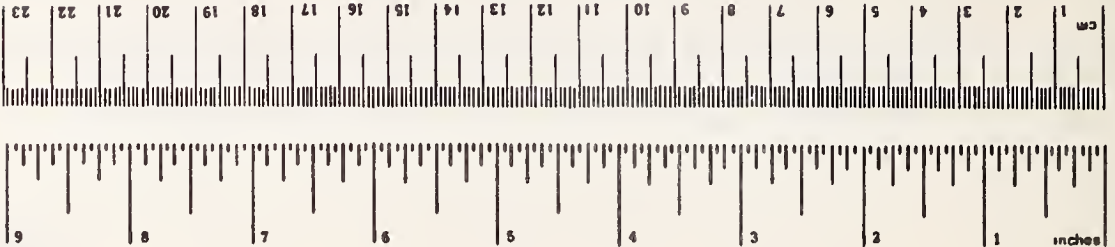
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Ralph G. Colello and James A. Kidd, Jr., of the U.S. Department of Transportation, Transportation Systems Center, are the technical monitors.



METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures				Approximate Conversions from Metric Measures			
Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find
LENGTH							
in	inches	2.5	centimeters	mm	millimeters	0.04	inches
ft	feet	30	centimeters	cm	centimeters	0.4	inches
yd	yards	0.9	meters	m	meters	3.3	feet
mi	miles	1.6	kilometers	km	kilometers	1.1	yards
						0.6	miles
AREA							
in ²	square inches	6.5	square centimeters	cm ²	square centimeters	0.16	square inches
ft ²	square feet	0.09	square meters	m ²	square meters	1.2	square yards
yd ²	square yards	0.8	square meters	km ²	square kilometers	0.4	square miles
mi ²	square miles	2.6	square kilometers	ha	hectares (10,000 m ²)	2.5	acres
	acres	0.4	hectares				
MASS (weight)							
oz	ounces	28	grams	g	grams	0.035	ounces
lb	pounds	0.45	kilograms	kg	kilograms	2.2	pounds
	short tons (2000 lb)	0.9	tonnes	t	tonnes (1000 kg)	1.1	short tons
VOLUME							
teaspoon	teaspoons	5	milliliters	ml	milliliters	0.03	fluid ounces
Tablespoon	tablespoons	15	milliliters	ml	liters	2.1	pints
fl oz	fluid ounces	30	milliliters	l	liters	1.06	quarts
c	cups	0.24	liters	l	liters	0.26	gallons
pt	pints	0.47	liters	m ³	cubic meters	.36	cubic feet
qt	quarts	0.95	liters	m ³	cubic meters	1.3	cubic yards
gal	gallons	3.8	liters				
ft ³	cubic feet	0.03	cubic meters				
yd ³	cubic yards	0.76	cubic meters				
TEMPERATURE (exact)							
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature



1. INTRODUCTION

The data acquired from tests of a 1976 Chevrolet 85 CID engine are presented in this report. This engine is used by Chevrolet in the Chevette models (2,250 lb weight class). The test results are sufficient to establish steady-state maps for fuel consumption and emissions (carbon monoxide, unburned hydrocarbon, and oxides of nitrogen) over the entire operating range of the engine.

The objective of this program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of this work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.

2. ENGINE TEST REPORT

The engine test setup included a complete engine with the exception of a fan and a cooling tower which was used in place of the radiator. The alternator was included but was not wired into the engine's electrical system. The new mean-tolerance engine was equipped with emission control systems including exhaust-gas recirculation (EGR) and an oxidation catalyst. General engine specifications are listed in table 1. A single batch of unleaded regular-grade gasoline was used throughout the break-in (table 2) and test; a detailed fuel analysis is given in table 3. The engine break-in consisted of 40 hours of engine operation on the dynamometer. The engine was operated at various speeds and loads designed to simulate road/load conditions. Engine testing began on 10 October 1976 and ended on 23 November 1976. The engine was tested while operating at the steady-state modes shown in table 4.

The following data were recorded for each test point:

Test number
Date
Barometric pressure, mm Hg
Dewpoint, °F
Inlet air temperature, °F
Speed, rpm
Torque, lb-ft -- BLH strain gage load cell; Daytronics indicator
Fuel rate, lb/hr -- Fluidyne positive displacement fuel flowmeter
Ignition timing, °BTC
Manifold vacuum, in. Hg
Throttle angle, deg
CO, pct -- Beckman NDIR
CO₂, pct -- Beckman NDIR
O₂, pct -- Beckman polarographic detector
HC, ppmC -- Custom-built heated flame ionization detector
NO_x, ppm -- Thermo-Electron chemiluminescent detector
Oil temperature, °F
Oil pressure, psig
Coolant temperature, °F
Exhaust temperature, °F
Exhaust pressure, in. H₂O
Intake manifold temperature, °F.

The following equations were used in calculating power, air/fuel ratio, absolute humidity, and mass emission rates of carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NO_x):

1. Partial pressure of water vapor in intake air (millimeters of mercury):

$$P = \exp \left[18.717 - \frac{7308.1}{393 + D} \right] ,$$

where D = dewpoint, °F.

2. Absolute humidity (grains moisture per pound dry air):

$$H = \frac{4347.8(P)}{B - P} ,$$

where B = barometric pressure, mm Hg.

3. Humidity correction factor (dimensionless):

$$K_H = \frac{1}{1 - 0.0047(H - 75)} .$$

Note: This factor is used to correct the NO_x mass emission rate to a standard humidity of 75 grains moisture per pound dry air.

4. Stoichiometric air/fuel ratio (dimensionless):

$$AF_s = \frac{69(2 + \frac{x}{2} - y)}{MW_{fuel}} ,$$

where x = hydrogen-carbon atomic ratio of fuel,
 y = oxygen-carbon atomic ratio of fuel,
 MW_{fuel} = fuel molecular weight per carbon atom,
 $= 12.01115 + 1.00797x + 15.9994y$.

5. Hydrogen concentration in raw exhaust (percent):

$$H_2 = \frac{x(CO)(CO + CO_2)}{2(CO + 3CO_2)} ,$$

where CO = carbon-monoxide concentration (percent),
 CO₂ = carbon-dioxide concentration (percent).

Note: This equation assumes a water-gas shift equilibrium constant

$$\frac{(CO)(H_2O)}{(CO_2)(H_2)} = 3.$$

6. Correction factor for emission concentrations from wet basis to dry basis (dimensionless):

$$C_w = 1 + \frac{(\frac{x}{2})(CO + CO_2) - H_2}{100}.$$

Note: In these tests only HC is measured on a wet basis. All other species are measured on a dry basis.

7. Air/Fuel ratio (dimensionless):

$$AF = \frac{AF_s}{2 + \frac{x}{2} - y} \left[\frac{(1 + \frac{x}{2} - y)(CO) + (2 + \frac{x}{2} - y)(CO_2) + 2(O_2) + \frac{NO_x}{10^4} - H_2}{CO + CO_2 + C_w(\frac{HC}{10^4})} \right],$$

where O_2 = oxygen concentration (percent)
 NO_x = oxides of nitrogen (ppm)
 HC = unburned hydrocarbon concentration (ppmC).

8. Exhaust flow (pounds per hour):

$$M_{EX} = M_F(1 + AF),$$

where M_F = fuel flow rate (pounds per hour).

9. Carbon monoxide mass emission rate (grams per hour):

$$M_{CO} = \frac{M_{EX}}{C_w} \left(\frac{CO}{100} \right) \left(\frac{MW_{CO}}{MW_{EX}} \right) 453.59237,$$

where MW_{CO} = molecular weight of CO (=28.01115),
 MW_{EX} = molecular weight of exhaust gas (=28.967).

10. Unburned hydrocarbon mass emission rate (grams per hour):

$$M_{HC} = M_{EX} \left(\frac{HC}{10^6} \right) \left(\frac{MW_{HC}}{MW_{EX}} \right) 453.59237,$$

where MW_{HC} = molecular weight per carbon atom of HC,
 $= 12.01115 + 1.00797x + 15.9994y.$

11. Oxides of nitrogen mass emission rate (grams per hour):

$$M_{NO_x} = \frac{M_{EX}}{C_w} \left(\frac{NO_x}{10^6} \right) \left(\frac{MW_{NO_x}}{MW_{EX}} \right) (K_H) 453.59237,$$

where MW_{NO_x} = molecular weight of NO_2 (=46.0028).

12. Power (brake horsepower corrected to a standard barometric pressure of 736.6 mm Hg and a standard temperature of 85° F):

$$HP = \frac{N(T)}{5252.113} \left(\frac{736.6}{B - P} \right) \sqrt{\frac{t + 460}{545}},$$

where N = engine speed (revolutions per minute),

T = brake torque (foot-pounds),

t = air temperature (°F).

3. DISCUSSION OF TEST RESULTS

Maximum corrected brake horsepower, maximum corrected torque and brake specific fuel consumption (bsfc) are shown plotted as a function of engine speed at wide-open throttle (WOT) in figure 1. The maximum brake horsepower exceeds the value quoted in table 1. The engine produced a maximum torque similar to that value quoted in table 1. Maximum torque output and minimum bsfc were found at the same engine speed. The carburetion of the engine was such that lean A/F conditions were maintained throughout the entire engine-operating range except near WOT (figure 2) and at high speeds (4,500 and 5,300 rpm) combined with light loads (power less than 20 bhp). Emission rates of CO and HC were maintained at low levels for all speed and load conditions which were associated with lean A/F (figures 3 and 4). Emission rates of NO_x tended to increase with increasing power output above 1,000 rpm until A/F enrichment occurred for that particular engine speed (figure 5). Fuel rates were generally found to be repeatable for those tests which were duplicated (figure 6). Fuel rate was found to be nearly a linear function of power for engine speeds less than 4,500 rpm and loads less than 75 pct of full load.

4. CONCLUSIONS

The purpose of the experimental work that is reported here is to establish data for this engine. Those data are presented in the accompanying tables of this report.

TABLE 1. MANUFACTURER'S ENGINE SPECIFICATIONS

Displacement, cu in.....	85
Maximum horsepower, bhp @ 5,200 rpm.....	52
Maximum torque, lb-ft @ 3,600 rpm.....	70
Bore and stroke, in.....	3.228 x 2.606
Configuration.....	in-line 4-cylinder
Compression ratio.....	8.5:1
Firing order.....	1-3-4-2
Ignition timing at idle speed, °BTDC @ 800 rpm.....	10
Block material.....	cast iron
Head material.....	cast iron
Number of crankshaft main bearings.....	5
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive type.....	sprocket and belt
Valve lift:	
Intake, in.....	0.371
Exhaust, in.....	0.371
Valve timing:	
Intake opens, °BTC.....	20
Intake closes, °ABC.....	84
Exhaust opens, °BBC.....	84
Exhaust closes, °ATC.....	20
Spark plug gap, in.....	0.035
Engine weight, lb.....	200
Exhaust-gas-recirculation system:	
Valve type.....	modulated
Control signal.....	ported vacuum
Point of discharge.....	intake manifold
Crankcase emission control:	
Control method.....	positive crankcase ventilation
Point of discharge.....	intake manifold
Carburetor type.....	1V downdraft
Distributor specifications:*	
Centrifugal advance, begins, ° @ 600 rpm.....	0
Centrifugal advance, intermediate, ° @ 1,000 rpm.....	4
Centrifugal advance, full, ° @ 2,400 rpm.....	10
Vacuum advance, begins, ° @ 4 in. Hg.....	0
Vacuum advance, maximum, ° @ 8 in. Hg.....	7
Carburetor number.....	17056030
EGR valve number.....	7046282
Distributor number.....	1110654

*Distributor rpm and deg.

TABLE 2. ENGINE BREAK-IN SCHEDULE

Simulated Vehicle Speed, mph	Engine Speed, rpm	Manifold Vacuum, in. Hg	Fraction of Time in Mode
0	Idle	19.0	1/11
20	1,100	15.0	"
30	1,700	14.5	"
40	2,300	13.8	"
50	2,800	13.0	"
60	3,300	12.0	"
0	Idle	19.0	"
25	1,400	14.8	"
35	2,000	14.1	"
45	2,550	13.4	"
55	3,050	12.5	"

Mileage per cycle = 90.

Total mileage accumulated over 40-hour break-in period = 1,310.

TABLE 3. FUEL SPECIFICATIONS

Fuel No.....	7619
Research octane No.....	91.5
Motor octane No.....	83.5
Specific gravity, deg.....	0.7161
API gravity, deg.....	66.1
Distillation, °F:	
10 pct evaporated.....	128
50 pct ".....	218
95 pct ".....	404
100 pct ".....	417
Reid vapor pressure, psig.....	9.5
FIA analysis, pct:	
Aromatics.....	6
Olefins.....	17
Paraffins.....	77
Sulfur, pct.....	0.024
Lead, g/gal.....	Trace
Hydrogen/carbon atomic ratio.....	2.040
Oxygen/carbon atomic ratio.....	0.000

TABLE 4. TEST-NUMBER CROSS-REFERENCE INDEX

Pct Full Load	Engine Speed, rpm												
	700	800	1,000	1,500	2,000	2,500	3,000	3,400	3,600	4,500	5,200	5,300	5,500
0		1 71	14	22	30	38	46	54	116	62		70 133	
10		2 72	13 80	21 84	29 88	37 92	45 96	53 100	115	61 104	156	69 132	
25		3 73	12	20 129	28	36	44	52	114	60	155	68	
40			11 79	19 83	27 87	35 91	43 95	51 99	113	59 103	154	67 107	
60	4 74		10	18 127	26	34	42	50	112	58	153	66	
75	5 75		9 78	17 82	25 86	33 90	41 94	49 98	111	57 102	152	65 106	
90			8	16	24	32	40	48	110	56	151	64	
100	6 76		7 77	15 81	23 85	31 89	39 93	47 97	109 123	55 101	150	63 105	126

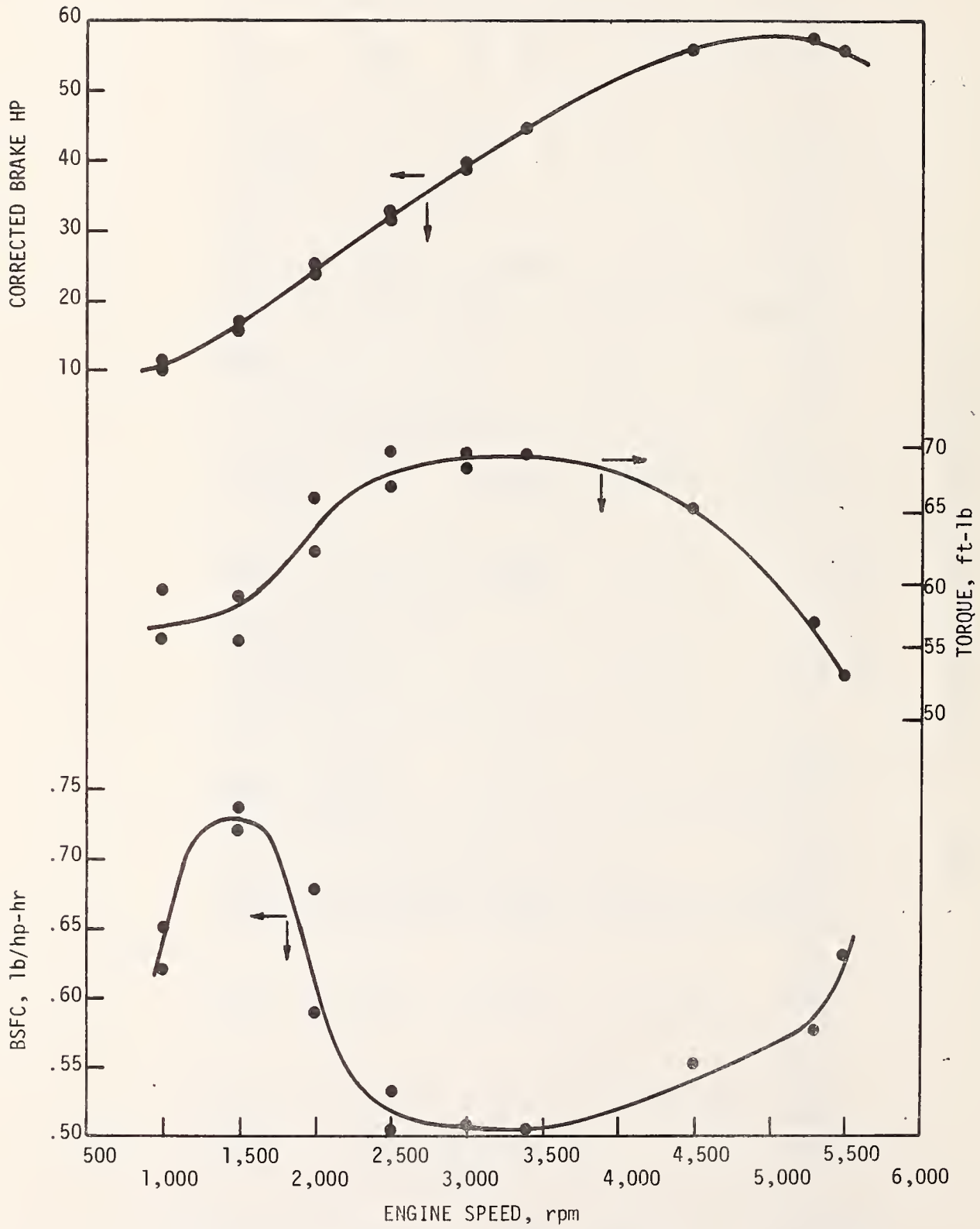


FIGURE 1. Brake Specific Fuel Consumption, Torque, and Brake Horsepower versus Engine rpm at Wide-Open-Throttle--Chevrolet 1.4 liter Engine.

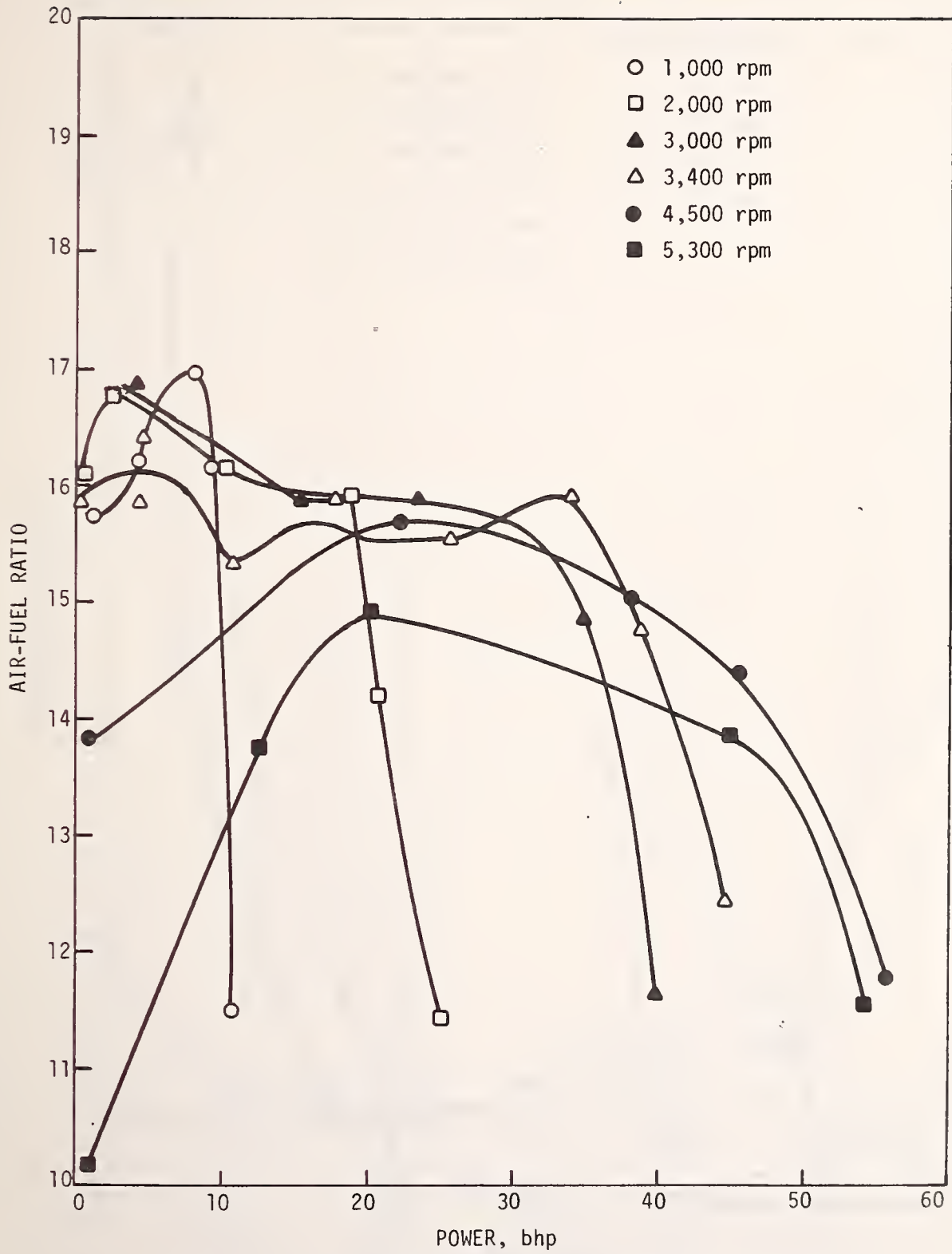


FIGURE 2. Air/Fuel Ratio versus Power at Various Speed and Load Conditions--Chevrolet 1.4 liter Engine.

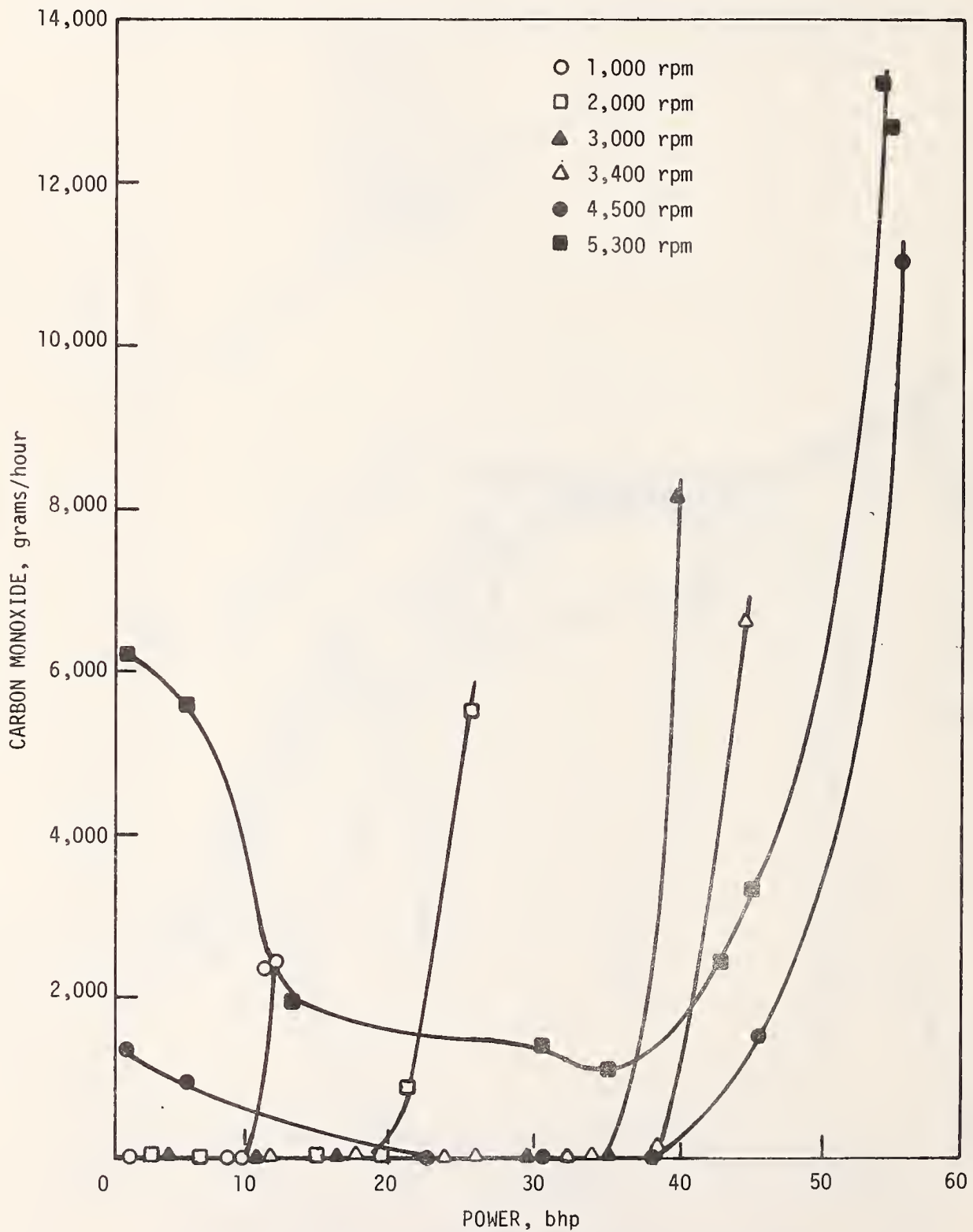


FIGURE 3. Carbon Monoxide Emissions versus Power at Various Speed and Load Conditions-- Chevrolet 1.4 liter Engine.

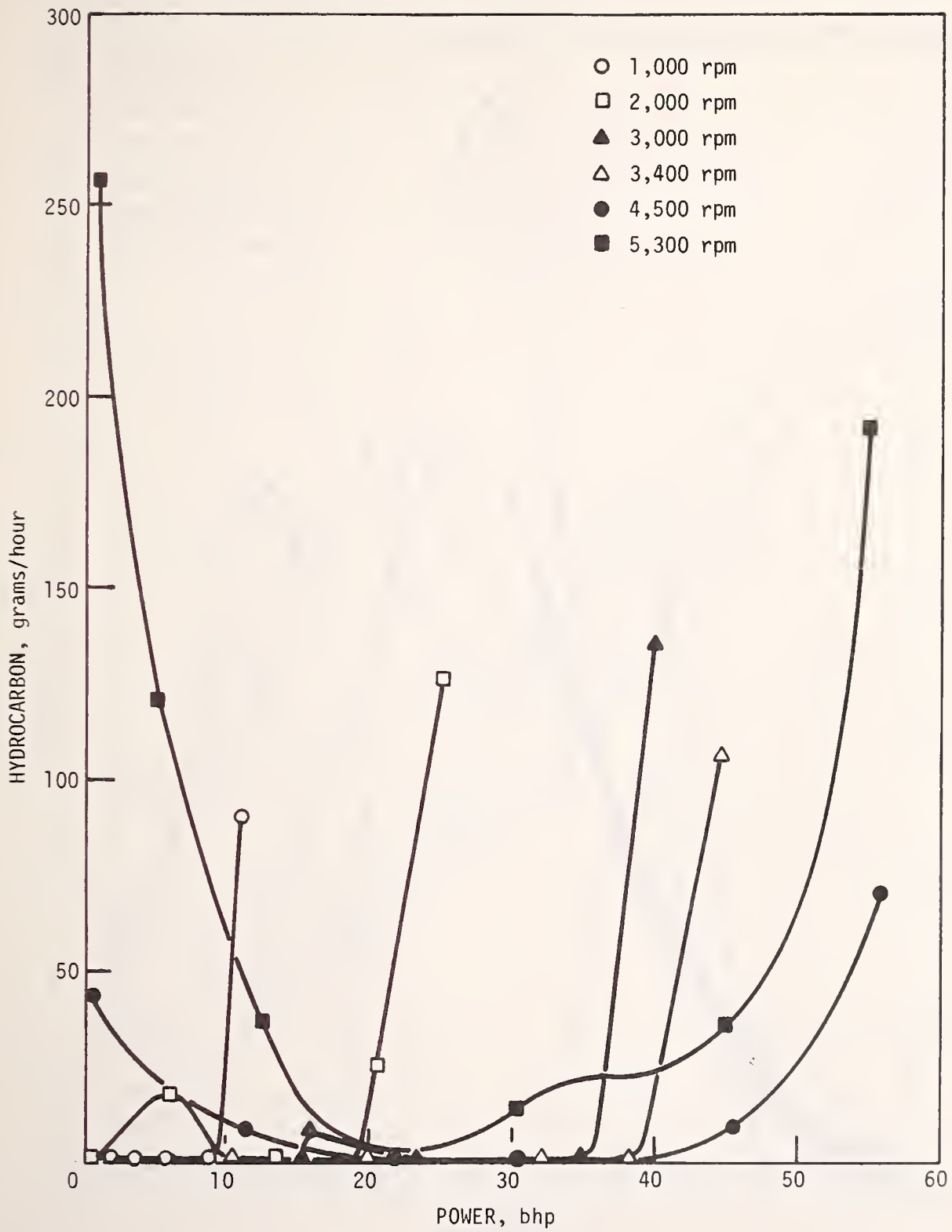


FIGURE 4. Hydrocarbon Emissions versus Power at Various Speed and Load Conditions-- Chevrolet 1.4 liter Engine.

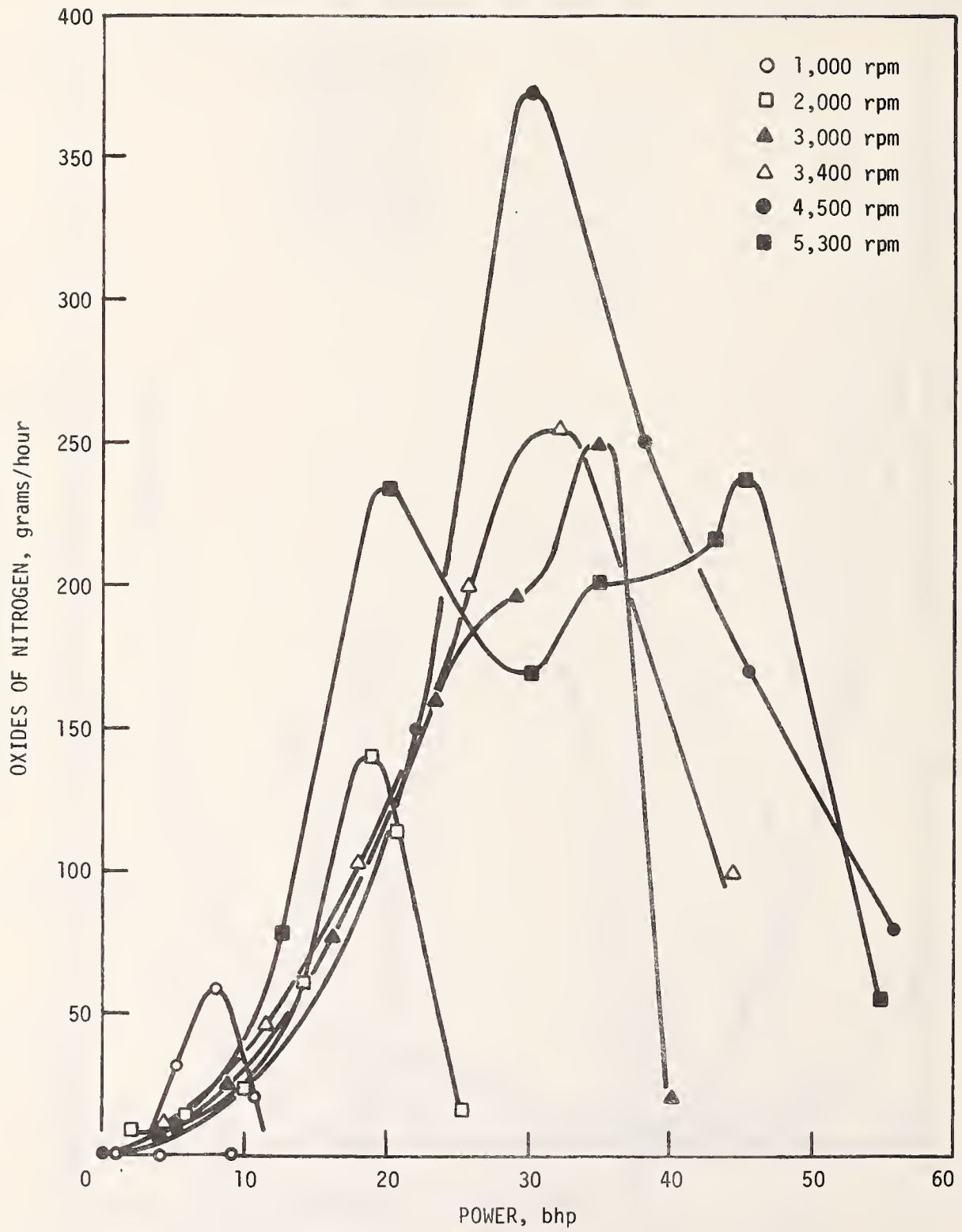


FIGURE 5. Oxides of Nitrogen Emissions versus Power at Various Speed and Load Conditions--Chevrolet 1.4 liter Engine.

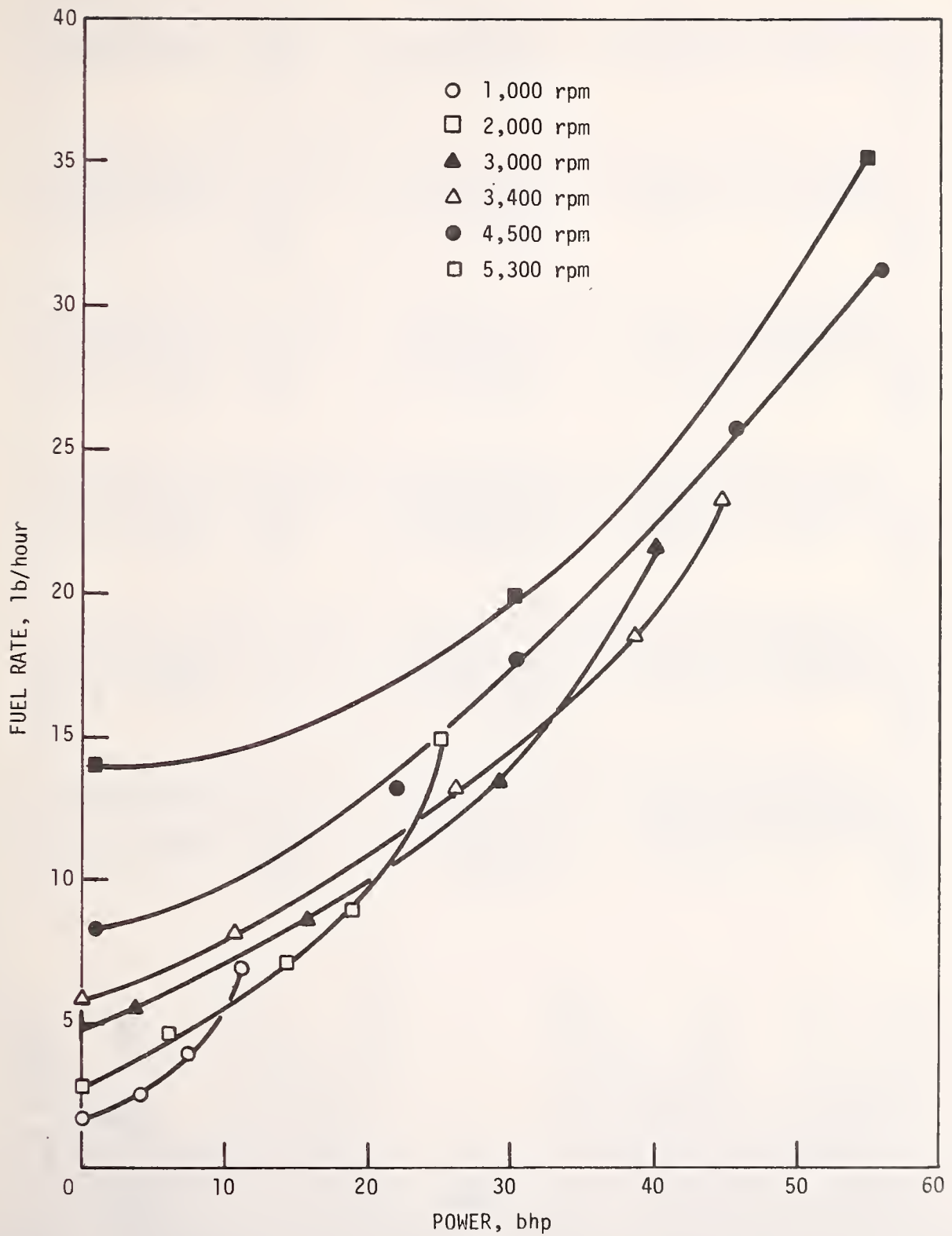


FIGURE 6. Fuel Rate versus Power at Various Speed and Load Conditions--Chevrolet 1.4 liter Engine.

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

	1.1	1.2	2.1	2.2	3.1	3.2
TEST NUMBER	10/29/76	10/29/76	10/29/76	10/29/76	10/29/76	10/29/76
BAROMETER, MMHG	745.5	745.5	745.5	745.5	745.5	745.5
HUMIDITY, GRAINS/LB	55	55	55	55	55	55
TEMPERATURE, F	87	87	87	87	87	87
ENGINE SPEED, RPM	800	800	800	800	800	800
TORQUE, FT-LB	.0	.0	9.6	9.6	20.0	20.0
POWER, BHP*	.0	.0	1.5	1.5	3.1	3.1
FUEL RATE, LB/HR	1.3	1.3	1.7	1.7	1.8	1.8
IGNITION TIMING, DEG BTDC	10.0	10.0	10.0	10.0	10.0	10.0
MANIFOLD VACUUM, IN HG	18.5	18.5	16.0	16.0	12.5	12.5
THROTTLE ANGLE, DEG	.0	.0	1.0	1.0	2.0	2.0
INTAKE MAN. TEMP., F	117	117	132	132	135	135

CONCENTRATIONS, DRY BASIS

CO, %	.3239	.1480	.1480	.0772	.3014	.0561
CO2, %	13.01	13.67	13.67	13.80	13.67	13.67
O2, %	2.39	2.19	1.25	1.25	1.33	1.32
HC, PPMC	5674	285	4476	2197	4908	2565
NOX, PPM	77	53	300	250	1375	1500
AIR/FUEL RATIO	15.74	16.27	15.15	15.42	15.12	15.49

EMISSION RATES, G/HR

CO	27.7	12.0	15.3	8.2	32.9	6.3
HC	24.4	1.2	23.3	11.7	26.9	14.4
NOX+	1.0	.7	4.7	4.0	22.6	25.2
OIL TEMPERATURE, F	144	144	161	161	175	175
OIL PRESSURE, PSI	25	25	20	20	20	20
COOLANT TEMPERATURE, F	151	151	171	171	184	184
EXHAUST PRESSURE, IN. H2O	1.0	.0	1.0	.0	1.0	.0
EXHAUST TEMPERATURE, F	418	531	465	337	505	381

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

	4.1	4.2	5.1	5.2	6.1	6.2
TEST NUMBER	10/29/76	10/29/76	10/29/76	10/29/76	10/29/76	10/29/76
TEST DATE	745.5	745.5	745.5	745.5	745.5	745.5
BAROMETER, MMHG	55	55	55	55	55	55
HUMIDITY, GRAINS/LB	74	74	76	76	76	76
TEMPERATURE, F	700	700	700	700	700	700
ENGINE SPEED, RPM	5.0	5.0	15.0	15.0	25.0	25.0
TORQUE, FT-LB	.7	.7	2.0	2.0	3.3	3.3
POWER, BHP*	1.3	1.2	1.7	1.7	2.2	2.2
FUEL RATE, LB/HR	10.0	10.0	10.0	10.0	10.0	10.0
IGNITION TIMING, DEG BTDC	16.5	16.5	13.5	13.5	10.0	10.0
MANIFOLD VACUUM, IN HG	.0	.0	1.0	1.0	2.5	2.5
THROTTLE ANGLE, DEG	137	137	136	136	134	134
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	.1180	.0193	.1465	.0378	.1227	.1740
CO2, %	13.00	13.27	13.53	13.80	13.53	13.67
O2, %	1.98	1.82	1.33	1.25	1.27	1.28
HC, PPMC	4080	886	4955	1740	4954	3593
NOX, PPM	113	150	400	540	750	752

AIR/FUEL RATIO

	15.75	16.05	15.16	15.51	15.14	15.27
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	9.9	1.6	15.3	4.2	16.7	23.8
HC	17.2	3.6	25.9	9.7	33.8	24.7
NOX+	1.4	1.8	6.3	9.0	15.3	15.4

OIL TEMPERATURE, F

	176	176	176	176	176	176
--	-----	-----	-----	-----	-----	-----

OIL PRESSURE, PSI

	18	18	16	16	17	17
--	----	----	----	----	----	----

COOLANT TEMPERATURE, F

	182	182	182	182	181	181
--	-----	-----	-----	-----	-----	-----

EXHAUST PRESSURE, IN. H2O

	1.0	.0	1.0	.0	1.0	.0
--	-----	----	-----	----	-----	----

EXHAUST TEMPERATURE, F

	437	374	444	392	480	382
--	-----	-----	-----	-----	-----	-----

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

7.1
10/29/76

7.2
10/29/76

8.1
10/29/76

8.2
10/29/76

9.1
10/29/76

9.2
10/29/76

BAROMETER, MMHG

752.0

752.0

745.5

745.5

745.5

745.5

HUMIDITY, GRAINS/LB

40

40

55

55

55

55

TEMPERATURE, F

84

84

81

81

82

82

ENGINE SPEED, RPM

1000

1000

1000

1000

1000

1000

TORQUE, FT-LB

60.0

60.0

48.0

48.0

40.3

40.3

POWER, BHP*

11.3

11.3

9.1

9.1

7.7

7.7

FUEL RATE, LB/HR

7.0

7.0

4.6

4.6

4.0

4.3

IGNITION TIMING, DEG BTDC

10.0

10.0

10.0

10.0

10.0

10.0

MANIFOLD VACUUM, IN HG

.0

.0

1.5

1.5

3.5

3.5

THROTTLE ANGLE, DEG

75.0

75.0

16.5

16.5

13.0

13.0

INTAKE MAN. TEMP., F

95

95

136

136

140

140

CONCENTRATIONS, DRY BASIS

CO, %

7.3800

6.9500

.0748

.0050

.0724

.0050

CO2, %

10.40

10.40

13.00

13.40

13.14

13.00

O2, %

.38

.25

2.29

1.78

2.54

2.50

HC, PPM

5045

5266

3286

85

2751

71

NOX, PPM

480

405

890

1625

750

1750

AIR/FUEL RATIO

11.71

11.73

16.12

16.16

16.35

16.75

EMISSION RATES, G/HR

CO

2507.2

2381.2

22.6

1.5

19.6

1.5

HC

86.1

90.6

49.8

1.3

37.3

1.1

NOX+

23.0

19.6

40.4

73.8

30.5

78.2

OIL TEMPERATURE, F

165

165

181

181

184

184

OIL PRESSURE, PSI

25

25

25

25

24

24

COOLANT TEMPERATURE, F

176

176

176

176

177

177

EXHAUST PRESSURE, IN. H2O

6.0

5.0

6.0

5.0

5.0

4.0

EXHAUST TEMPERATURE, F

765

667

795

726

772

706

* CORRECTED SAE JB16B

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

	10.1	10.2	11.1	11.2	12.1	12.2
TEST NUMBER	10/29/76	10/29/76	10/29/76	10/29/76	10/29/76	10/29/76
TEST DATE	745.5	745.5	745.5	745.5	745.5	745.5
BAROMETER, MMHG	55	55	53	53	53	53
HUMIDITY, GRAINS/LB	82	82	78	78	78	78
TEMPERATURE, F	1000	1000	1000	1000	1000	1000
ENGINE SPEED, RPM	32.3	32.3	21.5	21.5	13.5	13.5
TORQUE, FT-LB	6.1	6.1	4.1	4.1	2.6	2.6
POWER, BHP*	3.5	3.4	2.5	2.5	2.3	2.3
FUEL RATE, LB/HR	22.0	22.0	15.0	15.0	15.0	15.0
IGNITION TIMING, DEG BTDC	7.5	7.5	13.5	13.5	15.5	15.5
MANIFOLD VACUUM, IN HG	11.1	11.1	8.5	8.5	6.0	6.0
THROTTLE ANGLE, DEG	137	137	134	134	127	127
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	.0724	.0073	.0820	.0050	.0940	.0049
CO2, %	12.38	12.75	13.14	13.53	13.27	13.67
O2, %	2.70	2.50	2.20	1.90	2.23	1.32
HC, PPMC	3324	73	3687	85	2954	160
NOX, PPM	690	665	590	600	400	290

AIR/FUEL RATIO

AIR/FUEL RATIO	16.49	16.75	15.98	16.20	16.06	15.75
----------------	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	17.2	1.7	13.6	.8	14.2	.7
HC	39.6	.9	30.7	.7	22.4	1.2
NOX+	24.6	23.1	14.6	14.8	9.0	6.4

OIL TEMPERATURE, F

OIL TEMPERATURE, F	184	184	178	178	167	167
--------------------	-----	-----	-----	-----	-----	-----

OIL PRESSURE, PSI

OIL PRESSURE, PSI	25	25	25	25	27	27
-------------------	----	----	----	----	----	----

COOLANT TEMPERATURE, F

COOLANT TEMPERATURE, F	177	177	174	174	167	167
------------------------	-----	-----	-----	-----	-----	-----

EXHAUST PRESSURE, IN. H2O

EXHAUST PRESSURE, IN. H2O	4.0	3.0	2.0	1.0	2.0	1.0
---------------------------	-----	-----	-----	-----	-----	-----

EXHAUST TEMPERATURE, F

EXHAUST TEMPERATURE, F	684	678	595	602	584	504
------------------------	-----	-----	-----	-----	-----	-----

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

13.1

10/29/76

14.1

10/29/76

15.1

11/ 1/76

752.0

BAROMETER, MMHG

745.5

745.5

745.5

HUMIDITY, GRAINS/LB

53

53

53

TEMPERATURE, F

78

78

78

ENGINE SPEED, RPM

1000

1000

1000

TORQUE, FT-LB

5.4

5.4

.0

POWER, BHP*

1.0

1.0

.0

FUEL RATE, LB/HR

2.2

2.1

2.1

IGNITION TIMING, DEG BTDC

11.0

11.0

10.0

MANIFOLD VACUUM, IN HG

17.0

17.0

18.0

THROTTLE ANGLE, DEG

5.0

5.0

4.5

INTAKE MAN. TEMP., F

125

125

124

CONCENTRATIONS, DRY BASIS

CO, %

.1230

.0049

.1650

.0049

11.9100

CO₂, %

13.40

13.67

13.27

13.67

7.68

O₂, %

1.40

1.33

1.40

1.40

.25

HC, PPMC

2503

137

2273

142

6451

NOX, PPM

190

160

100

80

54

AIR/FUEL RATIO

15.49

15.75

15.50

15.80

9.93

EMISSION RATES, G/HR

CO

16.9

.7

22.6

.5

6282.8

HC

17.2

.9

15.6

.8

170.9

NOX+

3.9

3.2

2.0

1.3

4.0

OIL TEMPERATURE, F

165

165

161

161

206

OIL PRESSURE, PSI

29

29

29

29

29

COOLANT TEMPERATURE, F

158

158

154

154

191

EXHAUST PRESSURE, IN. H₂O

1.0

.0

1.0

.0

11.0

EXHAUST TEMPERATURE, F

577

487

536

464

918

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

16.1
11/ 1/76

16.2
11/ 1/76

24.1
11/ 1/76

24.2
11/ 1/76

25.1
11/ 1/76

25.2
11/ 1/76

BAROMETER, MMHG

745.5
53
81

745.5
53
81

748.2
56
84

748.2
56
84

748.2
56
88

748.2
56
88

HUMIDITY, GRAINS/LB

1500

1500

2000

2000

2000

2000

TEMPERATURE, F

50.0

50.0

54.4

54.4

46.5

46.5

ENGINE SPEED, RPM

14.2

14.2

20.6

20.6

17.7

17.7

TORQUE, FT-LB

7.3

7.3

10.0

9.9

8.7

8.6

POWER, BHP*

14.0

14.0

18.0

18.0

19.0

19.0

FUEL RATE, LB/HR

3.5

3.5

3.0

3.0

4.5

4.5

IGNITION TIMING, DEG 8TDC

18.0

18.0

24.0

24.0

18.5

18.5

MANIFOLD VACUUM, IN HG

136

136

137

137

107

107

THROTTLE ANGLE, DEG

136

136

137

137

107

107

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

.7625

.3150

1.6000

1.4700

.1350

.0049

CO2, %

13.93

14.63

13.66

13.93

13.80

14.08

O2, %

.60

.35

.45

.10

1.34

1.23

HC, PPMC

665

5181

2501

864

1884

57

NOX, PPM

2275

825

2050

1300

1300

1450

AIR/FUEL RATIO

14.88

14.43

14.23

14.20

15.53

15.71

EMISSION RATES, G/HR

CO

338.4

135.2

932.6

846.0

74.5

2.7

HC

14.8

111.7

73.2

25.0

52.2

1.6

NOX+

150.7

52.8

180.3

112.9

108.2

120.7

OIL TEMPERATURE, F

174

174

207

207

167

167

OIL PRESSURE, PSI

33

33

40

40

40

40

COOLANT TEMPERATURE, F

172

172

184

184

167

167

EXHAUST PRESSURE, IN. H2O

9.0

4.0

15.0

7.0

16.0

8.0

EXHAUST TEMPERATURE, F

972

902

1057

962

1078

956

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

26.1
11/ 1/76
748.2
56
87
2000
37.2
14.2
7.1
24.5
6.5
14.5
136

26.2
11/ 1/76
748.2
56
87
2000
37.2
14.2
7.2
24.5
6.5
14.5
136

27.1
11/ 2/76
748.8
56
78
2000
24.8
9.3
5.8
34.0
9.8
10.0
146

27.2
11/ 2/76
748.8
56
78
2000
24.8
9.3
5.8
34.0
9.8
10.0
146

28.1
11/ 2/76
748.8
56
85
2000
15.5
5.9
4.7
32.5
13.0
8.0
144

28.2
11/ 2/76
748.8
56
85
2000
15.5
5.9
4.6
32.5
13.0
8.0
144

CONCENTRATIONS, DRY BASIS

CO, %
CO2, %
O2, %
HC, PPMC
NOX, PPM

.1180
13.94
1.50
69
875

.1465
12.62
2.75
3163
320

.0049
13.01
2.50
62
290

.2340
12.62
3.00
3108
240

.0049
13.14
2.50
1111
300

AIR/FUEL RATIO

15.77

15.89

16.45

16.70

16.59

16.55

EMISSION RATES, G/HR

CO
HC
NOX+

54.3
55.3
60.8

57.2
62.0
18.9

1.9
1.2
17.3

74.3
49.6
11.5

1.5
17.6
14.3

OIL TEMPERATURE, F
OIL PRESSURE, PSI
COOLANT TEMPERATURE, F
EXHAUST PRESSURE, IN. H2O
EXHAUST TEMPERATURE, F

200
40
184
5.0
917

200
40
182
9.0
947

200
40
182
3.0
852

198
40
182
6.0
880

198
40
182
2.0
822

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	29.1	29.2	30.1	30.2	31.1	31.2
TEST DATE	11/ 1/76	11/ 1/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76
BAROMETER, MMHG	748.8	748.8	748.8	748.8	752.0	752.0
HUMIDITY, GRAINS/LB	56	56	56	56	44	44
TEMPERATURE, F	76	76	77	77	90	90
ENGINE SPEED, RPM	2000	2000	2000	2000	2500	2500
TORQUE, FT-LB	6.2	6.2	.9	.9	70.6	70.6
POWER, BHP*	2.3	2.3	.3	.3	33.4	33.4
FUEL RATE, LB/HR	3.3	3.2	2.6	2.9	18.1	18.1
IGNITION TIMING, DEG BTDC	32.0	32.0	33.0	33.0	20.0	20.0
MANIFOLD VACUUM, IN HG	19.8	19.8	20.6	20.6	.0	.0
THROTTLE ANGLE, DEG	5.0	5.0	4.0	4.0	75.0	75.0
INTAKE MAN. TEMP., F	116	116	119	119	87	87

CONCENTRATIONS, DRY BASIS

CO, %	1680	.0049	.1890	.0049	7.5900	7.8400
CO2, %	12.75	12.75	13.14	13.27	10.30	10.19
O2, %	3.00	2.50	1.75	1.75	.25	.13
HC, PPMC	1640	59	1419	72	3239	2895
NOX, PPM	310	330	175	165	310	155

AIR/FUEL RATIO

	16.80	16.74	15.85	16.10	11.68	11.55
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EMISSION RATES, G/HR

CO	37.8	1.1	32.5	.9	6659.7	6824.5
HC	18.5	.6	12.3	.7	142.7	126.5
NOX+	10.5	10.9	4.5	4.7	39.0	19.4

OIL TEMPERATURE, F	194	194	194	194	214	214
OIL PRESSURE, PSI	40	40	40	40	39	39
COOLANT TEMPERATURE, F	182	182	182	182	191	191
EXHAUST PRESSURE, IN. H2O	3.0	1.0	3.0	1.0	30.0	19.0
EXHAUST TEMPERATURE, F	777	705	767	672	1111	1024

* CORRECTED SAE J8168
 + CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

	32.1	32.2	33.1	33.2	34.1	34.2
TEST NUMBER	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76
TEST DATE	748.8	748.2	748.8	748.8	748.8	748.8
BAROMETER, MMHG	62	62	62	62	62	62
HUMIDITY, GRAINS/LB	90	90	87	87	86	86
TEMPERATURE, F	2500	2500	2500	2500	2500	2500
ENGINE SPEED, RPM	59.4	59.4	49.5	49.5	39.6	39.6
TORQUE, FT-LB	28.3	28.4	23.6	23.6	18.8	18.8
POWER, BHP*	13.0	13.0	11.1	11.2	8.9	8.7
FUEL RATE, LB/HR	20.0	20.0	20.0	20.0	32.0	32.0
IGNITION TIMING, DEG BTDC	2.0	2.0	4.0	4.0	7.5	7.5
MANIFOLD VACUUM, IN HG	36.0	36.0	26.0	26.0	22.0	22.0
THROTTLE ANGLE, DEG	92	92	102	102	130	130
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	.4664	.0073	.1534	.0049	.1230	.0049
CO2, %	13.67	14.35	13.53	13.94	13.40	14.49
O2, %	1.00	.50	1.25	1.25	1.25	.13
HC, PPMC	2171	57	1595	46	1991	56
NOX, PPM	2550	2500	1600	1650	1175	1175

AIR/FUEL RATIO

	15.14	15.23	15.51	15.74	15.47	14.93
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	374.6	5.9	107.9	3.5	69.4	2.6
HC	87.6	2.3	56.3	1.6	56.4	1.5
NOX+	317.6	312.5	174.5	183.7	102.7	96.8

OIL TEMPERATURE, F	211	211	214	214	214	214
OIL PRESSURE, PSI	40	40	40	40	40	40
COOLANT TEMPERATURE, F	182	182	182	182	182	182
EXHAUST PRESSURE, IN. H2O	30.0	16.0	22.0	15.0	15.0	8.0
EXHAUST TEMPERATURE, F	1212	1146	1196	1117	1064	1084

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

35.1

35.2

36.1

36.2

37.1

37.2

TEST DATE

11/ 2/76

11/ 2/76

11/ 2/76

11/ 2/76

11/ 2/76

11/ 2/76

BAROMETER, MMHG

748.8

748.8

748.8

748.8

748.8

748.8

HUMIDITY, GRAINS/LB

62

62

62

62

62

62

TEMPERATURE, F

84

84

79

79

76

76

ENGINE SPEED, RPM

2500

2500

2500

2500

2500

2500

TORQUE, FT-LB

26.0

26.0

16.5

16.5

6.6

6.6

POWER, BHP*

12.3

12.3

7.8

7.8

3.1

3.1

FUEL RATE, LB/HR

6.8

6.8

5.8

5.8

3.8

3.8

IGNITION TIMING, DEG BTDC

33.0

33.0

33.0

33.0

35.0

35.0

MANIFOLD VACUUM, IN HG

11.0

11.0

12.5

12.5

19.5

19.5

THROTTLE ANGLE, DEG

19.0

19.0

14.7

14.7

9.9

9.9

INTAKE MAN. TEMP., F

146

146

152

152

117

117

CONCENTRATIONS, DRY BASIS

CO, %

1443

1443

2205

2205

2100

2100

CO2, %

13.53

13.53

12.75

12.75

12.62

12.62

O2, %

1.50

1.50

2.50

2.50

2.75

2.75

HC, PPMC

2563

91

3395

114

961

54

NOX, PPM

500

500

2000

240

250

250

AIR/FUEL RATIO

15.55

15.87

16.24

16.28

16.69

17.12

EMISSION RATES, G/HR

CO

62.6

2.2

85.9

1.9

55.4

1.3

HC

55.9

2.0

66.4

2.2

12.7

.7

NOX+

33.7

34.2

120.8

14.3

10.2

10.4

OIL TEMPERATURE, F

208

208

206

206

204

204

OIL PRESSURE, PSI

42

42

42

42

44

44

COOLANT TEMPERATURE, F

185

185

182

182

182

182

EXHAUST PRESSURE, IN. H2O

10.0

5.0

8.0

4.0

4.0

2.0

EXHAUST TEMPERATURE, F

998

950

982

906

920

866

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE:	7619					
TEST NUMBER	38.1	39.1	39.2	40.1	40.2	
TEST DATE	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	
BAROMETER, MMHG	748.8	752.0	752.0	748.8	748.8	
HUMIDITY, GRAINS/L8	62	44	44	62	62	
TEMPERATURE, F	76	88	88	88	88	
ENGINE SPEED, RPM	2500	3000	3000	3000	3000	
TORQUE, FT-L8	3.0	70.6	70.6	61.2	61.2	
POWER, BHP*	1.4	40.0	40.0	35.0	35.0	
FUEL RATE, L8/HR	3.3	21.4	21.6	16.5	16.4	
IGNITION TIMING, DEG BTDC	35.0	21.0	21.0	21.5	21.5	
MANIFOLD VACUUM, IN HG	21.0	1.0	1.0	2.0	2.0	
THROTTLE ANGLE, DEG	8.0	75.0	75.0	40.0	40.0	
INTAKE MAN. TEMP., F	117	85	85	87	87	

CONCENTRATIONS, DRY BASIS

CO, %	.7520	7.7900	7.7700	.8140	.0040
CO2, %	14.08	10.19	10.19	13.80	14.92
O2, %	.03	.38	.25	.75	.02
HC, PPMC	1838	3152	2579	1490	20
NOX, PPM	270	315	130	2400	1625

AIR/FUEL RATIO

	14.33	11.68	11.65	14.88	14.87
--	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	147.0	8080.7	8122.7	818.1	4.0
HC	18.0	164.2	135.4	75.2	1.0
NOX+	8.2	46.9	19.5	374.0	249.6

OIL TEMPERATURE, F	202	222	222	195	195
OIL PRESSURE, PSI	44	40	40	44	44
COOLANT TEMPERATURE, F	182	191	191	184	184
EXHAUST PRESSURE, IN. H2O	3.0	40.0	26.0	42.0	25.0
EXHAUST TEMPERATURE, F	834	1166	1104	1300	1256

* CORRECTED SAE J8168
 + CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

41.1

11/ 2/76

748.8

41.2

11/ 2/76

748.8

42.1

11/ 2/76

748.8

42.2

11/ 2/76

748.8

43.1

11/ 2/76

748.8

43.2

11/ 2/76

748.8

BAROMETER, MMHG

62

88

62

85

62

82

HUMIDITY, GRAINS/LB

3000

51.0

29.1

13.9

23.0

3.5

29.0

120

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

.0049

14.35

1.00

25

1500

.1330

13.80

1.55

1712

1450

.0049

14.08

1.48

38

1500

.1420

13.80

1.50

1781

875

.0049

14.21

1.49

49

900

AIR/FUEL RATIO

15.70

15.54

15.70

15.89

15.63

15.86

EMISSION RATES, G/HR

CO

HC

NOX+

161.0

50.1

206.9

4.2

1.1

198.3

89.0

57.5

150.4

3.3

1.3

158.7

81.0

51.0

77.4

2.8

1.4

80.3

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

215

44

182

33.0

1285

215

44

182

21.0

1204

217

42

184

20.0

1134

217

42

184

12.0

1065

215

45

184

15.0

1092

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	44.1	44.2	45.1	45.2	48.1	48.2
TEST DATE	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76
BAROMETER, MMHG	748.8	748.8	748.8	748.8	748.8	748.8
HUMIDITY, GRAINS/LB	62	62	62	62	62	62
TEMPERATURE, F	78	78	78	78	92	92
ENGINE SPEED, RPM	3000	3000	3000	3000	3400	3400
TORQUE, FT-LB	17.0	17.0	6.8	6.8	59.4	59.4
POWER, BHP*	9.6	9.6	3.9	3.9	38.6	38.6
FUEL RATE, LB/HR	6.6	6.7	5.4	5.4	18.5	18.5
IGNITION TIMING, DEG BTDC	35.0	35.0	35.0	35.0	25.0	25.0
MANIFOLD VACUUM, IN HG	15.0	15.0	16.0	16.0	2.0	2.0
THROTTLE ANGLE, DEG	10.0	10.0	9.0	9.0	43.0	43.0
INTAKE MAN. TEMP., F	151	151	158	158	94	94

CONCENTRATIONS, DRY BASIS

CO, %	.7570	.1890	.3550	.0049	1.3000	.0910
CO2, %	14.21	15.21	12.38	13.53	13.67	15.06
O2, %	.25	.00	2.75	2.42	.50	.00
HC, PPMC	2415	58	5643	63	1492	14
NOX, PPM	213	130	93	123	2425	550

AIR/FUEL RATIO

	14.42	14.73	16.04	16.56	14.50	14.79
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EMISSION RATES, G/HR

CO	294.1	75.2	126.4	1.9	1423.0	100.9
HC	47.1	1.2	100.9	1.1	82.0	.8
NOX+	12.8	8.0	5.1	6.9	411.5	94.6

OIL TEMPERATURE, F	210	210	207	207	231	231
OIL PRESSURE, PSI	44	44	44	44	44	44
COOLANT TEMPERATURE, F	185	185	184	184	185	185
EXHAUST PRESSURE, IN. H2O	8.0	3.0	7.0	3.0	53.0	35.0
EXHAUST TEMPERATURE, F	1022	950	1032	977	1346	1365

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	49.1	49.2	50.1	50.2	51.1	51.2
TEST DATE	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76
BAROMETER, MMHG	748.8	748.8	748.8	748.8	748.8	748.8
HUMIDITY, GRAINS/LB	62	62	62	62	62	62
TEMPERATURE, F	90	90	88	88	84	84
ENGINE SPEED, RPM	3400	3400	3400	3400	3400	3400
TORQUE, FT-LB	49.5	49.5	39.6	39.6	26.4	26.4
POWER, BHP*	32.1	32.1	25.6	25.6	17.0	17.0
FUEL RATE, LB/HR	15.7	15.9	13.2	13.3	10.0	10.1
IGNITION TIMING, DEG BTDC	25.0	25.0	30.0	30.0	38.0	38.0
MANIFOLD VACUUM, IN HG	3.5	3.5	6.5	6.5	11.0	11.0
THROTTLE ANGLE, DEG	32.0	32.0	23.0	23.0	16.0	16.0
INTAKE MAN. TEMP., F	102	102	117	117	130	130

CONCENTRATIONS, DRY BASIS

CO, %	.1682	.0049	.1465	.0024	.1510	.0049
CO2, %	13.94	14.21	13.94	14.08	13.80	14.08
O2, %	1.49	1.45	1.50	1.00	1.55	1.00
HC, PPMC	800	16	972	27	1713	43
NOX, PPM	1650	1600	1400	1525	1000	1050

AIR/FUEL RATIO

AIR/FUEL RATIO	15.74	15.86	15.73	15.56	15.67	15.54
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EMISSION RATES, G/HR

CO	169.5	5.0	123.7	2.0	96.7	3.1
HC	40.5	.8	41.2	1.2	55.1	1.4
NOX+	257.8	254.3	183.2	199.6	99.3	104.2

OIL TEMPERATURE, F	227	227	226	226	222	222
OIL PRESSURE, PSI	45	45	46	46	47	47
COOLANT TEMPERATURE, F	184	184	184	184	184	184
EXHAUST PRESSURE, IN. H2O	42.0	27.0	29.0	19.0	18.0	8.0
EXHAUST TEMPERATURE, F	1342	1242	1246	1167	1134	1044

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	52.1	52.2	53.1	53.2	54.1	54.2
TEST DATE	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76	11/ 2/76
BAROMETER, MMHG	748.8	748.8	748.8	748.8	748.8	748.8
HUMIDITY, GRAINS/LB	62	62	62	62	62	62
TEMPERATURE, F	82	82	79	79	78	78
ENGINE SPEED, RPM	3400	3400	3400	3400	3400	3400
TORQUE, FT-LB	16.5	16.5	6.6	6.6	.0	.0
POWER, BHP*	10.6	10.6	4.2	4.2	.0	.0
FUEL RATE, LB/HR	8.3	8.3	6.4	6.4	5.9	5.9
IGNITION TIMING, DEG BTDC	38.0	38.0	38.0	38.0	38.0	38.0
MANIFOLD VACUUM, IN HG	13.6	13.6	16.0	16.0	17.1	17.2
THROTTLE ANGLE, DEG	12.5	12.5	9.8	9.8	9.0	9.0
INTAKE MAN. TEMP., F	140	140	152	152	158	158

CONCENTRATIONS, DRY BASIS

CO, %	.2320	.0024	.2900	.0024	.3600	.0024
CO2, %	13.94	14.50	13.53	13.94	13.14	13.80
O2, %	1.00	.75	1.56	1.50	1.75	1.50
HC, PPMC	1716	52	1596	57	3409	57
NOX, PPM	490	500	180	190	110	130

AIR/FUEL RATIO

	15.23	15.33	15.61	15.87	15.52	15.88
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EMISSION RATES, G/HR

CO	119.6	1.2	118.7	1.0	135.2	.9
HC	44.4	1.3	32.8	1.2	64.3	1.1
NOX+	39.2	40.3	11.4	12.2	6.4	7.7

OIL TEMPERATURE, F	218	218	214	214	212	212
OIL PRESSURE, PSI	45	45	45	45	45	45
COOLANT TEMPERATURE, F	184	184	183	183	183	183
EXHAUST PRESSURE, IN. H2O	11.0	4.0	9.0	4.0	8.0	3.0
EXHAUST TEMPERATURE, F	1092	987	1082	944	1072	974

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

56.2
11/ 3/76
748.8
53
92
4500
53.0
45.5
23.3
29.0
3.5
41.0
100

57.1
11/ 3/76
748.8
53
100
4500
44.0
38.1
19.9
27.0
4.5
34.0
117

57.2
11/ 3/76
748.8
53
100
4500
44.0
38.1
19.9
27.0
4.5
34.0
117

58.1
11/ 3/76
748.8
53
97
4500
35.0
30.2
17.7
55.0
6.2
29.0
120

58.2
11/ 3/76
748.8
53
97
4500
35.0
30.2
17.7
55.0
6.2
29.0
120

CONCENTRATIONS, DRY BASIS

CO, %
CO2, %
O2, %
HC, PPMC
NOX, PPM

1.4400
13.26
.50
1603
2400

.4740
13.80
.65
1144
1725

.0049
14.35
.25
17
1375

.2259
13.53
1.00
912
2075

.0024
13.80
.90
25
2225

AIR/FUEL RATIO

14.41

14.98

15.03

15.39

15.53

EMISSION RATES, G/HR

CO
HC
NOX+

1980.6
110.7
491.9

578.0
70.1
313.5

6.0
1.1
250.5

252.6
51.2
345.8

2.7
1.4
372.8

OIL TEMPERATURE, F
OIL PRESSURE, PSI
COOLANT TEMPERATURE, F
EXHAUST PRESSURE, IN. H2O
EXHAUST TEMPERATURE, F

216
47
188
73.0
1418

247
46
186
58.0
1411

247
46
186
38.0
1348

246
45
187
45.0
1347

246
45
187
29.0
1241

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	59.1	59.2	60.1	60.2	62.1	62.2
TEST DATE	11/ 3/76	11/ 3/76	11/ 3/76	11/ 3/76	11/ 4/76	11/ 4/76
BAROMETER, MMHG	748.8	748.8	748.8	748.8	752.5	752.5
HUMIDITY, GRAINS/LB	53	53	53	53	44	44
TEMPERATURE, F	96	96	97	97	81	81
ENGINE SPEED, RPM	4500	4500	4500	4500	4500	4500
TORQUE, FT-LB	23.0	23.0	14.0	14.0	.9	.9
POWER, BHP*	19.8	19.8	12.1	12.1	.8	.8
FUEL RATE, LB/HR	14.4	14.5	12.3	13.0	8.3	8.3
IGNITION TIMING, DEG BTDC	47.0	47.0	42.0	42.0	40.0	40.0
MANIFOLD VACUUM, IN HG	10.0	10.0	13.2	13.2	18.0	18.0
THROTTLE ANGLE, DEG	22.0	22.0	17.0	17.0	11.5	11.5
INTAKE MAN. TEMP., F	126	126	134	134	152	152

CONCENTRATIONS, DRY BASIS

CO, %	2.132	0.024	1.9300	4.1800	3.5500	2.9600
CO2, %	13.53	13.80	13.66	12.75	12.50	12.75
O2, %	1.15	.90	.25	.05	.15	.01
HC, PPMC	1026	25	2304	19	3736	1895
NOX, PPM	1875	1775	77	78	107	56

AIR/FUEL RATIO

	15.48	15.51	13.93	13.14	13.09	13.38
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EMISSION RATES, G/HR

CO	194.2	2.2	1350.0	2906.5	1587.5	1345.8
HC	46.9	1.2	80.9	.7	83.9	43.3
NOX+	254.5	243.2	8.0	8.0	6.9	3.7

OIL TEMPERATURE, F	244	244	234	234	236	236
OIL PRESSURE, PSI	47	47	46	46	45	45
COOLANT TEMPERATURE, F	187	187	186	186	185	185
EXHAUST PRESSURE, IN. H2O	29.0	18.0	18.0	13.0	7.0	4.0
EXHAUST TEMPERATURE, F	1261	1174	1186	1056	1094	971

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

63.1

64.1

64.2

65.1

65.2

TEST DATE

11/11/76

11/ 4/76

11/ 4/76

11/ 3/76

11/ 3/76

BAROMETER, MMHG

752.0

748.8

748.8

752.5

748.8

HUMIDITY, GRAINS/LB

44

53

53

52

53

TEMPERATURE, F

92

90

90

97

97

ENGINE SPEED, RPM

5300

5300

5300

5300

5300

TORQUE, FT-LB

54.0

44.6

44.6

34.4

34.4

POWER, BHP*

54.3

45.0

45.0

34.8

34.9

FUEL RATE, LB/HR

34.5

26.6

26.7

22.4

22.2

IGNITION TIMING, DEG BTDC

28.0

27.0

27.0

32.0

32.0

MANIFOLD VACUUM, IN HG

2.2

3.5

3.5

5.6

5.6

THROTTLE ANGLE, DEG

75.0

48.0

48.0

41.5

41.5

INTAKE MAN. TEMP., F

86

96

96

118

118

CONCENTRATIONS, DRY BASIS

CO, %

7.6300

7.9500

2.1900

1.1000

.8200

CO2, %

10.30

10.30

13.50

13.94

14.35

O2, %

.25

.13

.01

.65

.00

HC, PPMC

2809

2296

461

1609

334

NOX, PPM

520

265

1050

1750

1025

AIR/FUEL RATIO

11.70

11.58

13.87

14.65

14.46

EMISSION RATES, G/HR

CO

12791.5

13187.3

3306.9

1472.2

1072.4

HC

236.5

191.3

34.9

108.2

21.9

NOX+

125.1

63.1

236.3

348.4

199.8

OIL TEMPERATURE, F

265

265

265

264

264

OIL PRESSURE, PSI

42

42

44

45

45

COOLANT TEMPERATURE, F

194

194

187

186

186

EXHAUST PRESSURE, IN. H2O

95.0

50.0

50.0

68.0

47.0

EXHAUST TEMPERATURE, F

1357

1282

1382

1408

1344

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	66.2	67.1	67.2	68.1	68.2
TEST DATE	11/ 3/76	11/ 3/76	11/ 3/76	11/ 3/76	11/ 3/76
BAROMETER, MMHG	748.8	748.8	748.8	748.8	748.8
HUMIDITY, GRAINS/LB	53	53	53	53	53
TEMPERATURE, F	97	96	96	97	97
ENGINE SPEED, RPM	5300	5300	5300	5300	5300
TORQUE, FT-LB	29.7	19.8	19.8	12.3	12.3
POWER, BHP*	30.2	20.1	20.1	12.5	12.5
FUEL RATE, LB/HR	19.6	16.7	16.6	14.8	15.0
IGNITION TIMING, DEG BTDC	41.0	41.0	41.0	41.0	41.0
MANIFOLD VACUUM, IN HG	7.5	10.5	10.5	13.0	13.0
THROTTLE ANGLE, DEG	33.0	25.0	25.0	20.5	20.5
INTAKE MAN. TEMP., F	121	126	126	134	134

CONCENTRATIONS, DRY BASIS

CO, %	1.1200	.3650	.0120	1.9400	2.2900
CO2, %	13.90	14.08	14.60	13.53	13.40
O2, %	.50	.75	.12	.63	.00
HC, PPMC	1839	1146	25	2531	864
NOX, PPM	2225	1700	1550	925	613

AIR/FUEL RATIO

	14.54	15.09	14.94	14.17	13.77
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EMISSION RATES, G/HR

CO	1300.0	376.3	12.1	1654.6	1935.0
HC	107.2	59.3	1.3	108.4	36.6
NOX+	384.8	261.2	232.9	117.6	77.2

OIL TEMPERATURE, F	262	258	258	256	256
OIL PRESSURE, PSI	45	45	45	45	45
COOLANT TEMPERATURE, F	185	185	185	185	185
EXHAUST PRESSURE, IN. H2O	56.0	40.0	27.0	26.0	18.0
EXHAUST TEMPERATURE, F	1361	1336	1272	1257	1175

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

69.1

11/ 4/76

70.1

11/ 4/76

71.1

11/ 4/76

TEST DATE

752.5

752.5

752.5

752.5

752.5

752.5

BAROMETER, MMHG

44

44

44

44

45

45

HUMIDITY, GRAINS/LB

77

77

84

84

76

76

TEMPERATURE, F

5300

5300

5300

5300

800

800

ENGINE SPEED, RPM

5.0

5.0

.8

.8

.6

.6

TORQUE, FT-LB

5.0

5.0

.8

.8

.1

.1

POWER, BHP*

13.9

14.7

13.8

13.9

1.3

1.3

FUEL RATE, LB/HR

43.0

43.0

42.5

42.5

8.5

8.5

IGNITION TIMING, DEG BTDC

16.5

16.5

17.0

17.0

17.0

17.0

MANIFOLD VACUUM, IN HG

18.0

18.0

17.0

17.0

.0

.0

THROTTLE ANGLE, DEG

122

122

131

131

141

141

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

9.4900

8.0000

10.7500

10.2900

.1420

.0049

CO2, %

8.73

10.09

8.10

8.19

11.78

12.25

O2, %

.15

.01

.25

.05

4.00

3.65

HC, PPMC

4943

3438

10766

8496

5606

169

NOX, PPM

90

75

53

23

32

32

AIR/FUEL RATIO

10.72

11.39

10.04

10.16

17.22

17.71

EMISSION RATES, G/HR

CO

5980.6

5589.3

6323.4

6181.6

13.6

.5

HC

156.5

120.6

318.0

256.3

27.0

.8

NOX+

8.1

7.5

4.5

2.0

.4

.5

OIL TEMPERATURE, F

234

234

247

247

187

187

OIL PRESSURE, PSI

46

46

45

45

17

17

COOLANT TEMPERATURE, F

186

186

185

185

192

192

EXHAUST PRESSURE, IN. H2O

15.0

8.0

13.0

8.0

1.0

.0

EXHAUST TEMPERATURE, F

1090

967

1072

982

482

525

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619	72.1	72.2	73.1	73.2	74.1	74.2
TEST NUMBER	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76
TEST DATE	752.5	752.5	752.5	752.5	752.5	752.5
BAROMETER, MMHG	45	45	45	45	45	45
HUMIDITY, GRAINS/LB	76	76	77	77	77	77
TEMPERATURE, F	800	800	800	800	700	700
ENGINE SPEED, RPM	10.0	10.0	20.0	20.0	7.6	7.6
TORQUE, FT-LB	1.5	1.5	3.0	3.0	1.0	1.0
POWER, BHP*	1.8	1.8	2.0	2.0	1.3	1.3
FUEL RATE, LB/HR	10.0	10.0	10.0	10.0	9.0	9.0
IGNITION TIMING, DEG BTDC	15.0	15.0	12.0	12.0	15.0	15.0
MANIFOLD VACUUM, IN HG	1.0	1.0	1.9	1.9	.0	.0
THROTTLE ANGLE, DEG	134	134	131	131	138	138
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	.0916	.0024	.0748	.0024	.0916	.0024
CO2, %	12.75	13.00	12.62	12.88	12.25	12.50
O2, %	3.75	2.55	3.00	2.20	3.75	3.75
HC, PPMC	2770	255	4969	311	3095	226
NOX, PPM	170	100	580	410	93	78

AIR/FUEL RATIO

	17.26	16.71	16.47	16.46	17.31	17.73
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EMISSION RATES, G/HR

CO	11.4	.3	9.9	.3	8.8	.2
HC	17.3	1.6	33.1	2.1	14.9	1.1
NOX+	3.0	1.8	11.1	8.1	1.3	1.1

OIL TEMPERATURE, F	184	184	184	184	182	182
OIL PRESSURE, PSI	19	19	17	17	16	16
COOLANT TEMPERATURE, F	192	192	187	187	191	191
EXHAUST PRESSURE, IN. H2O	1.0	.0	2.0	1.0	1.0	.0
EXHAUST TEMPERATURE, F	481	401	504	411	468	422

* CORRECTED SAE JB168
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	75.1	75.2	76.1	76.2	77.1	77.2
TEST DATE	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76
BAROMETER, MMHG	752.5	752.5	752.5	752.5	752.5	752.5
HUMIDITY, GRAINS/LB	45	45	45	45	45	45
TEMPERATURE, F	77	77	77	77	77	77
ENGINE SPEED, RPM	700	700	700	700	1000	1000
TORQUE, FT-LB	15.0	15.0	25.0	25.0	56.8	56.8
POWER, BHP*	2.0	2.0	3.3	3.3	10.6	10.6
FUEL RATE, LB/HR	1.8	1.7	2.1	2.2	6.9	6.7
IGNITION TIMING, DEG BTDC	9.0	9.0	9.0	9.0	10.0	10.0
MANIFOLD VACUUM, IN HG	13.0	13.0	11.0	11.0	.0	.0
THROTTLE ANGLE, DEG	1.0	1.0	2.0	2.0	75.0	75.0
INTAKE MAN. TEMP., F	134	134	124	124	86	86

CONCENTRATIONS, DRY BASIS

CO, %	.0782	.0049	.0072	.0073	6.8300	7.3800
CO2, %	13.14	13.40	13.00	12.88	10.60	10.41
O2, %	2.75	2.50	2.75	2.50	.25	.00
HC, PPMC	3404	477	3285	849	5388	5275
NOX, PPM	390	290	1150	575	663	450

AIR/FUEL RATIO

	16.41	16.59	16.51	16.62	11.80	11.49
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EMISSION RATES, G/HR

CO	9.7	.6	1.0	1.1	2305.7	2363.1
HC	21.1	2.8	24.0	6.5	91.3	84.8
NOX+	7.0	4.9	24.2	12.6	32.3	20.8

OIL TEMPERATURE, F	181	181	182	182	157	157
OIL PRESSURE, PSI	16	16	16	16	26	26
COOLANT TEMPERATURE, F	192	192	192	192	166	166
EXHAUST PRESSURE, IN. H2O	1.0	.0	1.0	.0	5.0	3.0
EXHAUST TEMPERATURE, F	464	414	502	408	784	617

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	78.1	78.2	79.1	79.2	81.1	81.2
TEST DATE	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/16/76	11/16/76
BAROMETER, MMHG	752.5	752.5	752.5	752.5	750.0	750.0
HUMIDITY, GRAINS/LB	45	45	45	45	42	42
TEMPERATURE, F	76	76	77	77	88	88
ENGINE SPEED, RPM	1000	1000	1000	1000	1500	1500
TORQUE, FT-LB	42.6	42.6	27.7	27.7	59.0	59.0
POWER, BHP*	8.0	8.0	5.2	5.2	16.8	16.8
FUEL RATE, LB/HR	4.2	4.2	2.6	2.7	12.1	12.4
IGNITION TIMING, DEG BTDC	10.0	10.0	22.0	22.0	11.5	11.5
MANIFOLD VACUUM, IN HG	3.5	3.5	12.5	12.5	.0	.0
THROTTLE ANGLE, DEG	10.5	10.5	3.0	3.0	75.0	75.0
INTAKE MAN. TEMP., F	112	112	127	127	98	90

CONCENTRATIONS, DRY BASIS

CO, %	.0770	.0049	.0724	.0049	11.4100	11.3600
CO2, %	12.75	12.88	13.00	13.40	8.19	8.20
O2, %	3.00	2.75	2.75	2.25	.25	.13
HC, PPMC	2657	51	3059	57	5114	4432
NOX, PPM	1725	1375	1625	1200	76	53
AIR/FUEL RATIO	16.79	16.95	16.51	16.49	10.23	10.22

EMISSION RATES, G/HR

CO	22.1	1.4	12.8	.9	5966.2	6122.3
HC	38.3	.7	27.1	.5	134.3	120.0
NOX+	71.6	58.2	41.4	31.1	5.7	4.1
OIL TEMPERATURE, F	192	192	191	191	199	199
OIL PRESSURE, PSI	20	20	20	20	29	29
COOLANT TEMPERATURE, F	190	190	192	192	190	190
EXHAUST PRESSURE, IN. H2O	5.0	2.0	2.0	1.0	11.0	6.0
EXHAUST TEMPERATURE, F	808	784	622	624	928	846

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	82.1	82.2	83.1	83.2	84.1	84.2
TEST DATE	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76
BAROMETER, MMHG	752.5	752.5	752.5	752.5	752.5	752.5
HUMIDITY, GRAINS/LB	48	48	48	48	48	48
TEMPERATURE, F	76	76	74	74	74	74
ENGINE SPEED, RPM	1500	1500	1500	1500	1500	1500
TORQUE, FT-LB	44.0	44.0	23.5	23.5	5.8	5.8
POWER, BHP*	12.3	12.3	6.6	6.6	1.6	1.6
FUEL RATE, LB/HR	6.2	6.2	3.8	3.7	2.4	2.5
IGNITION TIMING, DEG BTDC	18.0	18.0	27.0	27.0	20.0	20.0
MANIFOLD VACUUM, IN HG	5.2	5.2	14.0	14.0	19.5	19.5
THROTTLE ANGLE, DEG	8.5	8.5	5.0	5.0	2.2	2.2
INTAKE MAN. TEMP., F	102	102	116	116	124	124

CONCENTRATIONS, DRY BASIS

CO, %	.1060	.0049	.0988	.0024	.1511	.0024
CO2, %	13.27	13.53	12.88	13.27	13.40	13.67
O2, %	2.25	2.13	2.75	2.25	2.50	2.00
HC, PPMC	1647	57	2491	49	1650	74
NOX, PPM	1325	1225	1325	1475	195	155

AIR/FUEL RATIO

AIR/FUEL RATIO	16.26	16.39	16.57	16.52	16.36	16.24
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EMISSION RATES, G/HR

CO	43.6	2.0	25.3	.6	24.7	.4
HC	34.0	1.2	32.0	.6	13.6	.6
NOX†	79.6	74.7	49.5	53.6	4.7	3.8

OIL TEMPERATURE, F	198	198	196	196	192	192
OIL PRESSURE, PSI	30	30	30	30	30	30
COOLANT TEMPERATURE, F	187	187	191	191	190	190
EXHAUST PRESSURE, IN. H2O	7.0	4.0	3.0	2.0	1.0	.0
EXHAUST TEMPERATURE, F	952	844	780	792	668	597

* CORRECTED SAE J8168

† CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	85.1	86.1	86.2	87.1	87.2
TEST DATE	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76
BAROMETER, MMHG	752.5	752.5	752.5	752.5	752.5
HUMIDITY, GRAINS/LB	48	48	48	48	48
TEMPERATURE, F	82	78	78	76	76
ENGINE SPEED, RPM	2000	2000	2000	2000	2000
TORQUE, FT-LB	66.8	50.1	50.1	26.7	26.7
POWER, BHP*	25.1	18.8	18.8	10.0	10.0
FUEL RATE, LB/HR	14.8	9.0	9.0	5.7	5.9
IGNITION TIMING, DEG BTDC	17.0	18.0	18.0	32.0	32.0
MANIFOLD VACUUM, IN HG	.0	4.0	4.0	9.5	9.5
THROTTLE ANGLE, DEG	75.0	20.0	20.0	9.5	9.5
INTAKE MAN. TEMP., F	81	94	94	146	146

CONCENTRATIONS, DRY BASIS

CO, %	7.7600	.1325	.0049	.1511	.0049
CO2, %	10.09	13.53	13.94	13.27	13.80
O2, %	.25	1.75	1.50	2.38	1.88
HC, PPMC	3889	1708	46	2386	68
NOX, PPM	250	1725	1625	363	400

AIR/FUEL RATIO

	11.61	15.87	15.92	16.20	16.15
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EMISSION RATES, G/HR

CO	5398.3	77.4	2.9	57.6	1.9
HC	139.8	50.1	1.3	45.7	1.3
NOX+	26.1	147.2	138.8	20.2	22.7

OIL TEMPERATURE, F	207	208	208	206	206
OIL PRESSURE, PSI	36	36	36	37	37
COOLANT TEMPERATURE, F	194	192	192	187	187
EXHAUST PRESSURE, IN. H2O	22.0	18.0	9.0	9.0	5.0
EXHAUST TEMPERATURE, F	1036	1084	974	950	937

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

	88.1	89.1	89.2	90.1	90.2
TEST NUMBER	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76
TEST DATE	752.5	752.5	752.5	752.5	752.5
BAROMETER, MMHG	48	48	48	48	48
HUMIDITY, GRAINS/LB	76	82	82	77	77
TEMPERATURE, F	2000	2500	2500	2500	2500
ENGINE SPEED, RPM	6.7	70.0	70.0	52.5	52.5
TORQUE, FT-LB	2.5	32.9	32.9	24.6	24.6
POWER, BHP*	3.1	16.7	16.6	12.0	12.0
FUEL RATE, LB/HR	33.0	20.0	20.0	20.0	20.0
IGNITION TIMING, DEG BTDC	20.0	.0	.0	3.5	3.5
MANIFOLD VACUUM, IN HG	3.2	75.0	75.0	25.5	25.5
THROTTLE ANGLE, DEG	122	78	78	84	84
INTAKE MAN. TEMP., F					

CONCENTRATIONS, DRY BASIS

CO, %	.1700	5.1000	4.9500	.2116	.0049
CO2, %	13.14	11.80	12.02	13.40	13.80
O2, %	2.38	.25	.13	1.88	1.50
HC, PPMC	1419	2992	2506	1366	32
NOX, PPM	270	875	750	1775	1825

AIR/FUEL RATIO

	16.32	12.65	12.68	15.97	15.94
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EMISSION RATES, G/HR

CO	35.2	4421.9	4293.6	166.3	3.8
HC	14.7	130.3	109.2	53.9	1.3
NOX+	8.2	110.8	95.0	203.7	208.6

OIL TEMPERATURE, F	202	212	212	176	176
OIL PRESSURE, PSI	37	38	38	40	40
COOLANT TEMPERATURE, F	190	190	190	177	177
EXHAUST PRESSURE, IN. H2O	3.0	30.0	17.0	25.0	13.0
EXHAUST TEMPERATURE, F	787	1166	1042	1198	1008

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

91.1
11/ 4/76
752.5
48
76
2500
28.0
13.1
7.3
33.0
11.0
10.0
144

91.2
11/ 4/76
752.5
48
76
2500
28.0
13.1
7.2
33.0
11.0
10.0
144

92.1
11/ 4/76
752.5
48
76
2500
7.0
3.3
4.0
35.0
20.5
4.5
117

92.2
11/ 4/76
752.5
48
76
2500
7.0
3.3
3.9
35.0
20.5
4.5
117

93.1
11/ 4/76
752.5
48
82
3000
69.8
39.4
20.0
33.0
5
75.0
78

93.2
11/ 4/76
752.5
48
82
3000
69.8
39.4
20.0
33.0
5
75.0
78

CONCENTRATIONS, DRY BASIS

CO, %
CO2, %
O2, %
HC, PPMC
NOX, PPM

.4740
14.08
1.00
2523
500

.7475
14.08
.50
2470
480

.0240
14.78
.75
69
420

5.1300
11.66
.15
2816
790

5.2600
11.90
.00
2132
600

AIR/FUEL RATIO

15.11

14.58

15.31

12.57

12.53

EMISSION RATES, G/HR

CO

HC

NOX+

211.7
56.6
32.6

41.7
.6
20.7

177.3
29.4
16.6

5.9
.8
15.0

5312.8
146.5
119.5

5414.0
110.2
90.2

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

202
40
190
10.0
996

202
40
190
6.0
982

206
40
189
3.0
845

206
40
189
2.0
842

215
40
186
41.0
1215

215
40
186
23.0
1060

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	94.1	94.2	95.1	95.2	96.1	96.2
TEST DATE	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76
BAROMETER, MMHG	752.5	752.5	752.5	752.5	752.5	752.5
HUMIDITY, GRAINS/LB	48	48	48	48	48	48
TEMPERATURE, F	82	82	84	84	76	76
ENGINE SPEED, RPM	3000	3000	3000	3000	3000	3000
TORQUE, FT-LB	52.3	52.3	27.9	27.9	6.9	6.9
POWER, BHP*	29.5	29.5	15.8	15.8	3.9	3.9
FUEL RATE, LB/HR	14.0	14.0	8.7	8.7	5.7	5.7
IGNITION TIMING, DEG BTDC	22.0	22.0	35.0	35.0	36.0	36.0
MANIFOLD VACUUM, IN HG	3.5	3.5	10.5	10.5	15.5	15.5
THROTTLE ANGLE, DEG	28.0	28.0	13.5	13.5	8.5	8.5
INTAKE MAN. TEMP., F	94	94	132	132	157	157

CONCENTRATIONS, DRY BASIS

CO, %	.1682	.0049	.1603	.0024	.2950	.0049
CO2, %	13.67	13.94	13.53	13.80	12.50	13.14
O2, %	1.63	1.38	2.00	1.75	3.75	2.75
HC, PPMC	684	17	1139	285	3614	68
NOX, PPM	1475	1450	875	625	120	140

AIR/FUEL RATIO

AIR/FUEL RATIO	15.86	15.83	16.07	16.04	17.06	16.86
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EMISSION RATES, G/HR

CO	153.1	4.4	91.6	1.4	118.5	1.9
HC	31.3	.8	32.7	8.2	72.9	1.4
NOX+	196.1	191.8	73.0	52.1	7.0	8.1
OIL TEMPERATURE, F	224	224	219	219	212	212
OIL PRESSURE, PSI	40	40	42	42	42	42
COOLANT TEMPERATURE, F	192	192	188	188	192	192
EXHAUST PRESSURE, IN. H2O	33.0	22.0	15.0	10.0	8.0	5.0
EXHAUST TEMPERATURE, F	1274	1150	1106	1067	1032	952

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	97.1	97.2	98.1	98.2	99.1	99.2
TEST DATE	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76	11/ 4/76
BAROMETER, MMHG	752.5	752.5	752.5	752.5	752.5	752.5
HUMIDITY, GRAINS/LB	48	48	48	48	48	48
TEMPERATURE, F	81	81	81	81	80	80
ENGINE SPEED, RPM	3400	3400	3400	3400	3400	3400
TORQUE, FT-LB	69.8	69.8	53.2	53.2	27.9	27.9
POWER, BHP*	44.6	44.6	34.0	34.0	17.8	17.8
FUEL RATE, LB/HR	22.5	23.2	16.1	16.0	10.1	10.1
IGNITION TIMING, DEG BTDC	23.0	23.0	23.0	23.0	39.0	39.0
MANIFOLD VACUUM, IN HG	1.0	1.0	3.5	3.5	11.0	11.0
THROTTLE ANGLE, DEG	75.0	75.0	31.0	31.0	15.0	15.0
INTAKE MAN. TEMP., F	77	77	90	90	127	127

CONCENTRATIONS, DRY BASIS

CO, %	6.1230	5.5700	.1627	.0049	.1627	.0024
CO2, %	11.22	11.78	13.67	13.94	13.67	13.94
O2, %	.13	.00	1.50	1.50	1.63	1.50
HC, PPMC	2357	1787	399	13	1369	31
NOX, PPN	675	575	1638	1625	775	775

AIR/FUEL RATIO

	12.23	12.45	15.81	15.92	15.76	15.89
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EMISSION RATES, G/HR

CO	6962.2	6608.2	169.3	5.1	105.6	1.6
HC	134.6	106.5	20.9	.7	44.6	1.0
NOX+	112.1	99.6	248.9	246.2	73.4	74.3

OIL TEMPERATURE, F	232	232	230	226	226	226
OIL PRESSURE, PSI	42	42	44	44	44	44
COOLANT TEMPERATURE, F	188	188	187	187	192	192
EXHAUST PRESSURE, IN. H2O	53.0	33.0	41.0	28.0	17.0	13.0
EXHAUST TEMPERATURE, F	1264	1174	1332	1201	1161	1136

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	100.1	100.2	101.1	101.2	102.1	102.2
TEST DATE	11/ 4/76	11/ 4/76	11/ 5/76	11/ 5/76	11/ 5/76	11/ 5/76
BAROMETER, MMHG	752.5	752.5	748.8	748.8	748.8	748.8
HUMIDITY, GRAINS/LB	48	48	51	51	51	51
TEMPERATURE, F	78	78	85	85	86	86
ENGINE SPEED, RPM	3400	3400	4500	4500	4500	4500
TORQUE, FT-LB	6.9	6.9	65.4	65.4	48.0	48.0
POWER, BHP*	4.4	4.4	55.8	55.8	41.0	41.0
FUEL RATE, LB/HR	6.6	6.7	31.2	31.2	18.3	19.0
IGNITION TIMING, DEG BTDC	38.0	38.0	30.0	30.0	27.0	27.0
MANIFOLD VACUUM, IN HG	16.0	16.0	1.0	1.0	4.9	4.9
THROTTLE ANGLE, DEG	9.5	9.5	75.0	75.0	40.0	40.0
INTAKE MAN. TEMP., F	154	154	87	87	111	111

CONCENTRATIONS, DRY BASIS

CO, %	.2635	.0024	7.2400	7.2300	.3650	.0049
CO2, %	13.27	13.80	10.50	10.29	13.93	14.21
O2, %	1.50	2.25	.10	.03	.80	.75
HC, PPMC	1421	46	1491	916	1145	20
NOX, PPM	170	180	690	350	1725	1675

AIR/FUEL RATIO

	15.61	16.41	11.85	11.80	15.13	15.38
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EMISSION RATES, G/HR

CO	111.8	1.1	11086.2	11053.3	413.1	5.8
HC	30.3	1.0	114.7	70.3	65.1	1.2
NOX+	10.5	11.7	156.3	79.2	288.9	295.2

OIL TEMPERATURE, F	220	220	249	249	236	236
OIL PRESSURE, PSI	44	44	42	42	43	43
COOLANT TEMPERATURE, F	192	192	196	196	194	194
EXHAUST PRESSURE, IN. H2O	8.0	6.0	81.0	50.0	48.0	29.0
EXHAUST TEMPERATURE, F	1102	1001	1332	1252	1366	1236

* CORRECTED SAE J8168
 + CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	103.1	104.1	104.2	105.1	105.2
TEST DATE	11/ 5/76	11/ 5/76	11/ 5/76	11/12/76	11/12/76
BAROMETER, MMHG	748.8	748.8	748.8	752.0	752.0
HUMIDITY, GRAINS/LB	51	51	51	44	40
TEMPERATURE, F	78	81	81	87	87
ENGINE SPEED, RPM	4500	4500	4500	5300	5300
TORQUE, FT-LB	26.0	6.0	6.0	54.9	54.9
POWER, BHP*	22.0	5.1	5.1	54.9	54.9
FUEL RATE, LB/HR	13.2	8.6	8.5	35.5	35.1
IGNITION TIMING, DEG BTDC	41.0	37.0	37.0	27.0	27.0
MANIFOLD VACUUM, IN HG	11.0	17.0	17.0	1.5	1.5
THROTTLE ANGLE, DEG	28.0	16.0	16.0	75.0	75.0
INTAKE MAN. TEMP., F	117	146	146	87	87

CONCENTRATIONS, DRY BASIS

CO, %	.0024	1.5700	1.9300	7.6000	7.4300
CO2, %	13.80	13.80	13.80	10.09	10.30
O2, %	1.40	.35	.35	.23	.13
HC, PPMC	1025	1727	750	3175	2234
NOX, PPM	1200	200	112	480	225

AIR/FUEL RATIO

	15.70	14.20	14.14	11.63	11.72
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EMISSION RATES, G/HR

CO	169.5	782.7	949.3	13054.2	12690.9
HC	43.4	43.2	18.5	273.9	191.7
NOX+	149.7	14.8	8.2	118.3	54.2

OIL TEMPERATURE, F	206	231	231	268	268
OIL PRESSURE, PSI	47	45	45	43	43
COOLANT TEMPERATURE, F	196	196	196	198	198
EXHAUST PRESSURE, IN. H2O	20.0	10.0	5.0	99.0	74.0
EXHAUST TEMPERATURE, F	1213	1147	988	1354	1296

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHEVROLET 1.4 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	106.1	106.2	107.1	107.2	126.1	126.2
TEST DATE	11/ 5/76	11/ 5/76	11/ 5/76	11/ 5/76	11/12/76	11/12/76
BAROMETER, MMHG	748.8	748.8	748.8	748.8	752.0	752.0
HUMIDITY, GRAINS/LB	51	51	51	51	44	44
TEMPERATURE, F	87	87	86	86	86	86
ENGINE SPEED, RPM	5300	5300	5300	5300	5500	5500
TORQUE, FT-LB	42.6	42.6	22.7	22.7	53.7	53.7
POWER, BHP*	42.9	42.9	22.8	22.8	55.7	55.7
FUEL RATE, LB/HR	24.3	24.0	15.6	15.8	35.1	35.4
IGNITION TIMING, DEG BTDC	28.0	28.0	12.5	12.5	28.0	28.0
MANIFOLD VACUUM, IN HG	4.5	4.5	12.0	12.0	2.5	2.5
THROTTLE ANGLE, DEG	53.0	53.0	40.0	40.0	75.0	75.0
INTAKE MAN. TEMP., F	97	97	121	121	81	81

CONCENTRATIONS, DRY BASIS

CO, %	1.6500	1.7400	1.8800	2.0300	7.3700	7.3800
CO2, %	13.53	13.53	13.26	13.40	10.40	10.40
O2, %	.30	.05	.35	.05	.18	.10
HC, PPMC	1781	425	2410	782	2695	1806
NOX, PPM	1450	1050	1125	790	540	215
AIR/FUEL RATIO	14.16	14.07	14.02	13.91	11.76	11.76

EMISSION RATES, G/HR

CO	2325.3	2406.6	1687.7	1824.4	12608.6	12766.4
HC	126.0	29.5	108.6	35.3	231.5	156.9
NOX+	302.4	214.9	149.4	105.1	132.6	53.4
OIL TEMPERATURE, F	192	192	237	237	251	251
OIL PRESSURE, PSI	50	50	45	45	43	43
COOLANT TEMPERATURE, F	166	166	197	197	194	194
EXHAUST PRESSURE, IN. H2O	69.0	37.0	28.0	15.0	99.0	50.0
EXHAUST TEMPERATURE, F	1412	1207	1241	1097	1380	1300

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

HE 18.5 :A34
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