basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

TECHNICAL SCIENCES

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS (REVISED)

GRADE 12

2020

These guidelines consist of 20 pages.

TABLE OF CONTENTS

1. INTRODUCTION

The 17 Curriculum and Assessment Policy Statement subjects which contain a practical component all include a practical assessment task (PAT). These subjects are:

- AGRICULTURE: Agricultural Management Practices, Agricultural Technology
- ARTS: Dance Studies, Design, Dramatic Arts, Music, Visual Arts
- SCIENCES: Computer Applications Technology, Information Technology, Technical Sciences
- SERVICES: Consumer Studies, Hospitality Studies, Tourism
- TECHNOLOGY: Civil Technology, Electrical Technology, Mechanical Technology, Engineering Graphics and Design

A practical assessment task (PAT) mark is a compulsory component of the final promotion mark for all candidates offering subjects that have a practical component and counts 25% (100 marks) of the promotion mark at the end of the year. The practical assessment task for Technical Sciences Grade 12 consists of TWO experiments. The experiments are COMPULSORY for ALL candidates offering **Technical Sciences in Grade 12**.

The PAT is implemented during the first and third term of the school year. The PAT allows learners to be assessed regularly during the school year and it also allows for the assessment of skills that cannot be assessed in a written format, such as tests or examinations. It is therefore important that schools ensure that all learners complete the practical assessment tasks within the stipulated period to ensure that learners are promoted at the end of the school year. The planning and execution of the PAT differs from subject to subject.

The experiments should be administered under supervised conditions. Moderation of the experiments may take place on site and can include learners redoing the experiments in the presence of the moderator.

2. TEACHER GUIDELINES

2.1 How to administer the PATs

- The following documents must be available for all formal experiments:
    - Experiment instructions explaining the procedures to be followed for the experiments
    - The worksheets, which include questions to be answered under supervision
    - The teacher guidelines with experiment instructions, worksheets and marking guidelines (The teacher guidelines MUST NOT be released to the learners.)
- **Teachers should compile marking guidelines (memoranda) for the ACTUAL results of the experiments conducted (teachers should do the experiments themselves FIRST)**
- The teacher should hand out ONLY the Instruction Sheet for the conduct of the experiment.
- Experiments must be performed individually or in pairs. However, if sufficient apparatus is not available, experiments can be performed in groups. Each learner must record his/her OWN data and observations.
- Each learner must have his/her OWN worksheet and answer the questions INDIVIDUALLY under supervision by the teacher.
- Only once all the learners have performed the experiments and they are all seated and ready to answer questions, may teachers hand out a worksheet to each learner. Examination conditions have to be applied.
- If it is not possible to perform the experiment and answer the worksheet on the same day, the teacher must collect the learners' data after a part of the experiment has been done. This data must be kept at the school. Only when learners finalise the experiment may the data be returned to them.

2.2 Moderation of the PATs

For moderation the following are required either in a separate class or in a laboratory:

- List of names of learners who are sampled for district moderation
- Equipment/Apparatus/Chemicals placed ready at workstations
- Instruction sheets and worksheets (empty) for sampled learners to answer questions

For moderation the following documents are required in the teacher's file:

- Index stating all tasks with raw and weighted marks
- All instruction sheets for all experiments
- Marking guidelines for all experiments, with ticks and totals
- Composite working mark sheet for all learners showing raw and weighted marks
- Evidence of internal moderation

For moderation the following documents are required in the learner's file:

- Index stating all tasks with raw and weighted marks
- Answer sheets for all experiments
- Declaration of authenticity

3. LEARNER GUIDELINES

3.1 This PAT for Grade 12 consists of TWO experiments: Experiment for Term 1 and Experiment for Term 3.

3.2 Compilation of the PAT should start in Term 1, monitored through Term 3 and completed in Term 3.

3.3 The PAT counts 25% of your final promotion mark for Grade 12.

3.4 All the work in the PAT must be your own. Group work will NOT be allowed.

3.5 Show ALL calculations clearly and include units. Round off your final answers to TWO decimal places. Use correct SI units.

4. EVIDENCE OF MODERATION

LEARNER'S NAME: ----------

SCHOOL: ----------

MODERATION:	SIGNATURE: TEACHER	DATE	SIGNATURE: HOD	DATE
School-based				

MARK ALLOCATION

EXPERIMENT	MAXIMUM MARK	WEIGHTED MARK	LEARNER'S MARK (TEACHER)	MOD. MARK (SCHOOL)	MOD. MARK (DISTRICT)	MOD. MARK (PROVINCE)
1	**30**	**45**				
3	**40**	**55**				
TOTAL	**70**	**100**				

SCHOOL STAMP

5. DECLARATION OF AUTHENTICITY

NAME OF SCHOOL: ……..

NAME OF LEARNER: ……..……...
(FULL NAME(S) AND SURNAME)

CLASS: ……..…….

NAME OF TEACHER: ……

I hereby declare that the tasks submitted for assessment is my own original work and has not been previously submitted for assessment or moderation.

_____ _____
SIGNATURE OF CANDIDATE **DATE**

As far as I know, the above declaration by the candidate is true and I accept that the work offered is his/her own.

_____ _____
SIGNATURE OF TEACHER **DATE**

SCHOOL STAMP

6. CONCLUSION

On completion of the practical assessment task learners should be able to demonstrate their understanding of the industry, enhance their knowledge, skills, values and reasoning abilities as well as establish connections to life outside the classroom and address real-world challenges. The PAT furthermore develops learners' life skills and provides opportunities for learners to engage in their own learning.

7. EXPERIMENT INSTRUCTIONS AND WORKSHEETS

7.1 EXPERIMENT 1: THE RELATIONSHIP BETWEEN ACCELERATION AND THE RESULTANT/NET FORCE FOR A CONSTANT MASS

EXPERIMENT INSTRUCTIONS

1. **AIM:** To determine the relationship between the resultant/net force acting on an object and acceleration produced for constant mass

2. **APPARATUS/EQUIPMENT**

- Dynamics trolley kit
- Three mass pieces of equal mass
- Runway with a pulley
- Inextensible string
- Stopwatch
- Mass hanger

3. **PROCEDURE**

- Clean the runway.
- Set up the runway with a trolley, as shown below.

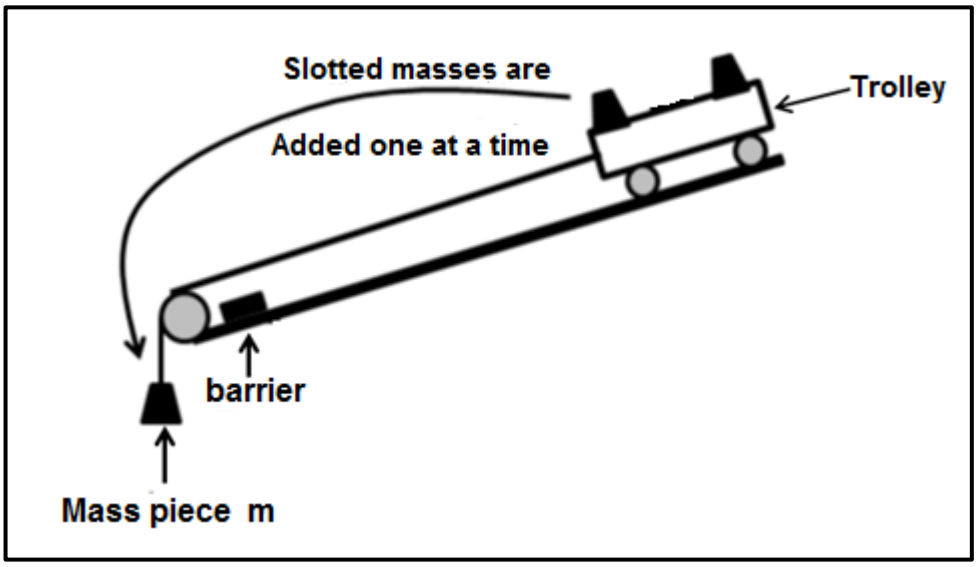

DIAGRAM 1

- Without any mass pieces, raise one end of the runway just enough so that the trolley rolls down the incline at constant velocity.
- Measure the length of the runway from the front wheel to the barrier.
- Pass a piece of string, with a mass piece **m** hanging on one end, over a pulley. Attach the other end of the string to the trolley so that, when the mass is released, it causes the trolley to accelerate.
- Use a stopwatch and measure the time from the moment the trolley is released up to the time it strikes the barrier. Repeat this action at least 3 times.
- Take one mass piece from the trolley and add it to the hanging mass piece. Record the time for the trolley to accelerate. Repeat this action at least 3 times.
- Take the second mass piece from the trolley and add it to the hanging mass pieces. Record the time for the trolley to accelerate. Repeat this action at least 3 times.
- Use the readings to calculate the <u>average velocity</u>.

4. DATA REPRESENTATION

1 mass piece

Trial number	Δx	Mass (kg)	Δt (s)	Δv
1				
2				
3				
Average				

2 mass pieces

Trial number	Δx	Mass (kg)	Δt (s)	Δv
1				
2				
3				
Average				

3 mass pieces

Trial number	Δx	Mass (kg)	Δt (s)	Δv
1				
2				
3				
Average				

WORKSHEET FOR THE RELATIONSHIP BETWEEN ACCELERATION AND THE RESULTANT/NET FORCE FOR A CONSTANT MASS

1. **PRACTICAL SKILLS**

CRITERIA	MARKS
Correct setting up of apparatus	2
Cleaning the runway	1
Raising the runway so that the trolley moves with a constant velocity	1
Measuring: the length of the runway accurately	1
Measuring: the mass of the trolley	1
Stopwatch used correctly	1
Following a sequence of instructions logically	1

(8)

2. **DATA REPRESENTATION:**

1 mass piece

Trial number	Δx	**Mass (kg)**	**Δt (s)**	**Δv**
1				
2				
3				
Average				

2 mass pieces

Trial number	Δx	**Mass (kg)**	**Δt (s)**	**Δv**
1				
2				
3				
Average				

3 mass pieces

Trial number	Δx	**Mass (kg)**	**Δt (s)**	**Δv**
1				
2				
3				
Average				

(6)

3. What is the independent variable? (1)

4. Give a reason for cleaning the runway. (1)

5. Give ONE reason why the mass pieces were transferred from the trolley to the hanging mass piece. (1)

6. Use average readings to calculate the resultant/net force for:

   6.1 1 mass piece (4)

   6.2 2 mass pieces (2)

   6.3 3 mass pieces (2)

7. Draw the graph of F_{net} versus acceleration using the values calculated in QUESTION 6. (3)

8. Draw a conclusion for the experiment. (2)

[30]

7.2 EXPERIMENT 3: THE POWER DISSIPATED IN BULBS CONNECTED IN SERIES AND PARALLEL

EXPERIMENT INSTRUCTIONS

1. **AIM:** To determine the power dissipated in bulbs connected in series and parallel.

2. **APPARATUS/EQUIPMENT**

NOTE: Bulbs are rated 6 V, 0,5 A **(6 V, 3 W)**. We cannot power them by 6 V as that is the maximum voltage. Rather use the maximum of 3 V for these experiments. The tungsten element bulb is preferred.

- Two cells of 1,5 V each (R 20 PP)
  OR
- 1 x variable power supply
- Battery holders for R 20 PP cells
- Three light bulbs of 6 V, 0,5 A each
- Bulb holders
- Two pages of graph paper
- Conducting wires
- Switch
- Ammeter
- Voltmeter

} OR two multimeters

3. **PROCEDURE**

3.1 PART 1: SERIES CIRCUIT

Overall set-up and precautions:

NOTE: Ensure that the power source is initially switched OFF. Switch it ON and set it to 3 V before commencing with any connections. Once set to 3 V, switch it OFF again and OPEN switch **S**, then follow the connection procedure:

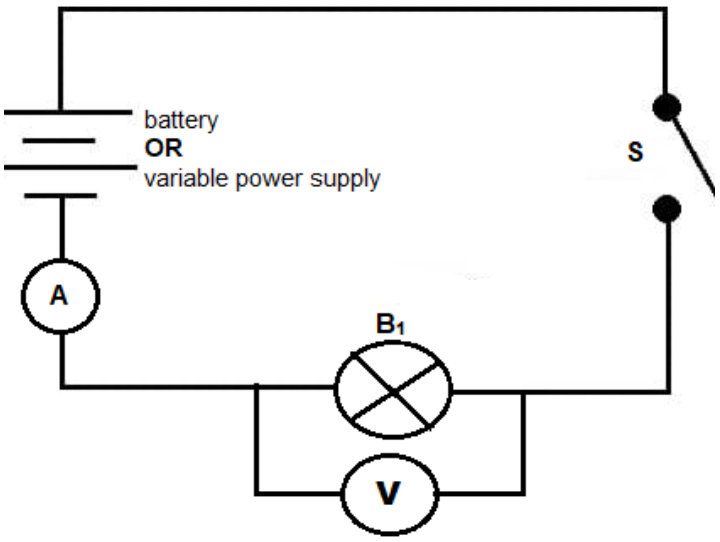

DIAGRAM 3.1

- Set up a circuit as shown in DIAGRAM 3.1.
- Switch the power source ON, close switch **S** and measure the current through the light bulb and the potential difference across it.
- Record the readings in TABLE 3.1 below.

Table of results:

TABLE 3.1

NO. OF BULBS	$V_{bulb(s)}$ (V)	$I_{circuit}$ (A)	POWER DISSIPATED PER CIRCUIT
1			
2			
3			

- Switch OFF the power source and open **S**, then add a second light bulb in series, as shown in DIAGRAM 3.2.

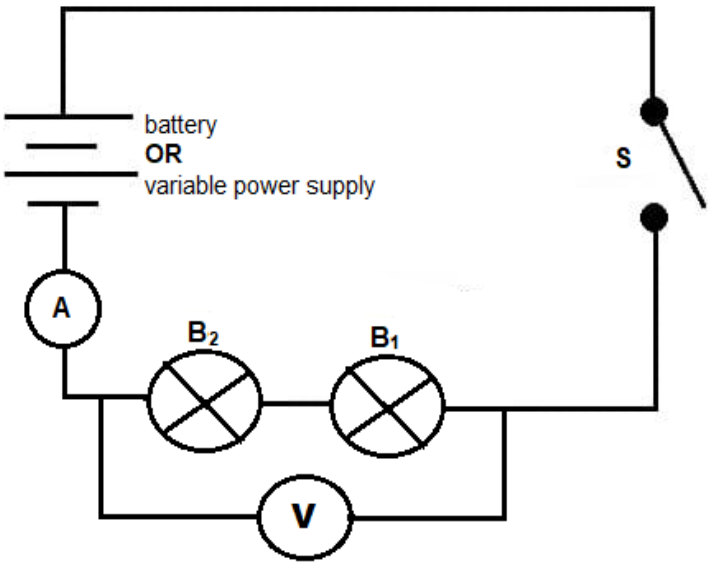

DIAGRAM 3.2

- Close **S** and measure the current through the light bulbs and the potential difference across the combination of the two light bulbs.
- Record the readings in TABLE 3.1 above.

NOTE: Always switch **S** OFF, then the power source before you proceed to the next part of the experiment.

- Set up a circuit, as shown in DIAGRAM 3.3.

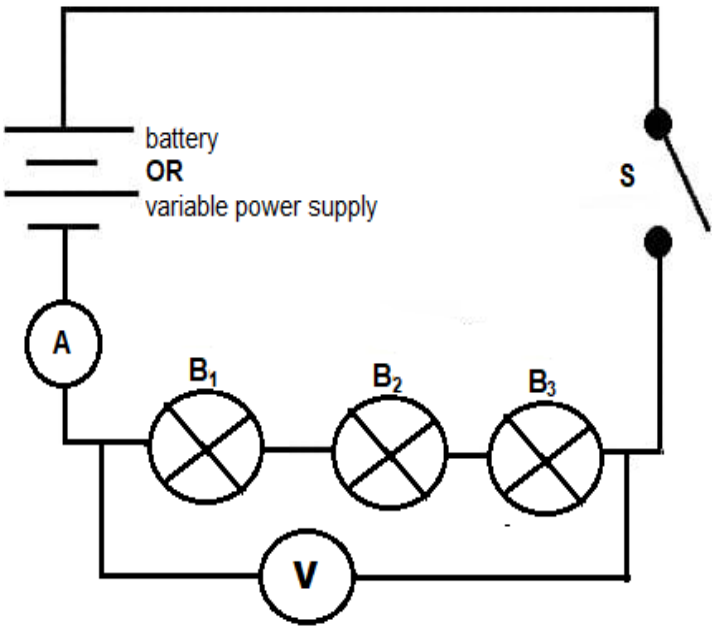

DIAGRAM 3.3

- Close switch **S** and measure the current through the light bulbs and the voltage across the combination of the three light bulbs.
- Record the readings in TABLE 3.1 and switch the circuit OFF thereafter.

3.2 PART 2: PARALLEL CIRCUIT

NOTE: Ensure that the power source is OFF and the switch is OPEN and set up the circuit, as shown in DIAGRAM 3.4.

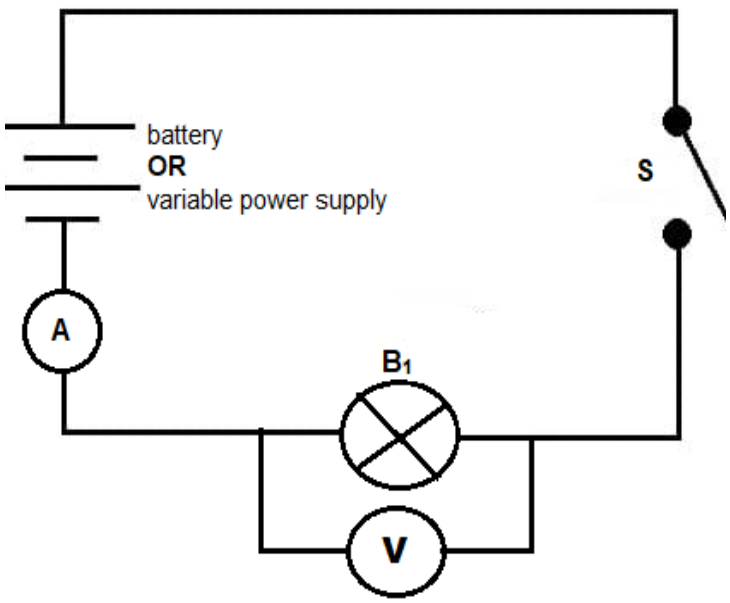

DIAGRAM 3.4

- Switch the power source ON, then close **S** and measure the current through the light bulb and the potential difference across it.
- Record the readings in TABLE 3.2 on the next page.

Table of results: Parallel circuits

TABLE 3.2

NO. OF BULBS	$V_{bulb(s)}$ (V)	$I_{circuit}$ (A)	POWER DISSIPATED PER CIRCUIT
1			
2			
3			

- Switch OFF the power source and add a second light bulb in parallel, as shown in DIAGRAM 3.5.

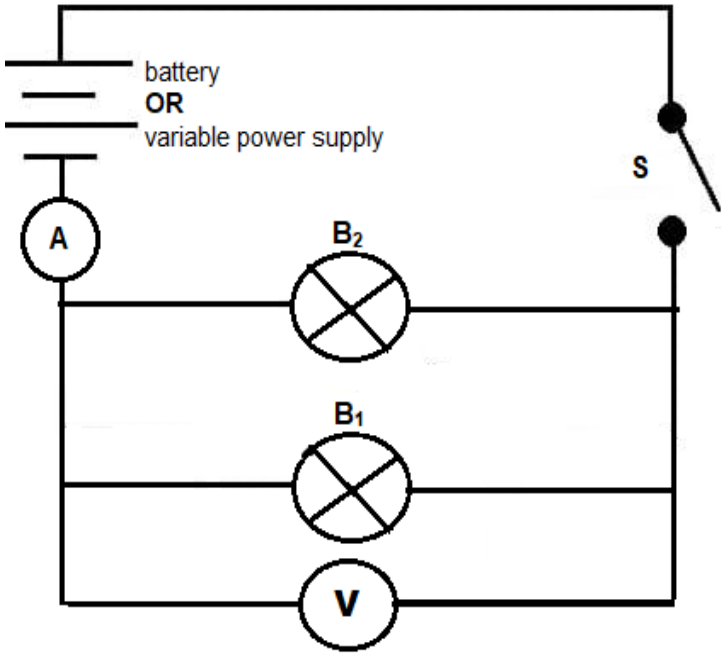

DIAGRAM 3.5

- Switch the power source ON, then close switch **S** and measure the current through the light bulb and the potential difference across it.
- Record the readings in TABLE 3.2.

- Switch OFF the circuit and add a third light bulb in parallel, as in DIAGRAM 3.6.

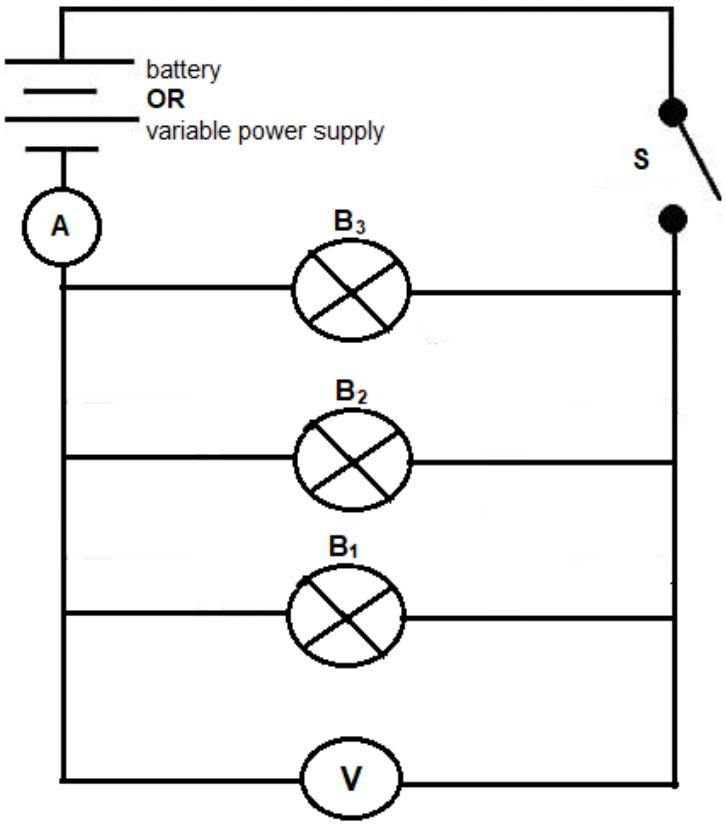

DIAGRAM 3.6

- Switch the power source ON, close **S** and measure the current through the light bulbs and the voltage across the combination of the three light bulbs.
- Record the readings in TABLE 3.2, then switch OFF the circuit.

WORKSHEET FOR THE POWER DISSIPATED IN BULBS CONNECTED IN SERIES AND PARALLEL

1. **PRACTICAL SKILLS**

CRITERIA	MARKS
Precaution: <u>For variable power source</u>: • Power source initially switched off, then set to 3 V <u>For cells power source:</u> • Cells correctly connected in series in cell holders and the switch was initially off	2
Set-up: • PART 1: o Correct connection of the first step of the experiment (bulb, ammeter, switch, resistors and power source in series and the voltmeter in parallel to the bulb) o Voltmeter set to most appropriate scale o Ammeter (multimeter) set to most appropriate scale o Correct addition of bulbs in series connection o Circuit switched OFF before the commencement of PART 2 • PART 2: o Correct addition of bulbs in parallel connection o Power source caution o Switched OFF on completion of each circuit	7

(9)

2.

2.1 **PART 1: DETERMINATION OF POWER DISSIPATED ACROSS BULBS CONNECTED IN SERIES**

Table of results: Series circuit

TABLE 3.1

NO. OF BULBS	$V_{bulb(s)}$ (V)	$I_{circuit}$ (A)	DETERMINE THE POWER DISSIPATED
1			
2			
3			

(9)

2.2 What caused the change in the current for this experiment (series bulbs)? (2)

3.

3.1 **PART 2: DETERMINATION OF POWER DISSIPATED ACROSS BULBS CONNECTED IN PARALLEL**

Table of results: Parallel circuit

TABLE 3.2

NO. OF BULBS	$V_{bulb(s)}$ (V)	$I_{circuit}$ (A)	POWER DISSIPATED
1			
2			
3			

(7)

3.2 What caused the change in the current for this experiment (parallel bulbs)? (2)

4. Draw a graph showing a relationship between power and current for the:

4.1 Series connection of bulbs (4)

4.2 Parallel connection of bulbs (4)

5. Write down the conclusion of the experiment. (3)
[40]

8. PAT MARK SHEET 2020

TERM			TERM 1		TERM 3		TOTAL
			Experiment 1		Experiment 3		
			Raw	Weighted	Raw	Weighted	
No.	SURNAME	NAME	30	45	40	55	100
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
		Average					