The procedure for MANOVA (multivariate analysis of variance) is similar to ANOVA. In ANOVA, there is a single column containing the measurements (for the single variable) and another column containing the category names. Both are likely in the same dataframe, so you would write:

```r
aov(measurements ~ categories, data = dataframe)
```

For example:

```r
aov(NA2O ~ rock.type, data = georoc)
```

MANOVA has a single column with category labels (corresponding to the samples), but multiple variables are measured within each sample. As a result, you’ll need to one matrix object containing multiple measurements columns.

To combine multiple columns into a matrix for input, use `cbind()`.

The function is called `manova()`:

```r
man_res <- manova(cbind(x1, x2, ..., xn) ~ categories, data = dataframe)
```

For example,

```r
manova(cbind(NA2O, CAO) ~ rock.type, data = georoc)
```

Make sure to store the results as a variable, in order to access the test statistics and p value. There is also a designated post-hoc function to do ANOVA tests on the results.

Type `summary(man_res)` to get the test statistics and p value. The default test statistic is Pillai’s trace, but you can specify any of the three others:

```r
summary(man_res, test = “wilks”) # wilks’ lambda
summary(man_res, test = “Hotelling-Lawley”) # can abbreviate
summary(man_res, test = “Roy”) # Roy’s largest root
```

Type `summary.aov(man_res)` to run separate ANOVA tests on each variable. I don’t think this method corrects for type I error risk during multiple comparisons, so be cautious if there are many separate ANOVAs.