



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

**Notes from E-Marking Centre on SSC-II Physics Annual Examinations 2025**

**Introduction**

This document has been produced for the teachers and candidates of the Secondary School Certificate (SSC) Part II Physics examination. It contains comments on candidates' responses to the 2025 SSC-II Examination, indicating the quality of the responses and highlighting their relative strengths and weaknesses.

**E-Marking Notes**

This includes overall comments on candidates' performance on every question and *some* specific examples of candidates' responses that support the mentioned comments. Please note that the descriptive comments represent an overall perception of the better and weaker responses as gathered from the e-marking session. However, the candidates' responses shared in this document represent some specific example(s) of the mentioned comments.

Teachers and candidates should be aware that examiners may ask questions that address the Student Learning Outcomes (SLOs) in a manner that requires candidates to respond by integrating knowledge, understanding and application skills they have developed during study. Candidates are advised to read and comprehend each question carefully before writing their response to fulfill the question's demand.

Candidates need to be aware that the marks allocated to the questions are related to the answer space provided on the examination paper as a guide to the length of the required response. A longer response will not in itself lead to higher marks. Candidates need to be familiar with the command words in the SLOs, which contain terms commonly used in examination questions. However, candidates should also be aware that not all questions will start with or contain one of the command words. Words such as 'how', 'why' or 'what' may also be used. It is imperative to refer to the command word guide available on the AKU-EB website for understanding the expectations of the command word.

**General Observations**

Generally, candidates demonstrated a weak understanding of the concepts, including image location by a spherical mirror, electromagnetism, information and communication technology, the half-life of radioactive elements, waves, and electrostatics. However, certain areas, though, had been performed better yet need improvement to ensure a more thorough understanding, such as logic gates and the audible frequency range.


**Note: Candidates' responses shown in this report have not been corrected for grammar, spelling, format, or information.**

**DETAILED COMMENTS**  
**Constructed Response Questions (CRQs)**

<b>Question No. 1</b>																	
<b>Question Text</b>	If an object is placed at a distance of 2 cm from a convex mirror of focal length 4 cm, then find the position of the image formed.																
<b>SLO No.</b>	12.2.1																
<b>SLO Text</b>	Solve word problems related to the image location by spherical mirrors using the mirror formula.																
<b>Max Marks</b>	03																
<b>Cognitive Level</b>	A*																
<b>Checking Hints</b>	1 mark for the correct formula 1 mark for the correct substitution 1 mark for the correct answer																
<b>Overall Performance</b>	Candidates' responses demonstrated a wide range of understanding and accuracy in solving the convex mirror problem. Overall, while a few candidates grasped the concept well, many struggled with foundational optics principles or mathematical rigour.																
<b>Description of Better Responses</b>	<i>Better responses</i> correctly applied the mirror formula to solve for the image position, demonstrating a clear understanding of convex mirror optics. For instance, better responses provided step-by-step calculations, arriving at the accurate result, which indicates a virtual image 4 cm behind the mirror. These responses maintained proper sign conventions and included units consistently. Some candidates correctly applied the mirror formula ( $1/f = 1/p + 1/q$ ) and arrived at the correct image position ( $q = -4$ cm), indicating a virtual image 4 cm behind the mirror.																
<b>Image of Better Response</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"><i>Data:</i> <math>p = 2\text{ cm}</math></td> <td style="width: 25%;"><i>Sol:</i></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <tr> <td><math>f = 4\text{ cm}</math></td> <td><math>\frac{1}{f} = \frac{1}{p} + \frac{1}{q}</math></td> <td><math>\frac{1-2}{4} = \frac{1}{q}</math></td> <td><math>q = -4</math></td> </tr> <tr> <td><math>q = ?</math></td> <td><math>\frac{1}{4} = \frac{1}{2} + \frac{1}{q}</math></td> <td><math>\frac{-1}{4} = \frac{1}{q}</math></td> <td><math>q = -4\text{ cm}</math></td> </tr> <tr> <td></td> <td><math>\frac{1}{4} - \frac{1}{2} = \frac{1}{q}</math></td> <td></td> <td><math>\therefore</math> image formed behind the mirror, that's why it's negative.</td> </tr> </table>	<i>Data:</i> $p = 2\text{ cm}$	<i>Sol:</i>			$f = 4\text{ cm}$	$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$	$\frac{1-2}{4} = \frac{1}{q}$	$q = -4$	$q = ?$	$\frac{1}{4} = \frac{1}{2} + \frac{1}{q}$	$\frac{-1}{4} = \frac{1}{q}$	$q = -4\text{ cm}$		$\frac{1}{4} - \frac{1}{2} = \frac{1}{q}$		$\therefore$ image formed behind the mirror, that's why it's negative.
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	$\frac{1}{4} - \frac{1}{2} = \frac{1}{q}$		$\therefore$ image formed behind the mirror, that's why it's negative.														
<b>Description of Weaker Responses</b>	<i>Weaker responses</i> demonstrated significant conceptual and mathematical errors in solving the convex mirror problem. For instance, candidates incorrectly attempted to calculate image position using irrelevant formulas like the formula of a pendulum, Newton's second law formula, power of lens formula, frequency and wavelength formula, simple microscope formula, refractive index and Snell's formula, formula of transformer and capacitor formula, etc., and arbitrary square roots, entirely missing the application of the mirror formula. Similarly, in some responses, the multiplied focal length and object distance ( $4 \times 2 = 8$ cm) without justification, showing a fundamental misunderstanding of image formation principles. These responses lacked proper physics reasoning, contained nonsensical calculations and failed to use the correct optical conventions (e.g., sign rules for convex mirrors). Others made significant errors, such as incorrect formula application (e.g., $f = d_1 d_2$ ) or irrelevant trigonometric manipulations. Common pitfalls included the use of inaccurate formulas and concepts, misinterpreting focal length signs, omitting units, or failing to justify steps logically.																

Image of Weaker Response	Object distance = 2cm	$v = f \times k$
	focal length = 4cm	$v = 4 \times 2$
	image distance = ?	$v = 8 \text{ cm Ans}$
	formula: $v = fd$	so the image position will 8cm

**Suggestions for improvement (Highlight all that apply)**

Maximising SLO Achievement	Preferred Pedagogy** Used for this SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Identify the expectation of command words (use Command Word Guide)</li> <li>Ensure the content is taught at the relevant cognitive level</li> <li>Identify necessary content required (skills + concepts)</li> <li>Review past paper questions on the concept</li> <li>Utilise the resource guide for additional materials</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual Resources</li> <li>Think, Pair, and Share</li> <li>Knowledge Platform videos</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul> <p>** For description of each Pedagogy, refer to Annexure A</p>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

**Any Additional Suggestions:**


- Teachers are encouraged to use the images containing correct and incorrect solutions to conduct live problem-solving sessions. Highlight step-by-step calculations and common pitfalls (e.g., sign conventions for mirrors) to reinforce conceptual clarity.
- Assign students to analyse and correct errors in weaker responses. This builds critical thinking and application skills.

**Question No. 2**

<b>Question Text</b>	i. Describe a condition under which a single electron can generate a magnetic field. ii. Will it be a weak or strong magnetic field?
<b>SLO No.</b>	12.2.1
<b>SLO Text</b>	Demonstrate that an electric current in a conductor produces a magnetic field around it.
<b>Max Marks</b>	03
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	i. 1 mark for writing the correct answer (2 required)  ii. 1 mark for writing the correct answer

<b>Overall Performance</b>	Candidates demonstrated a wide range of understanding regarding magnetic fields generated by single electrons. Some responses correctly identified that a moving electron generates a weak magnetic field, with some providing clear conditions like “current passing through the electron” or “electron moving in a conductor”. These answers were concise and scientifically accurate.
<b>Description of Better Responses</b>	<i>Better responses</i> demonstrated a clear understanding of how a single electron generates a magnetic field by focusing on its motion or the flow of current. For example, candidates accurately stated that “the electron should be moving in the conductor”, while some correctly linked magnetic field generation to current passing through the electron. These responses were concise, avoided irrelevant details and correctly identified the resulting field as weak.
<b>Image of Better Responses</b>	<p>As we know that flow of electron is current and it produce magnetic field around it so when an electron is flowed in a circuit it will produce current that will produce magnetic field.</p> <p>Will it be a weak or strong magnetic field? (1 Mark)</p> <p>Magnetic field generated by a single electron will be weak.</p>
<b>Description of Weaker Responses</b>	<i>Weaker responses</i> demonstrated significant conceptual misunderstandings about how single electrons generate magnetic fields. For example, candidates incorrectly wrote that a positive charge creates a “strong magnetic field”, confusing electrostatic attraction with magnetic field generation. Similarly, some responses incorrectly described mutual induction (a multi-electron phenomenon) for a single electron, while others vaguely referenced “medium properties” and used the concept of thermionic emission without explaining the electron’s motion. These responses incorrectly labeled the field as “strong” and failed to identify the key requirement: electron movement. Few responses contained conceptual errors, such as referencing “mutual induction” for a single electron or incorrectly stating that the field would be strong. Some answers were vague or nonsensical.
<b>Image of Weaker Responses</b>	<p>Magnetic field can be generated around a single electron by making it to come into contact with a positive charge. The force of attraction between the two charges will create a magnetic field perpendicular to that force.</p> <p>ii. Will it be a weak or strong magnetic field? (1 Mark)</p> <p>It will be a strong magnetic field with a potential to attract other opposite charges.</p>

## Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Identify the expectation of command words (use Command Word Guide)</li> <li>Ensure the content is taught at the relevant cognitive level</li> <li>Identify necessary content required (skills + concepts)</li> <li>Review past paper questions on the concept</li> <li>Utilise the resource guide for additional materials</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual Resources</li> <li>Think, Pair, and Share</li> <li>Knowledge Platform videos</li> <li>Questioning Technique (Socratic approach)</li> </ul> <p>Practical Demonstration</p>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

### Any Additional Suggestions:


- Teachers use simple experiments (e.g., moving a compass near a current-carrying wire) to visually demonstrate how a single electron's motion generates a weak magnetic field, addressing misconceptions like "strong fields".
- Assign students to compare stronger and weaker responses in groups, guiding them to identify and correct errors (e.g., "mutual induction" misuse) while reinforcing accurate terminology and logic.
- Teachers should emphasise that (1) only moving charges create magnetic fields, (2) single electrons produce exceptionally weak fields, and (3) terms like "induction" or "charge attraction" are irrelevant to this context. Targeted practice in distinguishing electric/ magnetic effects and calculating field strength from charge velocity would address these gaps.

### Question No. 3

<b>Question Text</b>	State any TWO uses of logic gates in daily life.
<b>SLO No.</b>	16.8.3
<b>SLO Text</b>	Describe the simple uses of logic gates.
<b>Max Marks</b>	02
<b>Cognitive Level</b>	K
<b>Checking Hints</b>	1 mark for each use (Any 2 required)
<b>Overall Performance</b>	Candidates demonstrate a better understanding of logic gate applications in daily life. Overall, while many candidates grasp basic applications in computing and security, others struggle with precision or real-world examples.
<b>Description of Better Responses</b>	<i>Better responses</i> provided clear and accurate examples of logic gate applications in daily life. For instance, candidates identified their use in microprocessors for arithmetic operations and in communication systems for signal direction, demonstrating a solid understanding of digital electronics. Similarly, in some responses, they effectively mentioned computers and security alarms, though with minor grammatical errors. These responses showed relevance to real-world technology and avoided vague or incorrect examples.

<b>Image of Better Response</b>	<p>1) logic gates are fundamental property of digitals devices , Computer is used in daily life which is build up of logic gates . It make our life easier.</p> <p>2) logic gates are used in security purposes devices , like buglur alarm . Also the calculators and other electric appliance in kitchen also used logic gates .</p>
<b>Description of Weaker Responses</b>	<p><i>Weaker responses</i> demonstrated significant misunderstandings about logic gate applications. For example, candidates merely listed gate types (NOR, NAND) without explaining their practical uses and failing to address the question’s requirement for real-world applications. Similarly, others provided irrelevant examples about “understanding language”, completely missing the technological context of logic gates. These responses lacked concrete examples and showed confusion between logic gate types and their actual functions in devices.</p>
<b>Image of Weaker Response</b>	<p>① NOR .      ③ NAND .</p> <p>② OR .      ④ NOT .</p>

**Suggestions for improvement (Highlight all that apply)**

<b>Maximising SLO Achievement</b>	<b>Preferred Pedagogy Used for this SLO</b>	<b>Assessment Strategies</b>
<ul style="list-style-type: none"> <li>Identify the expectation of command words (use Command Word Guide)</li> <li>Ensure the content is taught at the relevant cognitive level</li> <li>Identify necessary content required (skills + concepts)</li> <li>Review past paper questions on the concept</li> <li>Utilise the resource guide for additional materials</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual Resources</li> <li>Think, Pair, and Share</li> <li>Knowledge Platform videos</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 


**Any Additional Suggestions:**

- Teachers are encouraged to use stronger responses to create visual concept maps that contrast correct vs. incorrect explanations, helping students identify key principles like total internal reflection.
- Leverage digital tools to demonstrate convex mirror image formation, allowing students to manipulate variables and observe outcomes, correcting misconceptions like “parallel lines prevent image formation”.
- Teachers should emphasise concrete applications (e.g., digital circuits, household electronics) and discourage abstract or irrelevant connections to solidify understanding.
- Teachers should emphasise that logic gates are building blocks of digital circuits (e.g., in computers, appliances) and provide specific examples like traffic light controllers or automatic doors. Students need practice distinguishing between abstract concepts (gate types) and practical implementations to improve their answers' relevance and accuracy.

### Question No. 4

<b>Question Text</b>	Describe how light signals are transmitted through an optical fibre.
<b>SLO No.</b>	17.2.1
<b>SLO Text</b>	Describe the transmission of: a. electric signals through wires, b. radio waves through air, c. light signals through optical fibres.
<b>Max Marks</b>	02
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	1 mark for INCOMPLETE description Give 2 marks on the COMPLETE description
<b>Overall Performance</b>	Candidates' responses revealed a wide range of understanding regarding light signal transmission in optical fibres. A few answers demonstrated a clear grasp of the physics involved in the transmission of light signals through optical fibre.
<b>Description of Better Responses</b>	<i>Better responses</i> demonstrated a clearer understanding of optical fibre transmission principles. For example, candidates correctly identified key components (core/ cladding) and the role of total internal reflection when the incident angle exceeds the critical angle.
<b>Image of Better Response</b>	<p>In optical fibre data is transmitted as light signal. Optical fibres are thin hair like strand, in which inner surface is called core and outer surface called cladding.</p> <p>A light signal enters from one <del>side</del><sup>end</sup>, and strikes the core-cladding boundary at an angle <sup>-ward in this way.</sup></p> <p>This incident angle is greater than critical angle so, the signal is total reflected back and moves for.</p>
<b>Description of Weaker Responses</b>	<i>Weaker responses</i> demonstrated significant conceptual misunderstandings about optical fibre transmission. Candidates incorrectly described light signals being transmitted through “deflecting electrons” and “charge defects”, confusing optical transmission with electrical current flow. Similarly, some incorrectly equated a convex lens, energy conversion, defects of the lens and radioactivity with optical fibres, while others mentioned battery-powered transmission, all fundamentally incorrect mechanisms. These responses lacked key physics principles (total internal reflection, core/ cladding structure) and introduced irrelevant concepts. Many responses contained significant errors, such as confusing optical fibres with copper wires, convex lenses, or unrelated concepts like electron deflection. Some answers were incoherent or irrelevant. Common issues included misusing terminology, omitting the core physics principle (total internal reflection), and proposing incorrect mechanisms, e.g., electrical current.
<b>Image of Weaker Response</b>	<p>The light signals are transmitted through an optical fibre by radioactive element. The signals are transmitted through the flow of current and the elements.</p>

## Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Identify the expectation of command words (use Command Word Guide)</li> <li>Ensure the content is taught at the relevant cognitive level</li> <li>Identify necessary content required (skills + concepts)</li> <li>Review past paper questions on the concept</li> <li>Utilise the resource guide for additional materials</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual Resources</li> <li>Think, Pair, and Share</li> <li>Knowledge Platform videos</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

### Any Additional Suggestions:

- Teachers are encouraged to use a simple laser pointer and acrylic rod to physically demonstrate total internal reflection, contrasting correct explanations with common misconceptions.
- Assign groups of students to rewrite flawed responses using the accurate principle of total internal reflection, guided by exemplars.
- Teachers should emphasise: (1) the role of refractive index differences between core/ cladding, (2) the critical angle concept, and (3) avoiding conflation with electrical conduction. Targeted diagrams and real-world examples (e.g., internet cables) could reinforce learning.

### Question No. 5

<b>Question Text</b>	Suppose a radioactive element has an initial number of atoms (X) kept in a nuclear power station. Calculate the number of radioactive atoms left after 10 half-lives.
<b>SLO No.</b>	18.5.2
<b>SLO Text</b>	Calculate the half-life of radioactive elements and draw graphs showing decay curves of these elements.
<b>Max Marks</b>	03
<b>Cognitive Level</b>	A
<b>Checking Hints</b>	1 mark for writing the correct formula 1 mark for substituting the correct values 1 mark for writing the correct answer
<b>Overall Performance</b>	A few responses correctly applied the half-life formula and arrived at the accurate solution, demonstrating clear working steps.

**Description of Better Responses**

*Better responses* demonstrated a solid understanding of radioactive decay calculations by correctly applying the half-life formula. For example, candidates systematically showed the step-by-step reduction of atoms ( $X \rightarrow X/2 \rightarrow X/4 \dots \rightarrow X/1024$ ) over 10 half-lives, clearly illustrating the exponential decay process. Similarly, others correctly used the formula  $N = X \times (1/2)^{10}$  and arrived at  $X/1024$ , though with a minor typo (1034 instead of 1024). These responses effectively communicated the concept through both tabular and mathematical representations.

**Image of Better Response**

$N_0 = X$       formula:  $N = N_0 \times \frac{1}{2^t}$       Hence, only  $[\frac{1}{1024}]^{th}$  of the original  
 $t = 10$                        $N = X \times \frac{1}{2^{10}}$                       no. of atoms OR  $[\frac{X}{1024}]$  no. of atoms  
 $N = ?$                        $N = X \times \frac{1}{1024}$                       will be left after passing its 10 half-lives  
 OR                       $N = \frac{X}{1024}$   
 $X \xrightarrow{1} \frac{X}{2} \xrightarrow{2} \frac{X}{4} \xrightarrow{3} \frac{X}{8} \xrightarrow{4} \frac{X}{16} \xrightarrow{5} \frac{X}{32} \xrightarrow{6} \frac{X}{64} \xrightarrow{7} \frac{X}{128} \xrightarrow{8} \frac{X}{256} \xrightarrow{9} \frac{X}{512} \xrightarrow{10} \frac{X}{1024}$


**Description of Weaker Responses**

*Weaker responses* demonstrated significant conceptual and mathematical errors in calculating radioactive decay. For example, candidates used an incorrect formula  $N = N_0 \times 12t$  (mixing linear and exponential relationships) and included nonsensical symbols, showing no understanding of the half-life concept. Similarly, some incorrectly calculated  $10/2 = 5$  remaining atoms, treating the decay as linear subtraction rather than exponential reduction. These responses fundamentally misunderstood that radioactive decay follows, not linear division. A few responses showed fundamental errors, such as incorrect formulas (e.g.,  $N = X \times 12t$ ), arbitrary arithmetic (e.g.,  $10/2 = 5$  atoms), or complete misunderstandings of the concept (e.g., element transformation). Common issues included: misusing the decay formula, calculation errors with exponents, and confusing half-life reduction with linear division.

**Image of Weaker Response**

$N = N + 1/2$                        $\frac{19}{2} = N$   
 $10 = N + 1/2 \dots (i)$                        $9.5 = N$   
 Solution:  $10 - 1/2 = N$   
 $\frac{10 \times 2}{1 \times 2} - \frac{1 \times 1}{2 \times 1}$   
 $\frac{20 - 1}{2} = N$                       9.5 radioactive atoms left.

## Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"><li>Identify the expectation of command words (use Command Word Guide)</li><li>Ensure the content is taught at the relevant cognitive level</li><li>Identify necessary content required (skills + concepts)</li><li>Review past paper questions on the concept</li><li>Utilise the resource guide for additional materials</li></ul>	<ul style="list-style-type: none"><li>Story Board</li><li>Cause and Effect</li><li>Fish and Bone</li><li>Concept Mapping</li><li>Audio Visual Resources</li><li>Think, Pair, and Share</li><li>Knowledge Platform videos</li><li>Questioning Technique (Socratic approach)</li><li>Practical Demonstration</li></ul>	<ul style="list-style-type: none"><li>Past paper questions</li><li>Discussion on E-Marking Notes</li><li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li></ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

### Any Additional Suggestions:

- Teachers are encouraged to use good responses to create interactive diagrams showing the progressive halving of atoms over each half-life, contrasting these with flawed attempts.
- Link the math to tangible scenarios (e.g., medical isotope decay in treatments) to ground abstract calculations and address misconceptions.
- Assign groups of students to analyse and fix weaker answers using guided templates that emphasise the exponential decay formula and unit consistency.
- Teachers should emphasise: (1) the exponential nature of decay, (2) proper calculator use for powers, and (3) dimensional analysis to verify answers. Targeted practice with gradual half-life calculations (1 → 2 → 3 ... 10) would help bridge these conceptual gaps.

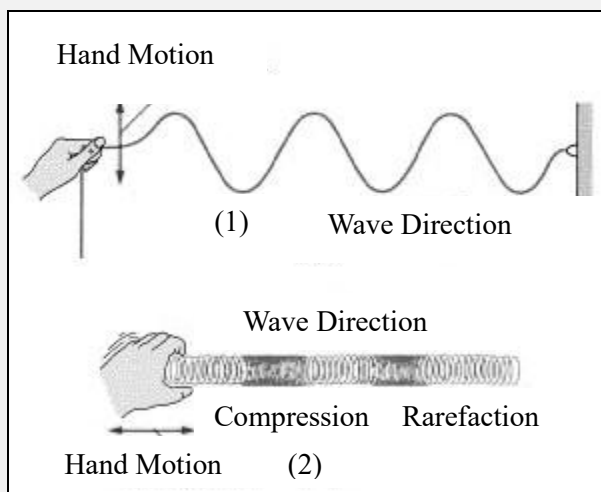
## Extended Response Questions (ERQs)

Extended response questions offered a choice between parts 'a' and 'b'

### Question No. 6a

**Question Text**

Two different waves are shown in the given diagrams.



Identify the types of waves and describe any FOUR differences between these waves.

**SLO No.**

10.2.3

**SLO Text**

Distinguish between mechanical and electromagnetic waves.

**Max Marks**

06

**Cognitive Level**

U

**Checking Hints**

1 mark for the correct identification of a transverse wave  
1 mark for the correct identification of a longitudinal wave  
1 mark for each correct difference (4 required)

**Overall Performance**

Most of the candidates attempted part A of the question. Yet the ones who opted for his question, their performance was unsatisfactory and required more deeper conceptual revision and practice in articulating distinctions clearly.

**Description of Better Responses**

*Better responses* demonstrated a clear understanding of wave types by presenting well-organised comparisons between transverse and longitudinal waves. The better responses used a structured table format to accurately highlight four key differences: direction of particle motion, wave speed, presence of compressions, and rarefaction. They demonstrated a basic understanding of transverse and longitudinal waves, correctly identifying their types and listing some key differences, such as medium requirements and examples.

**Image of Better Response**

① Transverse Wave.

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② Longitudinal Wave

Transverse	Longitudinal
① These waves travel up and down direction.	These waves travel straight in a line.
② Speed of these waves are slow.	Speed of these waves are fast.
③ No compression is occurred.	Compression occur in these waves.
④ No rarefaction is present in these waves.	Rarefaction is present in these waves.


**Description of Weaker Responses**

Weaker responses struggled to identify and differentiate between wave types accurately, often presenting confusing or incorrect information. The responses included nonsensical phrases like “unable to require medical treatment” and mixed-up fundamental concepts (e.g., incorrectly stating electromagnetic waves “do not need a material medium”). While the table format was attempted, the content reveals significant misunderstandings, such as describing mechanical waves with terms like “electromagnetic radiation” and failing to distinguish between wave types clearly. Additionally, other weaker responses suffer from unclear phrasing and inconsistent comparisons between wavelength and refraction, which are not directly comparable properties. These weaker responses highlight a need for candidates to review core wave concepts, practice precise terminology, and verify their examples before submission. Several responses contained inaccuracies (e.g., “ultrasonic waves” incorrectly listed as transverse, “radiation waves” as longitudinal) or lacked clarity in phrasing. While some answers were well-structured (e.g., clear tables comparing wavelengths and refraction), others were disjointed or incomplete. A few candidates confused mechanical/ electromagnetic waves with transverse/ longitudinal waves, indicating a need to reinforce foundational concepts.

**Image of Weaker Response**

Mechanical wave	Electromagnetic wave
1. Mechanical wave are those wave which required medium for their propagation.	Electromagnetic wave are those wave which don't required any medium for their propagation.
2. Examples: sound wave, water wave, etc.	2. X-rays, television, etc.
3. In mechanical wave the direction of wave is compression and rarefaction.	3. In electromagnetic wave the direction of wave is longitudinal.
4. In mechanical wave need material medium.	4. Does not need material medium.

**Suggestions for improvement (Highlight all that apply)**

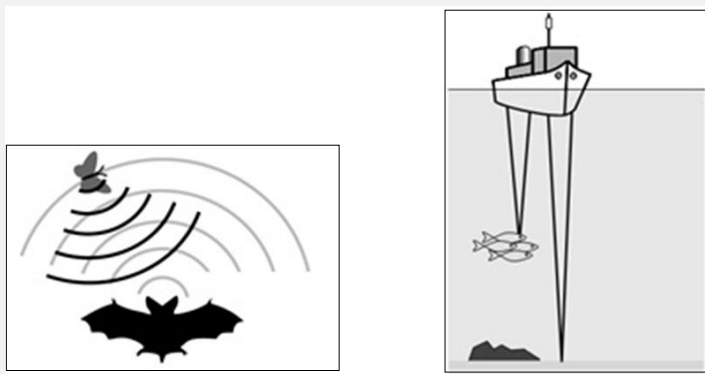
Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Identify the expectation of command words (use Command Word Guide)</li> <li>Ensure the content is taught at the relevant cognitive level</li> <li>Identify necessary content required (skills + concepts)</li> <li>Review past paper questions on the concept</li> <li>Utilise the resource guide for additional materials</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual Resources</li> <li>Think, Pair, and Share</li> <li>Knowledge Platform videos</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

**Any Additional Suggestions:**

- Teachers are encouraged to use spring and rope to physically model transverse and longitudinal waves, contrasting their motion (e.g., perpendicular vs. parallel to propagation) to clarify misconceptions like “speed differences” or incorrect examples (ultrasonic as transverse).
- To improve, students should focus on precision in definitions, avoid mixing unrelated wave categories, and provide consistent, error-free examples.

**Question No. 6b**

**Question Text** The given diagrams show two different uses of sound waves by two different things.




Identify the sound wave used in the given diagrams and describe any FIVE uses of that other than shown in the above diagrams.

<b>SLO No.</b>	11.4.2
<b>SLO Text</b>	Describe the uses of ultrasound.
<b>Max Marks</b>	06
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	i. 1 mark for writing the correct name of the sound ii. 1 mark for EACH correct use (Any 5 required)

<b>Overall Performance</b>	In comparison, fewer students selected this question. However, from the ones who selected it, the performance of candidates on the question related to ultrasound technology was better. Whereas some responses reflected an awareness of the scientific use of ultrasound.
<b>Description of Better Responses</b>	<i>Better responses</i> accurately identified practical applications of ultrasound technology, such as medical imaging, demonstrating a clear understanding of its scientific use in detecting kidney stones and measuring sea depth, etc.
<b>Image of Better Response</b>	<p style="text-align: center;">(13)</p> <p>→ The sound wave used in the given diagram is that Ultrasound -</p> <p>• The sound waves that are widely used are described as the following;</p> <ol style="list-style-type: none"> <li>(1) Detonating a TNT or an explosive bomb can be heard hundreds of kilometres away due to the loudness which result in longitudinal waves</li> <li>(2) A continuous <del>of</del> crying of a small baby can be heard far away due to high pitch and small wavelength of the sound waves.</li> <li>(3) A truck's horn can cause the sound waves to travel far enough in the open air due to the loudness.</li> <li>(4) The noise produced in a war or a conflict can travel very far due to the loudness coming from different sources.</li> <li>(5) The music played from the musical instruments can be easily heard in a particular distance due to different pitches and the loudness that causes the sound waves to travel in the air with a greater wavelength.</li> </ol>
<b>Description of Weaker Responses</b>	<i>Weaker responses</i> incorrectly wrote about the waves in a rope or wire; they described the longitudinal and transverse waves. Some of the candidates wrote about compression and rarefaction, the medium through which waves travel from one point to another. Some candidates confused general sound properties (loudness, pitch) with ultrasound, misapplying concepts like "long-wavelength waves".
<b>Image of Weaker Response</b>	<p>a) <u>Waves in the rope:</u> The one end of rope is vibrated than the energy present in the rope are transferred from one end to another end of the rope so the other end of the rope also starts vibrating automatically after some time.</p> <p><u>Waves in string:</u> In this phenomenon the particles are tightly packed together and donot move which is known a compression and also the particle are closely spread which is known as rarefaction. The waves in a string have compression and rarefaction.</p>

## Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Identify the expectation of command words (use Command Word Guide)</li> <li>Ensure the content is taught at the relevant cognitive level</li> <li>Identify necessary content required (skills + concepts)</li> <li>Review past paper questions on the concept</li> <li>Utilise the resource guide for additional materials</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual Resources</li> <li>Think, Pair, and Share</li> <li>Knowledge Platform videos</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

### Any Additional Suggestions:

- Teachers are encouraged to use tuning forks or smartphone apps to show how pitch and loudness differ, linking these properties to real-world examples (e.g., baby cries vs. truck horns) while correcting errors like “long-ridden waves”.
- To strengthen answers, students should focus on distinguishing between everyday sound waves and specialised ultrasound uses, ensuring terminology accuracy and conceptual clarity.

### Question No. 7a

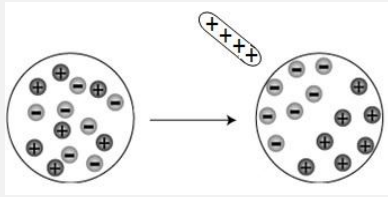
<b>Question Text</b>	<p>i. Identify the phenomenon in the given diagram.</p>  <p>ii. Write any FIVE hazards of the phenomenon identified in part (i).</p>
<b>SLO No.</b>	13.1.2
<b>SLO Text</b>	Discuss the potential dangers of electrostatic charges.
<b>Max Marks</b>	06
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	1 mark for the correct identification 1 mark for each hazard (Any 5 required)
<b>Overall Performance</b>	Most of the candidates attempted part B. However, of the ones who attempted this question, only one third were able to correctly name the phenomenon and list relevant hazards (e.g., electrical fires, equipment damage, or electric shocks).
<b>Description of Better Responses</b>	<i>Better response</i> accurately described electrostatic induction and listed relevant hazards, such as electrical accidents from improper tool use or wet conditions.

Image of  
Better  
Response

(a)

(i) The phenomenon is said to be "electrostatic induction".

When a charged body is brought close to an insulator conductor, the nearby part of the conductor becomes gains an unlike charge and far apart part of the conductor gains like charge. This separation of charges is said to be electrostatic induction.

(ii) Electrostatic induction has many hazards. Five of them are:-

- When petrol or gasoline is being pumped in vehicle, a part of vehicle and a part of petrol or gasoline's machine when come in touch, charges are separated. This can cause a huge explosion which is very dangerous.
- When a moving vehicle generates friction between the ~~tyre~~<sup>tyre</sup> and road, they both become charged and when vehicle speeds up, due to electrostatic induction, an <sup>accident occurs</sup>.
- When a heavy ~~me~~ object is being displaced, the surface and object both become charged and attract each other. This causes surface to heat up and hence <sup>causes fire</sup>.
- When fire extinguishers are used to end fire, the fire extinguisher has a flammable gas which due to electrostatic induction <sup>can</sup> make an explosion.
- As the rubber is rubbed over a page, page and rubber become charged and attract. This attraction produce current and page-tears.


Description of  
Weaker  
Responses

*Weaker responses* misunderstood the electrostatic phenomenon, either discussing irrelevant atomic structure or confusing it with magnetism. The poorest attempts contained nonsensical phrases (molecules of elections) or completely mislabeled the concept as "nuclear fusion". Candidates demonstrated three critical weaknesses: incorrect terminology (mutual intention), flawed scientific logic (linking charge separation to crop failure) and unclear expression (bite end). Their proposed hazards were either invented or irrelevant to actual electrostatic effects. Many answers were derailed by fundamental errors, such as confusing electrons with protons, mislabeling the phenomenon as "nuclear forces" or "mutual intention: or providing irrelevant examples (e.g., crop failure, economic losses). Few responses featured nonsensical phrasing (e.g., mutual indication), while others conflated concepts like radioactivity or magnetism with electrostatic effects. The examples lacked scientific depth (e.g., explaining how induction causes sparks). Candidates demonstrated significant difficulty in accurately identifying the phenomenon (likely electrostatic induction or charge polarisation) and articulating its hazards.

**Image of Weaker Response**

a.

In this phenomenon an positively charged body is attracting negative charges from an another body leaving behind the positive charges.

1) Positively charged body is not attracting the positive charges because they got same direction and not a same direct not attract. Like given 


2) Slowly slowly the negative charges will move towards the positively charged body and all the remaining charges will settle in the opposite direction.

3) Before the positive body become close to another body every ~~ch~~ different charge is attract to a opposite charge.

4) Through earth wire all the remaining positive charges ~~wit~~ will moves towards the earth.

5) Atthe end if we remove positively charged body all the negative charged will spread around the body.

**Suggestions for improvement (Highlight all that apply)**

Maximising SLO Achievement	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Identify the expectation of command words (use Command Word Guide)</li> <li>Ensure the content is taught at the relevant cognitive level</li> <li>Identify necessary content required (skills + concepts)</li> <li>Review past paper questions on the concept</li> <li>Utilise the resource guide for additional materials</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual Resources</li> <li>Think, Pair, and Share</li> <li>Knowledge Platform videos</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

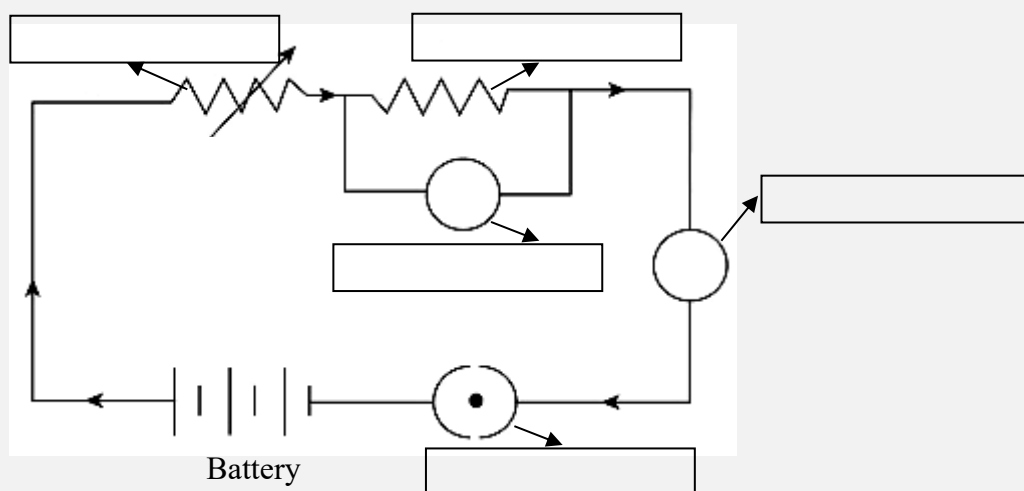
### Any Additional Suggestions:

- Teachers are encouraged to create side-by-side displays of stronger and weaker responses to highlight accurate terminology (electrostatic induction) versus misconceptions (nuclear forces/ atomic structure). Use simple diagrams to demonstrate charge separation and real-world hazards (e.g., sparks damaging electronics).
- Use balloons/ cloth for hands-on static electricity experiments, linking observations to hazards like insulation damage.
- To address these gaps, students should focus on foundational electrostatics through diagrams and real-world examples (e.g., static shocks), while practicing precise scientific language to properly describe charge behavior and its genuine risks.

### Question No. 7b

#### Question Text

i. Label the electrical component in the given circuit diagram.



ii. Describe any ONE use of each of the identified electrical components in the given circuit diagram.

#### SLO No.

14.8.1

#### SLO Text

Describe the use of electrical measuring devices (galvanometre, ammetre and voltmetre).

#### Max Marks

06

#### Cognitive Level

U

#### Checking Hints

1 mark for labelling any two parts (Any 4 parts required)

1 mark for writing the correct use (4 required)

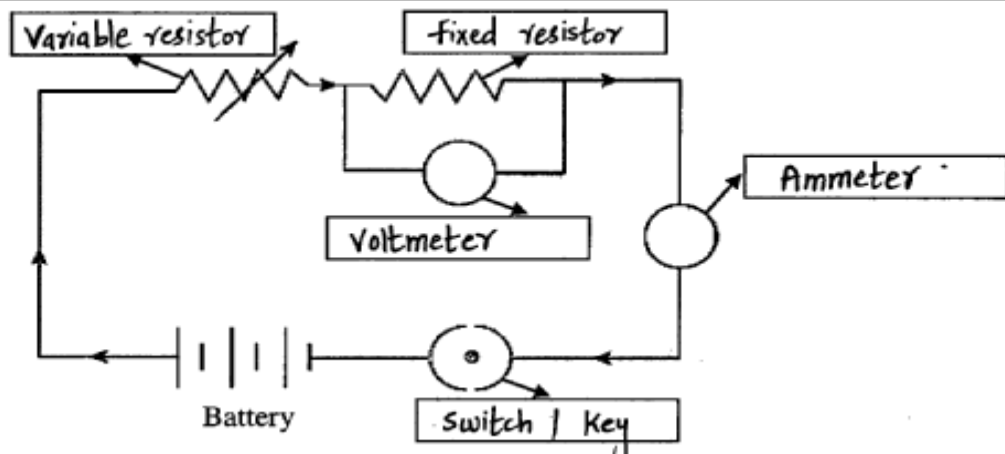
#### Overall Performance

Though most candidates opted for this question but the performance remained more or less the same as part a. The overall responses demonstrated inaccurate identification of circuit components (resistor, voltmetre, etc.) and clear functional descriptions (e.g., switch opens/ closes circuits). A few candidates used proper terminology (ammeter measures current) and organised answers logically.

#### Description of Better Responses

*Better responses* accurately identified electrical components (e.g., resistor, voltmetre, etc.) and described their functions with precision, such as noting a voltmetre measures potential difference or a variable resistor adjusts resistance, etc. These answers stood out for their correct terminology (e.g., rheostat), logical organisation and avoidance of major errors.

**Image of Better Responses**

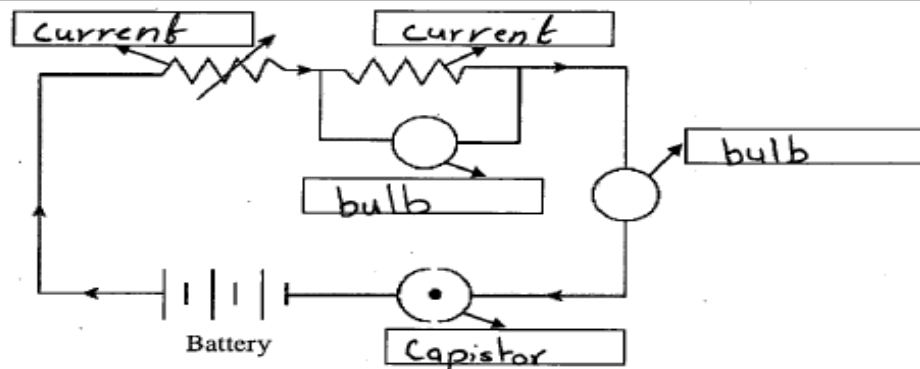


- ① **Switch / key** : This circuit component is responsible for closing the circuit and opening it. This component can be used to allow the flow of current or stop it.
- ② **Ammeter** : Ammeter is used to measure current in a circuit. In the given circuit diagram ammeter measures current and is connected in series with the circuit.
- ③ **Voltmeter** : Voltmeter is used to <sup>measure</sup> voltage or potential difference in a circuit. Voltmeter measures the electrical potential in a circuit. It is always connected in parallel with the circuit.
- ④ **Fixed resistor** : Fixed resistor is a circuit component that provides resistance in the circuit by opposing the flow of current. Fixed resistors have a fixed value of resistance.
- ⑤ **Variable resistor** : It is the circuit component that is responsible for providing resistance. Unlike fixed resistors, variable resistors resistance can be changed and we can allow as much resistance as we want to flow through it based on its limit.

**Description of Weaker Responses**

Weaker responses revealed significant challenges, including incorrect terminology, nonsensical phrasing (e.g., repetitive definitions of a key switch) and conceptual errors (e.g., describing voltage as optical difference). These responses also suffered from incomplete sentences and disorganised structure issues that hid meaning. Candidates demonstrated a lack of foundational knowledge about electrical components, such as the function of resistors or how to measure current. Few responses contained fundamental errors like mislabeled components, nonsensical repetitions (key is a device... etc.) and conceptual confusion (e.g., mixing voltmeters with resistors). Some struggled with basic distinctions between series/parallel configurations.


Image of Weaker Response



ii. Describe any ONE use of the each of the identified electrical component in the given circuit diagram. (4 Marks)

- If we are using solar system at home through solar panel battery get charged and at night time we use battery energy.
- Capistors store energy.
- Bulb glows provide us light with the help of battery.
- The help of current the energy reaches the bulb.

Suggestions for improvement (Highlight all that apply)

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**Any Additional Suggestions:**

- Teachers are encouraged to create matching exercises with labeled diagrams to reinforce correct terms, focusing on spelling and function.
- Have students analyse and rewrite flawed answers using exemplars, emphasising precision and completeness.
- To improve, targeted revision is needed, focusing on accurate device names, core principles (e.g., switches control circuit flow), and structured explanations. Compared to stronger answers, which used precise labels (e.g., variable resistor) and correct measurement methods, these weaker responses highlight the urgency for remedial support in both content and communication skills.
- To bridge this gap, students should priorities precise labeling, concise functional descriptions and avoid fragmented phrasing. Targeted practice with circuit diagrams and terminology drills would significantly improve performance.

## Annexure A: Pedagogies Used for Teaching the SLOs

### Pedagogy: Storyboard

**Description:** A visual pedagogy that uses a series of illustrated panels to present a narrative, encouraging creativity and critical thinking. It helps learners organise ideas, sequence events, and comprehend complex concepts through storytelling.

**Example:** In a Literature class, students are tasked with creating storyboards to visually retell a novel. They draw key scenes, write captions, and present their stories to the class, enhancing their reading comprehension and fostering their imagination.

### Pedagogy: Cause and Effect

**Description:** This pedagogy explores the relationships between actions and consequences. By analysing cause-and-effect relationships, learners develop a deeper understanding of how events are interconnected and how one action can lead to various outcomes.

**Example:** In a History class, students study the causes and effects of the Industrial Revolution. They research and discuss how technological advancements in manufacturing led to significant societal changes, such as urbanisation and labour reform movements.

### Pedagogy: Fish and Bone

**Description:** A method that breaks down complex topics into main ideas (the fish) and supporting details (the bones). This visual approach enhances comprehension by highlighting essential concepts and their relevant explanations.

**Example:** During a Biology class on human anatomy, the teacher uses the fish and bone technique to teach about the human skeletal system. Teacher presents the main components of the human skeleton (fish) and elaborates on each bone's structure and function (bones).

### Pedagogy: Concept Mapping

**Description:** An effective way to visually represent relationships between ideas. Learners create diagrams connecting key concepts, aiding in understanding the overall structure of a subject and fostering retention.

**Example:** In a Psychology assignment, students use concept mapping to explore the various theories of personality. They interlink different theories, such as Freud's psychoanalysis, Jung's analytical psychology, and Bandura's social-cognitive theory, to see how they relate to each other.

### Pedagogy: Audio Visual Resources

**Description:** Incorporating multimedia elements like videos, images, and audio into lessons. This approach caters to different learning styles, making educational content more engaging and memorable.

**Example:** In a General Science class, the teacher uses a documentary-style video to teach about the solar system. The video includes stunning visual animations of the planets, interviews with astronomers, and background music, enhancing students' interest and understanding of space.

### Pedagogy: Think, Pair, and Share

**Description:** A collaborative learning technique where students ponder a question or problem individually, then discuss their thoughts in pairs or small groups before sharing with the entire class. It fosters active participation, communication skills, and diverse perspectives.

**Example:** In a Literature in English class, the teacher poses a thought-provoking question about a novel's moral dilemma. Students first reflect individually, then pair up to exchange their opinions, and finally participate in a lively class discussion to explore different viewpoints.

**Pedagogy: Questioning Technique (Socratic Approach)**

**Description:** Based on Socratic dialogue, this method stimulates critical thinking by posing thought-provoking questions. It encourages learners to explore ideas, justify their reasoning, and discover knowledge through a process of inquiry.

**Example:** In an Ethics class, the instructor uses the Socratic approach to lead a discussion on the meaning of justice. By asking a series of probing questions, the students engage in a deeper exploration of ethical principles and societal values.

**Pedagogy: Practical Demonstration**

**Description:** A hands-on approach where learners observe real-life applications of theories or skills. Practical demonstrations enhance comprehension, skill acquisition, and problem-solving abilities by bridging theoretical concepts with real-world scenarios.

**Example:** In a Food and Nutrition class, the instructor demonstrates the proper technique for filleting a fish. Students observe and then practice the skill themselves, learning the practical application of knife skills and culinary precision.

**(Note:** The examples provided in this annexure serve as illustrations of various pedagogies. It is important to understand that these pedagogies are versatile and can be applied across subjects in numerous ways. Feel free to adapt and explore these techniques creatively to enhance learning outcomes in your specific context.)

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