

Multiple-Choice and Bimodal Questions

1) Calculate the kinetic energy in J of an electron moving at 6.00×10^6 m/s. The mass of an electron is 9.11×10^{-28} g.

- A) 4.98×10^{-48}
- B) 3.28×10^{-14}
- C) 1.64×10^{-17}
- D) 2.49×10^{-48}
- E) 6.56×10^{-14}

2) Calculate the kinetic energy in joules of an automobile weighing 2135 lb and traveling at 55 mph. (1 mile = 1.6093 km, 1lb = 453.59 g).

- A) 1.2×10^4
- B) 2.9×10^5
- C) 5.9×10^5
- D) 3.2×10^6
- E) 3.2×10^{-6}

3) The kinetic energy of a 7.3 kg steel ball traveling at 18.0 m/s is _____ J.

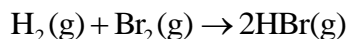
- A) 1.2×10^3
- B) 66
- C) 2.4×10^3
- D) 1.3×10^2
- E) 7.3

4) The ΔE of a system that releases 12.4 J of heat and does 4.2 J of work on the surroundings is _____ J.

- A) 16.6
- B) 12.4
- C) 4.2
- D) -16.6
- E) -8.2

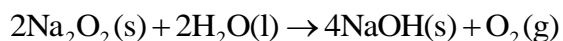
5) The change in the internal energy of a system that absorbs 2,500 J of heat and that does 7,655 J of work on the surroundings is _____ J.

6) The value of ΔH° for the reaction below is -72 kJ. _____ kJ of heat are released when 1.0 mol of HBr is formed in this reaction.



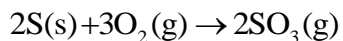
- A) 144
- B) 72
- C) 0.44
- D) 36
- E) -72

7) The value of ΔH° for the reaction below is -126 kJ. _____ kJ are released when 2.00 mol of NaOH is formed in the reaction?



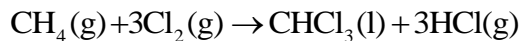
- A) 252
- B) 63
- C) 3.9
- D) 7.8
- E) -126

8) The value of ΔH° for the reaction below is -790 kJ. The enthalpy change accompanying the reaction of 0.95 g of S is _____ kJ.



- A) 23
- B) -23
- C) -12
- D) 12
- E) -790

9) The value of ΔH° for the reaction below is -336 kJ. Calculate the heat (kJ) released to the surroundings when 23.0 g of HCl is formed.



- A) 177
- B) 2.57×10^3
- C) 70.7
- D) 211
- E) -336

10) The value of ΔH° for the reaction below is +128.1 kJ:



How many kJ of heat are consumed when 15.5 g of $\text{CH}_3\text{OH}(\text{l})$ decomposes as shown in the equation?

- A) 0.48
- B) 62.0
- C) 1.3×10^2
- D) 32
- E) 8.3

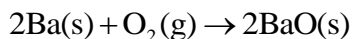
11) The value of ΔH° for the reaction below is +128.1 kJ:



How many kJ of heat are consumed when 5.10 g of $\text{H}_2(\text{g})$ is formed as shown in the equation?

- A) 162
- B) 62.0
- C) 128
- D) 653
- E) 326

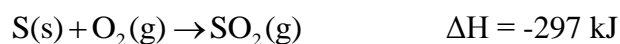
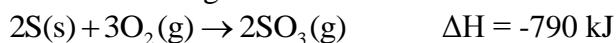
12) The value of ΔH° for the reaction below is -1107 kJ:



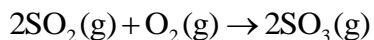
How many kJ of heat are released when 5.75 g of $\text{BaO}(\text{s})$ is produced?

- A) 56.9
- B) 23.2
- C) 20.8
- D) 193
- E) 96.3

13) Given the following reactions:



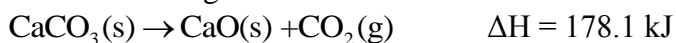
the enthalpy of the reaction in which sulfur dioxide is oxidized to sulfur trioxide



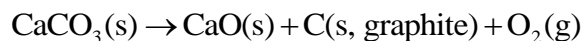
is _____ kJ.

- A) 196
- B) -196
- C) 1087
- D) -1384
- E) -543

14) Given the following reactions



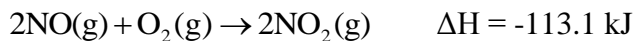
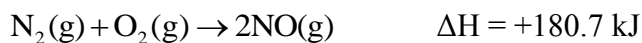
the enthalpy of the reaction



is _____ kJ.

- A) 215.4
- B) 571.6
- C) -215.4
- D) -571.6
- E) 7.01×10^4

15) Given the following reactions



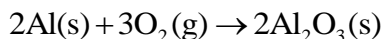
the enthalpy for the decomposition of nitrogen dioxide into molecular nitrogen and oxygen



is _____ kJ.

- A) 67.6
- B) -67.6
- C) 293.8
- D) -293.8
- E) 45.5

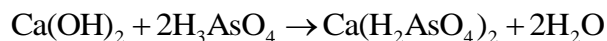
16) The value of ΔH° for the following reaction is -3351 kJ:



The value of ΔH_f° for $\text{Al}_2\text{O}_3\text{(s)}$ is _____ kJ.

- A) -3351
- B) -1676
- C) -32.86
- D) -16.43
- E) +3351

17) Given the data in the table below, $\Delta H^\circ_{\text{rxn}}$ for the reaction

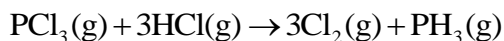


is _____ kJ.

Substance	ΔH_f° (kJ/mol)
Ca(OH)_2	-986.6
H_3AsO_4	-900.4
$\text{Ca(H}_2\text{AsO}_4)_2$	-2346.0
H_2O	-285.9

- A) -744.9
- B) -4519
- C) -4219
- D) -130.4
- E) -76.4

18) Given the data in the table below, $\Delta H^\circ_{\text{rxn}}$ for the reaction



is _____ kJ.

Compound	ΔH_f° (kJ/mol)
$\text{PCl}_3\text{(g)}$	-288.07
HCl(g)	-92.30
$\text{PH}_3\text{(g)}$	5.40

- A) -570.37
- B) -385.77
- C) 570.37
- D) 385.77
- E) The ΔH_f° of $\text{Cl}_2\text{(g)}$ is needed for the calculation.

19) A 25.5-g piece of cheddar cheese contains 37% fat, 28% protein, and 4% carbohydrate. The respective fuel values for protein, fat, and carbohydrate are 17, 38, and 17 kJ/g, respectively. The fuel value for this piece of cheese is _____ kJ.

- A) 450
- B) 330
- C) 790
- D) 99
- E) 260

20) Objects can possess energy as _____.

- (a) endothermic energy
- (b) potential energy
- (c) kinetic energy

- A) a only
- B) b only
- C) c only
- D) a and c
- E) b and c

21) The internal energy of a system is always increased by _____.

- A) adding heat to the system
- B) having the system do work on the surroundings
- C) withdrawing heat from the system
- D) adding heat to the system and having the system do work on the surroundings
- E) a volume compression

22) Which one of the following conditions would always result in an increase in the internal energy of a system?

- A) The system loses heat and does work on the surroundings.
- B) The system gains heat and does work on the surroundings.
- C) The system loses heat and has work done on it by the surroundings.
- D) The system gains heat and has work done on it by the surroundings.
- E) None of the above is correct.

23) When a system _____, ΔE is always negative.

- A) absorbs heat and does work
- B) gives off heat and does work
- C) absorbs heat and has work done on it
- D) gives off heat and has work done on it
- E) none of the above is always negative.

24) Which one of the following is an endothermic process?

- A) ice melting
- B) water freezing
- C) boiling soup
- D) Hydrochloric acid and barium hydroxide are mixed at 25 °C: the temperature increases.
- E) Both A and C

25) Of the following, which one is a state function?

- A) H
- B) q
- C) w
- D) heat
- E) none of the above

26) Which of the following is a statement of the first law of thermodynamics?

- A) $E_k = \frac{1}{2}mv^2$
- B) A negative ΔH corresponds to an exothermic process.
- C) $\Delta E = E_{\text{final}} - E_{\text{initial}}$
- D) Energy lost by the system must be gained by the surroundings.
- E) 1 cal = 4.184 J (exactly)

27) A _____ ΔH corresponds to an _____ process.

- A) negative, endothermic
- B) negative, exothermic
- C) positive, exothermic
- D) zero, exothermic
- E) zero, endothermic

28) Given the equation



Calculate the mass of liquid water (in grams) at 100 °C that can be converted to vapor by absorbing 2.400 kJ of heat.