B15 · Extra practice

Worked solutions | Items 1-2

Extra practice for this lesson. Original questions, not released diploma items. Select one option for multiple choice; other tasks state the required response.

Use the givens and conditions in each prompt. Enter the requested count, coefficient, oxidation number or potential with the stated unit and precision.

B15-D01 · Numerical response

A given result for iron and copper is predicted 0.79 V, measured 0.76 V. What is the difference, in volts to two decimal places?

1. Difference = 0.79 − 0.76 = 0.03 V.

2. Subtract the measured value from the predicted value.

B15-D02 · Numerical response

Four cells of 1.07 V are joined in a row. What is the battery voltage, in volts to two decimal places?

1. The voltages add: 4 × 1.07 = 4.28 V.

2. Multiply by the number of cells in the row.

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Worked solutions | Items 3-4

B15-D03 · Multiple choice

Which column of a results table holds observations?

A. The measured voltage
B. The predicted voltage
C. The table value
D. The controlled variables

1. Measured values come from the experiment, so they are observations.

2. Observations are measured or seen.

B15-D04 · Multiple choice

All measured voltages are 0.03 V below the predictions and the order matches. Which conclusion is best?

A. The data disprove the table
B. The data support the table with a small gap
C. The table is useless
D. The measurements are exactly right

1. The order and the size agree closely, so the data support the table. A small gap is expected from real equipment.

2. Look at the order and the size of the differences.

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Worked solutions | Items 5-6

B15-D05 · Select all that apply

Select every possible explanation for a small constant gap below the predicted voltage.

A. The salt bridge adds resistance
B. The strips have an oxide coating
C. The concentration is not exactly 1.0 mol/L
D. The table values are exact for all conditions

1. Resistance, oxide and concentration errors can all lower the voltage. The table values apply only at standard conditions.

2. Think about the equipment and the solutions.

B15-D06 · Multiple choice

How could you test whether oxide coatings caused part of a gap?

A. Sand the strips and measure again
B. Use a bigger strip
C. Change the metal
D. Remove the voltmeter

1. Changing only the surface condition and measuring again tests the oxide explanation.

2. Change one thing at a time.

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Worked solutions | Items 7-8

B15-D07 · Multiple choice

Which is an inference?

A. The zinc strip lost mass
B. The copper strip gained a reddish-brown coating
C. Zn^{2+} ions formed in the solution
D. The voltmeter read 1.07 V

1. Zinc ions are colourless, so we infer them from the mass loss. The other statements are observations.

2. Ask whether you could see it.

B15-D08 · Multiple choice

A student writes that the data prove the cause is the salt bridge. What is the best correction?

A. It is a possible cause until it is tested
B. It is certainly the cause
C. Salt bridges never matter
D. Remove the data

1. A cause is possible until a test that changes one thing supports it.

2. Only a test shows a cause.

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Worked solutions | Items 9-10

B15-D09 · Select all that apply

Select every part of a complete conclusion.

A. A claim
B. The evidence
C. A possible explanation
D. A guess without evidence

1. A conclusion states the claim, the evidence and a possible explanation. A guess without evidence is not a part.

2. The conclusion must be supported.

B15-D10 · Multiple choice

Why is repeating the trial an improvement to a design with one trial per cell?

A. It shows how much the measurement varies
B. It changes the table values
C. It removes the controls
D. It makes the cell stronger

1. Repeated trials show the variation, and an average is more reliable than one value.

2. One trial cannot show variation.

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Worked solutions | Items 11-12

B15-D11 · Matching

Match each item to its role in battery evaluation.

Items to match:

1. Voltage
2. Mass
3. Recycling
4. Lifetime

Targets:

A. How long the battery runs
B. How much power the cell gives
C. Handling used batteries
D. How heavy the battery is

1. Voltage is the power, mass is the weight, recycling is disposal and lifetime is how long it runs.

2. Each item is a separate piece of evidence.

B15-D12 · Ordering / ranking

Put the analysis steps in order.

First to last

1. Explain the gap with possible causes
2. Put together the table
3. Compare predicted and measured values
4. Write a limitation and an improvement

1. Make the table, compare, explain the gap, then judge the design.

2. Evidence comes before explanation.