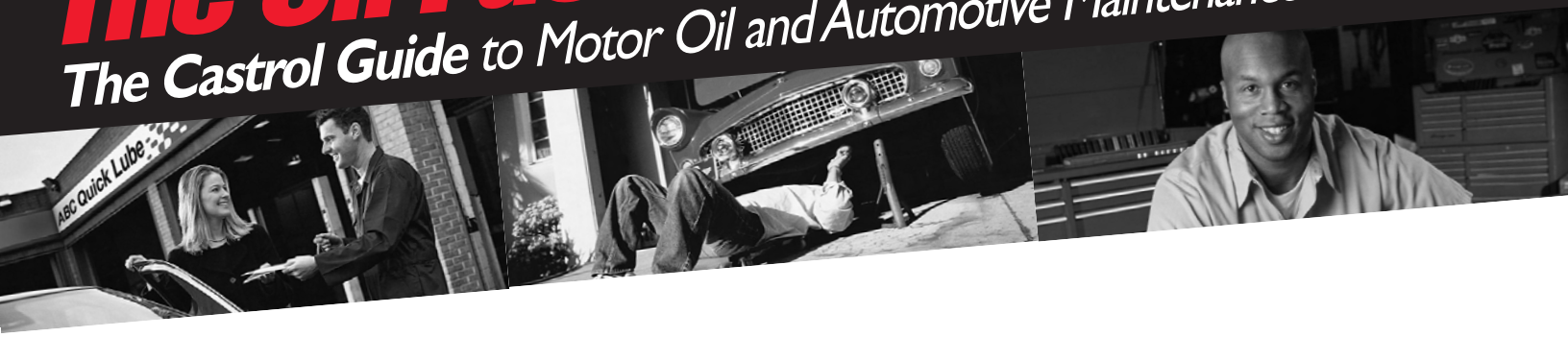
The Oil Factor

The Castrol Guide to Motor Oil and Automotive Maintenance



Dear Educator:

As an automotive educator, you are probably aware that today's smaller, higher-powered automobile engines, which typically operate under severe driving conditions, place greater demands on motor oil than ever before. And that means a greater need for today's new drivers and future automotive specialists to understand the key aspects of automotive lubrication and its role in overall automotive maintenance. To assist you in teaching these important topics, LearningWorks, in cooperation with BP Lubricants USA Inc. – the maker of premium-quality Castrol motor oils – is pleased to provide this free educational program, **The Oil Factor: The Castrol Guide to Motor Oil and Automotive Maintenance.**

Designed for driver education and automotive mechanics classes, **The Oil Factor** comes with a set of reproducible classroom activity sheets that cover topics such as:

- the function of motor oil in an automobile engine;
- the causes of sludge build-up and the damage it can do to an engine;
- the differences between conventional and synthetic motor oils;
- choosing the right motor oil for various driving conditions;
- how to check and change a vehicle's motor oil; and
- the importance of changing motor oil as part of routine auto maintenance.

To accommodate differing levels of automotive knowledge, the program's introductory and concluding activities come in two versions, one geared to the beginning driver's need for basic information, the other taking a more technical approach suited to future automotive specialists. The program's central activities, which cover more general topics, are presented in terms that all students should easily understand. In addition, the program includes take-home booklets to engage parents in this important learning experience as well.

We encourage you to share this timely program with other instructors in your school. Although the materials are copyrighted, you have permission to photocopy all components of the program for educational purposes.

And please take a moment to fill out and return the enclosed reply card, so that you will remain eligible to receive free LearningWorks educational programs in the future. Your comments help us as we create teaching materials that make a difference in the classroom. We look forward to hearing from you.

Sincerely,

Dr. Dominic Kinsley
Editor in Chief

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Introduction

The Oil Factor: The Castrol Guide to Motor Oil and Automotive Maintenance is an educational program designed to introduce students in driver education and automotive mechanics classes to the fundamentals of motor oil's function, application, and classification, and its critical importance to the proper operation and maintenance of every motor vehicle.

The reproducible activity sheets that form the heart of this program offer comprehensive activities covering key aspects of motor oil and automotive maintenance. Through these activities, students will learn the role motor oil plays in engine performance; the causes and consequences of sludge build-up; the differences between synthetic and conventional motor oil; how motor oil is manufactured to meet various driving conditions; how to distinguish the different types and grades of motor oil and choose the right motor oil for any vehicle; how to check and change a vehicle's motor oil; and the importance of changing motor oil regularly as part of overall automotive maintenance.

Target Audience

This program is designed for use as a supplement to driver education and automotive mechanics classes in high school and vocational-technical institutions.

Program Objectives

- To inform students of important facts and procedures concerning motor oil and its role in automotive maintenance.
- To introduce the fundamentals of motor oil function, formulation, and classification.
- To help students identify the grades and types of motor oil appropriate for various driving conditions.
- To highlight recent advances in motor oil technology, including synthetics, and the advantages of using premium motor oil.
- To encourage proper motor oil maintenance, including checking and changing a vehicle's motor oil regularly.

Program Components

1. This teacher's guide, which includes background information, presentation suggestions, and answers for each classroom activity, and follow-up activities to enhance the learning experience.
2. Five reproducible activities for students to use as worksheets. Activities One and Five are dual-sided, with one side designed for driver education classes and the reverse for automotive mechanics classes. Activities Two through Four are designed for both beginning drivers and aspiring automotove specialists.
3. A dual-sided reproducible car-care handout providing an auto maintenance calendar for new drivers on one side, and an oil change checklist for future auto mechanics on the other.
4. A wall poster for display in the classroom as a motivational tool and reminder of the program and its goals.
5. Take-home booklets containing helpful motor oil and car-care information for families.
6. A reply card for your comments. Please return this card to remain eligible to receive free LearningWorks programs in the future.

Using the Program Components

1. Review the program activities and choose those most appropriate for your students. The activities are presented in a logical sequence, but you can alter the order to fit your class plans.
2. Photocopy the reproducible sheets to provide a complete set for each student in your class. Make a master copy of all components of the program to share with other teachers in your school.
3. Display the poster in your classroom or shop to generate interest in the program; keep the poster on display as a long-term reminder of the importance of proper motor oil maintenance.
4. Conclude the program by distributing copies of the enclosed take-home booklet, encouraging students to share this information with their families and to keep it handy as a reference in the car, garage, or shop.

Activity One
Motor Oil Essentials

There are two versions of this introductory activity: a version for driver education students on one side of the sheet, and a more challenging version for automotive mechanics students on the reverse. Both versions are designed to help students assess their knowledge of motor oil, providing a review of what they might know already and a foundation for further learning. Have students complete the activity individually as an ungraded quiz, then review their answers in a class discussion, encouraging students to add information and raise questions as you cover each point. (You may also wish to use this activity again at the program's conclusion to reinforce student learning.)

Driver Education Version

Answers

1. **The main function of motor oil in your vehicle is to:**

   b. provide lubrication between moving metal parts of the engine.
   Although motor oil does help cool the engine during operation, its main function is to provide lubrication between the moving metal parts of the engine. Engine coolant (antifreeze) prevents overheating; transmission fluid makes it easier to change gears.

2. **When a vehicle's motor oil runs low or is not regularly changed:**

   c. both (sludge accumulation and friction).
   If an engine's oil is not maintained to the recommended level or is not regularly changed, sludge can accumulate, accelerating engine wear, and friction can occur between metal engine parts, which can cause serious damage such as a blown piston rod.

3. **A vehicle's motor oil level is checked with a:**

   a. dipstick.
   Even in this age of sophisticated electronic devices, an engine's oil level is still checked the old-fashioned way – with a dipstick, which is removed, wiped clean, and re-inserted manually to obtain a visual reading of a mark which indicates if the level is high, low, or right where it should be.

4. **When a vehicle's motor oil level is at the "add" mark on the indicator, you need to add:**

   a. one quart.
   The "add" level on the dipstick indicates that one quart of oil should be added; lower

readings will require adding more oil and usually indicate that a vehicle is overdue for an oil change or may need servicing.

5. As a general rule, a vehicle's motor oil should be changed every:

b. 3,000 miles or three months, whichever comes first.
Although you should follow the recommendations for motor oil maintenance in a vehicle's owner's manual, the general rule recommends changing a vehicle's motor oil every 3,000 miles or three months, whichever comes first.

6. A vehicle's motor oil can be changed by:

c. anyone, provided she or he follows recommended guidelines.
If you're uncertain about doing your own oil change, it's a good idea to have it done by a mechanic or at a lube center. But the process is not complicated and requires only a few simple tools. As long as they know what they're doing and follow the recommendations in the vehicle owner's manual, anyone can change a car's oil.

7. The grade of a motor oil refers to its:

b. viscosity, or how easily it flows.
To perform its function as a lubricant, motor oil must flow easily and evenly through the parts of an engine. Thus, viscosity is a major factor in selecting motor oils. Those with a low viscosity will flow easily even under cold conditions, though they may breakdown as temperatures rise. Those with a high viscosity will flow easily in warm weather, though they may thicken too much in the cold. As students will learn, this is why manufacturers have developed multi-grade motor oils that flow easily under a wide range of operating conditions.

8. Premium motor oils are formulated for severe driving conditions. Which of these driving conditions is NOT severe?

b. mile after mile of highway driving.
Since an automobile engine operates at top efficiency when cruising at highway speeds, mile after mile of highway driving is not considered a "severe" driving condition (unless it is compounded by extreme heat, towing, or dusty conditions). Stop-and-go traffic and taking frequent short trips ARE considered severe driving conditions, because they can increase the formation of sludge, which can inhibit the flow of motor oil.

9. Synthetic motor oils are designed for:

d. all of the above.
Synthetic motor oils are made with precisely engineered based stocks that provide superior protection and performance. They are designed to stand up to the severe driving conditions that most drivers experience today and can be used in all cars, not just high powered or heavy duty vehicles.

10. The best way to find the recommended grade of oil for your vehicle is:

b. to check your vehicle's owner's manual.
Always consult the owner's manual when choosing motor oil for your car. Getting the right grade and type of oil does matter if you want your car to operate reliably and efficiently for years to come.

Automotive Mechanics Version

Answers

Part I

1. The two primary ingredients of conventional motor oil are:

b. petroleum base stocks and additives
The primary ingredients of conventional motor oil are petroleum base stocks and performance additives. Synthetic motor oils are composed of precisely engineered base stocks and performance additives.

2. Which of the following is a key function of motor oil?

d. all of the above
A premium motor oil performs several key functions in the engine: it reduces friction, lubricates and cools vital engine parts, and protects against rust and corrosion.

3. The motor oil refining process separates crude oil from such undesirable components as:

d. all of the above
Wax, sulfur compounds, and nitrogen compounds are all among the undesirable components removed from raw petroleum during the process of refining crude oil.

4. Detergents, antioxidants, rust inhibitors, and viscosity modifiers are examples of:

c. performance additives
Detergents, antioxidants, rust inhibitors, and viscosity modifiers all represent types of performance additives that are blended into most premium motor oils.

5. Which of these engine parts does not play a role in motor oil distribution?

b. dipstick
The dipstick, while used to measure oil level, does not play a direct role in oil distribution, while the oil pump, oil jet, and oil sump certainly do.

6. Viscosity is a measure of motor oil's:

c. thickness and thinness, or resistance to flow
An oil's viscosity is a measure of its thickness or thinness, or resistance to flow.

7. In cold, winter weather, an engine would be best protected by an oil with:

a. low viscosity
Because motor oil thickens when it cools, an oil with low viscosity – one that is relatively thin to begin with – will flow and perform better in cold, winter weather.

8. The grade of motor oil refers to its:

b. viscosity
A motor oil's grade is an indication of the oil's viscosity (resistance to flow). In fact, it's actually called the SAE Viscosity Grade. (SAE stands for the Society of Automotive Engineers, one of the organizations that set the standards for the grading and ratings of motor oil.)

9. Which of the following motor oils has the highest viscosity?

d. SAE 20W-50.
Of the motor oil grades listed, SAE 20W-50 has the highest viscosity rating at both low and high temperatures.

10. As a general rule, how often should a vehicle's motor oil be changed?

b. every 3,000 miles or three months, whichever comes first
As a general rule, a vehicle's oil should be changed every 3,000 miles or every three months, whichever comes first. However, one should always consult the recommendations in a vehicle's owner's manual concerning oil changes and other maintenance matters.

11. When a vehicle's motor oil runs low or is not regularly changed, which of the following can occur?

c. both of the above (sludge accumulation and friction)
If an engine's oil is not maintained to the recommended level or is not regularly changed, sludge can accumulate, accelerating engine wear, and friction can occur between metal engine parts, which can cause engine seizure or a blown piston rod.

12. Which of the following does not typify a type of modern motor oil?

c. Mono-grade.
A mono-grade motor oil is manufactured with a single viscosity rating and therefore can be used only within a narrow temperature range. Mono-grades were once the standard and required seasonal oil changes in regions with summer and winter temperature extremes.

Multi-grades are the standard today. They provide engine protection across a range of temperatures and come in many different types – such as conventional, synthetic, high mileage – each formulated to meet specific driving needs.

Part II

Oil flows through the engine in the following order: **1.** Oil sump, **2.** Pick-up tube, **3.** Oil pump, **4.** Oil filter, **5.** Main bearings, **6.** Oil jet, **7.** Camshaft bearings, **8.** Hydraulic lash adjuster.

Follow-Up Activities

1. Encourage students to take this quiz home to test the motor oil savvy of licensed drivers in their families. Compare results in a class discussion.
2. Have students photocopy and bring to class the motor oil section of the owner's manual for their own or their family's vehicle. Share this information in a class discussion to compare oil change intervals and oil grade recommendations across a wide variety of vehicles.
3. Locate diagrams of several different modern automobile engines and have automotive mechanics students compare the engine designs and how lubrication requirements may differ for each one.

Activity Two
Engine Enemy #1

This activity focuses on the consequences of neglecting motor oil maintenance, introducing students to sludge and the harm it can do to an automobile engine.

Students learn that sludge is composed of contaminants produced during engine operation that are neutralized by the motor oil as it circulates and held in suspension until they can be drained out of the engine at an oil change. If the oil is not changed regularly, these contaminants can clot together to form a dark, sticky goo that reduces the oil's ability to lubricate and cool vital engine parts and can even clog the passageways through which the oil circulates, causing decreased engine performance, reduced gas mileage, increased engine noise, and even engine seizure.

Sludge builds up more quickly under severe driving conditions such as those most drivers encounter today – stop-and-go traffic, short trip driving, extended idling in traffic jams – as well as in cold and humid weather. That's why, in addition to changing the oil regularly, drivers should use a quality motor oil that includes special additives called "dispersants," which protect against sludge build-up by keeping contaminant particles from clotting together.

To reinforce this important lesson in motor oil maintenance, the activity presents three driving scenarios, challenging students to identify for each scenario the factors likely contributing to sludge build-up and the symptoms that sludge has already begun to impair engine performance. Have students complete this activity individually, then review their answers in a class discussion, asking students to explain how the drivers in these scenarios could have avoided sludge build-up.

Answers

1. **Contributing Factors:** Every day driving in stop-and-go traffic accelerates sludge build-up in Ray's engine.
   Symptoms of Damage: Ray's loss of horsepower on the highway can indicate that sludge build-up has already begun to undermine his engine's performance.
2. **Contributing Factors:** Frequent short trips combined with an extended interval between oil changes is a formula for serious sludge build-up. Sandy should recognize that she does not drive under "normal" conditions and cannot go as long between oil changes as her owner's manual recommends.
   Symptoms of Damage: Increased engine noise and the first signs of engine seizure are a warning that sludge build-up is already damaging Sandy's engine.
3. **Contributing Factors:** Persistent cold weather conditions and extended idling in traffic jams can both cause sludge to build up quickly in an auto engine.
   Symptoms of Damage: Reduced gas mileage, which presumably becomes worse as the winter wears on, may be a clear sign that sludge is steadily decreasing the efficiency of Terri's engine.

Follow-Up Activities

1. As the scenario involving Sandy illustrates, so-called "normal" driving conditions are increasingly rare today. Most vehicles now operate under "severe" driving conditions that require frequent oil changes and top quality engine protection. To reinforce this important point, take a show of hands as you name the most common types of severe driving – frequent short trips, stop-and-go traffic, sitting in traffic jams with the engine idling. Students may be surprised at how few of them actually drive under "normal" conditions.
2. In automotive mechanics classes, have students role play the scenarios described on the activity sheet, with one student taking the part of the driver while another plays a knowledgeable automotive specialist. In each scenario, the automotive specialist should correct the driver's mistaken idea about his or her car problem and explain why sludge build-up is the most likely cause of poor engine performance.

Activity Three
Conventional or Synthetic?

This activity helps prepare students to choose the best oil for any vehicle by exploring the differences between conventional and synthetic motor oils. Students learn how conventional and synthetic motor oils are manufactured, then examine some key benefits of synthetic oil and some myths about synthetics that still persist, despite the fact that synthetics have been proving their superior effectiveness for decades.

Part I of the activity lists some unique characteristics of synthetics, all of which are chemically engineered into synthetic motor oil during the production process. Students match each characteristic to the performance benefit it provides. Have students complete this part of the activity individually, then review their answers in class.

Part II of the activity debunks the most common myths about synthetic motor oil, providing students with the facts to correct each misconception. Students then put this knowledge into practice by pairing up to role play situations in which an oil shopper asks an automotive expert for advice. Encourage your shoppers to use their knowledge to question the automotive expert closely in each role-play, and encourage your experts to practice helping each shopper to recognize the superior benefits of a top-of-the-line engine lubricant.

Answers

Part I: 1-b, 2-c, 3-d, 4-a.

Part II: Suggested answers

1. **Synthetic motor oils do not void a new car's warranty.** In fact, synthetics meet or exceed every manufacturer's motor oil performance standards.
2. **Synthetic motor oils are not just for new cars.** Quality synthetic motor oil can be used in old as well as new cars, including vehicles in which conventional oil was previously used. Synthetic motor oils are beneficial for the good health, long life, and top performance of both old and new cars.

3. **Today there's no need to break in an engine with conventional oil before using a synthetic.** New cars can benefit from synthetics right from the start. In fact, many new cars now come with synthetic motor oil already in the engine, as more and more auto manufacturers make synthetics their factory standard.

4. **There's no harm in switching back and forth between conventional and synthetic motor oil.** The two are completely compatible, and there are even combination conventional/synthetic motor oils on the market, like Castrol SYNTEC Blend.

Follow-Up Activities

1. The choice between conventional and synthetic motor oil is somewhat like other choices drivers have faced over the years as automotive technology has improved. Have students research or talk with parents about some of these choices: bias vs. radial tires; conventional vs. ABS braking systems; water and anti-freeze vs. all-weather coolant. Then talk in class about the underlying factors that have influenced drivers' decisions in each case (safety, performance, convenience, etc.) and how similar factors might help one make the choice between conventional and synthetic motor oil.

2. Have automotive mechanics students contact local dealerships or use Internet resources to identify auto manufacturers who have made the switch to synthetics in their new vehicles. Collect information on these vehicles to create a class profile of engine features and capabilities "made for" synthetic motor oil. Then take a look into the future to discuss which of these technological enhancements will likely become standard in years to come.

3. Students may be surprised to learn that synthetic motor oil was first developed in the 1930s and was used extensively during World War II when army tanks needed a motor oil that would not freeze up during the winter. Have students research the history of synthetic motor oil's development with special attention to its use in vehicles, such as jet airplanes and spacecraft, that require a lubricant custom-made to meet the most extreme performance requirements.

Activity Four
Making the Right Choice

This dual-sided activity guides students through the process of choosing the right motor oil by showing them how to decode the numbers and letters that identify different grades of motor oil and by introducing them to the major types of motor oil available today. The activity consists of an **Oil Type Chart** on one side of the sheet and a classroom activity on the other. Provide all students with copies of both sides of the reproducible sheet.

Part I of the activity explains that motor oil grades are based on viscosity, and that different grades are formulated for different operating temperatures. Students learn that multi-grade motor oils are formulated to provide protection across a range of operating temperatures, and learn to interpret the multi-grade designation found in the API (American Petroleum Institute) "donut" printed on almost every container of motor oil. Students then use this information to choose the appropriate grade of motor oil for each of four automotive scenarios. Have students complete this part of the activity individually or in small groups, then review the answers in a class discussion

Begin Part II of the activity by reviewing the accompanying **Oil Type Chart**, which profiles the purpose and benefits of the major types of motor oil manufactured today. Then have students look back at the four scenarios presented in Part I and recommend the best type of motor oil for each driver. Compare answers in a class discussion, then have students complete Part III of the activity by choosing the right grade and type of motor oil for their (or their family) vehicle.

Answers

Part I

1. **Brian:** 5W-20 or 5W-30 would be the best choice for heavy-duty driving in the icy temperatures of an Idaho winter. But please note that 5W-20 can only be used in vehicles where 5W-20 is specified by the manufacturer.

2. **Claire:** 20W-50 would be a smart choice for engine-stressing stop-and-go driving in the Florida heat.

3. **Dawn:** 10W-30, the grade most widely used by American drivers, would be a good choice for long distance driving in Tennessee, where temperatures are typically moderate all year round.

4. **Evan:** 5W-50, which offers the widest range of protection, would be a wise choice for short-trip driving outside Chicago, where the winters can be frigid and the summers blazing.

Part II

1. **b** Brian's ten-year-old SUV would benefit from a high mileage motor oil like Castrol GTX High Mileage, which is designed for older cars with more than 75,000 miles on the odometer. Brian's best choice would be a synthetic, like Castrol SYNTEC, to provide the best low temperature start-up protection and superior protection for high power towing.

2. **d** The combination of stop-and-go commuting with Florida's humid weather is a recipe for rapid sludge formation. Claire could choose a conventional oil with special anti-sludge additives, like Castrol GTX, though a better choice would be a synthetic, like Castrol SYNTEC, to give her engine maximum protection.

3. **a** A conventional motor oil, like Castrol GTX, is probably the right choice for all-around engine protection on long drives in rural Tennessee. Or Dawn could choose a synthetic, like Castrol SYNTEC, for an extra measure of protection that will help keep her new car running in top shape for years to come.

4. **c** The best choice for Evan's pizza delivery van would be a synthetic blend, like Castrol SYNTEC Blend, which is specially designed to protect against the wear and tear of short trip driving. For superior protection under all driving conditions, Evan might choose a synthetic, like Castrol SYNTEC.

Follow-Up Activities

1. Have students find out what grade and type of oil is currently being used in their family car. Based on what they have learned, is this the best choice for the operating conditions in their region of the country and their family's driving habits?

2. Suggest that students go to a local automotive supply store and take a close look at the variety of motor oil products available. Have them look for the API donut and other industry symbols, as well as on-package information about different oil types, and report their findings in class.

3. Invite automotive mechanics students to visit the Castrol global website at www.castrol.com, where they can find a wealth of information on motor oil and learn how different grades and types of oil are produced for vehicles around the world.

Activity Five
Time for a Change

There are two versions of this concluding activity: a version for driver education students on one side of the sheet, and a version for automotive mechanics students on the reverse. Both versions focus on the importance of changing a vehicle's motor oil regularly by guiding students through the steps involved. Driver education students learn how to check an engine's oil level using a dipstick and practice making arrangements for an oil change. Automotive mechanics students learn how to change a vehicle's motor oil safely and discuss how to avoid some typical oil change mishaps. The two versions are complementary and can be used together to give both beginning drivers and future automotive professionals a comprehensive introduction to this topic.

Driver Education Version

Have students complete Part I of the activity at home by following the step-by-step directions on the worksheet to check and record the oil level in their own or their family's car. Then have them discuss and compare their findings in a class discussion. You can also use this part of the activity to demonstrate checking the oil level of a vehicle at school.

Part II begins with a reminder of the general guidelines for motor oil maintenance, then asks students to gather information they will need when it's time to take their car in for an oil change – the location of a convenient facility, its hours of operation, the fee charged, and the kind of oil they will have put into their car. Have students complete this part of the activity in small groups, using the Internet to gather information, then compare answers in a class discussion.

Your Castrol Car Care Calendar

This reproducible handout provides students with a handy seasonal calendar that can help them keep track of their car's overall maintenance throughout the year. It provides a checklist of auto maintenance essentials appropriate to each season, including regular oil changes, and periodic checks of various systems, such as electrical, coolant, tires, and wipers. There's also space for students to record their car's "vital statistics," as recommended in the owner's manual, for ready reference – tire size and pressure, motor oil type/grade, light bulb and wiper blade replacement size, etc.

When you distribute copies of the Car Care Calendar, encourage students to take it home and record their car's vital statistics, then post it in the garage or keep it in their car's glove compartment as a ready reference.

Automotive Mechanics Version

This final activity emphasizes the critical importance of checking and changing a vehicle's motor oil regularly, and provides students with step-by-step instructions for safely and successfully changing a vehicle's motor oil. Additionally, the activity presents information on other fluids and lubricants that should be also be checked when a car receives an oil change, as part of the engine's overall maintenance.

Part I presents a step-by-step oil-change guide. Be sure to review each step with students in class, and stress the importance of Step Seven – disposing of used oil properly. The description of this step includes an Internet link through which students can find a waste oil disposal center in their area. The step-by-step guide concludes with with an "Oil Change Report" form which students can use to practice recording the information they will need to report when making an oil change as a professional – information such as make/model, VIN #, mileage, etc. Review this section with students as well, then have them complete Part I of the activity as homework, or use it to have student volunteers demonstrate an oil change using a vehicle at school.

Part II of the activity sets up a class discussion on preventing mishaps that might occur during an oil change. Review the list and invite students to suggest what might have caused the mishap, and how it could have been prevented.

Answers

Part II

1. Losing the oil plug can be prevented by making sure you complete its removal by hand rather than with your wrench and place it on the bench rather than let it sit in the drain pan.
2. Ensuring a tight seal for the new filter by applying a light film of oil to the gasket will help prevent leaks.
3. Over-tightening the oil filter can be prevented by snugging it up tightly by hand, rather than using the filter wrench to tighten it up.
4. Prevent overfilling by checking the owner's manual ahead of time to be sure you know the engine's oil capacity.
5. Prevent spilling by using a funnel to pour the oil into the filler tube.

Your Castrol Oil Change Checklist

This reproducible handout provides students with a handy checklist that can help them keep track of everything that should be checked on a car whenever they do an oil change – including such fluids as coolant, brake, transmission and power steering fluid; tire pressure; belts and hoses; and wipers.

When you distribute copies of the Oil Change Checklist, encourage students to post it at home or in the garage as a ready reference.

Follow-Up Activities

1. Arrange a field trip to a local automotive or oil change center to give students a firsthand look at how professional technicians check, maintain, and change motor oil and other fluids and lubricants. Have students prepare specific questions for the mechanics they will meet.
2. Have students research the environmental dangers of pouring used motor oil down a drain or sewer, and encourage them to find out all they can about local, state, and federal oil recycling programs. Students can also investigate new products created from recycled oil. A good place to start is the www.earth911.org website, which has a complete section on used motor oil recycling. Hold a class discussion on this topic in which students can share what they have learned.
3. Have automotive mechanics students choose another type of automotive fluid – brake fluid, transmission fluid, etc. – and research its function, composition, maintenance, and importance to the safe and reliable operation of a motor vehicle.

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The Oil Factor

Activity One
Motor Oil Essentials

So, you're learning to drive... and well-meaning experienced drivers are bombarding you with "advice" about practically everything to do with your driving and your car. Well, here's some advice you can really count on – choosing the right motor oil for your vehicle and changing it regularly are two of the most important things you can do for your car's engine.

Sound familiar? Take this quiz to see how much you really know about motor oil – and to learn more.

1 The main function of motor oil in your vehicle is to _____

a. keep the engine from overheating.
b. provide lubrication between moving metal parts of the engine.
c. make it easier to change gears while driving.

2 When a vehicle's motor oil runs low or is not regularly changed _____

a. sludge can accumulate and cause decreased performance and in some cases, engine seizure.
b. friction between engine parts can cause serious damage.
c. both of the above can happen.

3 A vehicle's motor oil level is checked with a _____

a. dipstick.
b. gauge.
c. computer.

4 When a vehicle's oil level is at the "add" mark on the indicator, you need to add _____

a. one quart.
b. two quarts.
c. three quarts.

5 As a general rule, a vehicle's motor oil should be changed every _____

a. 1,000 miles or one month, whichever comes first.
b. 3,000 miles or three months, whichever comes first.
c. 5,000 miles or five months, whichever comes first.

6 A vehicle's motor oil can be changed by _____

a. only a certified mechanic.
b. someone working at a qualified lube center.
c. anyone provided she or he follows recommended guidelines.

7 The grade of a motor oil refers to its _____

a. lubricity, or how slippery it is.
b. viscosity, or how easily it flows.
c. formulation, or the number of additives it contains.

8 Premium motor oils are formulated for severe driving conditions. Which of these driving conditions is NOT severe?

a. sitting in stop-and-go traffic.
b. mile after mile of highway driving.
c. frequent short trips less than five miles.

9 Synthetic motor oils are designed for _____

a. high performance sports cars.
b. minivans and SUVs.
c. family sedans.
d. all of the above.

10 The best way to find the recommended grade of oil for your vehicle is _____

a. to ask a friend who has the same kind of vehicle as you.
b. to check your vehicle's owner's manual.
c. neither, the grade of the oil doesn't matter.

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The Oil Factor

Activity One
Motor Oil Essentials

Your interest in and experience with automotive mechanics may make you already familiar with the key functions of motor oil – and with the simple fact that choosing the right oil for a vehicle and changing the oil regularly are among the most important things you can do for any car.

But there's always more to learn, right? So here's a quiz to help you discover even more about the function, composition, and science of motor oil – what we call "The Oil Factor."

Part I

1 The two primary ingredients of conventional motor oil are _____
a. hydrocarbons and sulfur compounds
b. petroleum base stocks and additives
c. crude oil and nitrogen compounds

2 Which of the following is a key function of motor oil?
a. reduces friction
b. lubricates and cools vital engine parts
c. protects against rust and corrosion
d. all of the above

3 The motor oil refining process separates crude oil from such undesirable components as _____
a. wax
b. nitrogen
c. sulfur
d. all of the above

4 Detergents, antioxidants, rust inhibitors and viscosity modifiers are examples of _____
a. refining byproducts
b. crude oil components
c. performance additives

5 Which of these engine parts does not play a role in motor oil distribution?
a. oil pump
b. dipstick
c. oil jet
d. oil sump

6 Viscosity is a measure of motor oil's _____
a. chemical composition
b. lubricating ability
c. thickness and thinness, or resistance to flow

7 In cold, winter weather, an engine would be best protected by an oil with _____
a. low viscosity
b. high viscosity
c. anti-freeze additives

8 The *grade* of motor oil refers to its _____
a. resistance to corrosion
b. viscosity
c. energy-conserving properties

9 Which of the following motor oils has the highest viscosity?
a. SAE 5W-30
b. SAE 10W-30
c. SAE 10W-40
d. SAE 20W-50

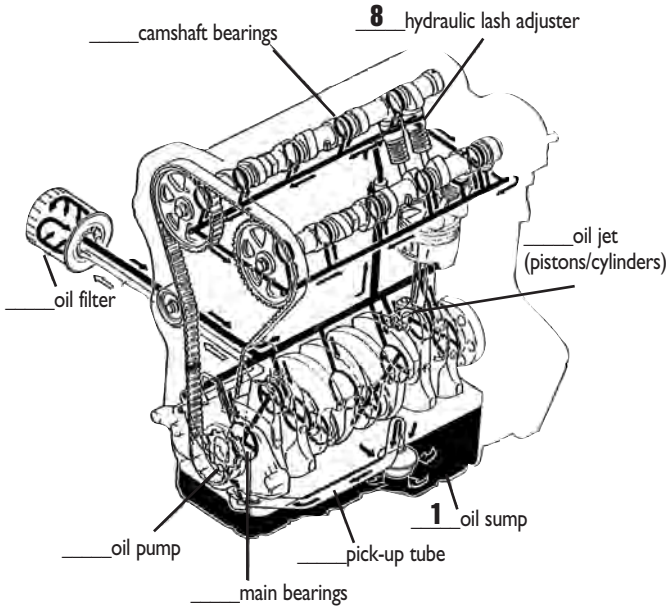
10 As a general rule, how often should a vehicle's motor oil and filter be changed?
a. every 1,000 miles or one month, whichever comes first
b. every 3,000 miles or three months, whichever comes first
c. every 5,000 miles or five months, whichever comes first

11 When a vehicle's motor oil runs low or is not regularly changed, which of the following can occur?
a. sludge can accumulate and cause decreased performance and in some cases, engine seizure
b. friction between engine parts can cause an engine breakdown
c. both of the above

12 Which of the following does not typify a type of modern motor oil?
a. High Mileage
b. Synthetic
c. Mono-grade
d. Conventional

Part II

Follow the oil flow through the engine. Each point is labeled but not numbered. Add the numbers to show the flow. Numbers 1 and 8 are done for you.



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The Oil Factor

Activity Two
Engine Enemy #1

Now that you know some basic facts about motor oil, let's take a close look at what can happen if you neglect your engine's motor oil. But don't get too close. It's going to get ugly. It even sounds ugly. The experts call it **sludge.**

What's sludge? Well, you know that motor oil helps keep an engine's vital parts clean by picking up contaminants, including fuel residue, water, soot, stray gases, acids, microscopic metal grindings, and just plain dirt. As these contaminants build up in the motor oil, they turn into a nasty goo that reduces the oil's ability to lubricate and cool critical engine parts. In time, this goo can clog the engine, causing lower gas mileage, loss of power, and increased engine noise. It can even cause an engine to seize up and break down entirely. That goo is sludge, Engine Enemy #1.

Stop-and-go traffic, short trips, and cold or humid weather all contribute to sludge build-up. Changing your motor oil regularly is the best way to prevent sludge. Also, in addition to regular oil changes, you should choose a motor oil engineered to stop the formation of sludge with special additives – called dispersants – that keep contaminants from clotting together and gooping things up. Castrol GTX, for example, is formulated to provide superior sludge protection for your engine – helping you fight Engine Enemy #1.

Ready to take action against sludge? Take a look at these car owner scenarios. For each one, identify the factors contributing to sludge build-up and the symptoms that sludge has already become a problem.

Scenario	Factors Contributing to Sludge Build-Up	Symptoms of Sludge-Caused Engine Damage
1 Ray commutes to school through stop-and-go traffic every day, so on the weekends he likes to cut loose with long drives into the countryside. Lately, though, he's noticed that he doesn't get the same pick-up when he's cruising the highway and wonders if he should upgrade his gasoline.		
2 The owner's manual for Sandy's car says to change the oil every 5,000 miles under normal driving conditions. But normal driving for Sandy means lots of short trips running errands around town. She's been changing her oil every 5,000 miles as the owner's manual recommends, but lately her engine seems noisy and even stutters sometimes, as though it were going to stall. She's thinking she may need a tune-up.		
3 Terri goes to college in Colorado, partly because she loves snowboarding. No matter how cold it gets, she heads to the mountains every weekend, sometimes sitting through hour-long back-ups to get on the slopes. She knows that winter weather can be tough on cars and figures that's why she gets such poor gas mileage during snow season.		

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The Oil Factor

Activity Three
Conventional or Synthetic?

There are many factors involved in choosing the right motor oil for your vehicle, but one of the first questions you're likely to ask is, What's the difference between conventional motor oil and synthetic? The short answer is that synthetic motor oil is custom-made to provide the best possible protection for your engine. Here's the long answer:

Conventional motor oil is made with a petroleum base stock. At the refinery, crude oil is separated into different petroleum products – gasoline, heating oil, lubricating oil, even asphalt. The base stock produced for motor oil is then processed further to remove impurities like wax and sulfur, and finally mixed with a variety of additives designed to improve the oil's performance in your engine.

The base stocks used in **synthetic motor oil** are of much higher quality than those used in conventional motor oils. These base oils are chemically converted to provide consistent and predictably superior performance to withstand the most demanding engine conditions. This synthetic base stock is then formulated with advanced additives to produce a motor oil that outperforms conventional motor oil by every standard. Castrol SYNTEC, for example, is engineered to provide superior engine protection that outperforms leading conventional and synthetic blend oils, passing severe industry torture tests.

Part I

Listed here are some unique characteristics of synthetic motor oil. See if you can match each characteristic to the performance benefit it provides.

Synthetic Motor Oil Characteristics

1. ___ Maximum flow and pumpability at low temperatures.
2. ___ Minimal evaporation at high temperatures.
3. ___ Superior lubrication at critical points of high heat and heavy pressure.
4. ___ Keeps engines cleaner longer.

Synthetic Motor Oil Benefits

a. Prevents harmful deposits from draining engine power and decreasing gas mileage.
b. Circulates quickly at start-up and smoothly in cold weather.
c. Resists burn-off that can result in oil loss and harmful emissions.
d. Provides protection even at high temperatures and high stress points.

Part II

Despite its clear superiority, synthetic motor oil is the subject of some myths that might misguide your choice of the best motor oil for your vehicle. For example:

MYTH: Synthetic and conventional motor oil are incompatible – once you switch to a synthetic, you can't go back.
FACT: You can switch from conventional to synthetic and back. Neither will cause any problems. You can even switch to a combination conventional/synthetic motor oil, like Castrol SYNTEC Blend.

MYTH: New cars need a break-in period with conventional motor oil before you can switch to a synthetic.
FACT: Today's new cars can benefit from synthetics from the start. Many even come with synthetic oil already in the engine, as more and more manufacturers make synthetics their factory standard.

MYTH: Using a synthetic motor oil might void a new car's warranty.
FACT: Synthetic motor oils meet or exceed every manufacturer's motor oil performance standards. And synthetics actually set the standards for today's most advanced engines.

MYTH: Synthetic oil is only for new cars.
FACT: Quality synthetic motor oil can be used in old as well as new cars, including vehicles in which conventional oil was previously used. Synthetic motor oils are beneficial for the good health, long life, and top performance of both new and old cars.

Now help these "myth-tified drivers learn the facts about synthetics. Imagine that you work in an auto supply store. Role-play each situation with a partner, explaining why synthetic motor oil is always a smart choice.

- **Driver 1** has just bought a brand-new mini-van for short-trip errands and everyday stop-and-go commuting. She's heard that switching to a synthetic will void her new car warranty.
- **Driver 2** owns a vintage sports car with more than 100,000 miles on it. He'd like to try synthetic motor oil, but he's been told that it's only for new cars.
- **Driver 3** is picking up a new SUV next week. She wants to use synthetic motor oil, but she understands you have to break in a new engine with conventional motor oil first.
- **Driver 4** hauls his bass boat to lakes all over the state. He'd like to upgrade to synthetic oil in his pickup, but he's heard that switching can cause engine problems.

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The Oil Factor

Activity Four
Making the Right Choice

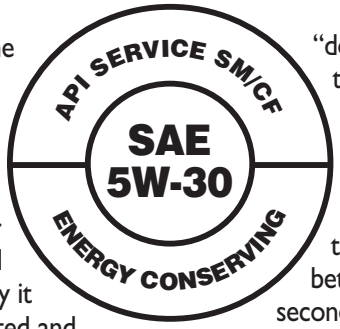
Finding the right motor oil for any vehicle involves making informed choices. First, you have to decide which grade of motor oil is appropriate for the driving conditions. Then you have to determine which type of oil best suits the driver's needs. Let's get started!

Part I

One of the most perplexing things about choosing the right motor oil is figuring out those numbers and letters that identify the different grades. Once you understand why there are different grades of motor oil, however, it's actually pretty simple.

As you probably remember from Activity One, motor oil grades are based on *viscosity,* which is the technical term for the oil's thickness or thinness and how easily it flows. Like all fluids, motor oil thins out when it's heated and thickens up when it's cooled. To keep your engine running, you need a motor oil that won't be too thick when you're starting up in the dead of winter or too thin to protect important engine parts when you're stuck in traffic on a blazing summer day. That's why multi-grade oils are so popular. They are specially formulated to perform across a wider range of operating temperatures.

So, how can you find the right multi-grade oil? Just look for the API "donut," like the one shown here. This symbol shows the oil's service and energy conservation ratings by the American Petroleum Institute (API) and, in the center, the oil's grade rating by the Society of Automotive Engineers (SAE). The first number in the grade rating indicates the oil's viscosity at low temperatures. The lower this "W" number, the better the oil will perform in the winter cold. The second number in the rating indicates the oil's viscosity at high temperatures. The higher this number, the better the oil will perform in summer heat. When you put the two rating numbers together, you've got a good idea of the range of operating temperatures that a particular grade of oil can handle.



Try it yourself using this multi-grade oil chart. For each of the drivers described here, choose the oil grade you'd recommend for maximum engine performance.

Multi-Grade Oil Chart

5W-20	5W-30	5W-50	10W-30	10W-40	20W-50

	Drivers	Oil Grade
1.	Brian uses his ten-year-old SUV to haul snowmobiles at a ski resort in Idaho.	
2.	Claire commutes thirty miles in stop-and-go traffic to her job at a Florida shopping mall.	
3.	Dawn needs to keep her new car in top shape for her job as a traveling nurse in rural Tennessee.	
4.	Evan depends on his mini-van to deliver pizzas year-round in the suburbs around Chicago.	

Part II

In addition to different grades, there are many different types of motor oil, each one designed to meet specific driving needs and provide specific benefits. You've already learned about two types of oil, conventional and synthetic. Now take a look at the accompanying **Oil Type Chart** to see how many different types of Castrol motor oil you can choose from. Read about what each type offers, then use the chart to tune up your motor oil savvy. Match each of the drivers described above to the type of oil you'd recommend for his or her driving needs. Be prepared to explain the reasons for your recommendations in class.

Drivers	Oil Types
1. ___ Brian	a. Conventional
2. ___ Claire	b. High Mileage
3. ___ Dawn	c. Synthetic Blend
4. ___ Evan	d. Synthetic

Part III: Your Turn

Ready for the most important motor oil choice? Use the space below to select the grade of motor oil that's right for driving conditions where you live and the type and brand of Castrol motor oil that meets your driving needs.

The Motor Oil
That's Right For You: Grade: _____ Type: _____ Brand: _____

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The Oil Factor

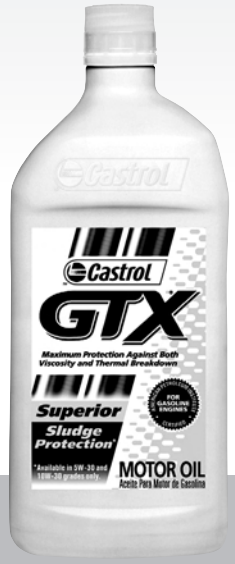
Activity Four
Oil Type Chart

Motor oil is specially formulated to provide different levels of protection for your engine. This chart shows the different brands of Castrol motor oil by type and provides details on the benefits of each one. Use the chart to help you decide which type and brand of Castrol motor oil you would recommend to each of the drivers described in Activity 4. Be ready to explain the reasons for your choices in a class discussion.

SUPERIOR PROTECTION AGAINST SLUDGE BUILD-UP*

Castrol GTX

- Formulated with unique dispersants to provide superior sludge protection among leading oils
- Passed one of the industry's toughest sludge standards**
- Provides the highest North American standard of protection against viscosity breakdown
- Delivers unsurpassed protection against thermal breakdown



Conventional

HELPS EXTEND THE LIFE OF YOUR ENGINE

Castrol GTX High Mileage

- Specially formulated for vehicles with over 75,000 miles
- Provides superior protection against oil burn-off as compared to leading oils
- Contains seal conditioners to help reduce oil leakage

High Mileage

ADDED PROTECTION FOR FREQUENT SHORT TRIPS

Castrol SYNTEC Blend

- Provides superior protection against the 'wear and tear' caused by short trip driving
- Offers superior viscosity and wear protection
- Combats volatility and harmful deposits
- Contains an added level of synthetic protection

Synthetic Blend

NO LEADING MOTOR OIL PROVIDES MORE HORSEPOWER*

Castrol SYNTEC

- Helps your vehicle maintain maximum horsepower by reducing harmful deposit formation
- Provides stability and endurance under extreme conditions like heat, load, and speed
- Superior engine protection that outperforms leading conventional and synthetic blend oils, passing severe industry tests

Synthetic

* Among leading motor oils. ** In 5W-30 and 10W-30 grades.

* Castrol SYNTEC 10W-30 tested vs. other leading 10W-30s.

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The Oil Factor

Activity Five
Time for a Change

Now that you know how to choose the right motor oil, it's time to learn how to check your oil and change it regularly – the real keys to keeping your engine protected.

Part I Experts recommend that you check your motor oil at least once a week, or every time you fill up the gas tank. To get in the habit, take this sheet home and follow the steps below to check the oil in your own or your family vehicle.* You'll find that it's easy and only takes a few minutes. Use the spaces provided to record the level and condition of your motor oil, then bring your findings back to class so you can compare your results with those of your classmates.

Checking Your Oil

Step 1 Read your owner's manual for guidelines related to checking and changing the motor oil in your vehicle. Then study the engine compartment diagram in the manual to find the location of your engine's oil dipstick. You might need to find out how to operate the vehicle's hood release, too.

Step 2 Make sure the engine is turned off and cool. Then open the hood and locate your engine's oil dipstick.

Step 3 Pull out the dipstick, wipe it with a rag to get a clean reading, then reinsert it, making sure you push it all the way in. Pull the dipstick out again and check the oil level at the tip.

- If the oil on the tip reaches only to the "ADD" mark on the dipstick, it usually means that you need to add a quart of oil. (Check your owner's manual to be sure.)
- If the oil reaches below the "ADD" mark, you're seriously low on oil and probably overdue for an oil change.
- If the oil reaches above the "ADD" mark, you have enough motor oil but should still check the oil's condition. If it appears dark and dirty, plan on an oil change soon. If it looks fairly clear and golden, you're ready for the road.

Step 4 If you need a quart of motor oil and have the right grade and type on hand, follow the owner's manual instructions for adding oil to the engine. Then wipe the dipstick clean with a rag, and check the oil level again.

Step 5 If the oil level and condition are satisfactory, replace the dipstick securely in its proper location, close the hood tightly, and you're done! (Nothing to it, right?)

My Oil Findings: Level _____

Condition: _____

***Safety Note:** Used oil is hazardous. Avoid prolonged contact. Wash skin thoroughly with soap and water after contact and launder or discard soiled clothes. Impermeable gloves and eye protection are recommended.

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Part II As you know, your car's motor oil should be changed regularly. Experts recommend a change every 3,000 miles or three months, whichever comes first, but you should always check your owner's manual for specific recommendations for your engine and vehicle.

When the time comes to change your oil, you'll want to be ready. So take a few minutes now to gather the information you'll need by filling out the planning chart below.

Planning for a Change

Where should I go? You can get your vehicle's oil changed at any "quick-lube" center, car dealership, or service station in your area. If you're not familiar with one yourself, they're easy to find in your local phone book or online.	Find the most convenient facility for you. Name: _____ Location: _____ _____ Phone: _____
How long will it take? Changing a car's oil is relatively quick and simple. The actual process should take no more than 20 minutes – assuming that this is the only service being performed.	Hours when the facility is open each day. Weekdays: _____ Weekends: _____ Other: _____
How much will it cost? Although prices vary, the average cost for a conventional oil change is $25 - $30. This generally includes the cost of the oil as well as checking and topping off other important automotive fluids – windshield washer, brake fluid, power steering fluid, etc. – and checking the tire pressure.	Fee charged by the facility and what that fee includes. _____ _____ _____ _____ _____
Which grade of oil should I ask for? Check your owner's manual to be sure you know the grade of oil recommended for your vehicle. Then talk with your mechanic to decide on the right grade for operating conditions in your region.	Vehicle manufacturer's recommended grade of motor oil: _____ Operating conditions in your region: _____ _____ _____ _____
What type of oil should I choose? Most facilities use an all-purpose "house brand" of motor oil, so you should plan to ask for the specific type and Castrol brand of oil that meets your driving needs. You can also bring your own choice of motor oil with you when you go in for an oil change.	My Driving Needs: _____ _____ _____ _____ Oil Type: _____ My Castrol Brand: _____

The Oil Factor

Activity Five
Time for a Change

Now's the time to put all that you've learned about motor oil and its critical functions into practice by performing one of the most basic tasks an automotive mechanic will face: changing a vehicle's motor oil.

It's important to check a vehicle's oil frequently, and it should be changed every 3,000 miles or three months (whichever comes first), or as recommended in the vehicle's owner's manual. The oil filter should be changed about every 5,000 miles, or every other oil change. Some other important automotive liquids and lubricants that should also be checked at every oil change include power steering fluid, brake fluid, auto transmission fluid, and grease level.

Part I Follow these easy steps to change a vehicle's motor oil. (Note: Used oil is hazardous. Avoid prolonged contact. Wash skin thoroughly with soap and wate after contact and launder or discard soiled clothes. Impermeable gloves and eye protection are recommended.)

Step One – Prepare the Vehicle

- Warm engine to its normal operating temperature for about 5 - 10 minutes to make sure the oil will drain easily.
- Switch off the engine and let it cool sufficiently to reduce burn hazards. Raise the hood, locate the oil filler cap and loosen it to avoid creating a vacuum that could impede drainage.

Step Two – Drain the Old Oil

- Locate the oil drain plug underneath the car – normally toward the rear of the engine sump.
- Place the drain pan beneath the drain plug and slightly toward the back.
- Engage the plug with your wrench and turn it counter-clockwise until it rotates freely; finish removing it by hand. Be careful of hot oil splashing on your skin!

Step Three – Remove the Old Oil Filter

- After the sump has drained, loosen the old oil filter by turning it counter-clockwise with a filter wrench. Finish removing the filter manually, catching it in your hand. Take care not to touch the hot exhaust manifold.
- Ease the filter down and away from the engine; then tip it over into the drain pan.

Step Four – Replace the Oil Filter

- Clean in and around the filter seat with a clean rag.
- Take a new filter and apply a light film of oil to the gasket.
- Carefully screw the new filter onto the threaded oil line, turning it clockwise. Snug it up tightly by hand, but avoid over-tightening.

Step Five – Clean and Replace the Oil Plug

- Clean the oil plug and drain seat with a rag. Align and replace the plug.
- Screw the oil plug in carefully by hand; avoid cross-threading.
- Tighten the plug firmly and snugly with a wrench.

Step Six – Add New Oil

- Remove the oil filler cap and fill the engine with the required quantity of Castrol oil.
- Check the oil dipstick to assure proper fill level; replace the filler cap.
- Start the engine. Visually check under the engine for obvious leaks. If there are no leaks, run the engine for several minutes to distribute the new oil throughout the engine.
- Turn off the engine and re-check the oil dipstick to assure proper oil level.

Step Seven – Dispose of Used Oil Properly

- Dispose of the used oil at an appropriate oil recycling center. You can find a center in your area by visiting the www.earth911.org website.

Step Eight – Complete Your Oil-Change Report

You should keep a record of every vehicle you work on. Many places now keep these records in the computer, but you will need to provide the information. Use the form below for practice. You might want to use your own or a family vehicle as your example. If you don't have access to either, create a hypothetical vehicle.

Owner: _____

Vehicle Make/Model: _____

Vehicle Identification Number (VIN): _____

Date of Oil Change: _____

Mileage at Last Oil Change: _____

Current Mileage: _____

Mileage of Next Recommended Oil Change: _____

Grade of Oil Needed: _____ Quantity: _____

Type/Brand of Oil Needed: _____

Model of Oil Filter: _____

Location of nearest oil recycling facility: _____

Part II Time for some troubleshooting! Listed here are some typical mishaps that might occur during an oil change. In a class discussion, talk about what you'd do to prevent them.

1. Losing the oil drain plug
2. A leak at the oil filter
3. Over-tightening the oil filter
4. Overfilling when adding new oil
5. Spilling oil into the exhaust system

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Your Castrol Car Care Calendar – *Keep It Running All Year Round!*

Castrol™

Use this handy calendar to help you keep track of the proper care and feeding of your car the whole year through. Post a copy at home, and keep one in your car's glove compartment as a ready reference.

FALL

When the leaves change, so should your tires; rotation keeps your tires from wearing unevenly and wearing out.

- **Oil Change:** Plan to change your oil every 3,000 miles or every three months, whichever comes first. Use oil type, grade, and Castrol brand appropriate for your vehicle.
- **Tires:** Have your tires rotated and the alignment checked.

WINTER

Colder temperatures test your car's performance and make maintenance even more critical. Perform these easy checks to ensure your car's readiness for rough weather.

- **Oil Change:** Time for another Castrol oil change. Remember every 3,000 miles or three months, whichever comes first.
- **Fluids Check:** Check all fluids including brake, power steering, transmission/transaxle, and – especially now – windshield washer solvent and antifreeze.
- **Systems Check:** Have your engine's cooling system tested and flushed. Inspect hoses and clamps for wear. Replace or adjust as needed.
- **Battery Check:** The American Automobile Association (AAA) recommends having a qualified service facility perform a battery load test, using a special diagnostic machine.
- **Lights:** Test brake, signal, and headlights. Replace burnt out or weak bulbs.

SPRING

This is an ideal time to correct nagging problems left over from winter; warmer weather is on its way, and can wreak havoc on your cooling and electrical systems.

- **Oil Change:** Time for another Castrol oil change. Make it a habit every 3,000 miles or three months, whichever comes first.
- **Tires:** The AAA recommends rotating tires every 6,000 miles; have a certified technician rotate the tires and check the alignment; consult your owner's manual for details.
- **Coolant:** Have your coolant level and the antifreeze/water mixture in the radiator checked.
- **Wiper Blades:** Inspect your windshield wiper blades whenever you fill up your car; if the rubber is ragged or brittle, replace them. Wiper blades should be changed once a year.

SUMMER

A perfect time for road trips... and potential breakdowns! Head off possible emergencies with these quick checks.

- **Oil Change:** Time for another Castrol oil change. Many manufacturers recommend an oil change every 3,000 miles or every three months, whichever comes first. Refer to your owner's manual.
- **Fluids Check:** Because hot weather can cause fluids to evaporate, have all fluids checked: battery, brake, power steering, and transmission/transaxle fluids, plus windshield washer solvent and especially the coolant.

Your Car's Vital Statistics:

Consult your owner's manual to find your vehicle manufacturer's recommendations for these car care essentials.

Tire size: _____

Tire pressure: (front) _____ (rear) _____

Headlight replacements: _____

Signal light replacements: _____

Wiper blade replacements: _____

Recommended grade of motor oil: _____

Engine oil capacity: (quarts) _____

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Your Castrol Oil Change Checklist

Regular engine maintenance is an important factor in keeping a vehicle running smoothly and extending its life. An easy way to make maintenance part of your regular routine is to check critical systems at every oil change. Here's a handy list of everything you should check when you change a vehicle's motor oil. Post it in your shop or garage as a reminder

- ◯ Change Oil (every 3 months or 3,000 miles, whichever comes first) – dispose of old oil properly!*
- ◯ Change Oil Filter (every 5,000 miles, if not with every oil change)
- ◯ Lubricate Grease Joints (if applicable)
- ◯ Check All Fluids (replenish/fill to proper level if necessary):
  - ◯ Engine coolant (maintaining the right mix of water and coolant is essential)
  - ◯ Brake fluid (check owner's manual first to see what type is needed)
  - ◯ Power steering fluid (pump is usually located behind the fan belt)
  - ◯ Transmission fluid (check the owners'/service manual for the recommended fluid)
- ◯ Check Tire Pressure
- ◯ Check General Condition of:
  - ◯ Engine belts
  - ◯ Fan belt
  - ◯ Cooling system belt
  - ◯ Engine hoses
  - ◯ Windshield wiper blades (replace if necessary)
  - ◯ Tires (front and back)

* Find an oil recycling center near you at www.earth911.org.

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A MESSAGE FOR STUDENTS

If motors are your motivation, you could be a Castrol SYNTEC Outperformer! The Castrol SYNTEC Outperformers Program rewards aspiring young auto technicians with a $7,500 scholarship to attend an automotive program, technical institute, or other school approved by BP Lubricants USA Inc. Starting on November 1, 2006, Castrol asks would-be auto technicians ages 16-25 to explain, in 500 words or less, why they should win the 2007 Castrol SYNTEC Outperformers scholarship. **For complete program details and to submit entries, please visit www.syntecoutperformers.com.**

A Change for the Better

If you're a do-it-yourselfer, remember to discard used motor oil properly.* Oil poured down a drain or sewer can pollute rivers and streams and even contaminate ground water. Take your used oil to a certified oil recycling center instead. To find a center near you, visit **www.earth911.org** on the Internet.

*Safety Note: Used oil is hazardous. Avoid prolonged contact. Wash skin thoroughly with soap and water after contact and launder or discard soiled clothes. Impermeable gloves and eye protection are recommended.

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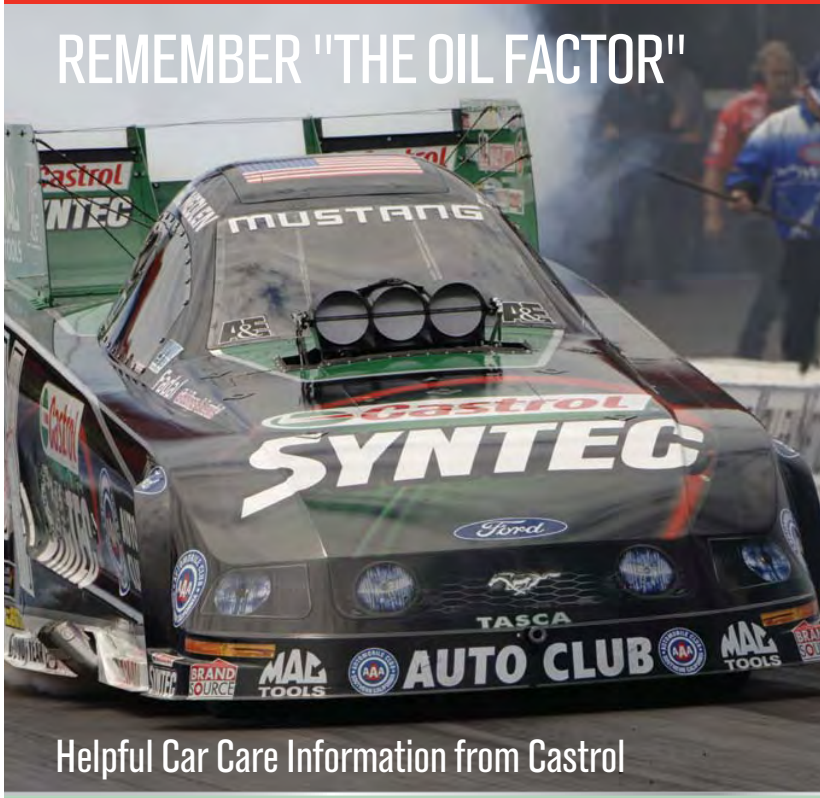
REMEMBER "THE OIL FACTOR"



Helpful Car Care Information from Castrol

IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.™

Castrol

WHICH CASTROL BRAND IS RIGHT FOR YOUR KIND OF DRIVING?

Proper lubrication is the key to maintaining and protecting your car's engine.
Keep this brochure handy as an easy reference when having your motor oil changed or when buying oil for your car.

Castrol GTX

Designed to provide superior protection against sludge build-up.*

- Formulated with unique dispersants to provide superior sludge protection among leading oils
- Passed one of the industry's toughest sludge standards**
- Provides the highest North American standard of protection against viscosity breakdown
- Delivers unsurpassed protection against thermal breakdown

*Among leading motor oils.

** In 5W-30 and 10W-30 grades.

CONVENTIONAL

Castrol GTX HIGH MILEAGE

Designed to help extend the life of your engine.

- Specially formulated for vehicles with over 75,000 miles
- Provides superior protection against oil burn-off as compared to leading oils
- Contains seal conditioners to help reduce oil leakage

HIGH MILEAGE

Castrol SYNTEC BLEND

Designed to provide added protection for frequent short trips.

- Provides superior protection against the 'wear and tear' of short trip driving
- Offers superior viscosity and wear protection
- Combats volatility and harmful deposits
- Contains an added level of synthetic protection

SYNTHETIC BLEND

Castrol SYNTEC

Designed to help maintain maximum horsepower by reducing harmful deposit formation.

- No leading motor oil provides more horsepower‡
- Provides stability and endurance under extreme conditions like heat, load, and speed
- Superior engine protection that outperforms leading conventional and synthetic blend oils, passing severe industry tests

‡ Castrol SYNTEC 10W-30 tested vs. leading 10W-30s.

SYNTHETIC

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