

Answer Key

Testname: TEST 1

Version A

- 1) C
- 2) D
- 3) C
- 4) C
- 5) A
- 6) C
- 7) A
- 8) E
- 9) C
- 10) B
- 11) C
- 12) A
- 13) A
- 14) E
- 15) D
- 16) A
- 17) A
- 18) B
- 19) E
- 20) D
- 21) E
- 22) E
- 23) C
- 24) B

Answer Key

Testname: TEST 1

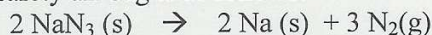
Version B

- 1) E
- 2) B
- 3) A
- 4) E
- 5) B
- 6) B
- 7) B
- 8) D
- 9) D
- 10) E
- 11) C
- 12) C
- 13) B
- 14) E
- 15) E
- 16) A
- 17) C
- 18) A
- 19) C
- 20) A
- 21) E
- 22) C
- 23) D
- 24) D

Version A

1. ATTEMPT ANY ONE OF THE FOLLOWING TWO PROBLEMS

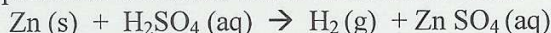
The reaction in a safety air bag is as follows:



If the airbag has a volume of 36 L and is to be filled with nitrogen gas at a pressure of 1.15 atm at a temperature of 26.0 °C., how many grams of NaN₃ needs to be decomposed?

Or

Hydrogen gas is produced when zinc reacts with sulfuric acid:



If 159 mL of wet H₂ is collected over water 24.0°C and a barometric pressure of 738 torr, how many grams of Zn have been consumed.

Answer:

a.

PV=nRT

$$n = \frac{PV}{RT} = \frac{(1.15 \text{ atm})(36 \text{ L})}{(0.0821 \text{ L-atm/mol-K})(299 \text{ K})}$$

$$= 1.69 \text{ mol N}_2$$

$$(1.68 \text{ mol N}_2) \left(\frac{2 \text{ mol NaN}_3}{3 \text{ mol N}_2} \right) \left(\frac{65 \text{ g NaN}_3}{1 \text{ mol NaN}_3} \right) = 73.08 \text{ g NaN}_3$$

$$= 73 \text{ g with correct sig figs}$$

b.

PV=nRT

P has to take into consideration the fact that it has water vapor in it.

$$P = 738 - 22.38 \text{ torr (partial pressure of water at } 24^\circ\text{C)}$$

$$= 715.62 \text{ torr} \times \frac{1 \text{ atm}}{760 \text{ torr}} = 0.9416 \text{ atm}$$

$$n = \frac{PV}{RT} = \frac{(0.9416 \text{ atm})(0.159 \text{ L})}{(0.0821 \text{ L-atm/mol-K})(297 \text{ K})}$$

$$= 0.006140 \text{ mol H}_2$$

$$(0.006136 \text{ mol H}_2) \left(\frac{\text{mol Zn}}{\text{mol H}_2} \right) \left(\frac{65.39 \text{ g Zn}}{1 \text{ mol Zn}} \right) = 0.401 \text{ g Zn}$$

formula
1 point

4 points

4 points
1 point for correct sig figs

1 point

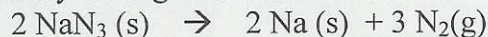
4 point

4 point
1 point for correct sig figs

Version b

1. ATTEMPT ANY ONE OF THE FOLLOWING TWO PROBLEMS

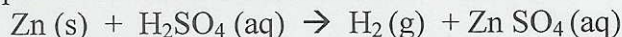
The reaction in a safety air bag is as follows:



If the airbag has a volume of 40 L and is to be filled with nitrogen gas at a pressure of 1.15 atm at a temperature of 26.0 °C., how many grams of NaN₃ needs to be decomposed?

Or

Hydrogen gas is produced when zinc reacts with sulfuric acid:



If 169 mL of wet H₂ is collected over water 24.0°C and a barometric pressure of 738 torr, how many grams of Zn have been consumed.

Answer:

a.

$$PV=nRT$$

$$n = \frac{PV}{RT} = \frac{(1.15 \text{ atm})(40 \text{ L})}{(0.0821 \text{ L-atm/mol-K})(299 \text{ K})}$$

$$= 1.874 \text{ mol N}_2$$

$$(1.873 \text{ mol N}_2) \left(\frac{2 \text{ mol NaN}_3}{3 \text{ mol N}_2} \right) \left(\frac{65 \text{ g NaN}_3}{1 \text{ mol NaN}_3} \right) = 81.20 \text{ g NaN}_3$$

$$= 80 \text{ g with correct significant figures.}$$

b.

$$PV=nRT$$

P has to take into consideration the fact that it has water vapor in it.

$$P = 738 - 22.35 \text{ torr (partial pressure of water at } 24^\circ\text{C)}$$

$$= 715.65 \text{ torr} \times \frac{1 \text{ atm}}{760 \text{ torr}} = 0.9416 \text{ atm}$$

$$n = \frac{PV}{RT} = \frac{(0.9416 \text{ atm})(0.169 \text{ L})}{(0.0821 \text{ L-atm/mol-K})(297 \text{ K})}$$

$$= 0.006526 \text{ mol H}_2$$

$$(0.006526 \text{ mol H}_2) \left(\frac{\text{mol Zn}}{\text{mol H}_2} \right) \left(\frac{65.39 \text{ g Zn}}{1 \text{ mol Zn}} \right) = 0.426 \text{ g Zn}$$

← formula 1 point

← 1 point

← 4 points
+ 1 for correct sig fig

← 1 point

← 4 points

← 4 points
+ 1 for sig fig

YOU MUST ATTEMPT THIS PROBLEM

2. The fluorocarbon compound $C_2Cl_3F_3$ has a normal boiling point of $47.6^\circ C$. The specific heat of $C_2Cl_3F_3$ (l) and $C_2Cl_3F_3$ (g) are $0.91 J/g K$ and $0.67 J/g K$ respectively. The heat of vaporization for the compound is $27.49 kJ/mol$. Calculate the heat required to convert $25.0 g$ of $C_2Cl_3F_3$ from a liquid AT $5.00^\circ C$ to a gas at $82.00^\circ C$.

Molecular mass = 187.4 ← one point

$$25 g \times \frac{1 \text{ mole}}{187.4 g} = 0.1334 \text{ mol}$$

$$Q_1 = mc\Delta T = 25 g \times 0.91 \frac{J}{gK} \times 42.6 K$$
$$= 969 J = .969 kJ$$
] 2 point

$$Q_2 = \text{mass in moles} \times \text{heat of vaporization}$$
$$= 0.1334 \text{ moles} \times 27.49 \frac{kJ}{mol}$$
$$= 3.667 kJ$$
] 2 point

$$Q_3 = 25 g \times 0.67 \frac{J}{g} \times 34.4 K$$
$$= 576 J = 0.576 kJ$$
] 2 point

$$Q = Q_1 + Q_2 + Q_3 = 5.21 kJ$$

← 2 points for answer
+ 1 point for calculation