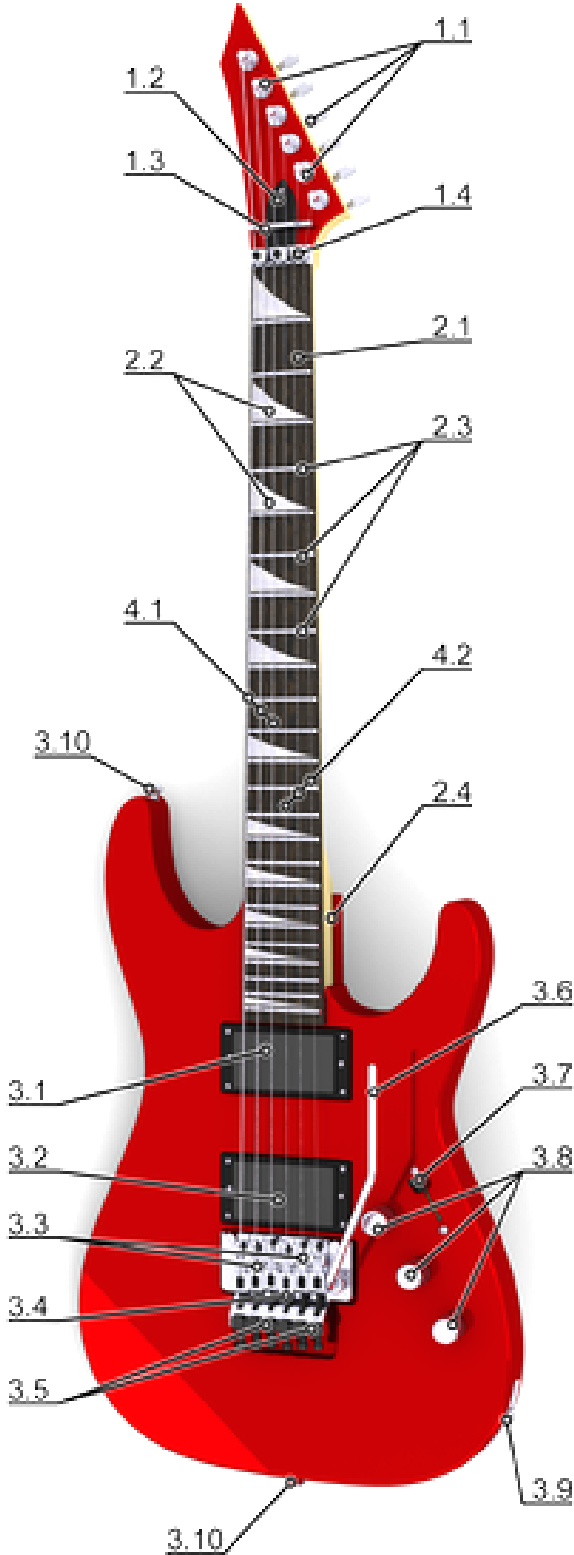




U6 Music Technology > The Electric Guitar

How many of the components of an electric guitar can you name?



1.
- 1.1
- 1.2
- 1.3
- 1.4
2.
- 2.1
- 2.2
- 2.3
- 2.4
3.
- 3.1
- 3.2
- 3.3
- 3.4
- 3.5
- 3.6
- 3.7
- 3.8
- 3.9
- 3.10
4.
- 4.1
- 4.2



Teacher's Sheet

Conceived in 1931, the electric guitar became a necessity as jazz musicians sought to amplify their sound.

1. Headstock:

1.1 machine heads - *worm gears which the player turns to change the string tension and thus adjust the tuning*

1.2 truss rod cover - *a metal cylinder used for adjusting the tension on the neck (not found on all instruments)*

1.3 string guide

1.4 nut - *thin fret-like strip of metal, plastic, graphite or bone which the strings pass over as they first go onto the fingerboard;*

2. Neck:

2.1 fretboard

2.2 inlay fret markers

2.3 frets - *thin metal strips which stop the string at the correct pitch when a string is pressed down against the fingerboard*

2.4 neck joint - *neck is either glued or bolted to the body*

g 3. Body

3.1 "neck" pickup

3.2 "bridge" pickup

3.3 saddles

3.4 bridge - *fixed or spring-loaded hinged "tremolo" system*

3.5 fine tuners

3.6 tremolo arm (whammy bar)

3.7 pickup selector switch

3.8 volume and tone control knobs

3.9 output connector (input jack)(TRS)

3.10 strap buttons

4. Strings:

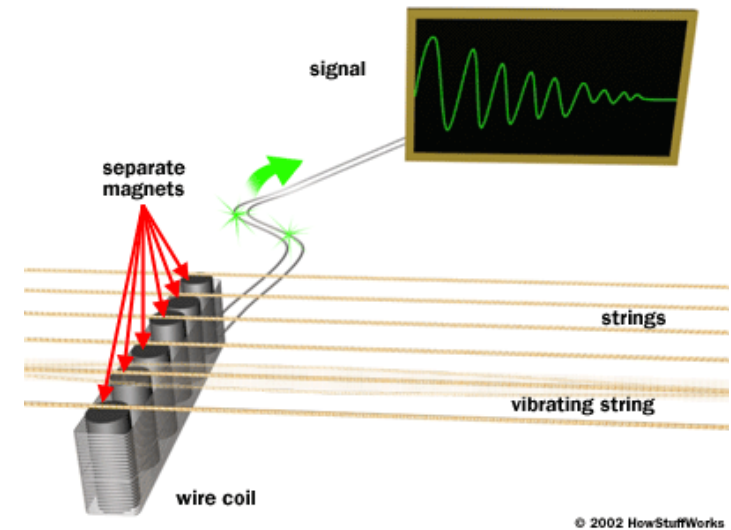
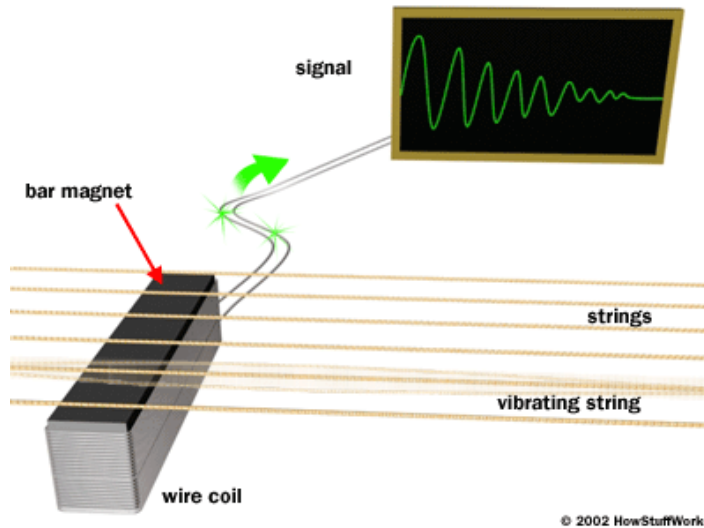
4.1 bass strings

4.2 treble strings



Pickups

- 'Pickups' are magnets wrapped with coils of very fine wire.
- Movement of the strings generates ("induces") a very small electric current in the magnetic pickups
- That current is then sent through a cable to a guitar amplifier





Hum

- Classic single coil pickups also act like an antenna
- They can pick up mains hum along with the musical signal
- Mains hum consists of a fundamental signal at a nominal 50 or 60 Hz
- The pickups also are sensitive to the electromagnetic field from nearby cathode ray tubes in video monitors or televisions.

“Humbucker” pickups

- invented as a way to reduce hum
- two coils of opposite magnetic and electric polarity
- electromagnetic noise hitting both coils should cancel itself out
- the two coils are wired in phase, so the signal picked up by each coil is added together
- gives a richer, “fatter” tone



<http://www.youtube.com/watch?v=yudXHR6agaM>



Vibrato arms or “whammy bars”

- lever attached to the bridge which can slacken or tighten the strings
- although sometimes called a “tremolo bar”, this is misleading:
 - Tremolo is a fluctuation of volume
 - Vibrato is a fluctuation of pitch
- Design is not straightforward - early vibrato systems ('Bigsby vibrato tailpiece') caused the guitar to go out of tune easily.
- For (lots!) more detail, search Wiki for 'tremolo arm'!

<http://www.youtube.com/watch?v=kTpNrseXfsE>





Guitar necks

- Scale = overall length of the strings from the nut to the bridge
- Typical scales include Fender's 25.5", Gibson 'Les Paul' 24.75"
- Frets placed proportionally according to the scale length
- Set-in necks - glued to the body in the factory - most traditional method
 - Said to have a warmer tone and greater sustain
- Bolt-on necks facilitate easy adjustment and replacement. Most popular.
- Neck-through instruments extend the neck itself to form the center of the guitar body, and are known for long sustain and for being particularly sturdy. Difficult or even impossible to repair. More common in bass guitars.
- Usually made of hardwood (maple, ash, mahogany)
- In the 1980s, exotic man-made materials such as graphite began to be used, but are pricey and never really replaced wood
- Different neck shapes (refer to the cross-sectional shape of the neck)
- C necks, U necks, and V necks
- Several sizes of fret wire available
 - traditional players often prefer thin frets; metal shredders prefer thick!



Some weird and wonderful guitars

- “Foldaxe” - neck which folds back



- Steinberger guitars developed a line of exotic instruments without headstocks, with tuning done on the bridge instead.

plus... <http://www.youtube.com/watch?v=d1ymkoY2yRU> !





Built-in sound shaping

- Electric guitars usually have up to three magnetic pickups.
- Identical pickups will have different tones depending on how near they are to the neck or bridge:
 - Bridge pickups have a bright or trebly timbre
 - Neck pickups are warmer or bassy.
- The type of pickup also affects tone:
 - Dual-coil pickups sound warmer, thicker, perhaps even muddy
 - Single coil pickups sound clear, bright, perhaps even biting
- Common arrangement: “fat strat” - one dual-coil at the bridge position, with single coils in the middle and neck positions
- Selector switching allows the outputs of 2+ pickups to be combined
- Further circuitry is sometimes provided to combine the pickups in different ways, e.g. phase switching (one pickup out of phase with another)
- Individual pickups can also have their timbre altered by switches, typically coil tap switch, which effectively short-circuits some of a dual-coil pickup's windings, giving a tone like a single coil pickup.



- Volume control (potentiometer)
- Tone control (“rolls off” treble frequencies)
- Where there are individual volume controls for different pickups, and where pickup signals can be combined, the volume and tone controls affect the timbre of the *final sound*.

- The strings fitted to the guitar also have an influence on tone:
 - Rock musicians often prefer the lightest gauge of roundwound string (easier to bend)
 - Jazz musicians go for heavier, flatwound strings with a rich, dark sound.



Prep

*Carefully read the text below ('Pop Music – The Text Book', Winterson/Nickol/Bricheno, pp. 116-119)
Then, using both your own notes and this text, answer the following question:*

Without the invention of the electric guitar, rock music would probably not exist as we recognize it. Describe the features found on an electric guitar and give a technical explanation of how an electric guitar works.

[16]