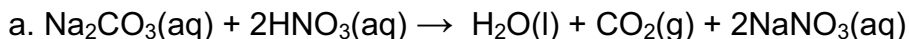


1. A solution of sodium carbonate is treated with a solution of nitric acid. Bubbles are observed in the colorless solution. The balanced equation is



2. When an aqueous solution of lead(II) nitrate is treated with an aqueous solution of potassium carbonate, one may observe

a. the formation of a precipitate, PbCO_3 .

3. The oxidation number of chromium in Na_2CrO_4 is

c. +6.

4. What volume of 0.150 M NaOH is needed to react completely with 3.45 g iodine according to the equation:



e. 181 mL

5. What is the **total** concentration of ions in a 0.0360 M solution of Na_2CO_3 ?

d. 0.108 M

6. A solution of nitric acid contains which of the following ions in easily measurable quantities?

e. H^+ , NO_3^-

7. How many joules are equivalent to 37.7 cal?

e. 158 J

8. When 15.0 grams of an alloy is heated from 20.0 °C to 40.0 °C it absorbs 727 joules of energy. The specific heat of the alloy is

a. 2.42 J/g·K

9. When 325 grams of water at 21.0 °C is mixed with an unknown mass of water at a temperature of 45.0 °C, the final temperature of the resulting mixture is 36.0 °C. What was the mass of the second sample of water?

c. 542 g

10. What is ΔE for a system which has the following two steps:

Step 1: The system absorbs 70 J of heat while 40 J of work are performed on it.

Step 2: The system releases 40 J of heat while doing 70 J of work.

e. zero

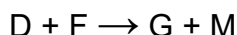
11. If 15.0 g water at 28.0 °C is added to 125.0 g water at 20.0 °C, what is the final temperature of the resulting mixture?

a. 20.9 °C

12. Which of the following produces radiation of the highest frequency?

a. x-rays

13. Calculate the enthalpy of reaction for the process



using the following equations and data:

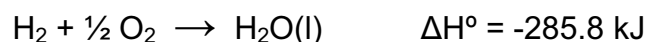
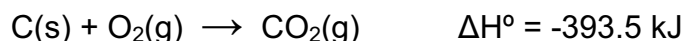
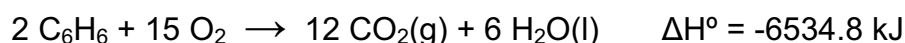


a. -132 kJ

14. Calculate the enthalpy of reaction for the process



using the following equations and data:



a. +49.0 kJ

15. Planck suggested that all energy gained or lost by an atom must be some integral multiple of a minimum amount of energy called a(n)

d. quantum.

16. What type of orbital is designated $n = 3, l = 2, m_l = 0$?

d. 3d

17. Which of the following electronic transitions in a hydrogen atom would have the longest wavelength?
- d. $n = 4$ to $n = 3$
18. What is the energy (in J) of one mole of photons of green light ($\lambda = 500$ nm). ($c = 2.998 \times 10^8$ m/s, $h = 6.626 \times 10^{-34}$ Js)
- d. 2.39×10^5 J/mol
19. In the photoelectric effect, no electrons are emitted from the surface of a silver foil when the frequency of the incident light is less than 1.15×10^{15} Hz. At frequencies $> 1.15 \times 10^{15}$ Hz electrons were emitted. What is the minimum energy necessary to eject an electron from the silver? ($1 \text{ Hz} = 1 \text{ cycle/second} = 1 \text{ s}^{-1}$, $h = 6.626 \times 10^{-34}$ Js)
- c. 7.62×10^{-19} J
20. How much thermal energy is required to heat 500 g of ice to steam at 200 °C? Use the following values to calculate:

State	specific heat capacity [J/g·K]
ice	2.1
water	4.2
steam	2.0

Heat of fusion of water = 333.5 J/g

Heat of vaporization of water = 2256 J/g

None of the solution choices offered was correct. Therefore, all students receive credit for this question. Those students who calculated the correct value (1605 kJ) received extra credit.