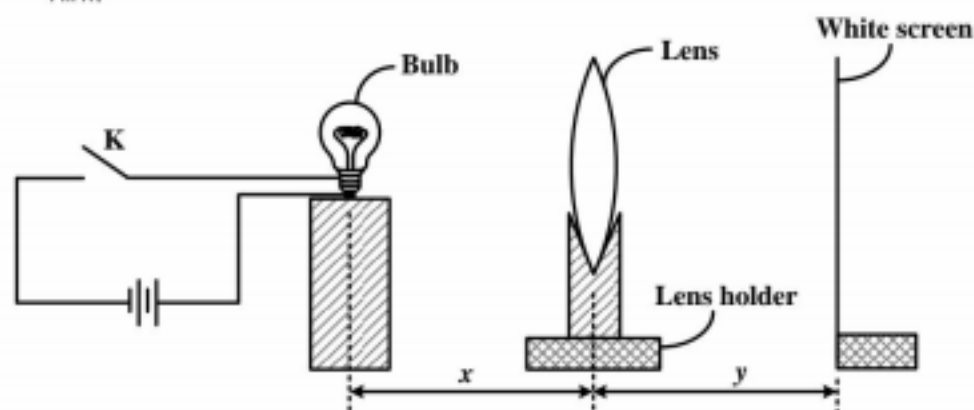


### Item 3

In one of secondary schools in the central region, the laboratory technician in-charge of the biology laboratory went to the village for burial, unfortunately this happened when senior one biology class were to use microscopes to study in depth features of a leaf. An effort to get the copy of keys from head of department hit a dead end since he was equally out station. This prompted the biology teacher to consult other departments where he was advised to improvise by using convex lens of magnifying power of 10 D. Physics laboratory has plenty of such lenses but are mixed with other lenses of different specification and are all not labeled.

**Task:** As a physics student, carry out a scientific investigation to sort the lenses such that lesson does not fail.

**Hint.**



- Other experimental setups may be used
- $f = \frac{xy}{x+y}$  where  $x$ - is the object distance while  $y$ -is the image distance.

### Item 4

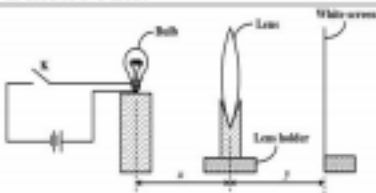
A battery manufacturing company has received complaints of its products overheating, and having low life span. This made the company director to have a consultation with its team of experts' in-charge of quality assurance; they predicted that this could be as result of internal resistance of the batteries exceeding  $1.8 \Omega$  and proved it right. In a bid to improve on the quality and life span of the batteries, the company's executive director decided that all the newly manufactured batteries should be tested before putting them into the

market. Unfortunately after the commencing the process of testing, the machine broke down. This forced them to seek for alternative approach which they are not familiar with, they seek for your expertise.

**Task:** Carryout scientific investigation to determine whether their newly manufactured batteries meet the minimum standards.

**Hint:**  $E = V + Ir$  where  $E$  is e.m.f of the cells,  $V$  is p.d drop and  $I$  is current

## Item 3

S/No	Items 1	Expected responses	code	Scores
1.	<b>Aim.</b>	✓ To determine the focal length of convex lenses such that ones with power 10D are sorted to carryout biology experiment.		2 scores
2.	<b>Variables</b>	✓ Independent Variable; the object distance $x$ . ✓ Dependent variable; the image distance $y$ .		2 scores • Stating any 2 variable score
3.	<b>Hypothesis</b>	✓ The focal length of lens provided is 10.0 cm		1 score for stating the hypothesis
4.	<b>List of apparatus</b>	✓ convex lens ✓ a bulb ✓ a lens holder ✓ double cells in a holder ✓ connecting wires ✓ a switch ✓ a screen ✓ a metre rule.		1score • for listing the apparatus
	<b>Procedure:</b>	 ✓ The apparatus are arranged as shown in the diagram above. ✓ The lens is adjusted to a distances $x = 15.0$ cm from the bulb.		

## Solutions to the seminar questions

5.		<ul style="list-style-type: none"><li>✓ The position of the screen is moved to and fro and until a sharp clear image the filament is obtained on the screen.</li><li>✓ The distance <math>y</math> of the screen from the lens is measured and recorded.</li><li>✓ The experiment is then repeated for at least 3 more values of <math>x</math> i.e <math>x = 20.0, 25.0, 30.0, 35.0</math> and <math>40.0</math> cm.</li><li>✓ The results recorded in a suitable including the values <math>xy</math> and <math>(x + y)</math>.</li><li>✓ A graph <math>xy</math> against <math>(x + y)</math> plotted and slope <math>f</math> calculated.</li></ul>		8 scores  ✓ For each correct step 1 score														
6.	Presentation of data:	<div><div>✓ Table of results.</div><table><tr><th><math>x</math> (cm)</th><th><math>y</math> (cm)</th></tr><tr><td>15.0</td><td></td></tr><tr><td>20.0</td><td></td></tr><tr><td>25.0</td><td></td></tr><tr><td>30.0</td><td></td></tr><tr><td>35.0</td><td></td></tr><tr><td>40.0</td><td></td></tr></table></div>	$x$ (cm)	$y$ (cm)	15.0		20.0		25.0		30.0		35.0		40.0			3 scores @ column
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40.0																		
8.	<b>Accuracy:</b>	<ul style="list-style-type: none"><li>✓ Appropriate number of decimal points</li></ul>		3 scores @ correctly recorded value half														

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9	<b>Data analysis and interpretation;</b>	<b>Graph work on the graph paper.</b> <ul style="list-style-type: none"> <li>✓ Title of the graph i.e A graph <math>x</math> against <math>y</math></li> <li>✓ Axes labeled with quantities units in bracket</li> <li>✓ Suitable and convenient scale covering at least half graph page</li> <li>✓ Correct plots</li> <li>✓ Line of best fit</li> <li>✓ Slope <math>f = \frac{\Delta xy}{\Delta(x+y)}</math> and calculating power <math>P</math> from <math>P = \frac{1}{f}</math></li> </ul>		8 scores: ✓ Title 1 ✓ Drawing and labeling 1 ✓ Scale 1 ✓ Correct plots 1 ✓ Line fit 1 ✓ Slope $f$ 1 ✓ Calculating $P$ from $P = \frac{1}{f}$														
10.	<b>Conclusion:</b>	<ul style="list-style-type: none"> <li>✓ The focal length of lens is approximately equal to that in the hypothesis hence the hypothesis is valid. Therefore, the lens has required power as such can be sorted out and used to carry out the biology experiment.</li> </ul>		2 scores														
11.	Possible error:	<ul style="list-style-type: none"> <li>✓ Error due to parallax</li> </ul>		Any two 1 score														