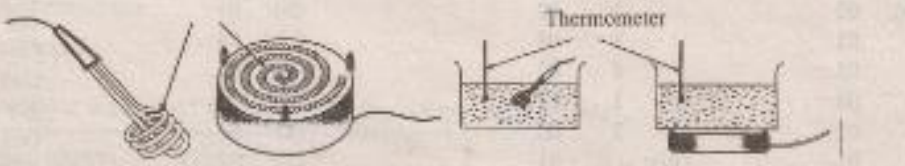
2008-Part B

6. Some information regarding an activity performed in he laboratory to gain experience on functioning of heating equipment are stated below.



Immersion heater Hot-plate Using immersion heater and a horplate to heat water

Two masses of water measuring 500 ml each were heated in two identical metal vessels under the same environmental conditions, using an immersion heater and a hot-plate functioning with equal power.

(i) Using which of these two equipment could the water be heated to the boiling temperature within a minimum time?

(ii) State the reason for your answer for (i) above.

(iii) State the modes of transference of heat, by which the heat generated in the hot plate, arrives at the water in the vessel.

(iv) It took 2 minutes to heat the water in the vessel with the immersion heater from 40°C to 50°C. If no loss of heat occurred, calculate the quantity of heat absorbed by the water. (Specific heat capacity of water 4200 J $kg^{-1}°C^{-1}$.)

(v) Write down the transformation of energy carried out by the immersion heater.

(vi) If a current of 5 A flows across the immersion heater when it is connected to a 230V electric supply, calculate the resistance of its heating coil.

(vii) If the immersion heater on which 1200 W is marked by the manufacturer is used twice a day each of 30 minutes, calculate the number of units contributed to the total electricity consumption of the house by it at the end of 30 days.

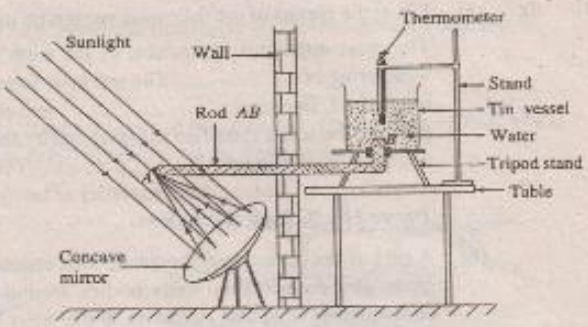
(viii) It is safer to use three-pin plugs rather than using two-pin plugs with the immersion heater. State the main reason for it.

(ix) Mention two features that should be present in a metal, for it be selected to make a heating coil.

(x) What is the name of the accessory which should compulsorily included in an electric circuit of a house for security purposes?

2009 Part A

4. Given below is a rough diagram (not drawn to scale) of a set-up presented by a student at an exhibition, that was planned to heat water inside a house by using solar energy. A concave mirror formed by fixing thin polished aluminium plates on to a curved frame is used in it.



(i) The rod AB is made of metal. What is the property that the metal rod should possess for it to be used here?

.....

(ii) At what point of the mirror should the end A of the rod AB, be placed? .....

(iii) When the mirror is kept exposed to sunlight, it is observed that the mercury column in the thermometer is rising. State the method by which heat is transferred at each stage of this process as given below.

(a) from the sun to the mirror .....

(b) along the rod from A to B .....

(c) through the water from the bottom of the vessel up to the surface of water .....

(d) from the water to the mercury in the thermometer .....

(iv) The temperature of the water not increasing during a short time, was a problem for the student. Given below are some experiments carried out by him in this regard. Write down on the dotted line in front, whether the rate at which the reading of the thermometer increases, is more or less or the same, at each of these instances:

(a) shortening the rod AB .....

(b) covering the whole of rod AB except the end A, by wrapping with dry cloth .....

(c) keeping the mirror closer to the end A of the rod AB .....

(d) by blackening the inner surface of the mirror .....

(v) The water will get heated quicker, when the tin vessel with the rod AB is removed and a similar tin vessel with water is kept at the place where the end A of the rod was earlier. What is the reason for this?

.....

(vi) State a change that can be made on the outer surface of the tin vessel to make the rising of temperature stated in (v) above more efficient.

.....

(vii) The temperature of 100 g of water in the tin vessel, increased by 2°C. Calculate the quantity of heat obtained, to heat the water considering the specific heat capacity of water to be 4200 J kg^{-1} $°C^{-1}$.

.....

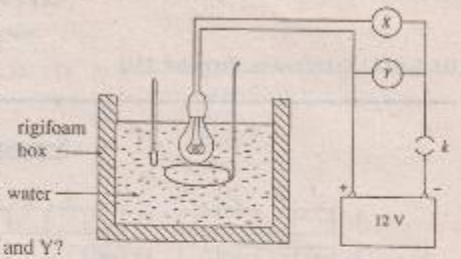
(viii) A viewer at the exhibition stated that it is easier to use a burner or electricity rather than using solar heat. As a student studying science, state two reasons that you will give to explain the advantages of using a method such as this.

(a) .....

(b) .....

2010 Part B 9.

(B) A large quantity of heat is evolved in addition to light when an electric bulb with a filament is burning. An experimental set up, planned to find out the power of emission of heat from the bulb, is shown in the diagram. 0.5 kg of water is taken in a small rigifoam box. A 12 V bulb immersed in water as shown in the diagram, is connected to a 12 V battery, a voltmeter and an ammeter.



(i) Which one should be the voltmeter from X and Y?

(ii) What is the electric power (W_1) of the bulb, if the reading of the voltmeter is 12 V and the reading of the ammeter is 2 A, when a current is supplied to the circuit?

(iii) What is the quantity of heat received by the water if the temperature of the water rises by 4 °C, when the current is supplied for 10 minutes.
(Specific heat capacity of water is 4200 $J\,°C^{-1}\,kg^{-1}$)

(iv) What is the power of emission of heat (W_2) from the bulb?

(v) Write down a statement for the power of emission of light by the bulb with respect to W_1 and W_2.

2013 Part A 4

(C) An aluminium vessel contains 1 kg of water at temperature 30°C. This vessel is kept on a hotplate, and heated until the temperature of water is raised up to 70°C.

(i) Name the method of heat transformation through aluminium vessel when it is heated.

.....

(ii) If the heat capacity of the aluminium vessel is 450 $J°C^{-1}$, what is the amount of heat absorbed by the vessel?

.....

.....

(iii) What is the amount of heat absorbed by water in the above situation? (Specific heat capacity of water is 4200 $J\,kg^{-1}\,°C^{-1}$)

.....

.....

(iv) If there is no heat loss in the above process, what is the total amount of heat provided by the hotplate?

.....

.....

2016 Part B 7 (B)

(iii) 1.5 kg of water in 27°C is put into the vessel in the arrangement which heats up water in a quicker time and the immersion heater is connected to the voltage supply.

(a) If the water was heated up to 97 °C find the amount of heat absorbed by water. (Take the specific heat capacity of water as 4 200 J kg^{-1} K^{-1})

(b) The power of the heater is 1 kW. If the time taken to heat the water up to 97 °C was 8 minutes, calculate the energy consumed by the immersion heater during that time.

(c) In that house, water is heated 4 times per day as above. Find the number of units of electricity they have consumed in a month of 30 days.

2017 Parb B

9. (A) The three solutions NaOH, HCl and NaCl of concentration 1.00 mol dm^{-3} are put separately into test tubes **A, B** and **C**.

(i) The tests carried out by a student to identify the solutions separately, and the observations made are given in the table below.

	Test	Observations
1.	Dipped red and blue litmus papers in the solution in tube **A**	• Blue litmus did not show any colour change • Red litmus turned to blue
2.	Dipped red and blue litmus papers in the solution in tube **B**.	• Red and blue litmus did not show any colour change

Mention the solutions in test tubes **A, B** and **C** respectively.

(ii) When 100 ml of each of the solutions NaOH and HCl stated above were mixed in a thermally insulated vessel, the temperature of the mixture rose up to 5 °C.

(a) Write the balanced chemical equation for the reaction between NaOH and HCl.

(b) Calculate the heat change associated with the reaction mentioned above.(Take the specific heat capacity of water as 4 200 J kg^{-1} $°C^{-1}$ and the density of water as 1 g cm^{-3}).

(iii) Write **two** assumptions that you made when determining the heat change associated with the reaction between NaOH and HCl stated above.

(*B*) The sun, atmosphere, land and the sea are natural resources.

(i) The sun's surface temperature is approximately 5 800 K.

(a) What is the surface temperature of sun in Celsius?

(b) In which heat transferring method does the heat transfer from sun to earth?

(c) Explain scientifically, how the sea breeze is formed in day time due to sun's heat.

(ii) In a certain day, the atmospheric pressure at sea level was 76 cm Hg and the atmospheric pressure at 10 km above sea level was 20 cm Hg.

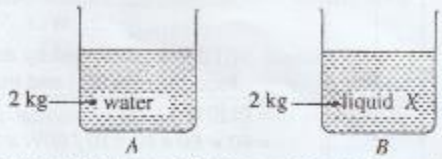
(a) Name a laboratory instrument which is used to take the measurements of atmospheric pressure stated above.

(b) What is the reason for the pressure difference observed above?

(iii) Calculate the hydrostatic pressure at a place 2 km deep from the sea level. Take the density of sea water as 1050 kg m^{-3} and acceleration due to gravity as 10 m s^{-2}.

2019 Part B 8

(B) *A* and *B* are two identical vessels of negligibly small thermal capacity. *A* contains 2 kg of water of specific heat capacity 4200 J kg °C^{-1} while *B* contains 2 kg of a liquid *X* of specific heat capacity 2100 J kg °C^{-1}. Each vessel is supplied with 8400 J of heat.



(i) Calculate how much will be the increase in the temperature of water contained in vessel *A* when supplied with the above amount of heat?

(ii) How much will be the increase in the temperature of liquid *X* contained in vessel *B* when supplied with the above amount of heat?

(iii) Which of the above liquids is more suitable to be used as a cooling agent? Give reasons for your answer.

(iv) A thermometer was introduced into the vessel *A*. Later, when the vessel was heated continuously, the thermometer reading stopped rising further after the water reached a certain temperature.
(a) By what name is that constant temperature known?
(b) At that instance, what can be observed in the water?
(c) What is the change of state occurring at that instance?
(d) By what name is the heat absorbed at that instance known?
(e) State the reason why the temperature of the liquid stopped rising though heat was supplied continuously.

(Total marks 20)