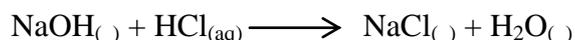Grade 11   Science   Unit : 08

## Heat changes associated with chemical reactions.

MCQ Questions

(1) Select the correct answer which having the appropriate physical nature respectively for the brackets in the following equation if aqueos solution of NaOH is used for the reaction.

$$NaOH_{(\ )} + HCl_{(aq)} \longrightarrow NaCl_{(\ )} + H_2O_{(\ )}$$

i) aq, aq, aq   ii) aq, s, l iii) s, aq, l iv) aq, aq, l

(2) Choose the incorrect answer about the above reaction.

i) Exothermic reaction   ii) Neutralization reaction

iii) Synthesis reaction   iv) Double displacement reaction

(3) Correct energy level diagram for an endothermic is,
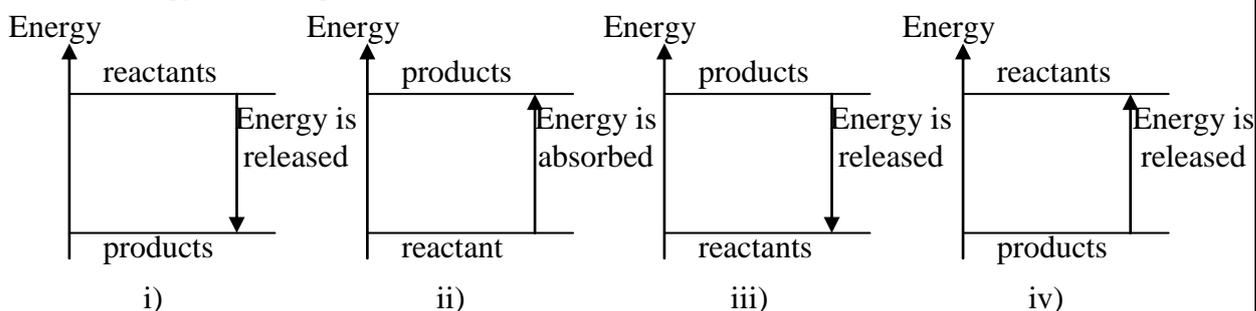
(4) What quantity of heat in Joules (J) is required to increase the temperature of 500 g of water from 32 °C to 47 °C.

(Specific heat capacity of water $= 4200 Jkg^{-1}C^{-1}$)

i) $500 \times 4200 \times 15$ ii) $\dfrac{500}{1000} \times 4200 \times 15$

iii) $\dfrac{500}{1000} \times 4200 \times 32$ iv) $\dfrac{500}{1000} \times 4200 \times 47$

(5) The correct statement about exothermic reaction is,

i) Energy in products are more than energy in reactions.

ii) Products have less energy than reactants.

iii) Energy absorbed from the environment.

iv) Dissolving glucose in water is an exothermic reaction.

(6) The correct statement about exothermic reaction is,

Energy

reactants

Release of energy

products
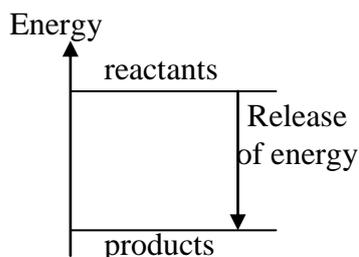
i) Dissolving of $CuSO_4$ crystals in water.

ii) Introducing Mg piece into $CuSO_4$ solution.

iii) Adding water to NH_4Cl solution.

iv) Dissolving of glucose in water.

(7) The following statements are about energy associated with chemical reaction.

A → Energy contained in the products is less than the energy contained in the reactants in exothermic reactions.

B → Energy contained in the products is less than the energy contained in the reactant in endothermic reactions.

C → Energy contained in the products is more than the energy contained in the reactants in endothermic reactions.

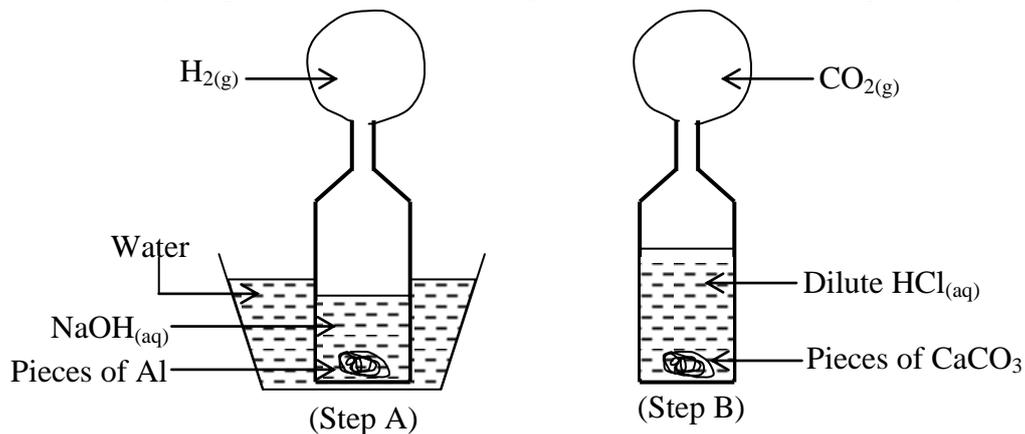Which of the following choice correct,

	A	B	C
i)	✔	×	✔
ii)	×	✔	✔
iii)	×	✔	×
iv)	✔	✔	✔

(8) Select the correct statement from the following statements.

i)   Heat capacity of a substance does not depend on its mass.

ii) The international unit of temperature is Fahrenheit.

iii) All non metals are non – conductors of heat.

iv) Blackened pipes at the back of refrigerators remove heat by radiation.

Structured essay questions

(1) In the following diagram, it is shown separately the setup prepared by a group of grade 11 students to fill hydrogen and carbondioxide gases in to two balloons separately.

$H_{2(g)}$

Water

$NaOH_{(aq)}$

Pieces of Al

(Step A)

$CO_{2(g)}$

Dilute $HCl_{(aq)}$

Pieces of $CaCO_3$

(Step B)

i) After collecting approximately equal volumes of H_2 gas and CO_2 gas in to the balloons in the two setup. Mouth of the two balloons were tied well and they were released to the atmosphere.

    a) State the expected observation upon the release of the balloons.

    …………………………………………………………………………………………

    b) Among the physical properties of gases H_2 and CO_2, state respectively the physical property of each gas that lead to the above observation.

    …………………………………………………………………………………………

ii) The chemical reaction relevant to the above two setup are exothermic. The experiment in setup A is done in a large water bath, byt not so in setup B. Give reasons for this.

…………………..…………………………………………………….…………………

iii) Draw a labeled energy diagram for an exothermic reaction.

(2)   An experiment was designed to determine the heat change associated with the following chemical reaction.

$$2KOH_{(aq)} + H_2SO_{4(aq)} \longrightarrow K_2SO_{4(aq)} + 2H_2O_{(l)}$$
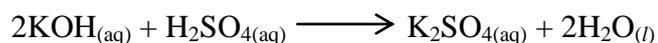
In the experiment, 50 cm^3 of a dilute H_2SO_4 solution were taken in to a beaker and 2g of solid NaOH were added to it. The mixture was stirred so that the reactant mixed well. The initial temperature of the mixture and the maximum temperature of it were recorded.

i) State an evidence in support of the fact that a chemical reaction between KOH and H_2SO_4 accurred here.

…………………..…………………………………………………….…………………

ii) Taking the mass of the reaction mixture as m its specific heat capacity as C and the observed temperature change as Q, write an equation to calculate the heat change Q occurred in the beaker.

…………………..…………………………………………………….…………………

iii) The heat change occurred in the beaker during the experiment was 4kJ. What would be the heat change when 1 mole of solid KOH completely reacts with a dilute H_2SO_4 solution.

……………..………………………………………………………………………………

……………..………………………………………………………………………………

Essay questions

(1) a) When the metal Na is reacted with $Cl_{2(g)}$ it forms $NaCl_{(s)}$ and the temperature of the mixture is increased by 10 C. (Specific heat capacity of Na – $200Jkg^{-1}C^{-1}$)

(Mass of Na = 100g)

   i)   Write down the balanced chemical equation for the above mentioned situation.
   ii) Find the heat change.
   iii) Represent the above mentioned situation on an energy level diagram.
   iv) Express what is the meant of an exothermic reaction with the help of the diagram.

   b) i)   What is an endothermic reaction.
      ii) Represent the endothermic reaction on an energy diagram.

(2) a) An experiment is planned to heat change of sodium hydroxide and HCl reaction experimently.

   So the following equipments are provided,

   2 moldm^{-3} HCl, 50 cm^3 2 beakers of 100 cm^3
   2 moldm^{-3} NaOH, 50 cm^3 Thermometer
   Styrafoam cup   Glass rod

   i)   In this experiment draw the apparatus and lable it.
   ii) What are the measurements croadings that should be taken inorder to achieve the aim of the practical.
   iii) Why do we use a glass rod.

   b) The heat change can be calculated by the equation $Q = mc\theta$.
   i)   Introduce the terms m, c and θ.
   ii) Then calculate Q by considering,
        (Specific heat capacity of water = 4200 Jkg^{-1}°C^{-1}, θ = 10 °C)
   iii) What are the assumptions made here in the experiment.