SNS COLLEGE OF PHYSIOTHERAPY
(Affiliated by the Tamil Nadu Dr. M. G. R. Medical University, Chennai.)
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CASE-BASED LEARNING GAMES

ELECTROMAGNETISM AND RADIATION PHYSICS

COURSE TITLE

Electromagnetism & Radiation Physics (Electrotherapy Foundations)

CLASS DETAILS

Total number of students: 100

Group division: 10 groups × 10 students each

TEAM ROLES (Rotate for Each Puzzle)

Team Leader

Recorder

Timekeeper

Presenter

Physics Analyst – 2 students

Clinical Integrator – 2 students

Safety Officer – 2 students

GENERAL RULES FOR ALL PUZZLES

Time allotted per puzzle: **20 minutes**

15 minutes: Group discussion

5 minutes: Reporting

Only **provided materials** (diagrams, case sheets, radiation charts) may be used

All students must actively participate

Each team presents a **2-minute explanation** after solving the puzzle

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SCORING RUBRIC (10 MARKS PER PUZZLE)

Correct identification of principle/law – **3 marks**

Logical reasoning and justification – **3 marks**

Clinical or practical application – **2 marks**

Safety considerations – **1 mark**

Teamwork and clarity – **1 mark**

Total marks per team (10 puzzles): 100 marks

PUZZLE SET

(Aligned with **Bloom's Taxonomy: Apply – Analyze – Evaluate – Create**)

ELECTRIC CURRENT & MAGNETISM

PUZZLE 1: THE NON-HEATING MACHINE (Apply)

Clinical Scenario:
A short-wave diathermy unit switches ON but does not produce therapeutic heating.

Clues Provided:

Current is flowing

No magnetic field detected

Tasks:

Identify the missing physical principle

Explain the effect of electric current producing magnetism

Suggest corrective measures

PUZZLE 2: THE DEFLECTED NEEDLE (Analyze)

Clinical Scenario:
During equipment testing, a compass needle deflects near a current-carrying wire.

Clues Provided:

Direction of current is reversed

Needle deflection also reverses

Tasks:

Explain the phenomenon

Identify the magnetic field direction

Relate to clinical electrotherapy equipment

ELECTROMAGNETIC INDUCTION

PUZZLE 3: THE INDUCED CURRENT (Apply)

Clinical Scenario:
A physiotherapy unit generates current without direct electrical contact.

Clues Provided:

Coil and changing magnetic field

No electrode contact

Tasks:

Identify the principle involved

Explain electromagnetic induction

Give one clinical application

PUZZLE 4: THE STRONGER OUTPUT (Analyze)

Clinical Scenario:
Increasing the speed of magnetic field change increases output current.

Clues Provided:

Increased rate of change

Larger induced current

Tasks:

Identify the governing law

Analyze the relationship between field change and induced EMF

Explain its importance in electrotherapy

CONDENSERS (CAPACITORS) & INDUCTANCE

PUZZLE 5: THE STORED ENERGY (Analyze)

Clinical Scenario:
After switching OFF a machine, mild current discharge is felt.

Clues Provided:

Plates separated by insulating material

Tasks:

Identify the component

Explain charge storage

State safety precautions

PUZZLE 6: THE RESISTED CHANGE (Evaluate)

Clinical Scenario:
A circuit resists sudden change in current flow.

Clues Provided:

Coil present

Delayed current rise

Tasks:

Identify inductance

Explain its effect on current

Clinical significance

RADIATION PHYSICS

PUZZLE 7: THE DISTANCE EFFECT (Apply)

Clinical Scenario:
Moving a lamp farther from the patient reduces therapeutic intensity.

Clues Provided:

Same power output

Increased distance

Tasks:

Identify the radiation law

Explain the intensity change

Clinical implication

PUZZLE 8: THE HEATING PATTERN (Analyze)

Clinical Scenario:
Different tissues absorb radiation differently.

Clues Provided:

Dark vs light surfaces

Varying absorption

Tasks:

Identify the radiation law

Analyze tissue absorption

Modify treatment approach

PUZZLE 9: THE SAFE THERAPY (Evaluate)

Clinical Scenario:
A therapist plans radiation treatment for a patient with sensitive skin.

Clues Provided:

Skin reaction history

Tasks:

Evaluate radiation dose

Apply safety principles

Prevent adverse effects

INTEGRATION PUZZLE

PUZZLE 10: DESIGN A SAFE ELECTROMAGNETIC THERAPY SETUP (Create)

Clinical Scenario:
You are setting up an electrotherapy unit using electromagnetic principles.

Tasks:

Design a safe setup using induction and radiation principles

Label components

Include safety guidelines

REFLECTION ACTIVITY

Each student writes for 5 minutes:
"One electromagnetism or radiation principle I can apply in clinical practice."