basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

TECHNICAL SCIENCES

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

GRADE 11

2017

These guidelines consist of 13 pages and 2 rubrics.

TABLE OF CONTENTS

1. INTRODUCTION

A practical assessment task (PAT) is COMPULSORY for all candidates offering **Technical Sciences in Grade 11**. It counts 25% (100 marks) of the final promotion mark.

The Grade 11 PAT is implemented across the first and third terms of the school year. This is broken down into different phases or a series of smaller activities that make up the PAT. 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 Technical Sciences PAT in Grade 11 consists of two experiments and a project. The experiments and the project should be administered under supervised conditions. Moderation of the PAT components may take place on site and can include learners redoing the PAT components in the presence of the moderator.

2. LEARNER GUIDELINES

2.1 This PAT consists of TWO experiments and ONE project.

2.2 Compilation of the PAT should start in Term 1, monitored through Terms 2 and 3 and completed in Term 3.

2.3 In the event where learners have to use some equipment from home, the equipment needs to be brought to school so that it can be used under supervised conditions.

2.4 The PAT counts 25% of your final promotion mark for Grade 11.
(Experiment 1 = 25; Experiment 2 = 25; Project = 100: TOTAL = 150)

2.5 All work in this PAT must be your own. Group work will NOT be allowed.

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

3. EVIDENCE OF MODERATION

Learner's name:	
School:	

EVIDENCE OF MODERATION

MODERATION	SIGNATURE	DATE	SIGNATURE	DATE
School-based				

MARK ALLOCATION

PAT COMPONENTS	MAXIMUM MARK	LEARNER'S MARK (TEACHER)	MODERATED MARK (SCHOOL)	MODERATED MARK (DISTRICT)	MODERATED MARK (PROVINCE)
Experiment 1	**25**				
Experiment 2	**25**				
Project	**100**				
TOTAL	**150**				

SCHOOL STAMP

5. DECLARATION OF AUTHENTICITY

NAME OF THE SCHOOL: ……..

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

CLASS: ……..…….

NAME OF TEACHER: …….

SCHOOL STAMP

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

_____ _____
SIGNATURE OF TEACHER DATE

EXPERIMENT 1: DETERMINE THE DIFFERENCE BETWEEN PITCH AND LOUDNESS USING AN OSCILLOSCOPE

25

AIM:

To determine the difference between pitch and loudness using an oscilloscope.

APPARATUS:

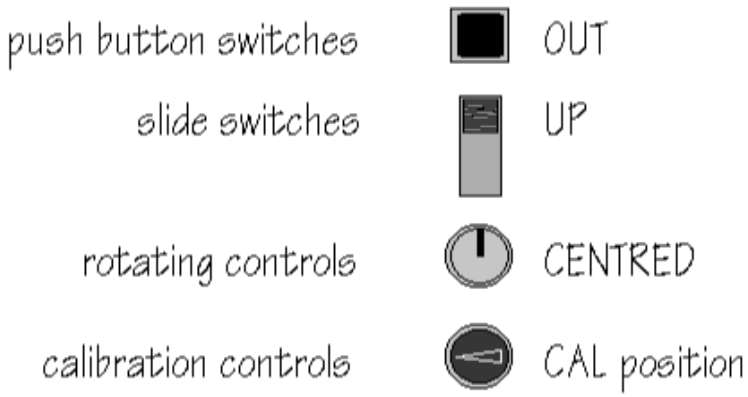
Oscilloscope
Function/Signal generator/Microphone
Loudspeaker
BNC cables

NOTE: Check the type of oscilloscope and the type of function generator you are using. There are two types: digital and analogue.

SAFETY PRECAUTIONS:

Before making any connection on the oscilloscope, make sure that all controls are in their normal positions. That is:

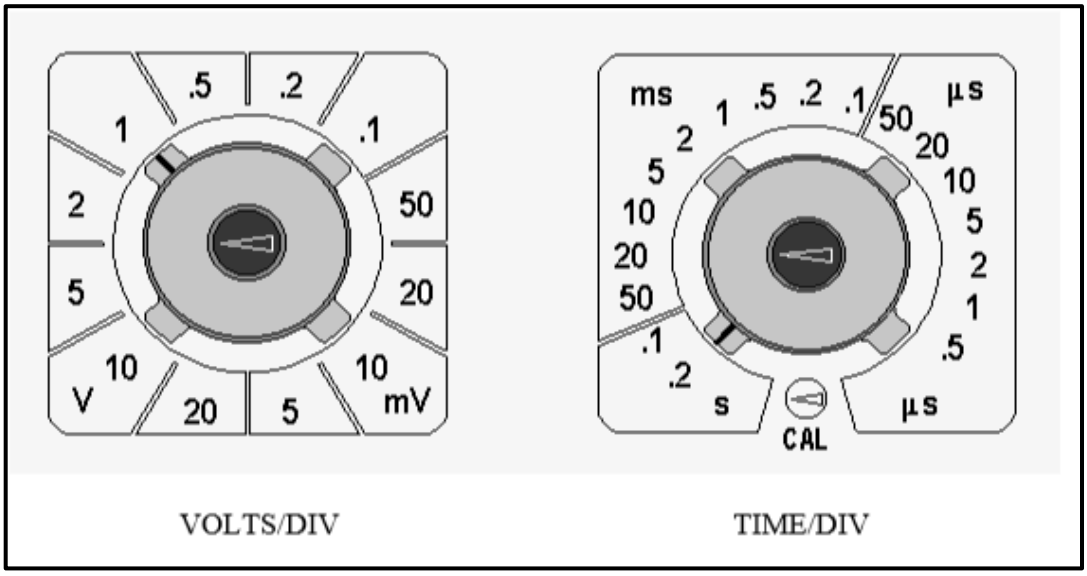
- All push button switches are in an OUT position.
- All slide switches are in the u positions.
- All rotating controls are centred.
- All central TIME/DIV, VOLT/DIV and HOLD OFF controls are in the calibrated, or CAL position.



METHOD:

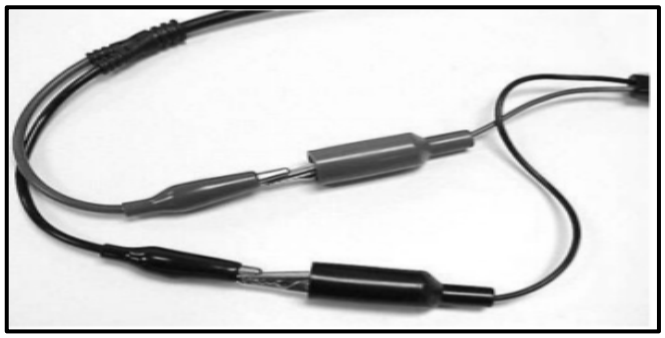
1. **Switching on the oscilloscope**

   Set the VOLT/DIV control to 1 V/DIV and the TIME/DIV control to 0, 2 s/DIV.



2. Turn on the digital oscilloscope.

3. Use the BNC cables to connect the output of the generator to channel (CH1) of the oscilloscope and the 'aux' (or 'sync' or 'TTL') output to channel (CH2).



4. **Switching on the function generator**

   Turn on the function generator.

   NOTE: The digital function generator takes a few seconds to complete the internal tests, but the analogue generator will be ready right away.

5. Adjust the output level of the generator to produce a variable signal on the oscilloscope screen.

   Adjust TIME/DIV and VOLT/DIV to obtain a clear display and investigate the effects of pressing the waveform shape button.

   The rotating FREQUENCY control and the RANGE switch are used together to determine the frequency of the output signal.

NOTE: Depending on the type of generator, this is how it may be done.

6. **When using an analogue generator**

To set the frequency:
- Use the waveform or function switch to select the sine waveform type.
- Use the frequency-adjust knob and multiplier button/switch to select the frequency.

To set the amplitude:
- Set the amplitude knob (Ampl or Attenuator at about 12 o' clock (with any attenuator switches set at 0 dB).

OR

When using a digital generator

To set the frequency:
- Use the ∆, ▼ button under the FUNCTION menu to highlight the sine function symbol.
- Press the FREQ button and the key in '1' followed by the 'kHz/Vrms' unit buttons.

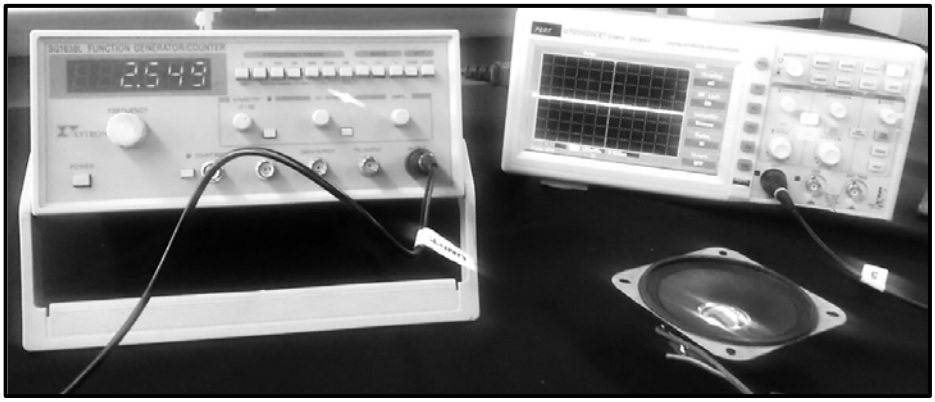
To set the amplitude:
- Press the AMPL button followed by '2' and the 'kHz/Vrms' unit button.

7. Set the controls of the function generator to produce a sine wave of about 400–1 000 Hz (1 kHz).

8. Set the amplitude of the signal/function generator output to 1 or 2 volts.

9. Connect the output of the signal/function generator to the oscilloscope. Ensure that the two grounds are connected together.

10. Connect the signal/function generator to the loudspeaker.



11. Increase the frequency on the generator by a factor of two while keeping the amplitude constant. Then observe and draw the pattern of the waves on the oscilloscope. Also listen to the pitch and the loudness of the sound from the speakers, and record your observations.

12. Repeat step 11 TWICE.

13. Increase the amplitude on the generator by a factor of two whilst keeping the frequency at the original reading. Then observe and draw the pattern of the waves on the oscilloscope. Also listen to the pitch and the loudness of the sound from the speakers, and record your observations

14. Repeat step 13 TWICE.

RESULTS:

FREQUENCY	PATTERNS OBSERVED ON THE SCREEN (2)	PITCH (Low, High, Very high) (1)	Marks
			3
			3
			3

AMPLITUDE	PATTERNS OBSERVED ON THE SCREEN (2)	LOUDNESS (Loud, Louder, Loudest) (1)	Marks
			3
			3
			3

CONCLUSION:

What conclusion can you draw between your observation of the wave pattern and the:

1.1 Pitch (2)

1.2 Loudness (2)

QUESTIONS:

1.3 List THREE practical applications of the pitch of sound in technology. (3)
[25]

EXPERIMENT 2: DETERMINING THE RESISTANCE OF AN UNKNOWN RESISTOR

25

AIM:

To determine the resistance of an unknown resistor.

APPARATUS:

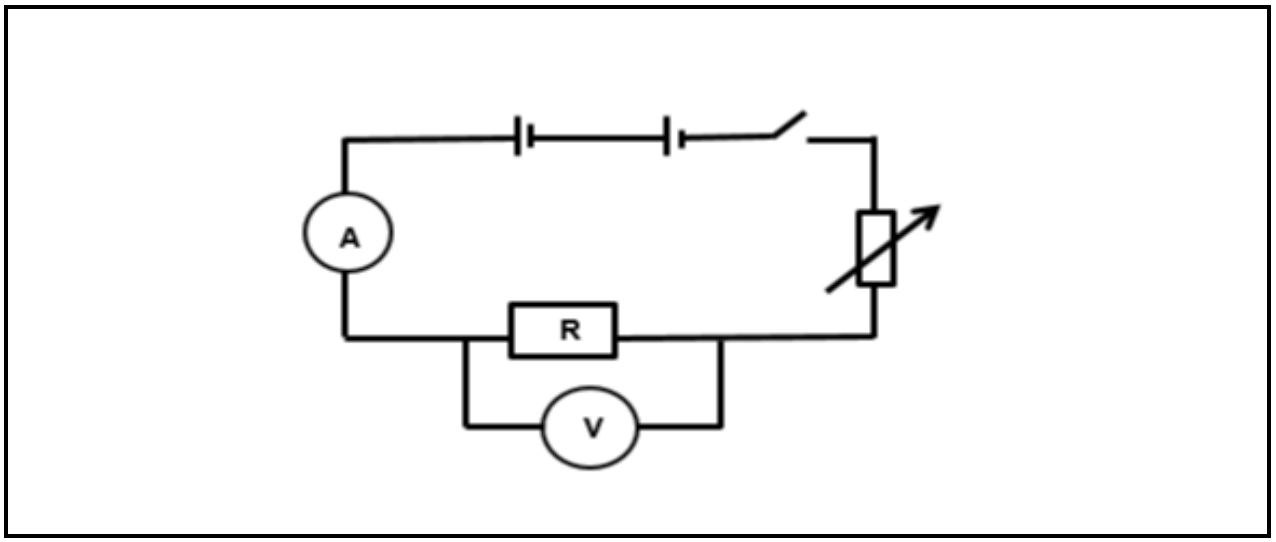
Battery (two or three 1,5 V batteries)/a variable power supply/DC power source
Ammeter/Multimeter
Voltmeter/Multimeter
An unknown resistor (Nichrome wire)
Rheostat
Switch
Connecting wires
Graph paper

SAFETY PRECAUTIONS:

The switch must be open between readings to prevent the unknown resistor from heating up.

The rheostat should be set to its maximum resistance to obtain the minimum current strength through the circuit.

METHOD:



1. Connect the battery/power source, ammeter, the unknown resistor, the switch and the rheostat in series using connecting wires.

2. Connect the voltmeter across the unknown resistor.

3. Close the switch. Take the ammeter and voltmeter readings.

4. Adjust the rheostat to CHANGE THE CURRENT in the resistance wire, to obtain a new set of voltmeter and ammeter readings.

5. Repeat step 4 to obtain FOUR other sets of voltmeter and ammeter readings.

RESULTS:

RHEOSTAT SETTING	AMMETER READING (A) (1 mark for each correct reading)	VOLTMETER READING (V) (1 mark for each correct reading)	MARKS
1.			2
2.			2
3.			2
4.			2
5.			2

INTERPRETATION AND CONCLUSION:

1. Use the readings obtained to plot the graph. (5)

2. Use the graph to calculate the gradient. (4)

3. What does the gradient of the graph represent? (2)

4. What is the value of the unknown resistor? (1)

5. Is the unknown resistor an ohmic conductor or a non-ohmic conductor? Give a reason(s) for your answer. (3)

[25]

PROJECT

The project consists of a design portfolio, working drawings and a product.

INSTRUCTIONS:

Develop and design an electric door alarm that can detect any entry into a house or room with a door entrance.

The following should be part of the design portfolio:

• Cover page

• Table of contents

• Declaration of authenticity

• Problem statement/Situation

• Design brief

• Research/Investigation

• Evaluation of the product

• Bibliography/List of reference

• Evidence of research, e.g. Internet research, books, magazines, et cetera

Provide evidence that you have gathered information to manufacture the device. The flow chart below may help you to complete the project and the portfolio.

Situation/Scenario
⇩
Analyse the situation
⇩
Carry out research
⇩
Write a general design brief according to the problem statement and research
⇩
Work out possible solutions
⇩
Select preferred solution
⇩
Write the specifications
⇩
Prepare working drawing and plan ahead
⇩
Gather material
⇩
Construct the product
⇩
Test and evaluate the design

NOTE: Use the attached rubric to ensure all requirements are met and appropriate steps were followed.

ANNEXURE A: RUBRIC FOR ASSESSMENT OF DESIGN PORTFOLIO

CRITERIA	80–100%	70–79%	60–69%	50–59%	40–49%	30–39%	0–29%	MARK
20	16–20	14–15	12–13	10–11	8–9	6–7	1–5	
Presentation	Exceeded the required information, extremely neat: • Name of learner • Name of school • Register class • Year • Appropriate cover illustration • Appropriate title • Table of contents • All sections • Page numbers	Required information extremely neat: • Name of learner • Name of school • Register class • Year • Appropriate cover illustration • Appropriate title • Table of contents • All sections • Page numbers	Adequate information from list below, neatly presented: • Name of learner • Name of school • Register class, • Year • Appropriate cover illustration • Appropriate title • Table of contents • All sections • Page numbers	Necessary information from list below, neatly presented: • Name of learner • Name of school • Register class • Year • Appropriate cover illustration • Appropriate title • Table of contents • All sections • Page numbers	Limited information from list below, neatly presented: • Name of learner • Name of school • Register class • Year • Appropriate cover illustration • Appropriate title • Table of contents • All sections • Page numbers	Lack of essential information, not very neatly presented.	Only name and register class untidily presented.	20
Development of a design brief	The design brief is extremely well-formulated and defines the need or opportunity. It lists detailed specifications and constraints.	The design brief is very well-formulated and defines the need or opportunity. It lists detailed specifications and constraints.	The design brief is well-formulated and defines the need or opportunity. It lists detailed specifications and constraints.	The design brief defines the need or opportunity and provides a list of specifications and constraints.	The design brief defines the needs or opportunity and provides limited specifications.	The simple design brief makes little reference to the need or problem.	The design brief is vague and lists no specifications or constraints.	20
20	16–20	14–15	12–13	10–11	8–9	6–7	1–5	
Investigation and analyses information	Shows evidence of a variety of investigation strategies used to obtain all relevant information to assist in developing innovative design ideas.	Uses a wide range of appropriate information sources to develop innovative design options.	Uses of a range of information sources which shows understanding of the problem or need.	Uses adequate sources to collect relevant information to assist with design ideas.	Uses relevant research to address the problem or need identified in the design brief.	Uses less than adequate sources and collects less than adequate information.	Collects very little relevant information.	20

20	16–20	14–15	12–13	10–11	8–9	6–7	1–5	MARK
Generation of design ideas	Generates an OUTSTANDING variety of alternative and innovative ideas with different approaches to address the problem or need.	Generates an EXCELLENT variety of alternative and innovative ideas with limited approaches to address the problem or need.	Shows a HIGH level of evidence to generate a variety of alternative and innovative approaches to address the problem or need.	Shows an ADEQUATE level of evidence to generate a variety of alternative and innovative approaches to address the problem or need.	Shows an ACCEPTABLE level of evidence to generate a variety of alternative and innovative approaches to address the problem or need.	Shows a POOR level of evidence to generate a variety of alternative and innovative approaches to address the problem or need.	Shows a VERY POOR level of evidence to generate alternative and innovative approaches to address the problem or need.	10
	OUTSTANDING justification of the preferred option with clear links to the design brief.	EXCELLENT justification of the preferred option with clear links to the design brief.	A HIGH level of justification of the preferred option with clear links to the design brief.	An ADEQUATE level of justification of the preferred option with clear links to the design brief.	An ACCEPTABLE level of justification of the preferred option with clear links to the design brief.	A POOR level of justification of the preferred option with clear links to the design brief.	NO justification of the preferred option with clear links to the design brief. Does not consider links for the research.	10
10	**8–10**	**7–8**	**6–7**	**5–6**	**4–5**	**3–4**	**1–3**	
Communication of ideas	Develops a very interesting solution and communicates it exceptionally well using appropriate techniques and methods. Uses modelling ideas to test and explore design thinking.	Develops a very interesting solution and communicated it very well using appropriate techniques and methods.	Develops an interesting solution and effectively communicates it effectively using appropriate techniques.	Reasons well for choice of solution. Uses good overall communication techniques.	The solution lacks creativity with limited communication techniques used.	The solution lacks creativity with inappropriate communication techniques used.	The solution lacks detail, making interpretation difficult. Scant attention is given to communication techniques.	10
10	**8–10**	**7–8**	**6–7**	**5–6**	**4–5**	**3–4**	**1–3**	**MARK**
Evaluation of product or artefact	Shows an OUTSTANDING ability to evaluate the product against the design brief.	Shows an EXCELLENT ability to evaluate the product against the design brief.	Shows an ADEQUATE ability to evaluate the product against the design brief.	Shows an ACCEPTABLE ability to evaluate the product against the design brief.	Shows a POOR ability to evaluate the product against the design brief.	Shows a VERY POOR ability to evaluate the product against the design brief.	Shows NO ability to evaluate the product against the design brief.	5
	Shows an OUTSTANDING procedures, techniques and processes and indicates possible improvements.	Shows an EXCELLENT procedures, techniques and processes and indicates some possible improvements.	Shows an ADEQUATE procedures, techniques and processes.	Shows an ACCEPTABLE procedures, techniques and processes.	Shows POOR procedures, techniques and processes.	Shows VERY POOR procedures, techniques and processes	Shows NO sense of understanding to procedures, techniques and processes	5

ANNEXURE B: RUBRIC FOR ASSESSMENT OF FINAL PRODUCT

CRITERIA	80–100%	70–79%	60–69%	50–59%	40–49%	30–39%	0–29%	MARK
20	16–20	14–15	12–13	10–11	8–9	6–7	1–5	
Planning	Demonstrates continual review of the making process.	Reviews design of the making process.	Reviews design of the making process with very few challenges.	Applies ADEQUATE knowledge to review design of the making process with few challenges.	Applies ADEQUATE knowledge to review design of the making process, BUT seeks assistance from teacher to proceed with the design.	Applies POOR knowledge to review design of the making process and seeks assistance from teacher MORE OFTEN.	NO commitment shown in the planning of the design.	5
	OUTSTANDING capability to adapt and modify the design when difficulties arise.	Demonstrate EXCELLENT resourcefulness and adapt capability in making modifications to ensure a high quality product.	Shows GOOD resourcefulness and adapt capability to adapt and modify the design when difficulties arise.	Shows ADEQUATE resourcefulness and adapt capability to adapt and modify the design when difficulties arise	Shows LITTLE evidence of adopting alternative ways of proceeding when difficulty is experienced.	Shows VERY LITTLE evidence of alternative ways of proceeding when difficulty is experienced.	No attempt made to overcome problems	10
	OUTSTANDING time management.	EXCELLENT time management.	GOOD time management.	ADEQUATE time management.	ACCEPTABLE time management.	POOR time management.	NO regard for time management.	5
Creativity/ Innovation	It shows an OUTSTANDING level of innovation that is appropriate to the design brief.	It shows an EXCELLENT level of innovation that is appropriate to the deign brief.	It shows a HIGH level of innovation that is appropriate to the design brief.	It shows an ADEQUATE level of innovation for the identified need/problem.	It shows an ACCEPTABLE level of innovation for the identified need/problem.	It shows POOR innovation for the identified need/problem.	NO evidence of innovation in the solution to the identified need/problem.	10

40	32–40	28–31	24–27	20–23	16–19	12–15	1–11	MARK
Manufacturing competency (assembling)	Demonstrates an OUTSTANDING level of skill/competence in the correct and safe use of a wide range of materials, tools, equipment and instruments under teacher supervision.	Demonstrates an EXCELLENT level of skill/competence in the correct and safe use of a wide range of materials, tools, equipment and instruments under teacher supervision.	Demonstrates a HIGH level of skill/competence in the correct and safe use of a range of materials, tools, equipment and instruments under teacher supervision.	Demonstrates an ADEQUATE level of skill/competence in the correct and safe use of appropriate materials, tools, equipment and instruments under teacher supervision.	Demonstrates an ACCEPTABLE level of skill/ competence in the correct and safe use of appropriate materials, tools, equipment and instruments under teacher supervision.	Demonstrates POOR regard for accuracy and safety in the use of materials, tools, equipment and instruments under teacher supervision. .	Demonstrates a LACK of skill/ competence in the use of appropriate materials, tools, equipment and instruments under teacher supervision.	30
	Adhere to ALL safety precautions with EXTENSIVE understanding of the rules and regulations	Adhere to MOST of the safety precautions with EXCELLENT understanding of the rules and regulations.	Pays HIGH level of attention to safety precautions with HIGH level of understanding of the rules and regulations	Pays an ADEQUATE level of attention to safety precautions with SATISFACTORY understanding of the rules and regulations.	Pays LITTLE attention to safety precautions with POOR understanding of the rules and regulations.	Pays VERYLITTLE attention to safety precautions with VERY POOR understanding of the rules and regulations	Pays NO attention to safety with NO understanding of the rules and regulations.	10