

Brainiacs Chemistry Olympiad Preliminary Round Sample Exam Paper 3

Category I – grades 7 and 8

Q1.

Which element is classified as a noble gas?

- A) Oxygen
- B) Argon**
- C) Nitrogen
- D) Hydrogen

Q2.

Which of the following metals reacts with cold water to produce hydrogen gas?

- A) Copper
- B) Sodium**
- C) Aluminum
- D) Zinc

Q3.

Which process involves the change of a solid directly to a gas?

- A) Evaporation
- B) Sublimation**
- C) Condensation
- D) Melting

Q4.

The chemical formula for baking soda is:

- A) NaCl
- B) Na₂CO₃
- C) NaHCO₃**
- D) CaCO₃

Q5.

What type of chemical reaction is represented by $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$?

- A) Decomposition
- B) Synthesis**
- C) Combustion
- D) Single Displacement

Q6.

Which one of the following is not a greenhouse gas?

- A) CO_2
- B) CH_4
- C) O_2
- D) N_2O

Q7.

Which of the following statements about allotropes of carbon is true?

- A) Graphite is harder than diamond
- B) Diamond conducts electricity
- C) Fullerenes are made of carbon atoms
- D) Graphite has a tetrahedral structure

Q8.

What is the empirical formula of a compound containing 40% sulfur and 60% oxygen by mass?

- A) SO
- B) SO_2
- C) S_2O_3
- D) SO_3

Q9.

How many grams are there in 2.5 moles of NaOH ?

- A) 100g
- B) 200g
- C) 150g
- D) 250g

Q10.

In a special container two moles of O_2 as is found at STP. How many liter volume does it occupies?

- A) 22,4L
- B) 44,8L
- C) 33,6L
- D) 5,6L

Q11.

Which one of 16 grams of the following compounds has the largest volume at STP?

- A) O_2
- B) SO_2
- C) CO_2
- D) CH_4

Q12.

At STP 5.6 L of XO_2 gas has a mass of 11 g. Find the molar mass of X.

- A) 32g/mol
- B) 3g/mol
- C) 44g/mol
- D) 64g/mol

Q13.

Which of the following is a non-renewable resource?

- A) Solar energy
- B) Wind energy
- C) Coal
- D) Hydropower

Q14.

Which of the following statements best describes why ionic compounds conduct electricity when dissolved in water?

- A) They are non-polar
- B) They dissociate into ions
- C) Water reduces their melting point
- D) They contain delocalized electrons

Q15.

What is the volume of 1.204×10^{22} CO_2 molecules, in mL at STP?

- A) 0.448mL
- B) 4.48mL
- C) 44.8mL
- D) 448 mL

Q16.

What volume of carbon dioxide gas at STP will be released when 15 g of sodium carbonate containing 15% impurities is treated with an excess of hydrochloric acid?

- A) 5,56L
- B) 3,36L
- C) 4,39L
- D) 2,69L

Q17.

A chemical element consists of two isotopes. The nucleus of the first isotope contains 10 protons and 10 neutrons. The nucleus of the second isotope has 2 more neutrons than the first isotope. The ratio of lighter to heavier isotope atoms is 9:1. Calculate the average atomic mass of the element.

- A) 32,3
- B) 16,5
- C) 20,2
- D) 17,4

Q18.

When 10 g of a metal reacts with an acid solution, 4 liters of hydrogen gas at STP is released. Determine the metal.

- A) Cd
- B) Kr
- C) Fe
- D) Si

Q19.

When 4.5 grams of aluminum reacts with 33,6 liters of oxygen at STP to form aluminum oxide, what is the mass of aluminum oxide produced? (Al = 27, O = 16)

- A) 8.5 g
- B) 17 g
- C) 22.5 g
- D) 34 g

Q20.

Calculate the number of nitrogen atoms in 100 g of ammonium carbonate containing 10% non-nitrogen impurities.

A) $1,13 \times 10^{24}$

B) $3,01 \times 10^{23}$

C) $6,02 \times 10^{24}$

D) $2,24 \times 10^{23}$