



Automotive Tech.

Flexible Instruction Day

Assignment #3

Learning Standard	Automotive Technology CIP 47.0604
Task # & Description	900 Engine Repair Engine Fundamentals

CONTACT INFORMATION/ASSISTANCE

Instructor Name: Tim McLaughlin

Instructor E-Mail: mclaughlint@butlertec.us

I will be available by email and Phone 724-282-0735 Ext. 216 from 7:40-12, and 12:30-3:10 to answer your questions. Please reach out if you are having difficulty completing your assignments.

INSTRUCTIONS

All work is due on the day we return to school. This is counted towards your attendance **and** as a classroom assignment.

Read over PowerPoint slide print out and answer questions.

Name: _____

Session: _____

____/____40____ points

Day 3

Presentations for PowerPoint

Modern Automotive Technology

1

CHAPTER 11 Engine Fundamentals

2

Objectives

- Identify the major parts of a typical automotive engine.
- Describe the four-stroke cycle.
- Define common engine terms.
- Explain the basic function of the major parts of an automotive engine.
- Cite and demonstrate safe working practices related to engines.
- Correctly answer ASE certification test questions that require knowledge of the basic operation of piston engines.

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

3

Engine Operation (1 of 2)

- Engine is source of power for vehicle
- Fuel is energy source
- Combustion chamber
 - Hollow area between top of piston and bottom of cylinder head
 - Fuel is burned here

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

4

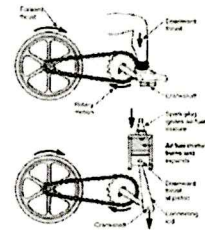
Engine Operation (2 of 2)

- Combustion produces heat
- Heat causes expansion of gases in engine
- Expansion causes pressure
- Piston, connecting rod, and crankshaft convert pressure to motion
- Motion drives gears, chains, sprockets, and belts

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

5

Crankshaft Operation



Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

6

Engine Main Bearings (1 of 2)

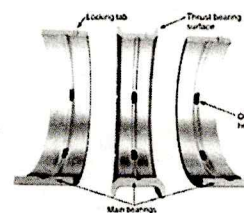
- Fit between block main bores and crankshaft main journals
- Two removable inserts
 - Upper main bearing fits into cylinder block
 - Lower main bearing fits into main caps
- Oil holes and grooves
 - Allow oil to flow through block, main bearings, and crankshaft

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

13

Engine Main Bearings (2 of 2)

- Main thrust bearing limits distance crankshaft can slide in block
- Main bearing clearance
 - Space between crankshaft main journal and main bearing insert
 - Allows oil to enter and journal to rotate without rubbing


Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

14

Crankshaft Oil Seals

- Keep oil from leaking from front and rear of engine
- Oil pump forces oil into main and rod bearings
- Seals placed around front and rear of crankshaft contain this oil

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

15

Flywheel

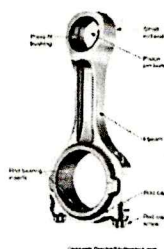
- Large metal disk mounted on rear of crankshaft
 - Connects crankshaft to transmission or transaxle
 - Can help smooth engine operation
 - Generally contains large ring gear used to start the engine

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

16

Connecting Rod

- Fastens piston to crankshaft
 - Transfers piston motion and combustion pressure to crankshaft rod journals
 - Causes piston movement during non-power-producing strokes
- Connecting rod bearings
 - Ride on crankshaft rod journals
 - Fit between connecting rods and crankshaft


Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

17

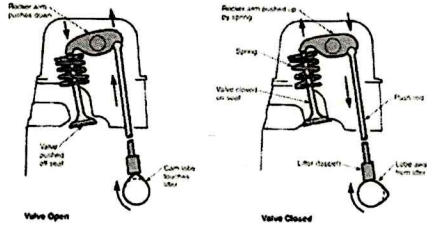
Piston

- Transfers pressure of combustion to connecting rod and crankshaft
- Piston head is top of piston
- Piston clearance
 - Amount of space between sides of piston and cylinder wall
 - Allows for lubricating film of oil
 - Allows for expansion when piston heats up

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

18

Valve Train Arrangement



25

Camshaft

- Located in engine block or cylinder head
- Has lobes that open each valve
- Camshaft rotates on journals

26

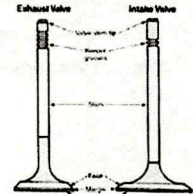
Other Valve Train Parts

- Valve lifter (cam follower)
 - Rides on cam lobes and transfers motion to valve train
- Push rods
 - Transfer motion between lifters and rocker arms
- Rocker arms
 - Transfer motion to valves
 - Rock back and forth, opening and closing valves

27

Valves

- Valves
 - Open and close ports in cylinder head
 - Intake valves control flow of fuel mixture
 - Exhaust valves control flow of exhaust gases out of cylinder



28

Valve Seals and Valve Spring Assembly

- Valve seals
 - Prevent oil from entering combustion chambers
- Valve spring assembly
 - Closes valve
 - Valve spring, retainer, two keepers

29

Intake Manifold

- Bolts to side of cylinder head(s)
- Often made of plastic or aluminum
- Air and fuel route through runners
 - With fuel injectors, only air passes through runners
 - Injectors extend directly into combustion chamber

30

Camshaft Drive

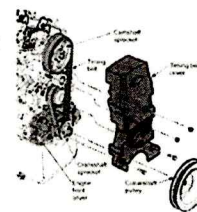
- Turns camshaft at one-half engine speed
 - Timing belt
 - Timing gears
 - Timing chain
- Times camshaft with crankshaft

Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

37

Front Cover

- Bolts over crankshaft snout
- Holds oil seal that seals front of crankshaft
- Also called timing cover

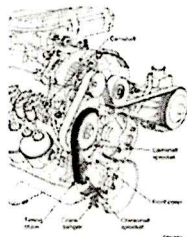


Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

38

Crank Damper

- Heavy wheel on crankshaft snout
- Mounted in rubber
- Helps prevent vibration and damage
- Also called harmonic balancer or vibration damper



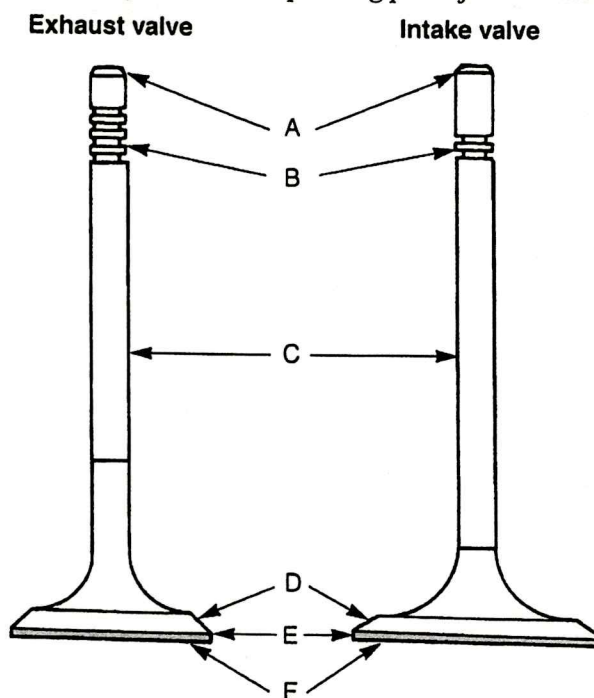
Copyright Goodheart-Willcox Co., Inc. May not be posted to a publicly accessible website.

39

Day 3 Engine Repair

Matching

Match each of the letters in the drawing to the corresponding part of the intake and exhaust valves.



- A. Choice A
- B. Choice B
- C. Choice C
- D. Choice D
- E. Choice E
- F. Choice F

- ___ 1. Face
- ___ 2. Valve stem tip
- ___ 3. Head
- ___ 4. Stem
- ___ 5. Margin

Over →

Name: _____

ID: A

Completion

Complete each statement.

6. The engine main _____ are removable inserts that fit between the crankshaft main journals and the block main bore.
7. The connecting rod small end is attached to the _____ by a wrist pin.
8. A(n) _____ rod transmits motion from the lifters to the valve rocker arms.
9. A machined surface, called the valve _____, seals against the valve seat to close an intake or exhaust port.
10. _____ rings prevent combustion pressure from leaking into the engine's crankcase.

