QUIZ 1 SOLUTION + GUIDELINE

SLOT 1

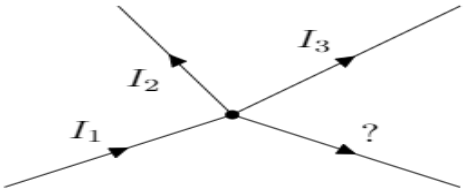
1. Say you have a conductor that has a resistance of **R=10 Ω**. You apply a voltage of **V1=−30 V** on one end and **V2=10 V** on the other end. How much **current** would you observe **from higher voltage end to the lower voltage end**?

   Answers: 4 A
   Reason: I = (V2-V1)/R
   Marking: Correct: 2
   Formula correct, answer wrong: 1
   Formula & answer wrong: 0

2. On the left at point **A**, there's a voltage of **Va=22 V**. And on the right, there's another point **B**. If a charge with **q=−2 C** moves **from point A to point B** and while moving it does a work of **W=10 J**, what's the **voltage** of point **B**?

   Answers: 27 V
   Reason: W = q (Va – Vb) ⟶ Vb = Va - W/q
   Marking: Correct: 2
   Formula correct, answer wrong: 1
   Sign wrong / Va & Vb swapped: 1
   Formula & answer wrong: 0

3. Given that, **I1=12 mA, I2=9 mA, I3=−1 mA**, what is the value of the unknown current (**with ± sign**)? Is it actually **entering** or **exiting** the node (considering the positive value)?



   Answers: 4 mA, exiting.
   Reason: KCL ⟶ I1 = I2 + I3 + I4
   Marking: Both Correct: 2
   One correct, one wrong: 1
   Both wrong: 0

4. An electron has a very tiny charge of about $\mathbf{-1.602\times10^{-19}\ C}$. How many electrons do you need to create $\mathbf{-8.01\ C}$ of charge?

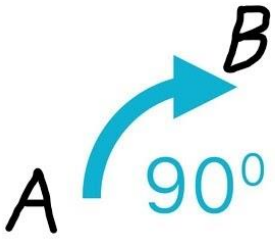
Answers: 5×10^{19}

Reason: n = q/e

Marking: Correct: 2

Wrong: 0

5. On the circumference of a circle, a charge with **q=−5 C** is released at some point **A**, there's a voltage of **Va= −22 V** at point **A**. Then the charge travels **90 degrees** along the circumference and arrives at point B where the voltage is **Vb= −7 V**. The voltage at the center of the circle is **Vo= − 1 V** and the radius of the circle is **10 cm**. how much **work** did the charge do by going **from point A to point B**?



Answers: 75 V

Reason: $W = q\,(V_a - V_b)$

Marking: Correct: 2

Formula correct, answer wrong: 1

Sign wrong / Va & Vb swapped: 1

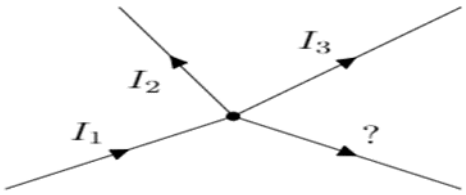
Formula & answer wrong: 0

SLOT 2

1. Say, you have a conductor. When you apply a voltage difference of **ΔV=10.5 V**, you observe a current of **I=4.5 mA**. What will be the **resistance** of that conductor? (**In Ohms**)
   Answers: 2333.33 Ohms.
   Reason: R = ΔV/I
   Marking: Correct: 2
   Formula correct, answer wrong: 1
   Unit wrong (e.g.: Ohm instead of kOhm): 1
   Formula & answer wrong: 0

2. On the left at point **A**, there's a voltage of **Va=22 V**. And on the right, there's another point **B** with voltage **Vb=27 V.** If a Charge **q** moves **from point A to point B** and while moving it does a work of **W=10 J**, what's the **value** of **q**? (**In Coulombs**)
   Answers: -2 Coulombs
   Reason: W = q (Va – Vb) ⟶ q = W/(Va – Vb)
   Marking: Correct: 2
   Formula correct, answer wrong: 1
   Sign wrong / Va & Vb swapped: 1
   Formula & answer wrong: 0

3. Given that, **I1=17 mA, I2=11 mA, I3=−7 mA**, what is the value of the unknown current (**with ± sign**)? Is it actually **entering** or **exiting** the node (considering the positive value)?



   Answers: 13 mA, exiting.
   Reason: KCL ⟶ I1 = I2 + I3 + I4
   Marking: Both Correct: 2
   One correct, one wrong: 1
   Both wrong: 0

4. An electron has a very tiny charge of about $\mathbf{-1.602\times10^{-19}\ C}$. How many electrons do you need to create **−24.03 C** of charge?

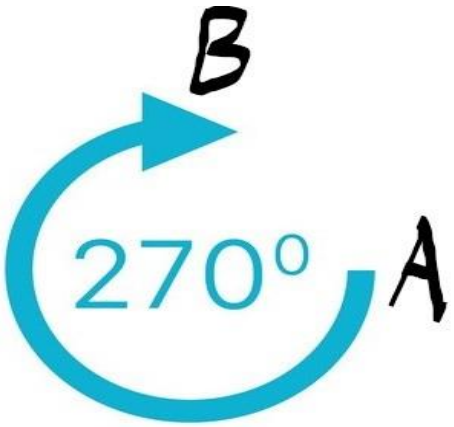
Answers: 15×10^{19}

Reason: n = q/e

Marking: Correct: 2

Wrong: 0

5. On the circumference of a circle, a charge with **q=−5 C** is released at some point **A**, there's a voltage of **Va= −22 V** at point **A**. Then the charge travels **270 degrees** along the circumference and arrives at point B where the voltage is **Vb= −17 V**. The voltage at the center of the circle is **Vo= − 3 V** and the radius of the circle is **15 cm**. How much **work** did the charge do by going **from point A to point B**?



Answers: 25 V

Reason: W = q (Va – Vb)

Marking: Correct: 2

Formula correct, answer wrong: 1

Sign wrong / Va & Vb swapped: 1

Formula & answer wrong: 0