basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

TECHNICAL SCIENCES

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

GRADE 12

2026

These guidelines consist of 27 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
- SERVICES: Consumer Studies, Hospitality Studies, Tourism
- TECHNOLOGY: Civil Technology, Electrical Technology, Mechanical Technology, Engineering Graphics and Design
- TECHNICAL: Technical Mathematics and Technical Sciences

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.

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2. TEACHER GUIDELINES

The practical assessment tasks 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.

2.1 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/provincial/national 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

2.2 Procedure for administering the formal experiments

- All formal experiments have the following documents:
  - Instructions sheets explaining the procedure to be followed for the experiments
  - The worksheet consisting of questions to be answered under supervision
  - The teacher's guide with instruction sheets, worksheets and marking guidelines (The teacher's guide should NOT be released to the learners.)

  NOTE: Teachers should compile marking guidelines for the actual results of the experiments conducted. (The teacher should perform the experiment prior to the learners performing the experiment.)
- The teacher should hand out ONLY the instruction sheet for the conduct of the experiment.
- The experiments should be done individually or in pairs.
- In the case where there is insufficient apparatus, the experiments can be performed in groups of not more than FIVE learners. Each learner must submit individual work. NO group work will be allowed.

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- 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.**
- Teachers should only hand out the worksheets to each learner once learners have conducted the experiment and are ready to answer the questions under supervision conditions.
- 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 part of the experiment has been done. The data should only be handed back to the learners when they have to complete the worksheet.

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 components count 25% of the final promotion mark for Grade 12.

3.4 All the work in the practical components 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: _____

	SIGNATURE OF TEACHER	DATE	SIGNATURE OF HEAD OF DEPARTMENT	DATE
MODERATION: 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. EXEMPLAR OF PAT MARK SHEET

TECHNICAL SCIENCES GRADE 12									
PAT WORKING MARK SHEET 2026									
SCHOOL:									
			TERM 1		TERM 2		TERM 3		TOTAL PAT
			Experiment 1: PAT		Experiment 2: PAT		Experiment 3: 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 THE SCHOOL: _____

NAME OF LEARNER:
(FULL NAME(S) AND SURNAME) _____

GRADE: _____

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 LEARNER **DATE**

As far as I know, the above declaration by the learner 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

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

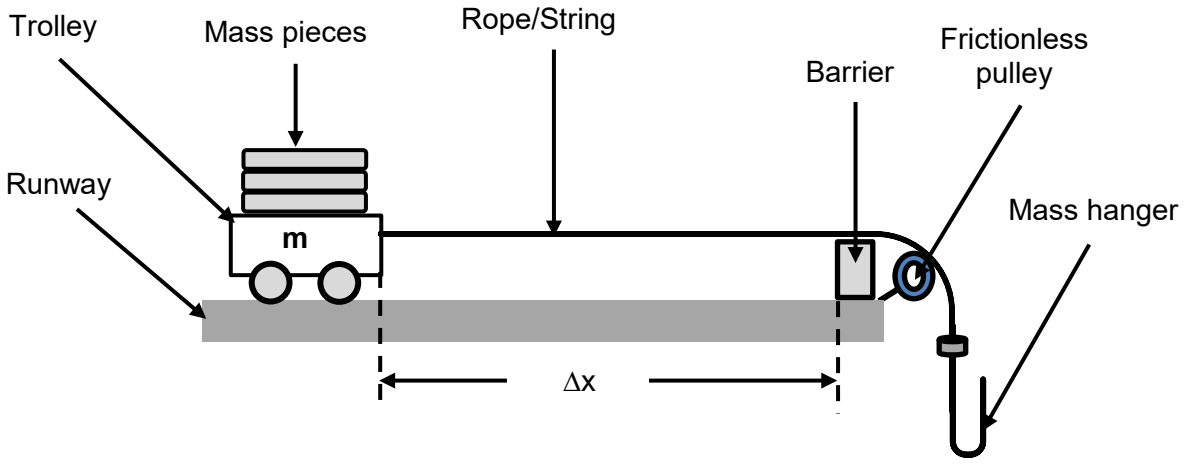
1. AIM: To determine the relationship between the net/resultant force acting on an object and the acceleration produced on a constant mass

2. APPARATUS/EQUIPMENT

- Dynamics trolley kit
- Inextensible string/rope
- Three 100 g mass pieces
- Measuring scale/Meter balance
- Stopwatch or appropriate timing device
- Runway with a pulley
- Cloth
- Mass hanger
- Ruler or measuring tape

3. PROCEDURE

Experimental setup:



Step 1: Measure the mass of the trolley and record the value in the spaces provided in **Tables 1**, **2** and **3**.

Step 2: Clean the runway, wheels of the trolley and frictionless pulley thoroughly.

Step 3: Set up the runway with the trolley, barrier, pulley and mass hanger, as shown in the diagram above.

Step 4: Measure the length of the runway from the front of the trolley to the barrier. Record it in the spaces provided in **Tables 1**, **2** and **3**.

Step 5: Clean three 100 g mass pieces and place them on top of the trolley.

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Step 6: Remove one mass piece from the trolley and attach it to the mass hanger. Calculate the net force acting on the system and record it in **Table 1**.

Step 7: Release the trolley and use a stopwatch/timing device to measure the time from the moment the trolley is released until it strikes the barrier. Record the time in **Table 1**.

Step 8: Repeat **step 7** three times. Use the readings to calculate the average velocity.

Step 9: Remove the second mass piece from the trolley and add it to the mass hanger such that there is ONE mass piece remaining on the trolley and TWO on the mass hanger. Calculate the net force acting on the system and record it in **Table 2**.

Step 10: Release the trolley and use a stopwatch/timing device to measure the time from the moment the trolley is released until it strikes the barrier. Record the time in **Table 2**.

Step 11: Repeat **step 10** three times. Use the readings to calculate the average velocity.

Step 12: Remove the third mass piece from the trolley and add it to the mass hanger such that there is no mass piece remaining on the trolley and THREE on the mass hanger and record it in **Table 3**.

Step 13: Release the trolley and use a stopwatch/timing device to measure the time from the moment the trolley is released until it strikes the barrier. Record the time in **Table 3**. Calculate the net force acting on the system.

Step 14: Repeat **step 13** three times. Use the readings to calculate the average velocity.

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DATA REPRESENTATION

TABLE 1: ONE MASS PIECE ON THE MASS HANGER; TWO ON THE TROLLEY

		Mass of the trolley = **…….. kg**			
TRIAL	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv ($m \cdot s^{-1}$)
1					
2					
3					
AVERAGE					

TABLE 2: TWO MASS PIECES ON THE MASS HANGER; ONE ON THE TROLLEY

		Mass of the trolley = **…….. kg**			
TRIAL	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv ($m \cdot s^{-1}$)
1					
2					
3					
AVERAGE					

TABLE 3: THREE MASS PIECES ON THE MASS HANGER; NONE ON THE TROLLEY

		Mass of the trolley = **…….. kg**			
TRIAL	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv ($m \cdot s^{-1}$)
1					
2					
3					
AVERAGE					

WORKSHEET FOR EXPERIMENT 1

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

PRACTICAL SKILLS

CRITERIA	MARKS
Correct setting of apparatus/equipment	2
Cleaning the runway, wheels of the trolley and the frictionless pulley	1
Accurate measurement of the: • Length of the runway • Mass of the trolley • Time	3
Following the sequence of instructions accurately and logically	1

(7)

DATA REPRESENTATION

TABLE 1: ONE MASS PIECE ON THE MASS HANGER; TWO ON THE TROLLEY

		Mass of the trolley = **…….. kg**			
TRIAL	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv ($m \cdot s^{-1}$)
1					
2					
3					
AVERAGE					

(5)

TABLE 2: TWO MASS PIECES ON THE MASS HANGER; ONE ON THE TROLLEY

		Mass of the trolley = **…….. kg**			
TRIAL	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv ($m \cdot s^{-1}$)
1					
2					
3					
AVERAGE					

(5)

TABLE 3: THREE MASS PIECES ON THE MASS HANGER; NONE ON THE TROLLEY

		Mass of the trolley = **…….. kg**			
TRIAL	Δx (m)	Mass (kg)	F_{net} (N)	Δt (s)	Δv ($m \cdot s^{-1}$)
1					
2					
3					
AVERAGE					

(5)

QUESTIONS

1. Identify ONE controlled variable in this experiment. (1)

2. Explain why the runway, wheels of the trolley and the frictionless pulley must be thoroughly cleaned. (2)

3. Draw a labelled free-body diagram showing ALL the forces acting on the hanging mass pieces. (2)

4. Use the average values in **Tables 1**, **2** and **3** and calculate the acceleration for the system with:

   4.1 ONE mass piece (2)

   4.2 TWO mass pieces (2)

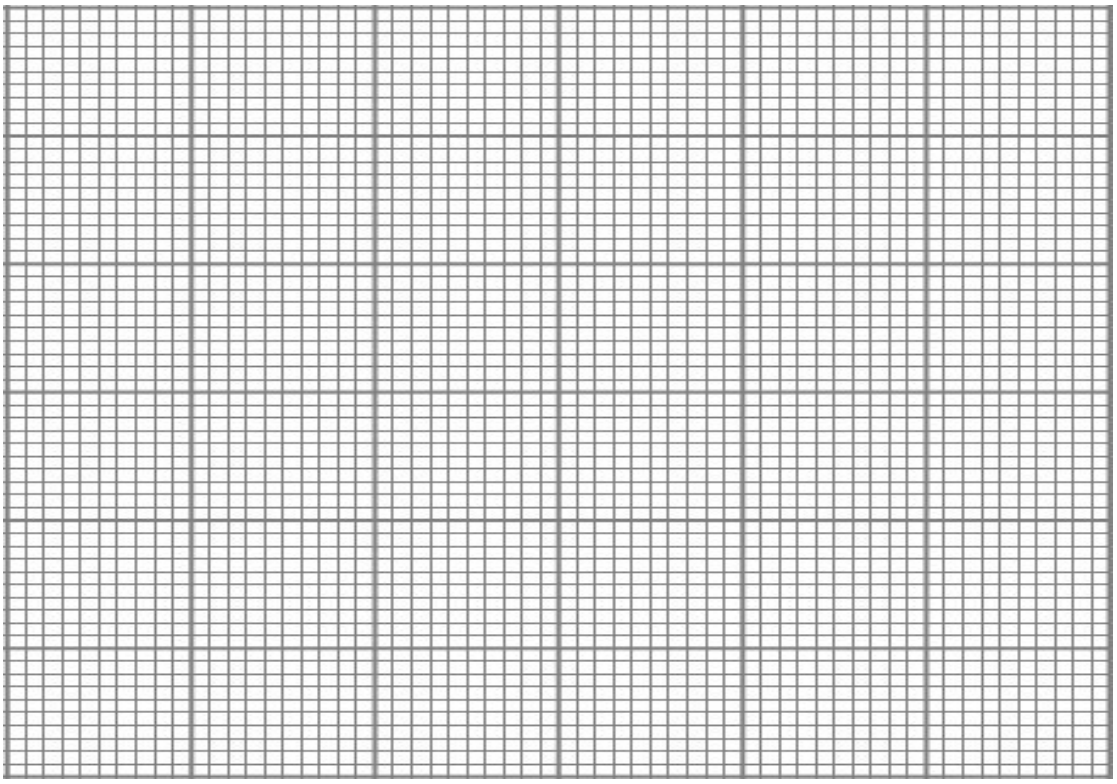
   4.3 THREE mass pieces (2)

5. Draw a graph of acceleration versus net force on the graph paper provided, using the values calculated in **Tables 1**, **2** and **3** for the net/resultant force and those calculated in QUESTIONS 4.1, 4.2 and 4.3 for acceleration. (6)

6. Write down the mathematical relationship between the acceleration and the net/resultant force acting on a constant mass. (1)

[40]

GRAPH OF ACCELERATION VERSUS NET/RESULTANT FORCE ACTING ON A CONSTANT MASS



EXPERIMENT 2

INVESTIGATING THE CHARACTERISTICS OF A p-n JUNCTION DIODE

1. AIM: (a) To study and understand a p-n junction in forward bias and reverse bias mode
(b) To draw a graph for the characteristics of a p-n junction diode in a forward and reverse mode

2. APPARATUS/EQUIPMENT

- Silicon semiconductor diode (1N4007 Si)
- Digital voltmeter (0–20 V)
- Digital ammeter (0–30 mA)
- Digital ammeter (0–200 µA)
- Rheostat (1 kΩ to 10 kΩ)
- Switch
- Connecting wires
- Battery/Variable DC power source (0–30 V)
- Bread board

SPECIFICATIONS FOR THE SILICON DIODE 1N4007 Si:

Maximum forward voltage:	0,8 V
Maximum forward current:	1 A
Maximum reverse voltage:	1 000 V
Maximum reverse current:	30 mA
Maximum power dissipation:	30 MW
Operating temperature range:	-65–200 ºC

3. SAFETY PRECAUTIONS

- Wear protective clothing.
- Ensure that all connections are clean and tight.
- Ensure correct polarity connections for the voltmeter and ammeter.
- Ensure that the connections are as indicated in the circuit diagrams before closing the switch from the power supply.
- Gradually adjust the voltage in small increments when varying the voltage.
- Do NOT exceed the diode's maximum rated voltage.
- Do NOT apply voltages beyond the breakdown voltage point of the diode.

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4. PROCEDURE

PART 1: FORWARD BIASED p-n JUNCTION DIODE

Experimental set-up:

Assemble the apparatus as shown in FIGURE 1 below.

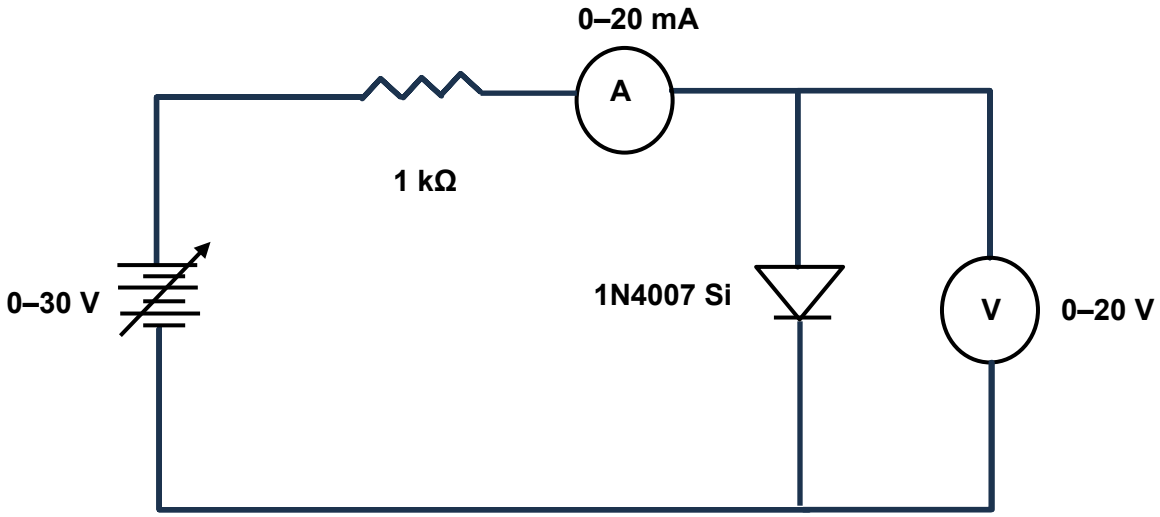


FIGURE 1

Step 1: Connect the circuit as shown in FIGURE 1 above, using a silicon p-n junction diode.

Step 2: Change the voltage gradually from zero to 5 V. Record the corresponding reading on the ammeter in **Table 1**. Continue until the diode starts conducting significantly. Note the point where the current suddenly increases rapidly with a small increase in voltage.

Step 3: Variation per step may not be fixed because of the non-linear curve and the X-axis variable may be varied (i.e. if output variation is more, decrease input step size and vice versa).

Step 4: Plot a graph of the forward current versus forward voltage in the FIRST QUADRANT of the graph paper provided. Clearly label the cut-in or threshold voltage on the graph. Mark this graph as SECTION A.

DATA REPRESENTATION

TABLE 1: FORWARD BIASED p-n JUNCTION DIODE

Experiment number	Regulated power supply voltage	Forward voltage across the diode V_f (volts)	Forward current through the diode I_f (milliamperes)
	(1)	(1)	(1)

(3)

PART 2: REVERSE BIASED p-n JUNCTION DIODE

Experimental set-up:

Assemble the apparatus as shown in FIGURE 2 below.

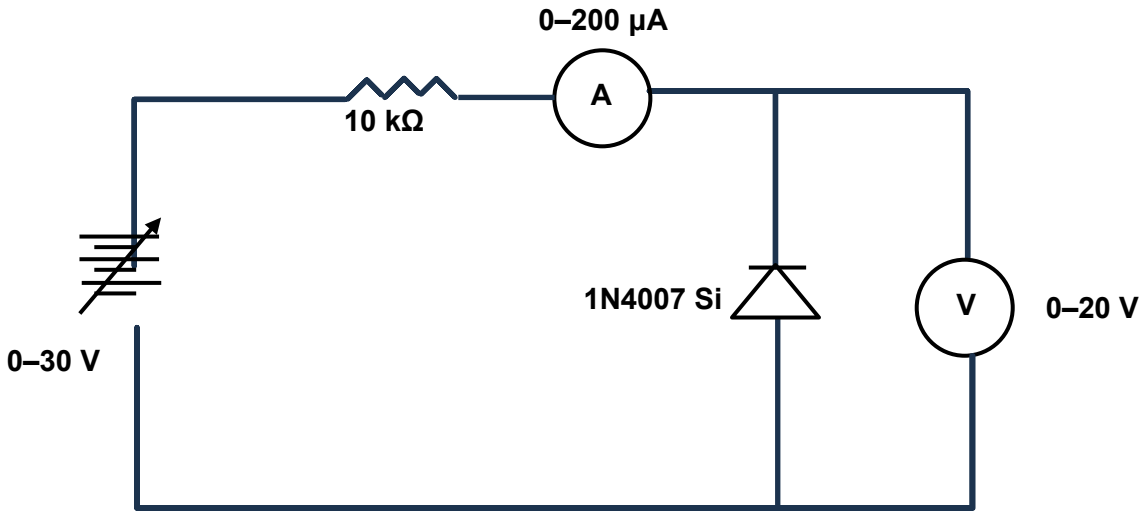


FIGURE 2

Step 5: Connect the circuit as shown in FIGURE 2 above, using a silicon p-n junction diode.

Step 6: Change the voltage gradually from zero to 5 V. Record the corresponding reading on the ammeter in **Table 2**. Continue until the diode starts conducting significantly. Note the point where the current suddenly increases rapidly with a small increase in voltage.

Step 7: Variation per step may not be fixed because of the non-linear curve and the X-axis variable may be varied (i.e. if output variation is more, decrease input step size and vice versa).

Step 8: Plot a graph of the reverse current versus reverse voltage in the THIRD QUADRANT of the same graph paper provided. Label the breakdown voltage clearly on the graph. Mark this graph as SECTION B.

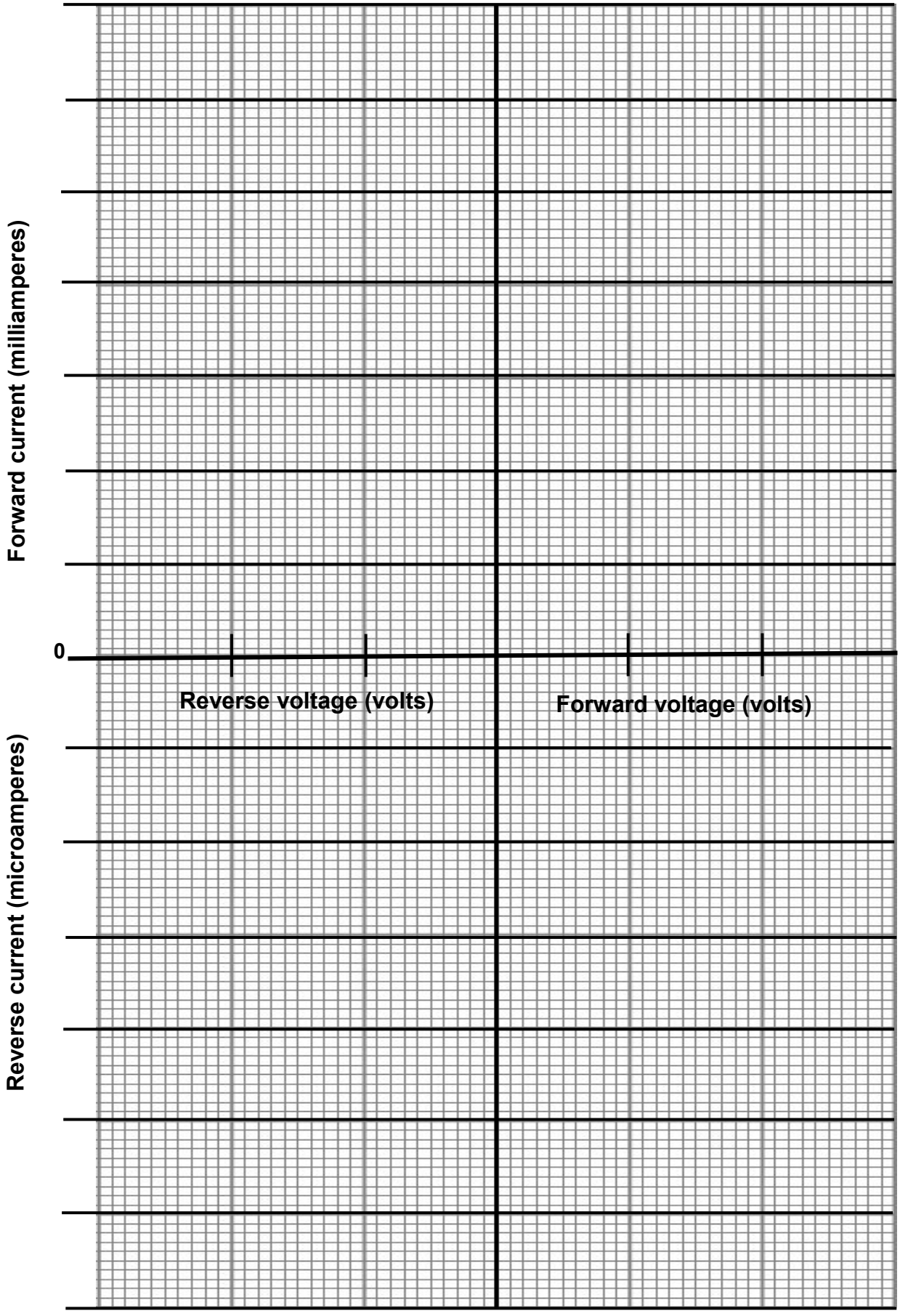
DATA REPRESENTATION

TABLE 2: REVERSE BIASED p-n JUNCTION DIODE

Experiment number	Regulated power supply voltage	Forward voltage across the diode V_f (volts)	Forward current through the diode I_f (milliamperes)
	(1)	(1)	(1)

(3)

Step 8: GRAPH OF CURRENT VERSUS VOLTAGE FOR A p-n JUNCTION DIODE



WORKSHEET FOR EXPERIMENT 2

INVESTIGATING THE CHARACTERISTICS OF A p-n JUNCTION DIODE

PRACTICAL SKILLS

CRITERIA	MARKS
Collecting and setting up all the apparatus/tools as per the instruction/ procedure	1
All connections are clean and tight	1
Correct polarity of the voltmeter and ammeter connection	1
Applied voltage is changed gradually	1
Safe handling of all electrical and electronic apparatus	1

(5)

TABLE 1: RESULTS – FORWARD BIASED p-n JUNCTION DIODE

Experiment number	Regulated power supply voltage	Forward voltage across the diode V_f (volts)	Forward current through the diode I_f (milliamperes)
	(1)	(1)	(1)

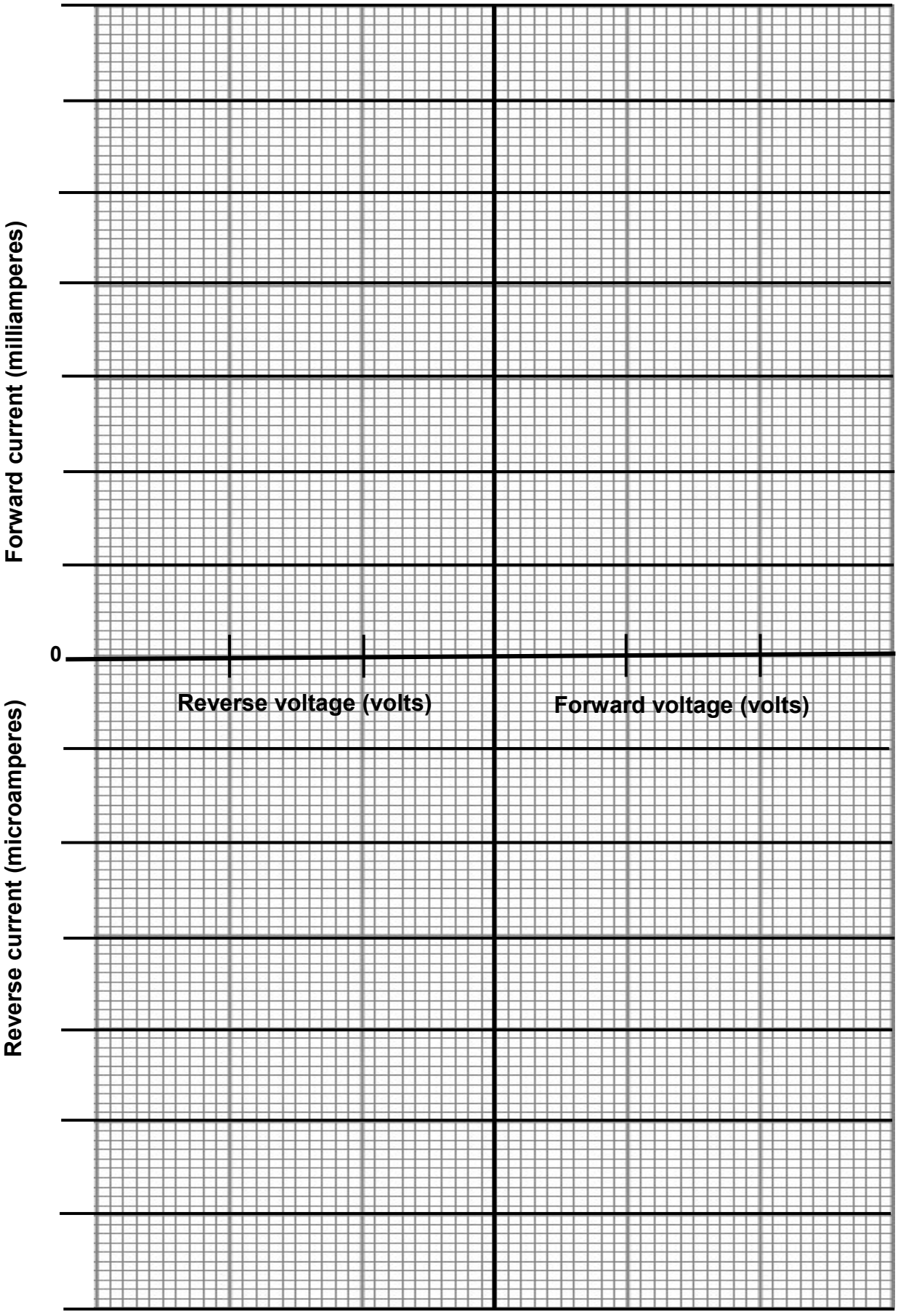
(3)

TABLE 2: RESULTS – REVERSE BIASED p-n JUNCTION DIODE

Experiment number	Regulated power supply voltage	Forward voltage across the diode V_f (volts)	Forward current through the diode I_f (milliamperes)
	(1)	(1)	(1)

(3)

GRAPHS OF CURRENT VERSUS VOLTAGE FOR A p-n JUNCTION DIODE



CRITERIA FOR MARKING THE GRAPH	MARKS
All points on the forward biased table of results plotted accurately	1
Correct shape of the forward biased graph	1
Cut-in voltage marked correctly	1
All points on the reverse biased table of results plotted accurately	1
Correct shape of the reverse biased graph	1
Breakdown voltage marked correctly	1
Correct labelling of SECTION A and SECTION B	2

(8)

QUESTIONS

1. Explain how a p-n junction diode is formed. (3)

2. Tabulate differences between *forward biased* and *reverse biased p-n junction diodes*. (4)

3. Write down the relationship between applied voltage and current in the following p-n junction diodes:

   3.1 Forward biased (2)

   3.2 Reverse biased (2)

[30]

EXPERIMENT 3

ELECTROPLATING A SCRATCHED COPPER SPOON WITH COPPER

1. AIM: To electroplate a scratched copper spoon with copper

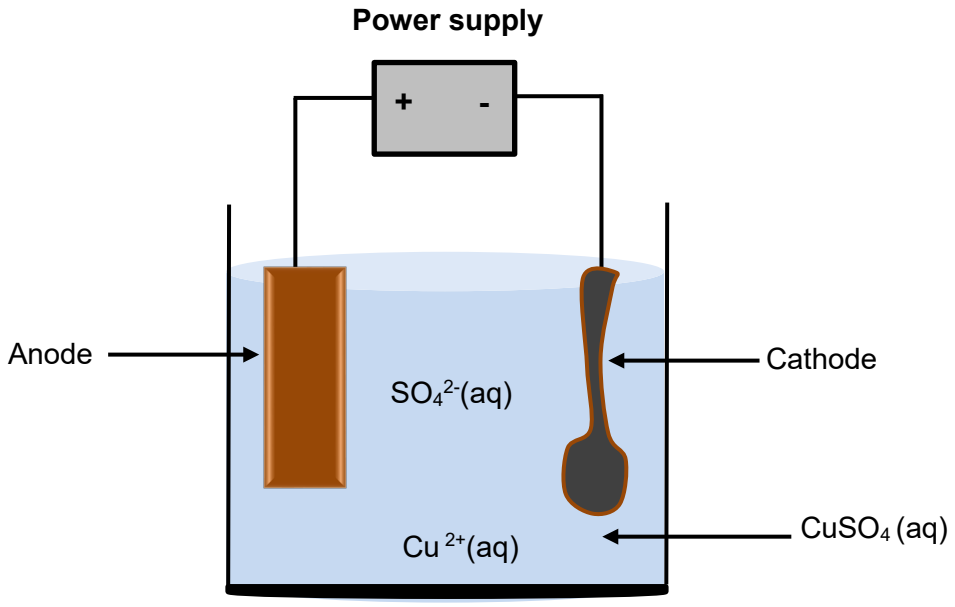
2. APPARATUS/EQUIPMENT

- 1 mol·dm^{-3} copper sulphate solution/$CuSO_4$(aq)
- Scratched copper spoon
- Copper plate/strip
- DC power source or battery
- Mass meter
- Glass beaker
- Distilled water
- Soft cloth
- Crocodile clips and connecting wires
- Sandpaper or steel wool

3. SAFETY PRECAUTIONS

- Wear protective clothing, e.g. gloves, laboratory coat and safety goggles.
- Ensure that the power source is switched off initially and immediately after completing the experiment.
- Work in a well-ventilated room or in a fume cupboard.

4. PROCEDURE



Step 1: Use the sandpaper or steel wool to clean the scratched copper spoon and copper plate/strip thoroughly. Wash and dry the glass beaker and electrodes with distilled water to remove any dirt.

Step 2: Add an appropriate amount of the 1 mol·dm^{-3} copper sulphate solution/$CuSO_4$(aq) into the glass beaker.

Step 3: Measure the initial mass of the scratched copper spoon and copper plate/strip. Record the masses in the spaces provided in **Table 1**.

Step 4: Attach the scratched copper spoon to the negative terminal of the power source and the copper plate/strip to the positive terminal.

Step 5: Submerge both the scratched copper spoon and the copper plate/strip in the copper sulphate solution. Ensure that they do not touch each other.

Step 6: Switch on the DC power supply and set it to **1–3 V** and observe what happens.

Step 7: Allow the process to run for 10 to 30 minutes depending on the desired thickness of the electroplating on the scratched copper spoon. Rotate the scratched copper spoon gently throughout the process to ensure even plating.

Step 8: Switch off the power supply. Remove the electroplated copper spoon and rinse it with distilled water to remove the excess solution. Dry it with a soft cloth.

DATA REPRESENTATION/OBSERVATIONS

	COPPER PLATE/STRIP	**COPPER SPOON**
Initial mass(g)		
Final mass(g)		

WORKSHEET FOR EXPERIMENT 3

ELECTROPLATING A SCRATCHED COPPER SPOON WITH COPPER

PRACTICAL SKILLS

CRITERIA	MARKS
All safety precautions observed	1
Correct handling of all apparatus and chemicals	2
Cleaning of apparatus	2
Correct assembling of apparatus: • Electrodes dipped into an electrolyte • Electrodes not touching each other • Electrodes correctly connected to the power supply	3
Accurate measurement of the masses of the electrodes:	2

(10)

DATA REPRESENTATION

MASS (g)	COPPER PLATE/STRIP	COPPER SPOON
Initial		
Final		

(2)

1. Consider the positive electrode.

   1.1 Write down the observation made while the electrochemical cell was in operation. (2)

   1.2 Explain the observation in QUESTION 1.1 above. (2)

   1.3 Write down a half-reaction to support the answer in QUESTION 1.2. (2)

2. Why is it important that the electrodes should not touch each other in the electrolyte? (2)

3. State ONE standard condition for this electrochemical cell, other than the concentration of the electrolyte. (1)

4. Briefly explain why alternating current is NOT suitable for this process. (2)

5. Write down TWO applications of electroplating in industry. (2)

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

7. Explain the answer to QUESTION 6. (2)

8. What will be observed if the power supply is cut off suddenly? (2)

[30]

TOTAL: 100

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