

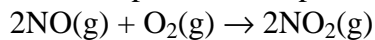
Study Guide 2

Student: _____

1. A sample of a gas occupies 1.40×10^3 mL at 25°C and 760 mmHg. What volume will it occupy at the same temperature and 380 mmHg?
 - A. 2,800 mL
 - B. 2,100 mL
 - C. 1,400 mL
 - D. 1,050 mL
 - E. 700 mL
2. If 30.0 L of oxygen are cooled from 200°C to 1°C at constant pressure, what is the new volume of oxygen?
 - A. 0.150 L
 - B. 17.4 L
 - C. 23.0 L
 - D. 51.8 L
 - E. 6.00×10^3 L
3. If the pressure of a gas sample is quadrupled and the absolute temperature is doubled, by what factor does the volume of the sample change?
 - A. 8
 - B. 2
 - C. $1/2$
 - D. $1/4$
 - E. $1/8$
4. A small bubble rises from the bottom of a lake, where the temperature and pressure are 4°C and 3.0 atm, to the water's surface, where the temperature is 25°C and the pressure is 0.95 atm. Calculate the final volume of the bubble if its initial volume was 2.1 mL.
 - A. 0.72 mL
 - B. 6.2 mL
 - C. 41.4 mL
 - D. 22.4 mL
 - E. 7.1 mL

5. 0.820 mole of hydrogen gas has a volume of 2.00 L at a certain temperature and pressure. What is the volume of 0.125 mol of this gas at the same temperature and pressure?
- A. 0.0512 L
 - B. 0.250 L
 - C. 0.305 L
 - D. 4.01 L
 - E. 19.5 L
6. Calculate the volume occupied by 35.2 g of methane gas (CH_4) at 25°C and 1.0 atm. $R = 0.0821 \text{ L} \cdot \text{atm}/\text{K} \cdot \text{mol}$.
- A. 0.0186 L
 - B. 4.5 L
 - C. 11.2 L
 - D. 49.2 L
 - E. 53.7 L
7. Gases are sold in large cylinders for laboratory use. What pressure, in atmospheres, will be exerted by 2,500 g of oxygen gas (O_2) when stored at 22°C in a 40.0 L cylinder?
- A. 3.55 atm
 - B. 1,510 atm
 - C. 47.3 atm
 - D. 7.56×10^4 atm
 - E. 10.2 atm
8. Determine the molar mass of chloroform gas if a sample weighing 0.389 g is collected in a flask with a volume of 102 cm^3 at 97°C . The pressure of the chloroform is 728 mmHg.
- A. 187 g/mol
 - B. 121 g/mol
 - C. 112 g/mol
 - D. 31.6 g/mol
 - E. 8.28×10^{-3} g/mol

9. What volume of oxygen gas at 320 K and 680 torr will react completely with 2.50 L of NO gas at the same temperature and pressure?



- A. 1.25 L
- B. 2.50 L
- C. 3.00 L
- D. 1.00 L
- E. 5.00 L

10. What volume of CO₂ gas at 645 torr and 800 K could be produced by the reaction of 45 g of CaCO₃ according to the equation?



- A. 0.449 L
- B. 22.4 L
- C. 25.0 L
- D. 34.8 L
- E. 45.7 mL

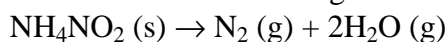
11. How many liters of oxygen gas at 153°C and 0.820 atm can be produced by the decomposition of 22.4 g of solid KClO₃? (The other decomposition product is solid potassium chloride.)

- A. 3.0 L
- B. 0.085 L
- C. 4.20 L
- D. 7.79 L
- E. 11.7 L

12. How many grams of N₂O, nitrous oxide, are contained in 500. mL of the gas at STP?

13. Calculate the molar mass of a gaseous substance if 0.125 g of the gas occupies 93.3 mL at STP.

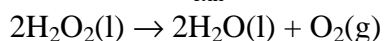
14. Ammonium nitrite undergoes decomposition to produce only gases as shown below.



How many liters of gas will be produced by the decomposition of 32.0 g of NH₄NO₂ at 525°C and 1.5 atm?

- 15.
- A.
 - B.
 - C.
 - D.
16. Calculate the amount of heat necessary to raise the temperature of 12.0 g of water from 15.4°C to 93.0°C. The specific heat of water = 4.18 J/g·°C.
- A. 0.027 J
 - B. 324 J
 - C. 389 J
 - D. 931 J
 - E. 3,890 J
17. If 325 g of water at 4.2°C absorbs 12.28 kJ, what is the final temperature of the water? The specific heat of water is 4.184 J/g·°C.
- A. 4.21°C
 - B. 4.8°C
 - C. 9.0°C
 - D. 13.2°C
 - E. 2,938°C
18. Glycine, C₂H₅O₂N, is important for biological energy. The combustion reaction of glycine is given by the equation
- $$4\text{C}_2\text{H}_5\text{O}_2\text{N}(\text{s}) + 9\text{O}_2(\text{g}) \rightarrow 8\text{CO}_2(\text{g}) + 10\text{H}_2\text{O}(\text{l}) + 2\text{N}_2(\text{g}) \quad \Delta H^\circ_{\text{rxn}} = -3857 \text{ kJ.}$$
- Given that $\Delta H^\circ_f[\text{CO}_2(\text{g})] = -393.5 \text{ kJ/mol}$ and $\Delta H^\circ_f[\text{H}_2\text{O}(\text{l})] = -285.8 \text{ kJ/mol}$, calculate the enthalpy of formation of glycine.
- A. -537.2 kJ/mol
 - B. -268.2 kJ/mol
 - C. 2,149 kJ/mol
 - D. -3,178 kJ/mol
 - E. -964 kJ/mol

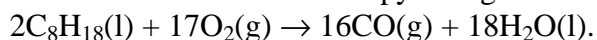
19. Calculate $\Delta H^\circ_{\text{rxn}}$ for the following reaction.



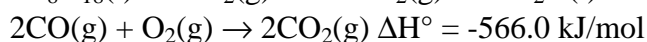
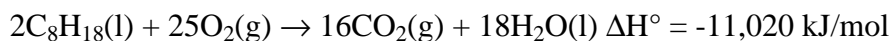
given that $\Delta H^\circ_{\text{f}}[\text{H}_2\text{O}(\text{l})] = -285.8 \text{ kJ/mol}$ and $\Delta H^\circ_{\text{f}}[\text{H}_2\text{O}_2(\text{l})] = -87.6 \text{ kJ/mol}$.

- A. 53.0 kJ/mol
- B. 98.2 kJ/mol
- C. -98.2 kJ/mol
- D. 196.4 kJ/mol
- E. -396.4 kJ/mol

20. Calculate the standard enthalpy change for the reaction



Given:



- A. 10,450 kJ/mol
- B. 6,492 kJ/mol
- C. 15,550 kJ/mol
- D. -6,492 kJ/mol
- E. -10.450 kJ/mol

21. For the reaction $\text{C}(\text{graphite}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$, $\Delta H^\circ = -393 \text{ kJ/mol}$.

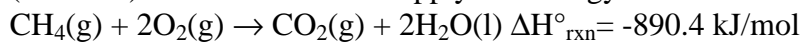
How many grams of C(graphite) must be burned to release 275 kJ of heat?

- A. 22.3 g
- B. 0.70 g
- C. 12.0 g
- D. 17.1 g
- E. 8.40 g

22.

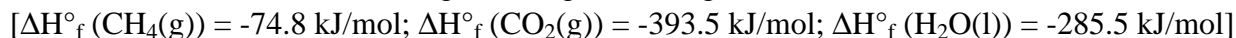
- A.
- B.
- C.
- D.

23. An average home in Colorado requires 20. GJ of heat per month. How many grams of natural gas (methane) must be burned to supply this energy?



- A. $1.4 \times 10^3 \text{ g}$
B. $3.6 \times 10^5 \text{ g}$
C. $7.1 \times 10^{-4} \text{ g}$
D. $2.2 \times 10^4 \text{ g}$
E. $1.4 \times 10^4 \text{ g}$
24. Calculate the amount of work done, in joules, when 2.5 mole of H_2O vaporizes at 1.0 atm and 25°C . Assume the volume of liquid H_2O is negligible compared to that of vapor. [1 L·atm = 101.3 J]
- A. 6,190 kJ
B. 6.19 kJ
C. 61.1 J
D. 5.66 kJ
E. 518 J
25. A gas is compressed in a cylinder from a volume of 20 L to 2.0 L by a constant pressure of 10.0 atm. Calculate the amount of work done on the system.
- A. $1.01 \times 10^4 \text{ J}$
B. -180 J
C. $1.81 \times 10^4 \text{ J}$
D. $-1.81 \times 10^4 \text{ J}$
E. 180 J
26. A 26.2 g piece of copper metal is heated from 21.5°C to 201.6°C . Calculate the amount of heat absorbed by the metal. The specific heat of Cu is $0.385 \text{ J/g}\cdot^\circ\text{C}$.
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27. Find $\Delta H^\circ_{\text{rxn}}$ for the reaction $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$.



28. What is the energy in joules of one photon of microwave radiation with a wavelength 0.122 m?
- A. 2.70×10^{-43} J
 B. 5.43×10^{-33} J
 C. 1.63×10^{-24} J
 D. 4.07×10^{-10} J
 E. 2.46×10^9 J
29. What is the binding energy (in J/mol or kJ/mol) of an electron in a metal whose threshold frequency for photoelectrons is 2.50×10^{14} /s?
- A. 99.7 kJ/mol
 B. 1.66×10^{-19} J/mol
 C. 2.75×10^{-43} J/mol
 D. 7.22×10^{17} kJ/mol
 E. 1.20×10^{-6} J/mol
30. Calculate the wavelength, in nanometers, of the light emitted by a hydrogen atom when its electron falls from the $n = 7$ to the $n = 4$ principal energy level. Recall that the energy levels of the H atom are given by $E_n = -2.18 \times 10^{-18} \text{ J}(1/n^2)$
- A. 4.45×10^{-20} nm
 B. 2.16×10^{-6} nm
 C. 9.18×10^{-20} nm
 D. 1.38×10^{14} nm
 E. 2.16×10^3 nm
31. Which one of the following sets of quantum numbers is not possible?

	n	l	m	m_s
A.	4	3	-2	+1/2
B.	3	0	1	-1/2
C.	3	0	0	+1/2
D.	2	1	1	-1/2
E.	2	0	0	+1/2

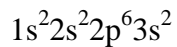
32. How many orbitals are allowed in a subshell if the angular momentum quantum number for electrons in that subshell is 3?
- A. 1
 - B. 3
 - C. 5
 - D. 7
 - E. 9

33. The orbital diagram for a ground-state nitrogen atom is



34. How many unpaired electrons does a ground-state atom of sulfur have?
- A. 0
 - B. 1
 - C. 2
 - D. 3
 - E. 4

35. Which element has the following ground-state electron configuration?



- A. Na
- B. Mg
- C. Al
- D. Si
- E. Ne

36. Write the ground state electron configuration for the selenium atom.

37. Calculate the energy of a photon of light with a wavelength of 360 nm.

38. What is the outermost electron configuration of (a) O (b) S (c) Se (d) Te?
