Ideal Op-amp

An ideal op-amp should satisfy following conditions:

Infinite Bandwidth

Bandwidth means range of input signal frequencies over which the gain of the amplifier is constant. Op-amp is expected to work with the same (infinite) gain for all frequencies. (Practically this is not possible due to the inter-junction capacitance of transistors used to construct op-amps. Well, this is an ideal op-amp isn't it ?)

Zero Output impendance

Output impedance decides the amount of current which can be delivered to the load by the op-amp. Lesser is the output impedance, more current it can deliver in to the load. For an ideal op-amp, this is zero. Which means the ideal op-amp can deliver infinite current into the load.

Infinite Gain

An ideal op-amp has infinite gain. Theoretically, a very small input signal can be made very large, using op-amp. Practically, an op-amp has very large gain (in thousands). In practice, input signals are in micro-volts or millivolts. An op-amp makes the output large enough to be compatible with the load on the op-amp.

Infinite Input impedance

Input impedance of a circuit decides how much current it draws from its input signal source. More is the input impedance, lesser current it takes. An ideal op-amp takes no current from the input signal source because it input impedance is infinite. A practical op-amp may draw current in micro-amperes from the input signal source.

Infinite CMRR

CMRR stands for Common Mode Rejection Ratio. This ratio decides how much immune the op-amp is against noise. In theory, CMRR is defined as:

$$CMRR = \frac{Differential\ mode\ gain}{Common\ mode\ gain}$$

In simple words,

$$CMRR = \frac{Gain\ offered\ to\ signal}{gain\ offered\ to\ noise}$$

In the above formula, if gain offered for noise is less (which is desired), CMRR will be large. An ideal op-amp rejects noise (offers zero gain to noise) and offers infinite gain to the signal. This makes the CMRR infinite. Practical op-amp has very high CMRR.