B14 · 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.

B14-D01 · Numerical response

Zn^{2+}/Zn is −0.76 V and Cu^{2+}/Cu is +0.34 V. What is the predicted E°cell, in volts to two decimal places?

1. E°cell = 0.34 − (−0.76) = +1.10 V.

2. Cathode value minus anode value.

B14-D02 · Numerical response

Fe^{2+}/Fe is −0.45 V and Cu^{2+}/Cu is +0.34 V. What is the predicted E°cell, in volts to two decimal places?

1. E°cell = 0.34 − (−0.45) = +0.79 V.

2. Iron has the lower value, so it is the anode.

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Worked solutions | Items 3-4

B14-D03 · Multiple choice

In an investigation of how the metal affects cell voltage, which is the dependent variable?

A. The metal
B. The voltage
C. The concentration
D. The salt bridge

1. The voltage is what we measure, so it is the dependent variable.

2. The dependent variable is the one that you measure.

B14-D04 · Multiple choice

A silver half-cell (+0.80 V) is joined to a copper half-cell (+0.34 V). Which statement is correct?

A. Silver is the anode
B. Copper is the anode
C. Both are cathodes
D. Neither electrode changes

1. Silver has the higher value, so it is the cathode and copper is oxidized at the anode.

2. The lower value is oxidized.

B14 · Extra practice

Worked solutions | Items 5-6

B14-D05 · Numerical response

A device needs 5.0 V and each cell gives 1.10 V. How many cells in a row are needed? Enter an integer.

1. The voltage needed divided by one cell is 5.0 ÷ 1.10 = 4.5, so round up to 5 cells.

2. You cannot use part of a cell, so round up.

B14-D06 · Select all that apply

Select every variable that should be controlled when comparing metals joined to copper.

A. The concentration of the solutions
B. The temperature
C. The size of the electrodes
D. The metal being tested

1. The concentration, temperature and electrode size are controlled. The metal is the variable that we change.

2. Controls stay the same in every trial.

B14 · Extra practice

Worked solutions | Items 7-8

B14-D07 · Multiple choice

What does the salt bridge do in the design?

A. It lets ions move to balance charge
B. It supplies electrons
C. It measures the voltage
D. It speeds up the metals

1. Ions move through the salt bridge to balance the charge in each half-cell, which completes the circuit.

2. Recall the job of the salt bridge from B6.

B14-D08 · Select all that apply

Select every correct safe handling step for solutions that contain metal ions.

A. Read the label and safety data sheet
B. Wear goggles, gloves and an apron
C. Collect the waste in a container
D. Pour the waste down the drain

1. Hazard information, protective equipment and a waste container are all part of a safe plan. Metal ions should not go down the drain.

2. Metal ions can harm water life.

B14 · Extra practice

Worked solutions | Items 9-10

B14-D09 · Numerical response

Ni^{2+}/Ni is −0.26 V and Ag^{+}/Ag is +0.80 V. What is E°cell, in volts to two decimal places?

1. E°cell = 0.80 − (−0.26) = +1.06 V. The silver value is not doubled.

2. Cathode value minus anode value.

B14-D10 · Multiple choice

Which statement is a prediction and not an observation?

A. The voltmeter read 1.07 V
B. The zinc strip lost mass
C. The table gives E°cell = +1.10 V
D. The copper strip gained a coating

1. A value from the reduction table is a prediction. The other statements come from measuring or seeing.

2. An observation comes from the experiment.

B14 · Extra practice

Worked solutions | Items 11-12

B14-D11 · Matching

Match each part of the design to its job.

Items to match:

1. Salt bridge
2. Voltmeter
3. Anode label
4. Waste container

Targets:

A. Reads the voltage
B. Marks where oxidation occurs
C. Balances charge
D. Holds metal-ion solutions

1. The salt bridge balances charge, the voltmeter reads the voltage, the anode label marks oxidation and the container holds metal-ion waste.

2. Think about what each part does.

B14-D12 · Ordering / ranking

Put the planning steps in order.

First to last

1. Predict the anode and voltage
2. Write a testable question
3. Plan safe handling and disposal
4. Draw and label the design

1. Start with the question, draw the design, predict, then plan the safe handling before any work starts.

2. The question comes first, then the design and the prediction.