SAS Output from Example

General Linear Models Procedure

Number of observations in data set = 8

Repeated Measures Analysis of Variance
Repeated Measures Level Information

Dependent Variable	VV1	VV2	VV3	VV4	VV5	VV6
Level of VENTVOL	1	2	3	4	5	6

Test for Sphericity: Mauchly's Criterion = 0.0233453
Chisquare Approximation = 19.162527 with 14 df   Prob > Chisquare = 0.1588

Applied to Orthogonal Components:
Test for Sphericity: Mauchly's Criterion = 0.0716586
Chisquare Approximation = 13.442794 with 14 df   Prob > Chisquare = 0.4920

General Linear Models Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

Source: VENTVOL

					Adj Pr > F	
DF	Type III SS	Mean Square	F Value	Pr > F	G – G	H – F
5	413.86666667	82.77333333	3.10	0.0203	0.0564	0.0252

Source: Error(VENTVOL)

DF	Type III SS	Mean Square
35	935.35000000	26.72428571

Greenhouse-Geisser Epsilon = 0.5364
Huynh-Feldt Epsilon = 0.9012

- The appropriate test of sphericity is the one based on orthogonal components ($p = .49$)

- The unadjusted and Hunyh-Feldt $\widetilde{\epsilon}$ corrected p-values are significant at the conventional $\alpha = 0.05$ level of significance

- For the conservative test, the observed F of 3.1 is compared to $F_{1,7,.95} = 5.59$

SAS Output from Example (Usual ANOVA Approach)

General Linear Models Procedure
Class Level Information

Class	Levels	Values
SUBJECT	8	1 2 3 4 5 6 7 8
TEMP	6	25 37 50 65 80 -10

Number of observations in data set = 48

General Linear Models Procedure

Dependent Variable: VENTVOL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	12	4259.346667	354.945556	13.28	0.0001
Error	35	935.350000	26.724286		
Corrected Total	47	5194.696667			

R-Square	C.V.	Root MSE	VENTVOL Mean
0.819941	7.423076	5.169554	69.6416667

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TEMP	5	413.866667	82.773333	3.10	0.0203
SUBJECT	7	3845.480000	549.354286	20.56	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TEMP	5	413.866667	82.773333	3.10	0.0203
SUBJECT	7	3845.480000	549.354286	20.56	0.0001

SAS Output from Example (Usual ANOVA Approach) with Absorption

General Linear Models Procedure
Class Level Information

Class   Levels   Values

TEMP   6   25 37 50 65 80 -10

Number of observations in data set = 48

General Linear Models Procedure

Dependent Variable: VENTVOL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	12	4259.346667	354.945556	13.28	0.0001
Error	35	935.350000	26.724286		
Corrected Total	47	5194.696667			

R-Square	C.V.	Root MSE	VENTVOL Mean
0.819941	7.423076	5.169554	69.6416667

Source	DF	Type I SS	Mean Square	F Value	Pr > F
SUBJECT	7	3845.480000	549.354286	20.56	0.0001
TEMP	5	413.8666667	82.7733333	3.10	0.0203

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TEMP	5	413.8666667	82.7733333	3.10	0.0203

SAS Output (Multivariate Data Structure)

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GROUP	3	1 2 3

Repeated Measures Level Information

Dependent Variable	W1	W3	W4	W5	W6	W7
Level of WEEK	1	2	3	4	5	6

Test for Sphericity: Mauchly's Criterion = 0.0160527
Chisquare Approximation = 41.731963 with 14 df   Prob > Chisquare = 0.0001

Applied to Orthogonal Components:
Test for Sphericity: Mauchly's Criterion = 0.0544835
Chisquare Approximation = 29.389556 with 14 df   Prob > Chisquare = 0.0093

Tests of Hypotheses for Between Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GROUP	2	18548.067	9274.033	1.06	0.3782
Error	12	105434.200	8786.183		

Univariate Tests of Hypotheses for Within Subject Effects

Source: WEEK

					Adj Pr > F	
DF	Type III SS	Mean Square	F Value	Pr > F	G - G	H - F
5	142554.5000000	28510.9000000	52.55	0.0001	0.0001	0.0001

Source: WEEK*GROUP

					Adj Pr > F	
DF	Type III SS	Mean Square	F Value	Pr > F	G - G	H - F
10	9762.7333333	976.2733333	1.80	0.0801	0.1457	0.1103

Source: Error(WEEK)

DF	Type III SS	Mean Square
60	32552.6000000	542.5433333

Greenhouse-Geisser Epsilon = 0.4856
Huynh-Feldt Epsilon = 0.7191

SAS Output (Univariate Data Structure, Error Term Explicitly Specified)

```
                        General Linear Models Procedure
                            Class Level Information

              Class    Levels    Values

              GROUP         3    1 2 3

              ANIMAL       15    1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

              WEEK          6    1 3 4 5 6 7

                    Number of observations in data set = 90
```

Dependent Variable: WEIGHT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	29	276299.5000	9527.5690	17.56	0.0001
Error	60	32552.6000	542.5433		
Corrected Total	89	308852.1000			

	R-Square	C.V.	Root MSE	WEIGHT Mean
	0.894601	4.166081	23.29256	559.100000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
GROUP	2	18548.0667	9274.0333	17.09	0.0001
ANIMAL(GROUP)	12	105434.2000	8786.1833	16.19	0.0001
WEEK	5	142554.5000	28510.9000	52.55	0.0001
GROUP*WEEK	10	9762.7333	976.2733	1.80	0.0801

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GROUP	2	18548.0667	9274.0333	17.09	0.0001
ANIMAL(GROUP)	12	105434.2000	8786.1833	16.19	0.0001
WEEK	5	142554.5000	28510.9000	52.55	0.0001
GROUP*WEEK	10	9762.7333	976.2733	1.80	0.0801

Tests of Hypotheses using the Type III MS for ANIMAL(GROUP) as an error term

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GROUP	2	18548.06667	9274.03333	1.06	0.3782

SAS Output (Univariate Data Structure, Use of RANDOM Statement)

General Linear Models Procedure
Class Level Information

Class	Levels	Values
GROUP	3	1 2 3
ANIMAL	15	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
WEEK	6	1 3 4 5 6 7

Number of observations in data set = 90

Dependent Variable: WEIGHT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	29	276299.5000	9527.5690	17.56	0.0001
Error	60	32552.6000	542.5433		
Corrected Total	89	308852.1000			

R-Square	C.V.	Root MSE	WEIGHT Mean
0.894601	4.166081	23.29256	559.100000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
GROUP	2	18548.0667	9274.0333	17.09	0.0001
ANIMAL(GROUP)	12	105434.2000	8786.1833	16.19	0.0001
WEEK	5	142554.5000	28510.9000	52.55	0.0001
GROUP*WEEK	10	9762.7333	976.2733	1.80	0.0801

Source	DF	Type III SS	Mean Square	F Value	Pr > F
GROUP	2	18548.0667	9274.0333	17.09	0.0001
ANIMAL(GROUP)	12	105434.2000	8786.1833	16.19	0.0001
WEEK	5	142554.5000	28510.9000	52.55	0.0001
GROUP*WEEK	10	9762.7333	976.2733	1.80	0.0801

SAS Output (Univariate Data Structure, Use of RANDOM Statement): Continued

General Linear Models Procedure

Source	Type III Expected Mean Square
GROUP	Var(Error) + 6 Var(ANIMAL(GROUP)) + Q(GROUP,GROUP*WEEK)
ANIMAL(GROUP)	Var(Error) + 6 Var(ANIMAL(GROUP))
WEEK	Var(Error) + Q(WEEK,GROUP*WEEK)
GROUP*WEEK	Var(Error) + Q(GROUP*WEEK)

Tests of Hypotheses for Mixed Model Analysis of Variance

Dependent Variable: WEIGHT

Source: GROUP *
Error: MS(ANIMAL(GROUP))

DF	Type III MS	Denominator DF	Denominator MS	F Value	Pr > F
2	9274.0333333	12	8786.1833333	1.056	0.3782

* - This test assumes one or more other fixed effects are zero.

Source: ANIMAL(GROUP)
Error: MS(Error)

DF	Type III MS	Denominator DF	Denominator MS	F Value	Pr > F
12	8786.1833333	60	542.54333333	16.194	0.0001

Source: WEEK *
Error: MS(Error)

DF	Type III MS	Denominator DF	Denominator MS	F Value	Pr > F
5	28510.9	60	542.54333333	52.550	0.0001

* - This test assumes one or more other fixed effects are zero.

Source: GROUP*WEEK
Error: MS(Error)

DF	Type III MS	Denominator DF	Denominator MS	F Value	Pr > F
10	976.27333333	60	542.54333333	1.799	0.0801