

### Question 1

A piece of copper whose temperature is ( $150^{\circ}\text{C}$ ) has thrown in a beaker containing boiled water.

Then heat transfers from the piece of copper to water due to:

- ☐ The high temperature of water.
- ☐ The high internal energy of the piece of copper.
- ☐ The high temperature of the piece of copper.
- ☐ The high internal energy of water.

### Question 2

A car factory decides to measure the heat of combustion of a certain fuel.

Which of the following can be used for this purpose?

- ☐ coffee-cup calorimeter
- ☐ thermometer
- ☐ bomb calorimeter
- ☐ internal combustion engine

### Question 3

The opposite table shows the specific heat ( $J / g. ^{\circ}C$ ) for four different substances at room temperature.

Which substance reaches  $80^{\circ}C$  in shorter time?

Substance	Specific heat
A	0.385
B	0.444
C	0.711
D	0.889

- ☐ B
- ☐ D
- ☐ A
- ☐ C

#### Question 4

If the separation energy of ammonium nitrate in water is 150 KJ , the hydration energy is 120 KJ and the separation energy of water is 100 KJ.

**So this dissolution is:**

- ☐ Endothermic and the heat of solution is 130 KJ.
- ☐ Endothermic and the heat of solution is 170 KJ.
- ☐ Exothermic and the heat of solution is 130 KJ.
- ☐ Exothermic and the heat of solution is 170 KJ.

#### Question 5

On adding a little amount of conc. sulphuric acid to a beaker containing an amount of water, the temperature of water increases.

**Then the reason for that increase is:**

- ☐ Separation energy of solute and solvent is greater than heat of hydration.
- ☐ Separation energy of solute and solvent is less than heat of hydration.
- ☐ Ions separation energy is less than heat of hydration.
- ☐ Ions separation energy is greater than heat of hydration.

#### Question 6

A student wants to make 1L of potassium hydroxide solution by dissolving 28g of it in water, so the temperature increases by  $6.89^{\circ}\text{C}$ .

[ K = 39 , O = 16 , H = 1 ]

**then the molar heat of solution of potassium hydroxide is :**

- ☐ +57.6 KJ/ mol
- ☐ -28.8 KJ/ mol
- ☐ + 28.8 KJ/ mol
- ☐ - 57.6 KJ/ mol

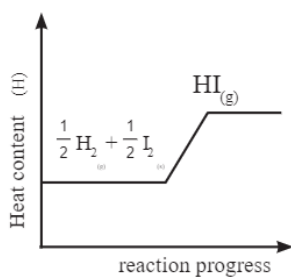
### Question 7

If you knew that the heat content of hydrogen bromide is less than the heat content of its constituents elements then the chemical equation which expresses the heat of formation of hydrogen bromide is:

- ☐  $\frac{1}{2}H_{2(g)} + \frac{1}{2}Br_{2(l)} \rightarrow HBr_{(g)}, \Delta H = +36.23KJ$
- ☐  $H_{2(g)} + Br_{2(l)} \rightarrow 2HBr_{(g)}, \Delta H = +36.23KJ$
- ☐  $H_{2(g)} + Br_{2(l)} \rightarrow 2HBr_{(g)}, \Delta H = -36.23KJ$
- ☐  $\frac{1}{2}H_{2(g)} + \frac{1}{2}Br_{2(l)} \rightarrow HBr_{(g)}, \Delta H = -36.23KJ$

### Question 8

The opposite energy diagram expresses the heat change of a reaction:

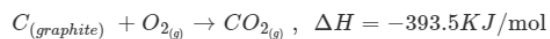
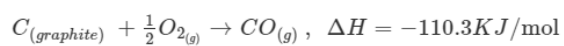


Which of the following best describes the heat change of this reaction?

- ☐ (H) of products is less than (H) of reactants and sign of  $\Delta H$  is negative.
- ☐ (H) of reactants is less than (H) of products and sign of  $\Delta H$  is negative.
- ☐ (H) of products is greater than (H) of reactants and sign of  $\Delta H$  is positive.
- ☐ (H) of reactants is greater than (H) of products and sign of  $\Delta H$  is positive.

### Question 9

In the following equations:-

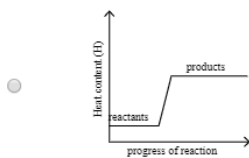
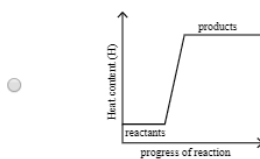
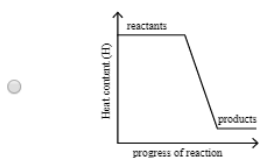


We conclude that:-

- ☐ the molar enthalpy of  $CO_2$  = the molar enthalpy of CO.
- ☐ the molar enthalpy of  $CO_2$  > the molar enthalpy of CO.
- ☐ the molar enthalpy of  $CO_2, CO = zero$
- ☐ the molar enthalpy of  $CO_2$  < the molar enthalpy of CO.

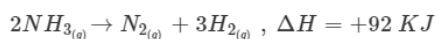
### Question 10

In which of the following energy diagrams the absorbed energy is the lowest ?



### Question 11

The following equation represents the dissociation of ammonia gas to its elements at standard state :



Conclude the thermochemical equation that expresses the standard heat of formation of ammonia.

### Question 12

Acetylene  $C_2H_{2(g)}$  combusts in excess of Oxygen, producing an amount of energy of  $1299 \text{ KJ/mol}$ .

Express the reaction by a balanced thermochemical equation.

### Question 13

A metallic object its mass is  $100 \text{ g}$  was placed in hot water so it acquires an amount of heat of  $100 \text{ cal}$ .

Calculate the temperature change of the object (specific heat  $0.24 \text{ J / g. } ^\circ\text{C}$ )

### Question 14

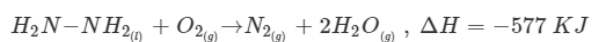
A  $5\text{g}$  sample of one of the substances listed in the opposite table was heated so its temperature increases from  $25.2^\circ\text{C}$  to  $55.1^\circ\text{C}$  acquiring  $133 \text{ J}$ .

substance	specific heat $\text{J/g.}^\circ\text{C}$
x	0.889
y	0.444
z	0.139
w	0.240

use the relation  $Q = m.c. \Delta t$  to identify this substance

### Question 15

In the following reaction:



If the the average bond energies are as in the opposite table:

Bond	energy $\text{KJ/mol}$
$N-H$	391
$O=O$	495
$N \equiv N$	941
$O-H$	463

Calculate the value of average bond energy of (  $N-N$  ) bond in hydrazine.

### Question 16

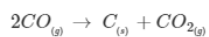
The opposite table shows the average energy of some chemical bonds in (KJ/mol)

Bond	Average bond energy KJ/mol
$H-H$	432
$H-H$	494
$O=O$	459

Calculate the standard heat of formation of water.

### Question 17

Calculate  $\Delta H^\circ$  for the following reaction:



using the following equations:

