

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**

$$1 + 1 = \cancel{3} 2$$

Batteries have 3 main uses:

Starting

Reserve

Dual Purpose

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

Flooded

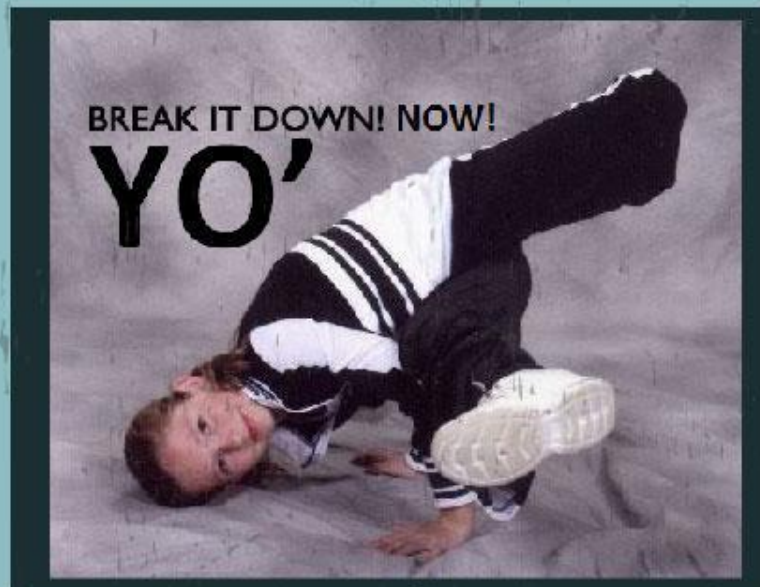
AGM

Lithium

Confused yet?

$$\begin{aligned}
 \langle \phi_n | \phi_n \rangle &= \langle \phi_n | \int_{-\frac{a}{2}}^{\frac{a}{2}} 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), \quad l=1,2,\dots \Rightarrow k_n = -\frac{\pi}{L} \quad \left(\begin{smallmatrix} 0 & 1 \\ 1 & 0 \end{smallmatrix} \right) \\
 \langle \phi_n | \phi_n \rangle &= \int_{-\frac{a}{2}}^{\frac{a}{2}} dx \phi_n^*(x) \cdot \phi_n(x) \quad \psi_n(x) = \sqrt{\frac{2}{L}} \cos \left[\frac{\pi}{L} (2n-1)x \right]; \quad \phi_n(x) = \sqrt{\frac{2}{L}} \sin \left[\frac{\pi}{L} nx \right] \\
 \langle \phi_n | \phi_n \rangle &= \frac{L}{2} \int_{-\frac{a}{2}}^{\frac{a}{2}} dx e^{-ikx} e^{ikx} = 0, \quad 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, \quad n=1,2,\dots; \quad \hat{H} \psi_n(x) = \frac{\hbar^2}{2m} \left(\frac{\pi}{L} \right)^2 \\
 |\psi(x)\rangle &= |\psi_0\rangle e^{-\frac{(x-x_0)^2}{2a^2}} \quad \psi_0(x) = \frac{1}{\sqrt{a}} e^{-\frac{(x-x_0)^2}{2a^2}} \quad a \approx 10^{-10} \text{ m} \\
 \int_{-\infty}^{\infty} dx e^{-\frac{x^2}{a^2}} &= \sqrt{\pi} a \\
 A &= \frac{1}{2a^2} \Rightarrow |\psi_0\rangle = \frac{1}{(\pi a^2)^{1/4}} \\
 \hat{H} \psi_a &= -\frac{\hbar^2}{2m} \partial_x^2 \psi_a(x) = \frac{\hbar^2}{2m} \frac{1}{2a^2} \psi_a(x) - \frac{\hbar^2}{2m} \frac{1}{a^2} (x-x_0)^2 \psi_a(x) \\
 &= -\frac{\hbar^2}{2m} \left(-\frac{1}{2a^2} + \left(\frac{1}{a^2} (x-x_0)^2 \right) e^{-\frac{(x-x_0)^2}{2a^2}} \right) \psi_a(x) = \frac{\hbar^2}{2m} \frac{1}{a^2} (x-x_0)^2 \psi_a(x) \\
 \hat{H} &\rightarrow \hat{H} = -\frac{\hbar^2}{2m} \partial_x^2 + V(x); \quad \hat{H} \psi_a = \frac{\hbar^2}{2m} \frac{1}{2a^2} \psi_a = E_0 \psi_a \\
 V(x) &= \frac{1}{2} m \omega^2 (x-x_0)^2 \Rightarrow m \omega^2 = \frac{\hbar^2}{m a^4} \Rightarrow \omega = \frac{\hbar}{2ma^2} \quad E_0 = \frac{\hbar^2}{2m} \frac{1}{2a^2} \\
 [\hat{p}, \hat{x}] &= \frac{\hbar}{i}; \quad \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); \quad a, b \in \mathbb{R}, \quad \mathbb{Z} \quad (a\hat{p}+ib\hat{x})(a\hat{p}-ib\hat{x}), \quad a, b \in \mathbb{R} \\
 &= a^2 \hat{p}^2 + iba\hat{x}\hat{p} - iba\hat{p}\hat{x} + b^2 \hat{x}^2 = a^2 \hat{p}^2 + b^2 \hat{x}^2 - b a \hbar \\
 \hat{H} &= (a\hat{p}+ib\hat{x})(a\hat{p}-ib\hat{x}) = b a \hbar, \quad a^2 = \frac{1}{2m}; \quad b^2 = \frac{1}{2} m \omega^2 \\
 \text{Def. } C^{\pm} &= \frac{1}{\sqrt{\hbar \omega}} (a\hat{p} \pm ib\hat{x}); \quad C^- = \frac{1}{\sqrt{\hbar \omega}} (a\hat{p} - ib\hat{x}) \Rightarrow \hat{H} = \hbar \omega C^+ C^- \\
 \left(\omega \pm \frac{1}{2} \right) \hbar \omega \in \mathbb{C} \quad \{ \pm 1 \} / \text{SU}(2) \cong \text{S}^3 \quad A \rightarrow \omega \tilde{A} \omega^{-1} \quad + \frac{1}{2} \hbar \omega
 \end{aligned}$$

Don't be!
We got ya covered.



Vehicle Battery Uses



**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

**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



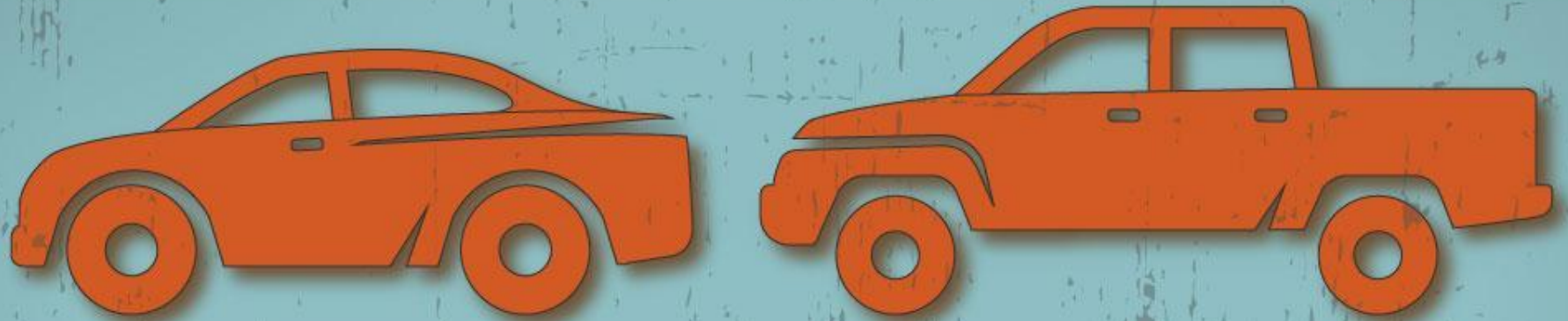
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- Newest most advanced battery technology for vehicles.
- Not common in cars except electric and luxury sedans.
- High reliability, light weight and stability make them popular in motorcycles & power sports.

Range \$100 - \$\$\$

3 Types of Batteries and 3 Battery Technologies

*WHAT'S IT ALL
MEAN TO YOU?*



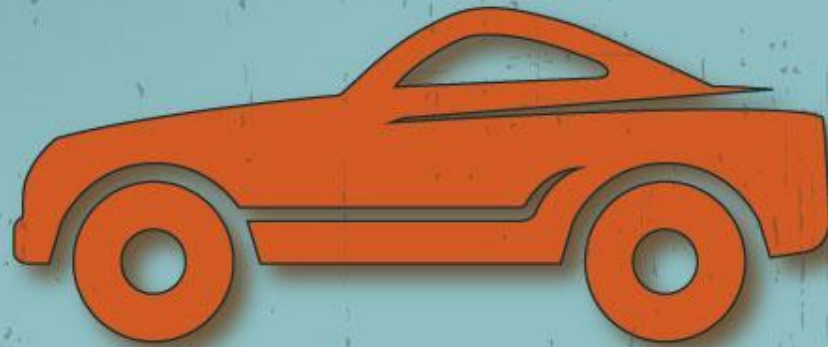
Average everyday car or truck?

**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.**

There you go!

Now you have the basics of battery maintenance.

Here are a few extra things to keep in mind.

**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