

1. What does radioactivity reveal about the nature of the atom?

1. Not all isotopes of an atom possess the same nuclear properties.
2. Gamma rays are released by electrons.
3. Beta rays are emitted by the decomposition of unstable neutrons.
4. Very little energy is stored in the atomic nucleus.

A) 1 and 2
C) 1 and 3

B) 2 and 3
D) 2 and 4

2. Thomson is credited with the discovery of the electron. Which of the following can be explained partly as a result of Thomson's model?

1. The continuous model of matter.
2. The ionization of atoms.
3. Electrical phenomena.
4. The nature of light.
5. Chemical changes.

A) 1, 2 and 3
C) 2, 3 and 5

B) 3, 4 and 5
D) 1, 2 and 4

3. Which of the following is TRUE?

- A) Among second period elements, lithium has the highest electronegativity.
B) Radium's numerous shells raise its electronegativity.
C) Beryllium's two valence electrons are responsible for its high electronegativity.
D) Oxygen's high electronegativity is due to its "appetite" for electrons.

4. What electrical quantity measures the amount of energy dissipated per coulomb of charge?

- A) current
B) conductivity
C) resistance
D) voltage

5. **Why does Hydro Quebec use either 735 kV or 315 kV power lines to transport energy from James Bay?**
- A) Electrical energy will be available more rapidly for distribution.
B) High power lines reduce the amount of energy converted to heat.
C) This maximizes the current delivered to its customers.
D) The tension of the lines is proportional to the power generated.
6. **What is the power of a blow dryer that consumes 1125 kJ in 15 minutes?**
- A) 75 W
B) 1125 W
C) 1250 W
D) 4500 W
7. Through an amplifier of a certain stereo system, 3.75×10^{21} electrons flow every 5 minutes. (Note: 1 C is simply the charge of 6.24×10^{18} electrons)

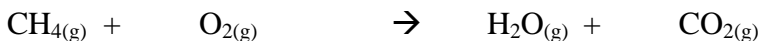
What current flows through this amplifier?

- A) 0.008 A
B) 0.5 A
C) 2 A
D) 120 A

8. **What is the charge of the polyatomic ion HSO_4 in $\text{Al}(\text{HSO}_4)_3$?**

- A) +3
B) -3
C) -1
D) +4

9. Given the following unbalanced equation:



What minimum number of moles of oxygen gas are needed to completely burn 50 kg of methane, $\text{CH}_{4(g)}$?

- A) 6.25 mol O_2
B) 1.99×10^2 mol O_2
C) 3.12×10^3 mol O_2
D) 6.25×10^3 mol O_2

10. **What is the molar concentration of hydroxide in a sulphuric acid solution with a pH of 3?**

- A) 1×10^{-3} mol/L
- B) 2×10^{-3} mol/L
- C) 1×10^{-11} mol/L
- D) 5×10^{-12} mol/L

Part B Show all work

11. You need to prepare 150 ml of a 0.02 mol/L solution of HNO_3 . But all you have is 50.0 ml of a 0.378% (mass of solute/volume of solution) HNO_3 solution.

What would you do? (Show all calculations)

12. Zinc has the following isotope breakdown:

${}_{30}^{64}\text{Zn}$ 48.89%

${}_{30}^{66}\text{Zn}$ 27.81%

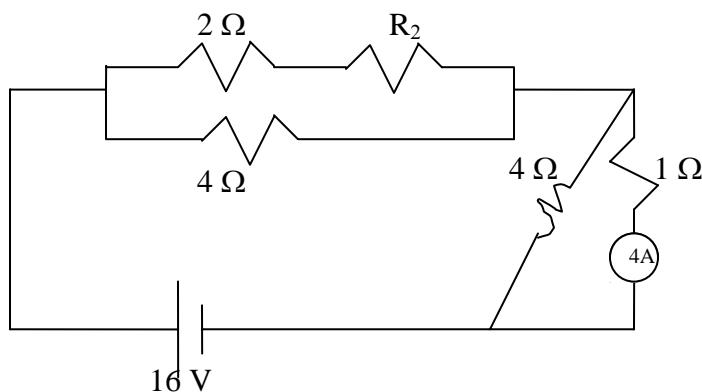
${}_{30}^{67}\text{Zn}$ 4.11%

${}_{30}^{68}\text{Zn}$ 18.57%

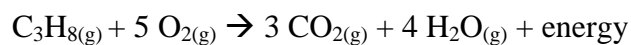
${}_{30}^{70}\text{Zn}$ 0.62%

What is zinc's average atomic mass?

13. Find the value of R_2 in the circuit shown.



14. A certain 3000 W electric heater takes in water at $12\text{ }^\circ\text{C}$ and heats it to $60\text{ }^\circ\text{C}$. If by the time you complete your 15 minute shower, the water is back down to $12\text{ }^\circ\text{C}$, **what volume of water have you used up in that time interval?**
15. Propane burns according to the following equation:



What mass of gases will be produced for every 10^{23} molecules of oxygen that react?