basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

TECHNICAL SCIENCES

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

GRADE 12

2022

These guidelines consist of 17 pages.

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1. INTRODUCTION

The 18 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, Technical Mathematics
- 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 examination mark at the end of the year. The practical assessment task for Technical Sciences Grade 12 consists of THREE experiments. The experiments are COMPULSORY for all candidates offering Technical Sciences in Grade 12. The practical component counts 25% of the final promotion mark.

The PAT is implemented during the first three terms of the school year. The formal experiments allow 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.

2. TEACHER GUIDELINES

2.1 How to administer the PATs

- The following documents must be available for all formal experiments:
    - Instructions sheets explaining the procedures to be followed for the experiments
    - The worksheet consisting of questions to be answered under supervision
    - The teacher's guides with instructions sheets, worksheets and marking guidelines (The teacher's guides should NOT be released to the learners.)

    NOTE: Teachers should compile marking guidelines (memoranda) for the actual results of the experiments conducted (teachers should perform the experiments prior to the learners performing the experiments.)

- The teacher should hand out ONLY the Instruction Sheet for the conduct of the experiment.
- The experiments should be performed individually or in pairs.
- In cases where there is insufficient apparatus, the experiments can be performed in groups.
- Each learner should record his/her OWN data or observations.
- Each learner should be provided with the worksheet to answer the questions under supervision conditions.
- Only once all the learners have conducted the experiment and they are ready to answer questions under supervision conditions, should teachers hand out a worksheet to each learner.
- If it is not possible to perform the experiment and complete the worksheet on the same day, the teacher should keep the data collected by the learners at the school after a part of the experiment has been done. The data should only be handed back to the learners when they have to complete the worksheet.

2.2 Moderation of the PATs

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.

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
- 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 practical component for Grade 12 consists of THREE experiments.

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

3.3 The practical component counts 25% of the final promotion mark for Grade 12.

3.4 All the work in the practical component must be the learner's own work. Group work will NOT be allowed.

3.5 Show ALL calculations clearly and include units. Round off answers to a minimum of TWO decimal places. Use correct SI units.

4. EVIDENCE OF MODERATION

LEARNER'S NAME: _____

SCHOOL: _____

MODERATION	SIGNATURE OF TEACHER	DATE	SIGNATURE OF HOD	DATE
SCHOOL-BASED				

PRACTICAL COMPONENT	MAX. MARK	WEIGHTING	LEARNER'S MARK (TEACHER)	MODERATED MARK (SCHOOL)	MODERATED MARK (DISTRICT)	MODERATED MARK (PROVINCE)
EXPERIMENT 1	**40**	**40**				
EXPERIMENT 2	**30**	**30**				
EXPERIMENT 3	**30**	**30**				
TOTAL	**100**	**100**				

SCHOOL STAMP

5. PAT MARK SHEET

TECHNICAL SCIENCES GRADE 12
PAT MARK SHEET 2022

SCHOOL:

			TERM 1		TERM 2		TERM 3		
			Experiment 1: PAT		Experiment 2: PAT		Experiment 3: PAT		TOTAL PAT
			Raw	Weighted	Raw	Weighted	Raw	Weighted	
No.	**SURNAME**	**NAME**	**40**	**40**	**30**	**30**	**30**	**30**	**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.									
		Average							

6. 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 have not been submitted for assessment or moderation previously.

_____ _____
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

7. 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.

8. EXPERIMENT INSTRUCTIONS AND WORKSHEETS

EXPERIMENT 1

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

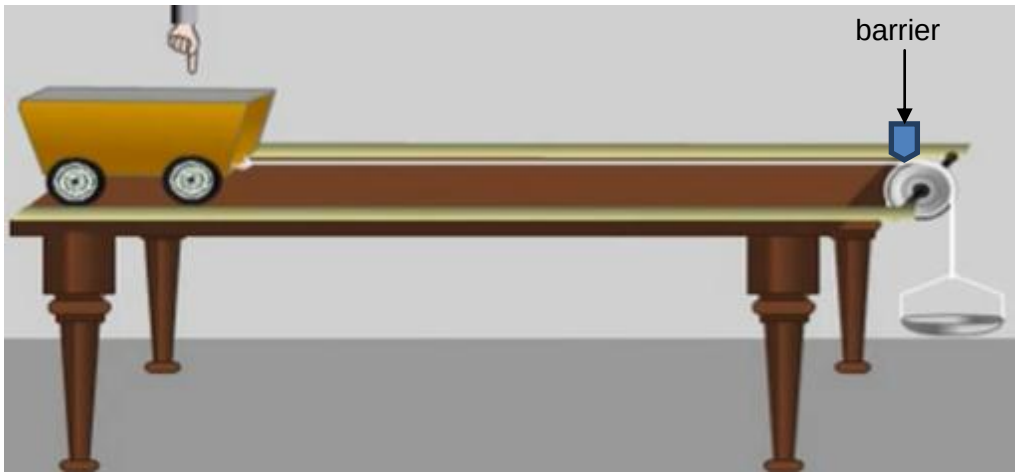
1. AIM: To determine the relationship between the resultant/net force acting on an object and acceleration produced on a constant mass

2. APPARATUS/EQUIPMENT

- Dynamics trolley kit
- Inextensible string
- Mass pieces
- Stopwatch
- Runway with a pulley
- Mass hanger
- Ruler or measuring tape if runway is not calibrated

3. PROCEDURE

- Measure the mass of the trolley and record it.
- Clean the runway.
- Set up the runway with a trolley, as shown below.



- Raise the one end of the runway so that the trolley moves at a constant velocity down the runway.
- Measure the length of the runway from the front wheel to the barrier.
- Place three to five mass pieces on top of the trolley.
- Take mass piece **m** from the trolley and attach it to the trolley using a string that passes over a pulley. Hang the mass piece so that, when the trolley is released, it accelerates.
- 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 three times.
- Take another mass piece from the trolley, add it to the hanger and repeat this action at least three times.
- Take another mass piece from the trolley and add it to the hanger.
- Record the time for the trolley to accelerate. Repeat this action at least three times.
- Use the readings to calculate the <u>average velocity</u>.

4. DATA REPRESENTATION

First mass piece

Trial number	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv (m·s^{-1})
1					
2					
3					
Average					

Table 1: ONE mark for each column of Δx, **mass**, Δt, F_{net} and **Δv**. Award a mark only if the column is completely filled with averages correctly calculated. (5)

Second mass piece

Trial number	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv (m·s^{-1})
1					
2					
3					
Average					

Table 2: ONE mark for each column of **mass**, Δt, F_{net} and **Δv**. Award a mark only if the column is completely filled with averages correctly calculated. (4)

Third mass piece

Trial number	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv (m·s^{-1})
1					
2					
3					
Average					

Table 3: ONE mark for each column of **mass**, Δt, F_{net} and **Δv**. Award a mark only if the column is completely filled with averages correctly calculated. (4)

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

PRACTICAL SKILLS

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

(7)

1. For this experiment, identify the following variables:

   1.1 Independent (1)

   1.2 Dependent (1)

   1.3 Controlled (1)

2. Use the average values in Tables 1–3 to calculate the acceleration in EACH of the three instances. (7)

3. How will the acceleration of the trolley be affected when the friction on the wheels increases? Write down only INCREASE, DECREASE or REMAINS THE SAME. (1)

4. Motivate the answer to QUESTION 3. (1)

5. Draw the graph of acceleration versus F_{net} using the values calculated in QUESTION 2. (6)

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

[40]

EXPERIMENT 2

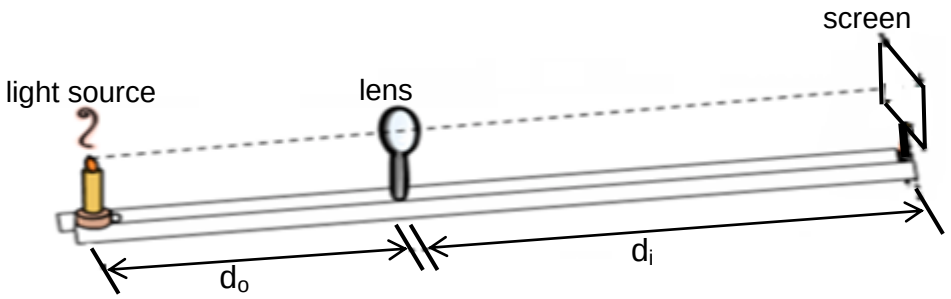
THE NATURE, POSITION AND SIZE OF IMAGE FORMED BY A CONVEX AND A CONCAVE LENS AS THE DISTANCE OF THE OBJECT FROM THE LENS CHANGES

1. AIM: To study the nature, position and size of image formed by a convex and a concave lens as the distance of the object from the lens changes

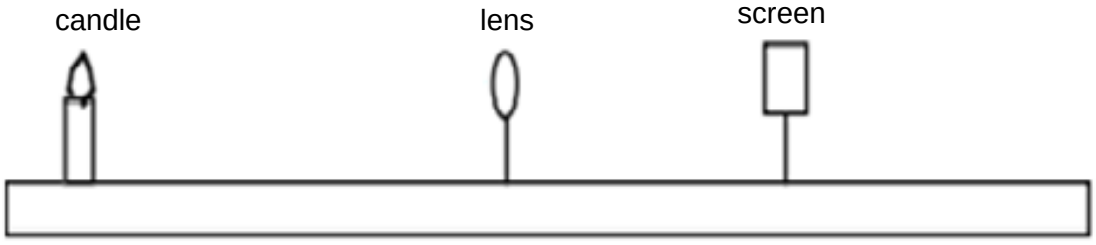
2. APPARATUS/EQUIPMENT

- Convex lens mounted in a lens stand
- Concave lens mounted in a lens stand
- Screen made of stiff white cardboard
- Candle
- Matchbox
- Lens support
- Meter stick

3. PROCEDURE



- Hold the convex lens in an upright position towards the centre of the meter stick.
- Place the meter stick along the convex lens.
- On the left-hand side of the lens, place a lighted candle at a distance of about 70 cm from the lens.
- On the other side of the lens you can put a sheet of white paper in an upright position.
- You can now move the screen along the meter stick until you get a well-defined image of the flame of the candle on the white sheet.
- Note the size and the nature of the image.
- Now move the candle towards the lens until it is 60 cm from the lens.
- Move the white sheet again until you get a well-defined image of the candle.
- Note the size and nature of the image on the white sheet.
- Repeat the experiment one more time, by moving the candle 50 cm away from the lens.
- Replace the convex lens with a concave lens and repeat the experiment above.
- Consider the safety precautions during this experiment.



4. DATA REPRESENTATION

THE NATURE, POSITION AND SIZE OF IMAGE FORMED BY A CONVEX LENS

Position of candle (object) (cm)	Distance of object (candle) away from lens d_o	Distance of image (cm) d_i	Image size (Larger/Smaller)	Type of image (Real/Virtual)	Direction of image (Inverted/Upright)
70					
60					
50					

(4)

THE NATURE, POSITION AND SIZE OF IMAGE FORMED BY A CONCAVE LENS

Position of candle (object) (cm)	Distance of object (candle) away from lens d_o	Distance of image (cm) d_i	Image size (Larger/Smaller)	Type of image (Real/Virtual)	Direction of image (Inverted/Upright)
70					
60					
50					

(4)

WORKSHEET FOR THE NATURE, POSITION AND SIZE OF IMAGE FORMED BY A CONVEX AND A CONCAVE LENS AS THE DISTANCE OF THE OBJECT FROM THE LENS CHANGES

PRACTICAL SKILLS

CRITERIA	MARKS
All apparatus was correctly set up	2
Measuring skills: • Take the correct measurements after the candle was placed • Populate the information in the table for every row after each placement	 1 1
List the safety precautions	3

(7)

1. For this experiment, identify the following variables:

   1.1 Independent (1)

   1.2 Dependent (1)

   1.3 Controlled (1)

2. Where is the image of the concave lens formed? (2)

3. What observation can be made when the object is placed between the principal focal point and the convex lens? (2)

4. What observation can be made when the object is placed at the principal focal point of the convex lens? (2)

5. State THREE differences between *real* and *virtual image*. (3)

6. State TWO uses of the convex lens in everyday life. (2)

7. Name the eye condition that can be corrected by using a concave lens. (1)

[30]

EXPERIMENT 3

ELECTROLYTIC CELL – ELECTROPLATING

1. AIM: To electroplate a carbon rod with copper through electrolysis

2. APPARATUS/EQUIPMENT

- One copper rod and one carbon rod
- Power supply
- Glass beaker
- Connecting wires
- Wire brush/Sand paper/Steel wool
- 1 mol.dm^{-3} copper (II) chloride solution

3. PROCEDURE

- Pour 1 mol.dm^{-3} copper (II) chloride solution into a beaker.
- Clean both the carbon rod and copper rod using the wire brush/sand paper/steel wool.
- Ensure that the power source is switched off.
- Connect a copper rod to the positive terminal of the power source and a carbon rod to the negative terminal using connecting wires.
- Switch on the power source.
- Write down your observations.

WORKSHEET FOR THE ELECTROLYTIC CELL – ELECTROPLATING

PRACTICAL SKILLS

CRITERIA	MARKS
Wearing of appropriate protective clothing, e.g. coat, goggles, rubber gloves	1
Safety precautions followed: • Prevent skin or eye contact with the copper (II) chloride solution • Power source initially switched off and immediately after completing the experiment • Ensure that the room is well ventilated or work in a fume cupboard	3
Correct and safe handling of glassware (no breakage) and chemicals (no spillage/ swallowing)	2
Ensuring that electrodes were cleaned with steel wool/wire brush/sand paper	1
Correct assembling and handling of apparatus: • Electrodes dipped into an electrolyte • Electrodes not touching each other • Electrodes correctly connected to the power supply	3

(10)

1. Draw a cell diagram to indicate how the apparatus will be assembled. Label the electrodes and give formulae of the ions present in the electrolyte. (6)

2. Write down your observations made at the negative electrodes. (2)

3. Write down the electrode that represent the following:

   3.1 Anode (1)

   3.2 Cathode (1)

4. How is the concentration of the electrolyte changing over time? Write down only REMAINS CONSTANT or BECOMES POSITIVE or BECOMES NEGATIVE. (1)

5. Explain the answer to QUESTION 4 by referring to the observed colour change of the electrolyte. (2)

6. Identify an electrode that will undergo:

   6.1 Decrease in mass (1)

   6.2 Increase in mass (1)

7. Identify the following from the cell reaction:

   7.1 Reducing agent (1)

   7.2 Oxidising agent (1)

8. Direct current is used during this process. Briefly explain why alternating current is NOT suitable for this process. (3)

[30]

TOTAL: 100