

1-

7- A system ^{↑ve gain} takes 250 kJ of heat and does 60 kJ of mechanical work [→] to the surrounding. How many kJ has the internal energy of the system changed?

$w = -ve$ done by system
 $w = +ve$ done on system

$q = +250 \text{ kJ}$
 $w = -60 \text{ kJ}$
 $\Delta U = q + w$
 $= +250 - 60 = +190 \text{ kJ}$

a) -250
b) 60
c) -190
d) 190
e) -310
 Leave blank

2-

$1 \text{ Ba(OH)}_2 + 2 \text{ HCl} \rightarrow 1 \text{ BaCl}_2 + 2 \text{ H}_2\text{O}$

3- Which of the following is wrong about an acid-base reaction?

a) The number and type of atoms do not change during the reaction.
b) While acid and base reactions are balanced, they react according to the number of H^+ and OH^- ions they contain.
c) The total mass remains constant before and after the reaction.
d) The moles of reactants and products during the reaction are equal.
e) When acid and base react, salt and water are formed.
 Leave blank

3-

7 - Which of the following sets of quantum numbers, n, l, m_l, m_s , represents the 3s orbital?

- a) (3, 0, 0, -1/2)
- b) (3, 1, 1, 0)
- c) (3, 2, 1, 0)
- d) (1, 1, 1, 1/2)
- e) (2, -1, 0, 1/2)
- Leave blank

4-

8 - By giving 330 J of heat to the nitrogen (N_2) gas, it did 190 J of work. Calculate the change in internal energy of nitrogen gas.

- a) -520 J
- b) 520 J
- c) -140 J
- d) 140 J
- e) 0
- Leave blank

internal energy \rightarrow

$$q = +330 \text{ J}$$

$$w = -190 \text{ J}$$

$$\Delta U = q + w$$

$$= +330 - 190 = +140 \text{ J}$$

5-

6 - How many kJ of heat is needed to raise the temperature of 25 g of iron at 30 °C to 1000 °C? (Specific heat of iron = 0.45 J/g°C)

- a) 8.2
- b) 13.6
- c) 10.9
- d) 24.3
- e) 0.34
- Leave blank

$$q = ? \text{ kJ}$$

$$m = 25 \text{ g}$$

$$T_1 = 30^\circ \text{C}$$

$$T_2 = 1000^\circ \text{C}$$

$$C_p = 0.45 \text{ J/g}^\circ \text{C}$$

$$q = m \cdot c \cdot \Delta T$$

$$= 25 \times 0.45 \times (1000 - 30)$$

$$= 10912.5 \text{ J} \div 1000$$

$$= 10.912 \text{ kJ}$$

$$\approx \underline{10.9 \text{ kJ}}$$

6-

8- 1 atm pressure corresponds to how many bar pressure?

a) 0,987
 b) 2,5
 c) 0,125
 d) 7,3
 e) 1,01325
 Leave blank

1 atm = 760 mmHg
 = 760 torr
 = 1.01325×10^5 Pa
 = 101.325 kPa
 = 1.01325 bar

7-

8- In a cylindrical system, 1 mole of gas is compressed to 10 L at a temperature of 300 K. Calculate the work in J when the piston is compressed until the pressure is 5 atm at constant temperature.

a) 256
 b) -2565
 c) -256
 d) 0
 e) 2565
 Leave blank

$n = 1 \text{ mole}$
 $V_i = 10 \text{ L}$
 $T = 300 \text{ K}$
 $w = ? \text{ J}$
 $p = 5 \text{ atm}$

① $P_2 V_2 = nRT$
 $V_2 = \frac{nRT}{P_2} = \frac{1 \times 0.0821 \times 300}{5} = 4.926 \text{ L}$

② $w = -P_{\text{ext}} \Delta V = -5 \times (4.926 - 10) = \underline{\underline{25.37 \text{ J}}}$

8-

5- There is 4.8 g of O₂ gas in a 5.6 L container at 273°C. How many atm is the pressure applied to the vessel? (O: g/mol)

a) 1,2
 b) 1,5
 c) 1
 d) 0,5
 e) 2
 Leave blank

9-

5 - The pressure of the gas in a 12 L container with an ideal frictionless piston is 2 atmospheres. When the piston is pushed down until the vessel volume is 4 liters, it is observed that the pressure of the gas is 8 atmospheres and the temperature is 127 °C. What is the initial temperature of the gas in °C? (Assume that the gas behaves ideally.)

- a) 200
- b) 105
- c) 52
- d) 27
- e) 300
- Leave blank

10-

4 - 1 bar pressure corresponds to how many atm pressure?

- a) 7,3
- b) 0,987
- c) 1,01325
- d) 2,5
- e) 0,125
- Leave blank

11-

5- $2 \text{Fe}(k) + \text{O}_2(g) \rightarrow 2 \text{FeO}(k) \Delta H = -544,0 \text{ kJ}$ and $3 \text{Fe}(k) + 2\text{O}_2(g) \rightarrow 2 \text{Fe}_3\text{O}_4(k) \Delta H = -1118,4 \text{ kJ}$. What is the enthalpy of the reaction $4 \text{FeO}(k) \rightarrow \text{Fe}(k) + \text{Fe}_3\text{O}_4(k)$ in kJ?

- a) 574,4
- b) 1662,4
- c) 2206,4
- d) -30,4
- e) -1662,4
- Leave blank

12-

1 - 200 ml of NaOH solution of unknown concentration is titrated with 0.1 M H_2SO_4 solution. Since 40 ml H_2SO_4 is consumed during this process, what is the concentration of NaOH solution (M)?

- a) 0,1
- b) 1
- c) 0,08
- d) 1,6
- e) 0,5
- Leave blank

13-

6 - How many kJ is the heat released when 10 ml of ethanol is burned? (The molar enthalpy of combustion is -1367 kJ/mol ; its density is $0,789 \text{ g/ml}$; its molar mass is 46 g/mol)

- a) -856
- b) -1367
- c) -296
- d) -234
- e) -1079
- Leave blank

14-

7- Calculate the enthalpy value of the reaction $4 \text{NH}_3(\text{g}) + 5 \text{O}_2(\text{g}) \rightarrow 4 \text{NO}(\text{g}) + 6 \text{H}_2\text{O}(\text{l})$ in terms of the enthalpy values of the reactions given below. $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightarrow 2 \text{NH}_3 \Delta H_1$ $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{NO} \Delta H_2$ $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{H}_2\text{O} \Delta H_3$

- a) $2 \Delta H_1 - \Delta H_2 - 2 \Delta H_3$
- b) $2 \Delta H_1 - 2 \Delta H_2 - 3 \Delta H_3$
- c) $3 \Delta H_1 - 2 \Delta H_2 - 2 \Delta H_3$
- d) $\Delta H_1 + 3 \Delta H_2 - 2 \Delta H_3$
- e) $-2 \Delta H_1 + 2 \Delta H_2 + 3 \Delta H_3$
- Leave blank

15-

7- Which of the following sets of quantum numbers, n, l, m_l, m_s , represents the $2p$ orbital?

- a) $(2, 1, 0, 1/2)$
- b) $(3, 1, 1, 1/2)$
- c) $(3, 2, 1, 0)$
- d) $(1, 1, 1, 1/2)$
- e) $(3, 2, 0, -1/2)$
- Leave blank

16-

9- Which of the following sets of quantum numbers, n, l, m_l, m_s , represents the $3d$ orbital?

- a) $(1, 1, 1, 1/2)$
- b) $(2, -1, 0, 1/2)$
- c) $(3, 2, 0, -1/2)$
- d) $(3, 2, 1, 0)$
- e) $(3, 1, 1, 1/2)$
- Leave blank

17-

14 - 1900 mmHg pressure corresponds to how many atm pressure?

- a) 1.25
- b) 70.3
- c) 2.5
- d) 0.125
- e) 703000
- Leave blank

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