

## Physics (New Book) - 9th Class Physics Chapter 9 Long Question Preparation

Q1. What are the factors due to which radiation occurs

**Ans 1:** Various factors such as:

- Color and texture of the surface
- Surface temperature
- Surface area

**Ans 2:**

1. Decrease temperature by radiation: all the objects lying inside a room including the walls, roofs and floor of the room are radiating heat. However, there are also absorbing heat at the same time. When temperature of an object is higher than its surroundings then it is radiating more heat than it is absorbing. As a result, its temperature goes on decreasing till it becomes equal to its surroundings. At this stage, the body is giving out the amount of heat equal to the amount of heat it is absorbing.
2. Increase temperature by radiation: when temperature of an object is lower than its surroundings, then it is radiating less heat than it is absorbing. As a result, its temperature goes on increasing till it becomes equal to its surroundings.
3. Color and texture of the surface; the rate at which various surfaces emit heat depends upon the nature of the surface. Various surfaces can be compared using Leslie's cube.
4. Surface area: The transfer of heat by radiation is affected by the surface area of the body emitting or absorbing heat. Large surface area, greater will be the transfer of heat. It is due to the reason that large number of slots are made in radiators to increase their surface area.

Q2. What is greenhouse? also explain the greenhouse effect in global warming.

**Ans 1:** Greenhouse: a greenhouse is a heat trap. It is made of glass or transparent polythene sheets that allow only radiations of short wavelength to pass through them. Radiation of long wavelength cannot enter or escape from the greenhouse. Uses; greenhouse is usually used for plant growth.

**Ans 2:** Phenomenon of maintenance of temperature in greenhouse: light from the sun contains thermal radiations (infrared) of long wavelength as well as light and ultraviolet radiations of short wavelength to pass through easily but not long wavelength of thermal radiations. Thus, a greenhouse becomes a heat trap. Radiations from the sun pass easily through glass and warm up the objects in a greenhouse. These objects and plants give out radiations of much longer wavelengths. Glass and transparent polythene sheets do not allow them to escape out easily and are reflected back in the greenhouse. This maintains the inside temperature of the greenhouse. Greenhouse effect promises better growth of some plants.

**Ans 3:** Greenhouse effect: greenhouse effect is rising of temperature because of trapping of heat energy by greenhouse gases such as carbon dioxide, etc. in the atmosphere.

**Ans 4:** Mechanism of greenhouse effect: carbon dioxide in the atmosphere and water behave in a similar way to radiations as glass or polythene. Earth's atmosphere contains carbon dioxide and water vapors. It causes greenhouse effect and thus maintains the temperature of the earth. During the recent years, the percentage of carbon dioxide has been increased considerably. This has caused an increase in the average temperature of the earth by trapping more heat due to greenhouse effect.

**Ans 5:** Global warming: the average rise in the temperature of the earth by trapping more heat due to greenhouse effect is called global warming.

Effect of greenhouse in global warming: during the recent years, the percentage of carbon dioxide has been increased considerably by rapid use of fuels. This has caused an increase in the average temperature of the earth by trapping more heat due to greenhouse effect. This phenomenon is known as global warming. This has serious implications for the global climate.

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Q3. Write the uses of conductors and non-conductors

**Ans 1:** Uses of conductor: good conductors are used when quick transfer of heat is required through a body. Thus, cooker, cooking plates, boiler, radiators and condensers of refrigerators etc. are made of metals such as aluminum or copper. Similarly, metal boxes are used for making ice creams, etc..

**Ans 2:** Uses of insulators: insulators or bad conductors are used in home utensils such as handles of sauce-pans, hot plate, spoons etc. They are made of wood or plastic. Air is one of the bad conductors or best insulators.

- Cavity walls separated by an air space and double glazed windows keep the houses warm in winter and cool in summer
- Materials which trap air i.e. wool, felt, fur, feathers, polystyrenes, and fiber glass are also bad conductors. Some of these materials are used for laggings to insulate water pipes, hot water cylinders, ovens, refrigerators, walls and roofs of houses.
- Woolen cloth is used to make warm winter clothes.

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Q4. what measures may be taken to save energy?

**Ans 1:** In houses good thermal insulators mean lower consumption of fuel.

**Ans 2:** Measures to save energy: for this, following measures may be taken to save energy

- Hot water tanks are insulated by plastic or foam lagging
- Wall cavities are filled with plastic foam or wool
- Ceiling of rooms is covered by insulating material (false ceiling)
- Double glazed window panes are used. These window panes have air between sheets that provides good insulation.

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Q5. Define and explain the radiation

OR

How does heat reach us from the sun?

**Ans 1:** Radiation: radiation is the mode of transfer of heat from one place to another in form of waves called electromagnetic waves. Radiation is that process of heat transfer in which heat energy reaches in the form of waves from one place to another without affecting the medium on its way.

**Ans 2:** Explanation: it is a process by which solar energy reaches the earth passing through space. Radiation is an all-time continuous process around us. When a body is at a higher temperature than its surrounding objects, it emits more heat by thermal radiation and absorbs less heat by thermal radiation from nearby objects, thus the temperature of the body falls. Similarly, emission of less heat by radiation causes and absorption of more heat by radiation causes the rise in the temperature of nearby objects.

**Ans 3:** Examples:

- Heat of the sun: it is through radiation that heat reaches us from the sun. Our sun is the major source of heat energy. It reaches us neither by conduction nor by convection, because the space between the sun and the earth's atmosphere is empty. It is radiation by which heat travels from one place to another.

**Ans 4:**

- Heat from a fireplace; transfer of heat by radiation is the heat received from a fire place. Air is a poor conductor of heat. Heat does not reach us by conduction through air from the fire place, because air is a poor conductor of heat. Heat from the fire places

reaches us directly by the process of radiation in the form of waves called radiation. A sheet of paper or cardboard kept in the path of radiations stop these waves to reach us.

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Q6. What causes a glider to remain in air? describe

**Ans 1:** Gliding: a glider looks like a small aeroplane without engine. Glider pilots use upward movement of hot air currents due to convection of heat. these rising currents of hot air are called thermals.

Gliders ride over these thermals. The upward movement of air currents in thermals help them to stay in air for a long period.

**Ans 2:** Uses; the birds stretch out their wings and circle in these thermals. The upward movement of air helps birds to climb up with it. Eagles hawks and vultures are expert thermal climbers. after getting a free lift, birds are able to fly for hours without flapping their wings. They glide from one thermal to another and thus travel through large distances and hardly need to flap their wings.

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Q7. What is thermal conductivity ? explain on which factors it depends

**Ans 1:** Thermal conductivity: the rate of flow of heat across the opposite faces of a meter cube of a substance maintained at a temperature difference of one kelvin is called the thermal conductivity of that substance.

Unit:  $\text{Wm}^{-1}\text{K}^{-1}$  is the unit of thermal conductivity.

**Ans 2:** Definition of rate of flow of heat; the amount of heat that flows in unit time is called the rate of flow of heat.

Representation: it is represented as

Rate of flow of heat =  $Q/t$

Example: conduction of heat occurs at different rates in different materials. In metals, heat flows rapidly as compared to insulators such as wood or rubber.

Explanation; consider a solid block. One of its opposite faces each of cross-sectional area  $A$  is heated to the temperature  $T_1$ . Heat  $Q$  flows along its length  $L$  to opposite face at temperature  $T_2$  in  $t$  second

**Ans 3:** Factor affecting the rate of flow of heat: it is observed that the rate at which heat flows through a solid object depends upon various factors.

- Cross-sectional area of solid: large cross-sectional area  $A$  of a solid contain large number of molecules and free electrons on each layer parallel to its cross-sectional area and hence greater will be the rate of flow of heat through the solid

**Ans 4:**

- Length of the solid: larger is the length between the hot and cold ends of the solid thus, more time it will take to conduct heat to the colder end and smaller will be the rate of flow of heat

**Ans 5:**

- Temperature difference between ends: greater is the temperature difference  $T_1 - T_2$  between hot and cold faces of the solid, greater will be their rate of flow of heat.

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Q8. Write the uses of conductors and non-conductors.

**Ans 1:** Uses of conductor: good conductors are used when quick transfer of heat is required through a body. Thus, cooker, cooking plates, boiler, radiators and condensers of refrigerators etc. are made of metals such as aluminum or copper. Similarly, metal boxes are used for making ice creams, etc..

**Ans 2:** Uses of insulators: insulators or bad conductor are used in home utensils such as handles of sauce-pans, hot plate, spoons

etc. They are made of wood or plastic. Air is one of the bad conductor or best insulator.

- Cavity walls separated by an air space and double glazed windows keep the houses warm in winter and cool in summer
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### Q9. What is conduction. Explain it briefly

**Ans 1:** Conduction: the mode of transfer of heat by vibrating atoms and free electrons in solids from hot to cold parts of a body is called conduction of heat. Example: the handle of metal spoon held in hot water soon gets warm. But in case of a wooden spoon, the handle does not get warm. Both the materials behave differently regarding the transfer of heat. Metals are better conductors of heat than non-metals.

**Ans 2:** Conduction in solids: in solids, atoms and molecules are packed close together. They continue to vibrate about their mean position. The atoms or molecules present at the end begin to vibrate more rapidly. They also collide with their neighboring atoms or molecules. In doing so, they pass some of their energy to neighboring atoms or molecules during collisions with them with the increase in their vibrations. These atoms or molecules in turn pass on a part of the energy to their neighboring particles. In this way some heat reaches the other parts of the solids. This is a slow process and very small transfer of heat takes place from hot to cold parts in solids.

**Ans 3:** Conduction in metals: metals have free electrons. These free electrons move with very high velocities within the metal objects. They carry energy at a very fast rate from hot to cold parts of the object as they move. Conclusion: thus heat reaches from hot parts of metals to cold parts much more quickly

**Ans 4:** Conduction in non-metals: non-metals are bad conductor of heat and the substances through which heat does not conduct are called bad conductors or insulators. Example: wood, cork, cotton, wool, glass, rubber, etc. are bad conductors or insulators. Conclusion: non-metals are insulators thus heat does not conduct through it.

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### Q10. What are applications and consequences of radiation.

**Ans 1:** Applications and consequences of radiation:

Absorption of heat: different objects absorb different amounts of heat radiations falling upon them reflecting the remaining part.

Dependence: the amount of heat absorb by a body depends upon the color and nature of its surface.

Example: a black and rough surface absorb more heat than a white or polished surface. Since good absorbers are also good radiators of heat. Thus, a black colored body gets hot quickly in summer by absorbing heat from its surrounding. It cools down quickly by giving out its heat to its surroundings. The bottom of cooking pots is made black to increase the absorption of heat from fire.

**Ans 2:** Reflection: like light rays, heat radiations also obey the laws of reflection.

Dependence: the amount of heat reflected from an object depends upon its color and nature of the surface.

Example: white surface more heat than colored or black surfaces. Similarly, polished surfaces are good reflectors than rough surfaces and reflection of heat radiations is greater from polished surfaces. We wear white or light color clothes in summer, which reflect most of the heat radiations reaching us during the hot day. We polish the interior of cooking and hot pots for reflecting back most of the heat radiation within them.

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