Some questions for Breakout Rooms for each of the four Formats
Day 1, Sessions 1 and 2

A. Explaining: application of physics concepts to explain a model, theory, device, design or innovation. Tasks in this format focus on a model, theory, device, design or an innovation

1. Did you choose one type for all students or did you allow them a choice from within your chosen category or from across all categories?
2. Did you provide a list of possible examples from which students could choose?
3. Did you allow students to suggest other examples?
4. How did the students do the research, at home? In class?
5. Was developing a rubric difficult?
6. Any issues with authentication?
7. In the task itself, did you allow your students to use notes?
8. What information did you provide the students about the task?
9. Was the task a written exercise, presented orally or as a poster or powerpoint?
10. Did the task discriminate well across the students?

B. Analysing: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions.

1. Did you use primary or secondary data? What were your sources?
2. How many readings of the dependent variables were provided?
3. How many values of the independent variable were provided?
4. Did you use different data for each student?
5. How did you assess 'identified assumptions or data limitations'?
6. What depth of analysis did you require?
7. What measurement terms did you use?
8. Did your students use Excel to analyse and graph?
9. What did you look for in 'evaluation'?
10. What information did you provide the students about the task?
11. Any issues with authentication?
12. Did the task discriminate well across the students?

C. Applying: problem-solving, applying physics concepts and skills to real-world contexts.
Note: Problem-solving in this context is not mathematical problems, rather question(s) that come from a real-world context, such as which solution is the best option for that context.

1. Which real-world context did you use and what problem was being addressed?
2. Which skills did you assess and how?
3. In what ways did your task differ from questions on the end-of-year exam?
4. What information did you provide the students about the task?
5. Any issues with authentication?
6. Did the task discriminate well across the students?

D. Comparing: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities

1. Which of the three options did you choose for your task? Two solutions, two explanations or two methods and/or findings?
2. What was the subject of your task, that is, the problem, the phenomenon or the practical activities?
3. Did your task also assess the context or background of the subject?
4. What were your criteria for assessing the comparisons?
5. What were your criteria for assessing the evaluations?
6. What information did you provide the students about the task?
7. Any issues with authentication?
8. Did the task discriminate well across the students?

Day 2: Some questions for Breakout Rooms for Session 3: Electrical Generation

In Day 1, the teachers were able to share their experiences of the assessment tasks they had designed and gave to their students.
In Day 2, they may not have begun work on designing the task. The questions below may help explore some of the considerations.

A. Explaining: application of physics concepts to explain a model, theory, device, design or innovation.

1. What are some possible devices or innovations that use electromagnetic induction, (Some examples to suggest if nothing comes forward are: induction cooking, wireless energy transfer, eddy current brakes, guitar pickups, mechanically powered flashlights, generator, current clamp, graphics tablet, metal detection)
2. Would you offer your students a choice? Or would they all do the same device?
3. Can you select devices with comparable challenge?
4. How would the students do their research, at home? In class?
5. What resources would you provide the students?
6. In the task itself, would you allow your students to use notes?
7. Would you consider asking to students to present orally or as a poster or powerpoint?

B. Analysing: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions.

There are not many quantitative experiments in EMI at school level, but some experimental situations for which data can be supplied are:

- How does line resistance affect power losses in a transmission systems,
- Effect of load resistance on transformer efficiency (PDF) Experimental analysis of transformer efficiency in relation to load resistance (researchgate.net) Load data of a single-phase transformer [11]. | Download Scientific Diagram (researchgate.net)
- effect of the ratio of coils between the primary and secondary coil and the output voltage

1. Plotting of data: do the students start with:
   a. A blank sheet of graph paper,
   b. Labelled axes,
   c. Labelled axes and some data, or
   d. Labelled axes, some data and some uncertainty bars?
2. Would you provide data with gaps in the range of dep and indep variables?
3. 'Identified assumptions' and 'data limitations', what do these mean in the context of this experiment?
4. What depth of analysis would you expect?
5. Would you consider your students using Excel?
6. Evaluation of data: is this different from Identified assumptions' and 'data limitations'?
7. Students are expected to use measurement terms extensively such as accuracy, precision, resolution, repeatability, reproducibility, random and systematic errors, validity, outliers, uncertainty and contradictory/provisional/incomplete data. How can this be done in an assessment task?

   One option is multiple choice questions or questions to match meanings and words. An alternative is to have an opening instruction to the students that their answers on this assessment task must use at least five of these terms.

   Are there other ways of testing understanding of these terms?

Day 2: Some questions for Breakout Rooms for Session 3: Electrical Generation

In Day 1, the teachers were able to share their experiences of the assessment tasks they had designed and gave to their students.

In Day 2, they may not have begun work on designing the task. The questions below may help explore some of the considerations.

C. Applying: problem-solving, applying physics concepts and skills to real-world contexts.
Note: Problem-solving in this context is not mathematical problems, rather question(s) that come from a real-world context, such as which solution is the best option for that context.

1. What real-world contexts are suggested in this Area of Study? (One example is Power transmission AC or DC?, are there others?)
2. Which skills could you assess in this task? Interpretation of data, communication skills?
3. What background information could you provide to the students? Sources?
4. How would you make this task different from questions on the end-of-year exam?

D. Comparing: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.
One possibility is the two solutions for power transmission of AC and DC. Are there other examples in the three options?

1. Some features of each solution that could be examined are:
    a. Description in some detail on how each works,
    b. Benefits and problems of each solution,
    c. What are other aspects that could be looked at?
    d. Suggest using a table, see below.
2. Would you provide additional reading material? Sources?
3. What criteria would you use for assessing 'comparing'?
4. What aspect of the two explanations could be used to evaluate them?
5. What criteria would you use for assessing 'evaluating'?

Aspect being compared	Solution 1	Solution 2

Day 2: Session 4
Some questions for Breakout Rooms for Analysing of Units 4 AoS 1

In Session 4 of Day 2 on Unit 4 AoS 1 teachers may not have begun work on designing the task. The questions below may help explore some of the considerations.

B. Analysing: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions.

1. The PE Effect Experiment is an obvious source of data. Is there another option in this AoS?
2. Source of data: would you use the students' data or constructed data?
3. Which of the following information on the data would you provide:
    a. Few readings of the dependent variable for each of several values of the independent variable,
    b. Average of the readings of the dependent variable,
    c. Uncertainty of the data values,
    d. Values for uncertainty bars.
4. Plotting of data: do the students start with:
    a. A blank sheet of graph paper,
    b. Labelled axes,
    c. Labelled axes and some data, or
    d. Labelled axes, some data and some uncertainty bars?
5. Would you use different data sets across the class?
6. Would you provide data with gaps in the range of dep and indep variables?
7. 'Identified assumptions' and 'data limitations', what do these mean in the context of this experiment?
8. What depth of analysis would you expect?
    a. Draw line of best fit, possibly with upper and lower boundaries,
    b. Value of gradient and calculation of Planck's Constant,
    c. Value of intercept and Work Function
    d. Other?
9. Would you consider your students using Excel?
10. Evaluation of data: is this different from Identified assumptions' and 'data limitations'?
11. Students are expected to use measurement terms extensively such as accuracy, precision, resolution, repeatability, reproducibility, random and systematic errors, validity, outliers, uncertainty and contradictory/provisional/incomplete data. How can this be done in an assessment task?

    One option is multiple choice questions or questions to match meanings and words. An alternative is to have an opening instruction to the students that their answers on this assessment task must use at least five of these terms.

    Are there other ways of testing understanding of these terms?

Day 2: Session 4
Some questions for Breakout Rooms for Comparing of Units 4 AoS 1

In Session 4 of Day 2 on Unit 4 AoS 1 teachers may not have begun work on designing the task. The questions below may help explore some of the considerations.

D. Comparing: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.

1. To select to compare and evaluate ' 2 explanations of a physics phenomenon or concept' rather than the other alternatives is an obvious choice with the Particle and wave Models of Light. Is there any scope in Units 4 AoS 1 to consider the other approaches of two solutions to a problem or two methods … from practical activities?
2. Some features of each explanation that could be examined are:
    a. Description in some detail,
    b. Experimental evidence: What does it explain, what it doesn't explain?
    c. What are other aspects that could be looked at?
    d. Suggest using a table, see below
3. Would you provide additional reading material?
4. What criteria would you use for assessing 'comparing'?
5. What aspect of the two explanations could be used to evaluate them?
6. What criteria would you use for assessing 'evaluating'?

Aspect being compared	Explanation 1	Explanation 2