MULTIPLE CHOICE

Section 8.4 Expansion Work

- What is w for the expansion of a gas from 15. L to 35. L against a constant external pressure of 1.5 atm?

 L•atm = 101 J
 5.3 kJ
 3.0 kJ
 3.0 kJ
 - C) 3.0 KJ
 - d) 5.3 kJ

Section 8.6 The Thermodynamic Standard State

2. Find ΔE° for the reaction below if the process is carried out at a constant pressure of 1.00 atm and ΔV (the volume change) = -24.5 L. (1 L atm = 101 J) 2 CO(g) + 0₂ (g) \rightarrow 2 CO₂(g) ΔH° = -566. kJ a) +2.47 kJ b) -2.47 kJ c) -564 kJ d) -568 kJ

Section 8.7 Enthalpies of Physical and Chemical Changes

3. How much heat is absorbed in the reaction of 30.0 g of carbon with excess $SO_2(g)$ to form $CS_2(1)$ and CO(g)?

 $5 \operatorname{C}(s) + 2 \operatorname{SO}(g) \rightarrow \operatorname{CS}(l) + 4 \operatorname{CO}(g) \quad \Delta \mathrm{H}^{\circ} = 239.9 \text{ kJ}$

- a) 120 kJ
- b) 240 kJ
- c) 600 kJ
- d) 1439 kJ
- 4. The combustion of 5.00 g of $C_2H_6(g)$, at constant pressure, releases 259 kJ of heat. Find ΔH for the reaction:

Section 8.8 Calorimetry and Heat Capacity

- 5. The specific heat of copper is 0.385 J/(g C). If 34.2 g of copper, initially at 25 C, absorbs 4.689 kJ, what will be the final temperature of the copper? a) 14.2°C
 - b) 25.4 C
 - c) 356 C
 - d) 381 C

6. It takes 11.2 kJ of energy to raise the temperature of 145 g of benzene from 25.0°C to 70.0°C. What is the specific heat of benzene?
a) 1.10 J/(g °C)
b) 1.72 J/(g °C)
c) 3.48 J/(g °C)
d) 9.96 J/(g °C)

Section 8.9 Hess's Law

7.	Coal gasification can be represented by the equ	uation:
	$2 \operatorname{C}(s) + 2 \operatorname{H}_2 \operatorname{O}(g) \longrightarrow \operatorname{CH}_4(g) + \operatorname{CO}_2(g) $ $\operatorname{LH}_4(g) = \operatorname{CH}_4(g) + \operatorname{CO}_2(g)$	= ?
	Use the following information to find AH for t	he reaction above.
	$CO(g) + H_2(g) \rightarrow C(s) + H_2O(g)$ ΔH	= -131 kJ
	$\operatorname{CO}(g) + \operatorname{H}_2\operatorname{O}(g) \rightarrow \operatorname{CO}_2(g) + \operatorname{H}_2(g) \Delta \operatorname{H}$	= -41 kJ
	$CO(g) + 3 \operatorname{H}_2(g) \rightarrow \operatorname{CH}_4(g) + \operatorname{H}_2O(g) $ $\Delta \operatorname{H}$	= -206 kJ
	a) 15 kJ	
	b) 116 kJ	
	c) -116 kJ	
	d) - 372 kJ	
8.	Find ΔH for BaCO, $(s) \rightarrow BaO(s) + CO$, (g)	
	given 2 Ba(s) + 0 (g) \rightarrow 2 Ba0(s)	$\Delta H = -1107.0 \text{ kJ}$
	$Ba(s) + CO_1(g) + 1/2 O_1(g) \rightarrow BaCO_1(g)$) $\Delta H = -822.5 \text{ kJ}$
	a) - 1929. 5 kJ	
	b) -1376.0 kJ	
	c) - 284.5 kJ	
	d) 269.0 kJ	

Section 8.10 Standard Heats of Formation

9. Use the given standard enthalpies of formation to calculate △H^o for the following reaction
3 Fe₂O₃(s) + CO(g) → 2 Fe₃O₄(s) + CO₂(g).

Speci es	∆H ^o f, kJ/mol		
Fe ₂ 0;(<i>s</i>)	- 824. 2		
Fe 04 (s)	- 1118. 4		
C0(g)	- 110. 5		
C0 ₂ (g)	- 393. 5		

- a) 5213. 4 kJ
- b) 577.2 kJ
- c) 47.2 kJ
- d) +47.2 kJ
- 10. Acetylene torches utilize the following reaction: $2 C_2 H_2(g) + 5 0_2(g) \rightarrow 4 CO_2(g) + 2 H_2 O(g)$

Use the given standard enthalpies of formation to calculate ΔH^0 for this reaction

Speci es	∆H ^o , kJ/mol
$C_2 H_2(s)$	+226.7
CO ₂ (g)	- 393. 5
$H_20(g)$	- 241. 6

- a) 2511. kJ
- b) 408.6 kJ
- c) 408.6 kJ
- d) 2511. kJ

11. For the reaction 2 $CH_4(g) + 3 Cl_2(g) \rightarrow 2 CHCl_3(l) + 3 H_2(g)$, $\Delta H^{\circ} = -118.6 \text{ kJ}$. $\Delta H^{\circ}_f = -134.1 \text{ kJ/mol}$ for $CHCl_3(l)$. Find ΔH°_f for $CH_4(g)$.

- a) -193.4 kJ/mol
- b) -74.8 kJ/mol
- c) 74.8 kJ/mol
- d) 193.4 kJ/mol

Section 8.11 Bond Dissociation Energies

12. One method for making ethanol, $C_2\,H_5\,OH$, involves the gas-phase hydration of ethylene, $C_2\,H_4:$



Estimate AH for this reaction from the given average bond dissociation energies, D.

Bond	D, kJ/mol
c=c	615
С—Н	410
С-С	350
С-0	350
0 - H	460

- a) 580 kJ
- b) 35 kJ
- c) +35 kJ
- d) 580 kJ

Section 8.14 An Introduction to Free Energy

- 13. Methanol can be produced from carbon monoxide and hydrogen with suitable catalysts: $CO(g) + 2 H_2(g) \rightarrow CH_2OH(l)$ at 25°C $\Delta H^\circ = -128.1$ kJ and $\Delta S^\circ = -332$ J/K.
 - Find ΔG° at 25°C. a) -157.2 kJ b) -29.1 kJ c) 98.9 kJ d) 157.2 kJ
- 14. Calculate ΔG° for the reaction below and tell whether it is spontaneous or nonspontaneous under standard conditions at 25 C.

2 S(s) + 3 $0_2(g)$ + 2 H₂ $0(l) \rightarrow$ 2 H₂S $0_4(l) \Delta H^{\circ} = -1056 \text{ kJ/mol} \Delta S^{\circ} = -505 \text{ J/mol}$

a) $\Delta G^{\circ} = -1207$ kJ and the process is spontaneous. b) $\Delta G^{\circ} = -1207$ kJ and the process is nonspontaneous. c) $\Delta G^{\circ} = -906$ kJ and the process is spontaneous. d) $\Delta G^{\circ} = -906$ kJ and the process is nonspontaneous.

1.	b)				
2.	c)	Chapter:	8	QUESTI ON:	9
3	a)	Chapter:	8	QUESTI ON:	22
4	d)	Chapter:	8	QUESTI ON:	30
4.	u)	Chapter:	8	QUESTI ON:	31
5.	a)	Chapter:	8	QUESTI ON:	35
6.	b)	Chapter:	8	QUESTI ON:	36
7.	a)	Chapter:	8	QUESTI ON:	44
8.	d)	Chapter:	8	QUESTI ON:	45
9.	c)	Chapter:	8	QUESTI ON:	50
10.	d)	Chapter:	8	QUESTI ON:	52
11.	b)	Chanter	8		53
12.	b)	chapter.	0	QUESTION.	53
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14.	c)	Chapter:	8	QUESTI ON:	76
		Chapter:	8	QUESTI ON:	79