

NAME: _____

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The frequency of an electromagnetic wave is

- the number of complete oscillations or cycles over a distance of one meter
- the number of complete oscillations or cycles in a one second time interval
- the distance between successive maxima in the wave in one complete cycle
- the number of complete oscillations or cycles over a distance of one centimeter
- the distance between successive nodes in the wave

What is the wavelength of electromagnetic radiation which has a frequency of $4.464 \times 10^{14} \text{ s}^{-1}$?

- $1.338 \times 10^{23} \text{ m}$
- $1.489 \times 10^{-6} \text{ m}$
- $6.716 \times 10^{-7} \text{ nm}$
- 671.6 nm
- None of the above

Which one of the following types of radiation has the lowest frequency?

- gamma rays
- infrared radiation
- microwave radiation
- visible light rays
- ultraviolet rays

Calculate the energy of the orange light emitted by a neon sign with a frequency of $4.89 \times 10^{14} \text{ Hz}$.

- $3.09 \times 10^{-19} \text{ J}$
- $6.14 \times 10^{-19} \text{ J}$
- $3.24 \times 10^{-19} \text{ J}$
- $1.63 \times 10^{-19} \text{ J}$
- $5.11 \times 10^{-19} \text{ J}$

Which statement among the ones presented below is true?

- The line spectra of elements are the same provided they belong to the same family.
- The line spectra of elements are the same provided they belong to the same family **and** are combined with oxygen.
- The line spectra of elements are the same provided they belong to the same family **and** are in the same physical state.
- The line spectra of elements can be used for separation of elements from mixtures.
- The line spectra of elements can be used for identification purposes.

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Each of the following sets of quantum numbers is supposed to specify an orbital. Which of the following sets of quantum numbers contains an error?

- a. $n = 2, l = 1, m_l = -1$
- b. $n = 4, l = 2, m_l = 0$
- c. $n = 3, l = 3, m_l = -2$
- d. $n = 1, l = 0, m_l = 0$
- e. $n = 3, l = 0, m_l = 0$

Which of the following quantum numbers describes the spin of an electron?

- a. n
- b. l
- c. m_l
- d. m_s
- e. None of the above

How many different values of m_l are possible in the 4f sublevel?

- a. 1
- b. 7
- c. 3
- d. 5
- e. 2

How many different values of l are possible in the third principle level?

- a. 1
- b. 2
- c. 3
- d. 0
- e. 4

In which orbital below would an electron (on average) be farthest from the nucleus?

- a. 1s
- b. 4f
- c. 3s
- d. 3d
- e. 2p

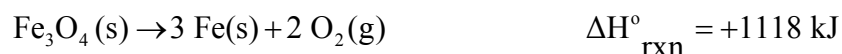
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A 4.98 g sample of aniline ($\text{C}_6\text{H}_5\text{NH}_2$, molar mass = 93.13 g/mol) was combusted in a bomb calorimeter with a heat capacity of 4.25 kJ/°C. If the temperature rose from 29.5°C to 69.8°C, determine the value of $\Delta H^\circ_{\text{comb}}$ for aniline. (that is, the heat, in KJ per mol, for the combustion reaction)

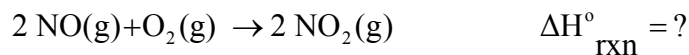
- a. $+7.81 \times 10^3 \text{ kJ/mol}$
- b. $-3.20 \times 10^3 \text{ kJ/mol}$
- c. $+1.71 \times 10^3 \text{ kJ/mol}$
- d. $-1.71 \times 10^3 \text{ kJ/mol}$
- e. None of the above

According to the following reaction, how much energy is required to decompose 55.0 kg of Fe_3O_4 ? The molar mass of Fe_3O_4 is 231.55 g/mol.

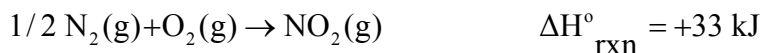


- a. $1.10 \times 10^6 \text{ kJ}$
- b. $2.38 \times 10^2 \text{ kJ}$
- c. $2.66 \times 10^5 \text{ kJ}$
- d. $1.12 \times 10^3 \text{ kJ}$
- e. None of the above

Use the standard reaction enthalpies given below to determine $\Delta H^\circ_{\text{rxn}}$ for the following reaction:



Given:

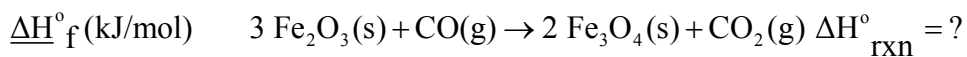


- a. -150. kJ
- b. -117 kJ
- c. -333 kJ
- d. +115 kJ
- e. None of the above

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Use the information provided to determine $\Delta H^\circ_{\text{rxn}}$ for the following reaction:



Fe ₂ O ₃ (s)	-824
Fe ₃ O ₄ (s)	-1118
CO(g)	-111
CO ₂ (g)	-394

- a. +277 kJ
- b. -577 kJ
- c. -470. kJ
- d. +144 kJ
- e. None of the above

Choose the reaction that represents ΔH°_f for Ca(NO₃)₂.

- a. Ca(s) + N₂(g) + 3O₂(g) → Ca(NO₃)₂(s)
- b. Ca²⁺(aq) + 2 NO₃⁻(aq) → Ca(NO₃)₂(aq)
- c. Ca(s) + 2 N(g) + 6 O(g) → Ca(NO₃)₂(s)
- d. Ca(NO₃)₂(aq) → Ca²⁺(aq) + 2 NO₃⁻(aq)
- e. Ca(NO₃)₂(s) → Ca(s) + N₂(g) + 3O₂(g)

A piece of iron (mass = 25.0 g) at 398 K is placed in a styrofoam coffee cup containing 25.0 g of water at 298 K. Assuming that no heat is lost to the cup or the surroundings, what will the final temperature of the water be? The specific heat capacity of iron = 0.449 J/g°C and water = 4.18 J/g°C.

- a. 348 K
- b. 308 K
- c. 287 K
- d. 325 K
- e. None of the above

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Determine the final temperature of a gold nugget (mass = 376 g) that starts at 398 K and loses 4.85 kJ of heat to a snowbank when it is lost. The specific heat capacity of gold is $0.128 \text{ J/g}^\circ\text{C}$.

- a. 133 K
- b. 398 K
- c. 187 K
- d. 265 K
- e. 377 K

Which of the following substances (with specific heat capacity provided) would show the greatest temperature change upon absorbing 100.0 J of heat?

- a. 10.0 g Ag, $C_{\text{Ag}} = 0.235 \text{ J/g}^\circ\text{C}$
- b. 10.0 g H_2O , $C_{\text{H}_2\text{O}} = 4.18 \text{ J/g}^\circ\text{C}$
- c. 10.0 g ethanol, $C_{\text{ethanol}} = 2.42 \text{ J/g}^\circ\text{C}$
- d. 10.0 g Fe, $C_{\text{Fe}} = 0.449 \text{ J/g}^\circ\text{C}$
- e. 10.0 g Au, $C_{\text{Au}} = 0.128 \text{ J/g}^\circ\text{C}$

How much kinetic energy (KE) does an object with a mass of 500 g traveling in a straight line with a speed of 50 m s^{-1} possess?

- a. 0.625 kJ
- b. 1.25 kJ
- c. 2.5 kJ
- d. 6.25 kJ
- e. 25 kJ

FILL IN THE BLANK: As the frequency of light increases, the wavelength of light _____.

- a. increases
- b. doubles
- c. decreases
- d. stops
- e. none of the above