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EXAM: TEE/Fall sem 2021-22
Subject: PHY2002

Slot: F11 + F12
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Date: 12 Jan, 2022
Term End Examination

1(b) Assuming that one is a okay source of black body, that can absorb incident electromagnetic radiation. ①

Wein's displacement law states that black-body radiation curve for different temperatures peaks at wavelength $\propto \frac{1}{T}$.

$$\lambda_{\max} = \frac{b}{T} \quad ; \quad b = 2.898 \times 10^{-3} \text{ mK}$$

$$\therefore T = (T_F - 32^\circ\text{F}) = \frac{5\text{K} + 273\text{K}}{1^\circ\text{F}} = 310.15\text{K} \quad (\text{converted to K})$$

$$\therefore \lambda_{\max} = \frac{2.898 \times 10^{-3} \text{ mK}}{310.15\text{K}} = \boxed{9.34 \times 10^{-6} \text{ m}} = 9.34 \mu\text{m}$$

\therefore It is close to $10 \mu\text{m}$, it is close to the infrared region.

2(a) SOLAR COOKERS

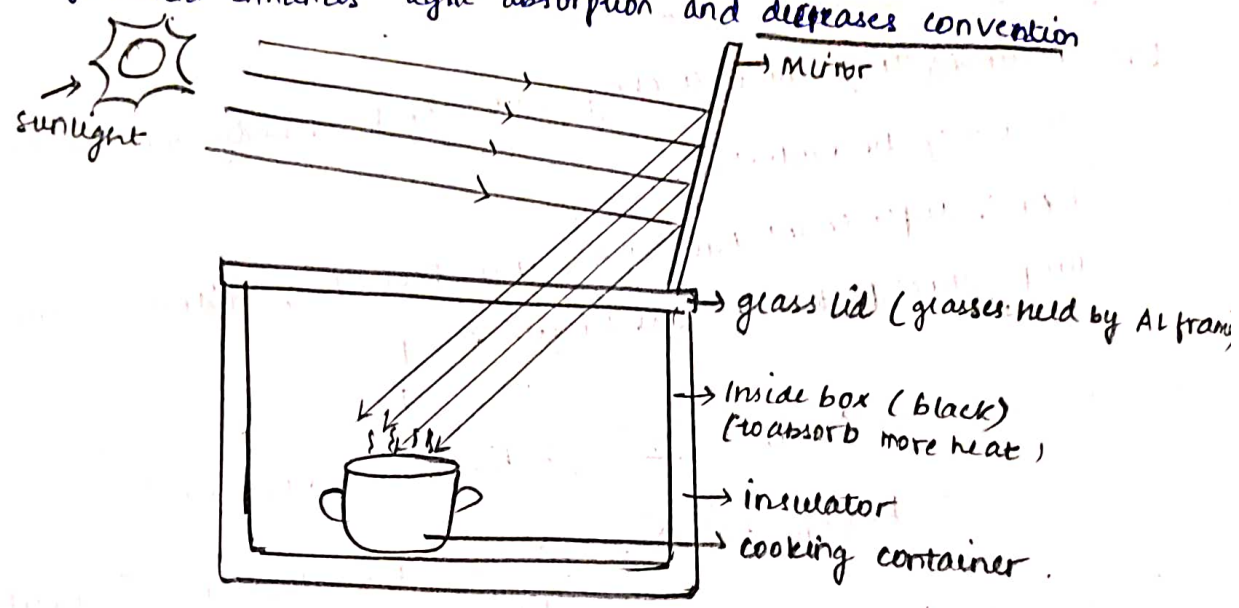
* Use light to cook - principle

Sublight radiates ~~radiation~~ ^{radiations} generated by changing electric and magnetic fields. These radiations are converted to heat when the light packets interact with substances. When the electromagnetic radiation strikes, the energy makes matter to vibrate and molecules jump to higher levels, this generates heat. This heat is used for cooking.

\Rightarrow WORKING

- * To concentrate the sunlight, a mirror surface is used to channel sunlight to the cooking spot.
- * The sunlight has to be concentrated enough and multiple times to cook i.e., metals.
- * The sunlight is focused onto a receiver utensil. Now as soon as the rays hit, the light energy gets converted to heat energy (CONDUCTION).

A good conducting cooking utensil is used to maximise the heat. The pot and pans should be matte black in colour to maximise absorption.
Now convection is ~~not~~ reduced to isolate the air inside the ~~cookers~~ oven. A glass lid enhances light absorption and decreases convection



The sunlight enters the box by the help of plane mirror. The insulated box has black coating from inside to absorb the radiations and heat is produced. The food absorbs heat and cooks. The glass doesn't allow the heat to escape and helps in increasing the temperature furthermore.

→ Advantages

- * No fuel required, only sunlight is needed as fuel which is a renewable resource, plenty in nature.
- * Cost efficient as it is a one time investment.
- * Non-polluting as no waste is generated.
- * Reduces carbon footprint as it cooks without carbon dioxide based fuels.
- * Even if there is a power cut, food can be prepared during daytime.
- * Clean cooking as food can't be burnt and the moisture and softness is retained.

→ Dis-advantages

- * Cannot be used in cloudy time or nights.
- * Some can take time to cook, so not time efficient.
- * Heavy dishes like breads can't be baked due to less temperature.
- * Radiations can effect eyes if not taken care of.

3(b)

3

TROPOSPHERE

- * The troposphere is the lowest layer of our atmosphere. Starting at ground, it extends upwards to about 10 km above sea level.
- * Energy source is heating of Earth's surface by the sun. The weather occurs here. Clouds appear here as 99% of water vapor is found here. &
- * The air pressure drops and temperature gets colder as one moves higher.

STRATOSPHERE

- * It extends from top of troposphere to 50 km above the ground.
- * Ozone layer is found here. It absorbs all UV light rays from sun, converts UV energy to heat.
- * It gets warmer as one goes upwards. Air here lacks turbulence and updrafts of troposphere beneath. Air here is stable as warmer, less dense air sits over denser air.
- * So pressure is a mix here.
- * Commercial jets fly here in lower region.

MESOSPHERE

- * It extends upward to a height of 85 km above the surface.
- * Meteors are born here. Temperature grows colder as one moves up. The Earth's coldest temperature is found at its top. ~~The~~
- * The air here is very thin so it doesn't help in breathing. Air pressure at the bottom of the layer is below 1% of pressure at sea level and drops continuously as one moves higher.

THERMOSPHERE

- * X-rays and UV radiation from sun are absorbed here, raising temperatures to thousands of degrees.
- * The air is so thin that it feels freezing. It feels like a part of the space and not the atmosphere.
- * They can absorb solar wind of nuclear particles, so temperatures increase.
- * Air molecules move very fast but pressure is very low here.

EXOSPHERE

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- * It is the uppermost layer of Earth's atmosphere, it almost merges with the space.
- * It is the warmest in temperature as it is the closest to the sun, but temperature vary a lot ~~not~~ because ~~the region~~ the region not exposed to sun at a time may be cold.
- * Air pressure drops as altitude increases and it is virtually nothing in the outer reaches.

- 4.
- * Alternate source of energy can help in improving our future.
 - * They have a much lower carbon footprint than non-renewable resources such as coal, petroleum etc.
 - * This alternate source of energy (Renewable sources) can help reverse the climate change or atleast slow its rate.
 - * Renewable sources such as hydropower, solar and wind energy can save ~~many~~ many lives which ~~die~~ ^{die} ~~happen~~ due to air pollution.
 - * By slowing climatic change and reducing harm, we can see reduction of the effects such as floods, droughts and storms.
 - * Energy supply won't be dependent on fossil fuels only and would use green cleaner and efficient renewable resources. This can also help in conserving fossil fuels as the new source will be inexhaustible. This is very much required as fossil fuels are very close to utter depletion altogether.
 - * There can be a rapid growth in economy and new jobs formed due to the implementation of inexhaustible renewable energy. The sustainable energy industry would grow rapidly.
 - * As the carbon dioxide emissions from fossil fuels and energy power plants contribute a large part in global warming, these alternate sources will help in improving the condition in future.

5* Let us first understand what is GWP. GWP or, The Global Warming Potential of a greenhouse gas is the ability of a greenhouse gas to trap extra heat in the atmosphere over time, relative to CO_2 . This is calculated over 100 years, so called 100 year GWP.

⇒ The GWP depends on:

- How effective the gas is at trapping heat from atmosphere.
- How long it can stay before breaking down.

eg CH_4 (methane) breaks down quickly. An average CH_4 molecule can stay for 12 years in the atmosphere. CH_4 traps more heat than CO_2 , while it can stay for much longer.

* Now, by understanding this, we can say if 1 kg of a greenhouse gas traps some amount of heat, we can find how much CO_2 would trap for same amount.

* The 100 year global warming potential of methane is 25, so 1 tonne of methane was released in the atmosphere, it would create the same warming as 25 tonnes of CO_2 . ~~That~~ So, it is a CO_2e , (CO_2 equivalent).

* Having a common scale for all greenhouse gases allows us to compare the emissions. By comparing, we can decide what we can do to reduce or stop those emissions. So, we can strategise, plan and target different sources and gases without much economic impact.

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Thankyou Ma'am!