

**EST. 2005**

**Joe's Auto**  
***Battery Picker***

**For Best Performance**

**Find the Right Battery And Maintain It**

# **Car or truck Busted? Need A New Battery?**





**A Battery...  
Is A Battery....  
Is A Battery.....**

**Right?**



**Just like Cars,  
Not all batteries are  
created equal.**



**So what is the  
difference?**

**Well Let's Start With  
The Basics**

**1 + 1 = ~~3~~ 2**

# **Batteries have 3 main uses:**

**Starting**

**Reserve**

**Dual Purpose**



**And several “types”  
of battery to fit each use:**

**Flooded**

**AGM**

**Lithium**

# Confused yet?

$\langle \phi_n | \phi_n \rangle = \langle \phi_n | \int_{-x_0}^{x_0} dx |x\rangle \langle x| \phi_n \rangle \Rightarrow \left( \frac{\sqrt{2}}{L} n + \frac{1}{2} \right) \frac{L}{2} = \frac{\pi}{2} (2l-1), l=1,2,\dots \Rightarrow k_n = -\frac{\pi}{L} \left( \begin{smallmatrix} 2 & 0 \\ 0 & 1 \end{smallmatrix} \right)$

$\langle \phi_n | \phi_m \rangle = \int_{-x_0}^{x_0} dx \phi_n^*(x) \phi_m(x), \psi_n(x) = \sqrt{\frac{2}{L}} \cos \left[ \frac{\pi}{L} (2n-1)x \right]; \phi_n(x) = \sqrt{\frac{2}{L}} \sin \left[ \frac{\pi}{L} nx \right]$

$\langle \phi_n | \phi_n \rangle = \frac{1}{L} \int_{-x_0}^{x_0} dx e^{-ikx} e^{ikx} = 0, k \neq 0$

$\hat{H} \psi_n(x) = -\frac{\hbar^2}{2m} \partial_x^2 \psi_n(x) = \frac{\hbar^2}{2m} \left( \frac{\pi}{L} (2n-1) \right)^2 \psi_n(x)$

$E_n = \frac{\hbar^2}{2m} \frac{\pi^2}{L^2} (2n-1)^2, n=1,2,\dots; \hat{H} \psi_n(x) = \frac{\hbar^2}{2m} \left( \frac{\pi}{L} \right)^2 n^2$

$\hat{H} \psi_0 = -\frac{\hbar^2}{2m} \partial_x^2 \psi_0(x) = \frac{\hbar^2}{2m} \frac{1}{2a} \psi_0(x) - \frac{\hbar^2}{2m} \frac{1}{4a^2} (x-x_0)^2 \psi_0(x)$

$= -\frac{\hbar^2}{2m} \left( -\frac{1}{2a^2} + \left( \frac{1}{2a} - (x-x_0) \right) e^{-\frac{(x-x_0)^2}{4a^2}} \psi_0(x) \right) \psi_0(x) = \frac{\hbar^2}{2m} \frac{1}{4a^2} (x-x_0)^2$

$\hat{H} \rightarrow \tilde{H} = -\frac{\hbar^2}{2m} \partial_x^2 + V(x); \tilde{H} \psi_0 = \frac{\hbar^2}{2m} \frac{1}{2a^2} \psi_0 = E_0 \psi_0$

$V(x) = \frac{1}{2} m \omega^2 (x-x_0)^2 \rightarrow m\omega^2 = \frac{\hbar^2}{m^2 a^4} \Rightarrow \omega = \frac{\hbar}{2ma^2}; E_0 = \frac{\hbar^2}{2m} \frac{1}{2a^2}$

$|\psi_0(x)| = |\psi_0| e^{-\frac{(x-x_0)^2}{2a^2}}$

$\int_{-\infty}^{\infty} dx e^{-\frac{x^2}{a^2}} = \sqrt{\frac{\pi}{a^2}}$

$A = \frac{1}{2a^2} \Rightarrow |\psi_0| = \frac{1}{(2\pi a^2)^{1/4}}$

$[a, \hat{x}] = \frac{\hbar}{i}; [a, \hat{p}] = \frac{\hbar}{i} \partial_x / \hat{H} = \frac{\hbar^2}{2m} + \frac{1}{2} m \omega^2 \hat{x}^2$

$a^2 + b^2 = (a+ib)(a-ib); a, b \in \mathbb{R}; \mathbb{Z} (a\hat{p} + ib\hat{x})(a\hat{p} - ib\hat{x}), a, b \in \mathbb{R}$

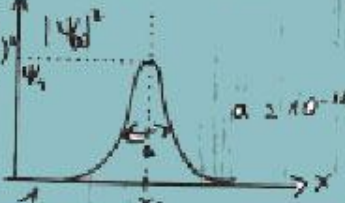
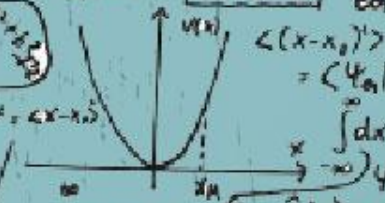
$= a^2 \hat{p}^2 + iba \hat{x} \hat{p} - iab \hat{p} \hat{x} + b^2 \hat{x}^2 = a^2 \hat{p}^2 + b^2 \hat{x}^2 - \hbar ab$

$\hat{H} = (a\hat{p} + ib\hat{x})(a\hat{p} - ib\hat{x}) = ba\hbar; a^2 = \frac{1}{2m}; b^2 = \frac{1}{2} m \omega^2$

$Dy = C^* \frac{1}{\hbar \omega} (a\hat{p} + ib\hat{x}); C = \frac{1}{\hbar \omega} (a\hat{p} - ib\hat{x}) \Rightarrow \hat{H} = \hbar \omega C^* C$

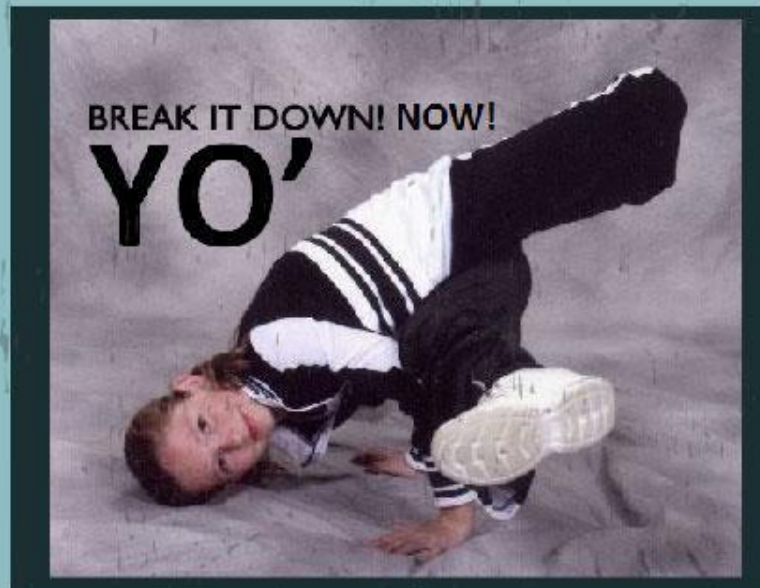
$(\hat{x} \pm \frac{\hbar}{2m\omega}) |n\rangle = C |n \pm 1\rangle; |SU(2) \cong S^3; A \rightarrow \omega \hat{A} \omega^{-1} + \frac{1}{2} \hbar \omega$

$\langle (x-x_0) \rangle = \langle \psi_0 | (x-x_0) | \psi_0 \rangle = \int dx |x\rangle \langle x| \psi_0(x) (x-x_0) \psi_0(x)$



**Don't be!**  
**We got ya covered.**



# Vehicle Battery Uses



**Caution! Do Not Eat Them!**

**Back to those 3 main  
uses:**

**Starting**

**Reserve**

**Dual Purpose**



# Starting Battery



- **The main use for a vehicle battery.**
- **Starts the engine.**
- **Bigger the engine = more powerful the battery\*.**

**\*battery physical size does not always equal battery power**

# Reserve Battery



- **This battery gives a continuous flow of power.**
- **Used for things like boat trolling motors or RVs.**
- **A good idea for cars or trucks with lots of electronics.**
- **Not the best for starting an engine.**

# Dual Purpose Battery



- **The best of both worlds.**
- **Use when you have an engine to start & have electronics to power.**
- **Perfect for cars with big stereos or lots of accessories.**



# Got that?

*Batteries can:*

*Start an engine*

*Power electronics and boats*

*or Both*

The background is a light blue-grey color with a distressed, wood-grain-like texture. It is decorated with several question marks of varying sizes and colors, including orange, light brown, and dark brown. The text is centered and reads:

**Now What About  
Those Battery  
“Types”?**

*Caution!*

*The Next Few Slides  
Get Technical!*

*But hang in there, it's worth it.*





# **“Types” of batteries:**

**Flooded**

**AGM**

**Lithium**

# Flooded Battery



\$

- 100 year old technology
- Makes up the majority of vehicle batteries in use.
- Very reliable but has limited power and service life
- Most rated for 3-6 years

Range \$50 - \$200

# AGM Battery



\$\$\$

- A modern take on the old battery technology.
- Rated 8-10 year design life.
- Almost twice the power of conventional batteries.
- Perfect for high performance or project vehicles.

Range \$200 - \$350



# Lithium Battery



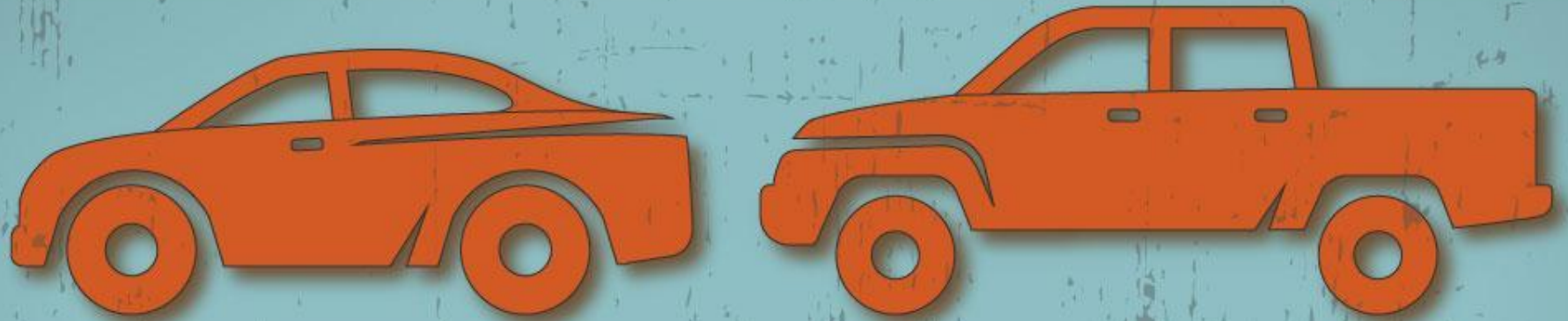
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- Newest most advanced battery technology for vehicles.
- Not common in cars except electric and luxury sedans.
- High reliability, light weight and stability make them popular in motorcycles & power sports.

Range \$100 - \$\$\$

# **3 Types of Batteries and 3 Battery Technologies**

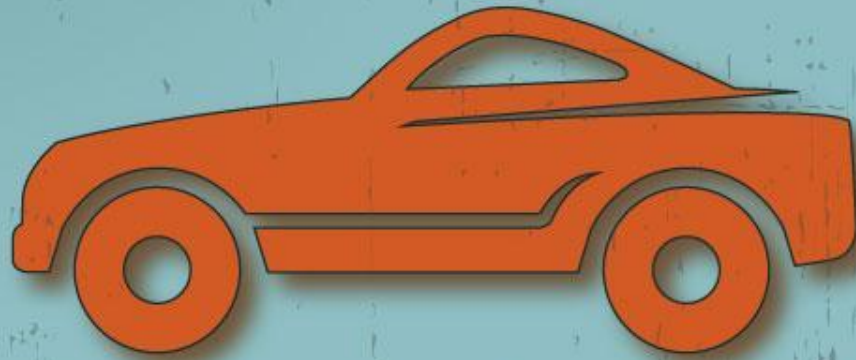
*WHAT'S IT ALL  
MEAN TO YOU?*



## **Average everyday car or truck?**

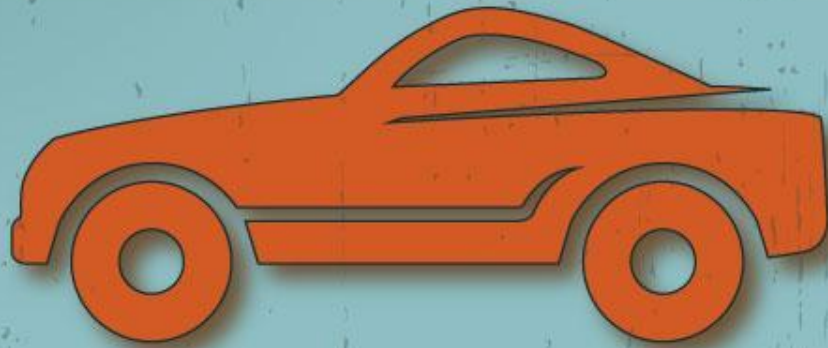
**Get a standard “flooded battery”.  
Affordable and will the basic job of  
starting your car.**





**High Performance Vehicle?  
Or tired of buying batteries every  
few years?**

**Get a premium “AGM” battery.  
The power and reliability to perform!**



**High Performance Vehicle?  
Or tired of buying batteries every  
few years?**

**Get a premium “AGM” battery.  
The power and reliability to perform!**





**High performance power  
sport, luxury or electric car?**

**Indulge in the latest “**Lithium**” battery  
technology.**

**The wave of the future in batteries.**



Whatever your battery needs  
**Battery Joe** has you covered with  
batteries from top quality  
companies like:

**EVERMAX**



**ODYSSEY**  
THE EXTREME BATTERY



**So now you have your  
battery all picked out.**

**Now you need to  
take care of it!**

**Here are some tips to keep  
your vehicle battery  
happy and healthy.**





**A clean, tight, well secured  
and fully charged battery  
will serve you well.**

**Here is how you do it:**

# #1 Make It Clean

**If your battery terminals are corroded, make a paste of baking soda & water and a scrub brush to clean away any corrosion from the battery clamps and terminals using a wire brush.**



# #1 Make It Clean

Once clean use a product like “Whip” to prevent future corrosion.





## **#2 Make It Tight**

**Make sure positive and negative clamps are seated all the way down.**

**If not loosen the clamps and use a screw driver to spread the clamps gently until the clamp slides all the way down the post.**

# #2 Make It Tight

**Make sure the battery hold downs are in place and tight. Replace as needed.**

**Excessive vibration will kill your battery!**





# #3 Keep It Well Charged

If you store your car, truck, motorcycle or ATV for more than a month at a time use a battery maintainer like one of these:





# #3 Keep It Well Charged

**These chargers are “set and forget”  
Just attach, plug in and leave!**

**The smart technology inside will keep your  
battery ready to go at all times and never  
overcharge!**

# **Remember:**

**A clean, tight, well secured  
and fully charged battery  
will always serve you well.**

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**There you go!**

**Now you have the basics of battery maintenance.**

**Here are a few extra things to keep in mind.**

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**No need to check the “water”  
on most batteries.**

**The majority of car batteries sold today are  
maintenance free and do not need regular  
water checks and can be damaged if you  
attempt to open them.**

**Remember that not all electrical problems are battery related!**

**Sometimes a problem that seems to be a battery issue may just be a symptom of a deeper electrical issue.**

**A new battery may not always solve your every problem.**

**Always remember:**

**If you have concerns with  
your vehicle's battery  
come in for a free consul-  
tation with a battery  
expert at Battery Joe.**



*Your "everything" battery experts!*



[www.BatteryJoe.com](http://www.BatteryJoe.com)