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Important Techniques in Practical Science.

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ABSTRACT:

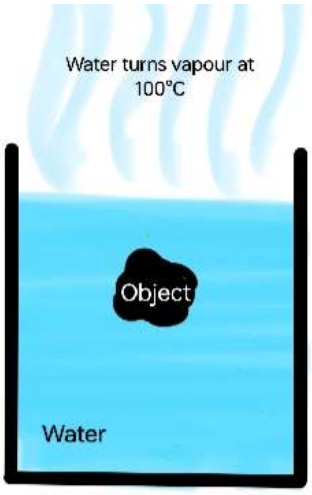
This paper contains some very basic concepts of theoretical science. These concepts are modified in this paper and also one can see the variations in the concept with the help of this paper. This paper explains that how can this concepts be used in increasing power leading to economic development. The two basic concepts covered in this paper are latent heat and lens (basically convex lens). With the help of this paper one can understand that how we can fasten the process of Nuclear and Thermal Power Plants leading to fast and more generation of electricity. This paper also contain some interesting variations in reflection through a convex lens.

Keywords: Latent heat, evaporation, boiling/melting point, convex lens, Focus, Centre of Curvature.

Introduction

During transition of solid phase to liquid, the object absorbs heat energy, but it's temperature does not increase. This heat energy is utilised for weakening the bonds between the atoms or molecules in solid and transform it into liquid phase. The heat energy absorbed at constant temperature during transformation of solid into liquid is called the latent heat of fusion. Once all the ice is transformed into water, the temperature of water starts rising. It increases up to 100°C. Thereafter, even though heat energy is supplied to water, it's temperature does not rise. The heat energy is absorbed by water at this temperature and used to break the bonds between molecules of the liquid and convert the liquid into gaseous state. Thus, during transformation from liquid phase to gas phase, heat energy is absorbed by the liquid, but it's temperature does not change. The constant temperature at which the liquid transforms into gaseous state is called the boiling point of liquid. The heat energy absorbed at constant temperature during transformation of liquid into gas is called the latent heat of vaporization. Reference[1]

Methodology



Let us suppose that we have a beaker which contains a certain amount of water. If we supply heat energy to that water, then the temperature of water will increase. After reaching at the temperature range of about 100°C, the water in liquid state transforms into gaseous state according to the latent heat of vaporization. But if we keep an object which is a very good conductor of heat inside that beaker, into that water and then supply heat energy. After water reaching at the temperature range of about 100°C, it's temperature will not increase and water will change it's state from liquid to gaseous.

The question is – Will the temperature of that object increase on further heating or it will remain constant as 100°C ?

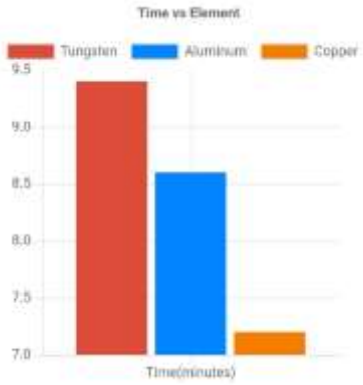
Modelling And Analysis

Now, there are two conditions.

If the temperature of that object increases on further heating then, that object will posses more heat energy as compared to the surrounding water. That object will supply heat energy to the surrounding water according to the principle of heat exchange. But, the temperature of water can't increase more than 100°C. Water gets converted into steam at 100°C. So, the temperature of water will not increase but water will reach at the temperature of 100°C in less time because of the heat supplied by that object. Here, we can conclude by saying that water gets boiled (evaporated) in less time when an object being good conductor of heat is placed inside it.

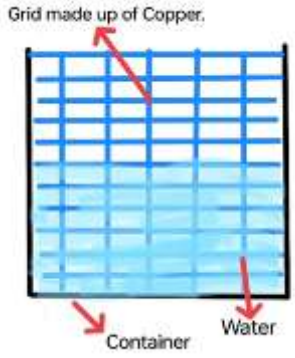
Now, If the temperature of that object remains constant as 100°C then the water will get boiled in the same time when the object is removed.

Results And Discussion



We carried out an experiment in order to find whether the temperature of that object increases on further heating or it will remain constant as 100°C. And we observed that the temperature of the object or element increases on further heating and water gets evaporated in comparitively less time. We can call this process as "**Elemental Evaporation**".

Conclusion



In Nuclear and Thermal Power Plants, the power is generated with the help of the principle of electromagnetic induction. In these plants a turbine is moved in order to produce electricity. Here, the turbine is rotated with the help of steam (water vapour). With the help of Elemental Evaporation water

get evaporated in less time and hence most steam is produced. Hence elemental evaporation fastens the process of Nuclear and Thermal Power Plants leading to greater energy supply and faster development.

The above diagram explains the principle of elemental evaporation. Copper (a good conductor of heat) is used in the above diagram however, we are free to use any element which is a good conductor of heat.

Fun Fact about convex lens:

In order to understand this topic, first we need to understand some basic terms

Centre of curvature (C): The centres of spheres whose parts form surfaces of the lenses are called centres of curvatures of the lenses. A lens with both surfaces spherical, has two centres of curvature C1 and C2.

Radius of curvature (R): The radii (R1 and R2) of the spheres whose parts form surfaces of the lenses are called the radii of curvature of the lens.

Principal axis: The Imaginary line passing through both centres of curvature is called the principal axis of the lens.

Optical centre (O): The point inside a lens on the principal axis, through which light rays pass without changing their path is called the optical centre of a lens.

Principal focus (F): When light rays parallel to the principal axis are incident on a convex lens, they converge to a point on the principal axis. This point is called the principal focus of the lens. Light rays parallel to the principal axis falling on a convex lens come together i.e. get focused at a point on the principal axis. So this type of lens is called a converging lens. Rays travelling parallel to the principal axis of a concave lens diverge after refraction in such a way that they appear to be coming out of a point on the principal axis. This point is called the principal focus of the concave lens. Light rays parallel to the principal axis falling on a concave lens go away from one another (diverge) after refraction. So this type of lens is called a divergent lens.

Focal length (f): The distance between the optical centre and principal focus of a lens is called it's focal length.Reference[2].

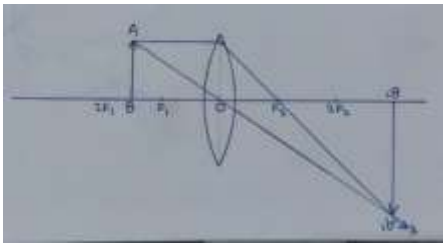
The lens which has spherical surfaces puffed up outwards is called a convex lens. Images can be formed through convex lenses by keeping object at different positions. The nature of images formed by convex lens is usually real and inverted except when the object is kept between F2 and O. (When object is kept between F2 and O, then the nature of image formed is virtual and erect). The image formed by concave lens is always virtual, erect and smaller than the object.

Are all erect images virtual and inverted images real ?

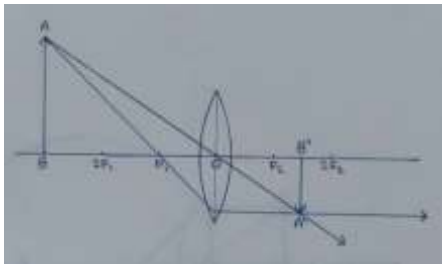
The answer to this question is no !

All virtual images are erect but all erect images are not virtual.

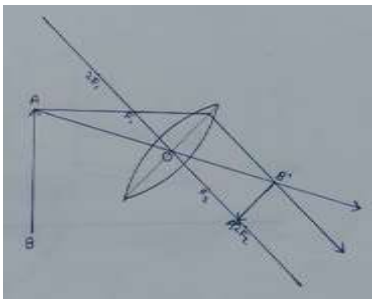
Similarly, all real images are inverted but all inverted images are not real.



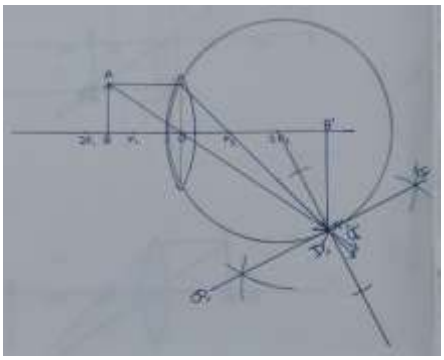
1) By taking this ray diagram into consideration, we can observe that the object A B is placed before a convex lens. Here, the image formed is beyond 2F2, the image is larger than the object and it is real and inverted.



2) As we all know that the ray which is parallel to the principle axis passes through the focus after passing through the lens. But what if the object is bigger than the lens ? In this case, the ray passes through the focus and becomes parallel to the principal axis after passing through the lens. This is possible only when the object is kept much beyond the 2F



3) However, image can also be formed by tilting the lens towards right or left according to the position of object.



4) By taking this ray diagram into consideration, we can observe that the object A B is placed before a convex lens. Here, the image formed is beyond 2F2, the image is larger than the object and it is real and inverted. By considering the distance between 2F2 and A' as radius, draw a circle with 2F2 at its centre. Point A' is on the surface of the circle. Draw a tangent passing from point A'. Let the two ends of the tangent be B'. Image of object A' B' is A B. From this we come to know that, images can be formed through many ways.

Here, the image of tilted object A' B' is A B. You can notice that the image is not inverted i.e. it is erect. As all virtual images are erect but all erect images are not virtual. This ray diagram is an example of this statement. Also when you see this image through the lens it feels as if the image is coming out of the lens. The experience is fantastic.

References:

1) Maharashtra State Board Standard 10th Science Part 1, Chapter 5: Heat, Page 62 and 63.
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3) Latent Heat Transfer: An Introduction to Fundamentals (Oxford Engineering Science Series) by G.S.H Lock, 1994.
4) Convex and Concave: The Mystery of the Magical Lenses by Dizazzo, Ray:
5) Encyclopaedia of General Science by Arihant