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(1)

1(a) Energy transformations in a car :

- Internal combustion engine in cars converts the chemical energy in the fuel and oxygen into thermal energy.
- The thermal energy is converted into mechanical energy that accelerates the vehicle by increasing the kinetic energy and by causing the pressure on the pistons
- So we can see chemical energy stored in the fuel is converted to kinetic energy via combustion in engine. Also, battery of car converts electrical to mechanical energy.
- Heat energy changes into mechanical energy which moves the car. and the chemical energy that stored in fuel changes to heat energy of engine.
- The kinetic energy of expanding gas is converted to piston motion and then to rotation of the wheels and the steering wheel.
- Also, a part of electric energy is converted into light energy in car lights and all. A part of electric energy is converted to sound energy for audio and into heat energy for heater or air conditioner.

To make it more energy efficient,

- Invest in efficient cars: from the beginning itself, find a car which provides more mileage.
- Limit AC usage : ~~use~~ Limit your AC usage as it uses up more fuel.
- Maintainence : Maintain your vehicle properly, get it serviced on time and get its pollution checked.
- Use only when needed : Switch to bicycles and public transports for shorter distances and use personal vehicle when needed.
- Check air filters and fuel system from time to time.

(6)

Work done (W) = Force × S × cos θ

Force is acting perpendicularly, θ = 90°

∴ W = F × S cos 90

W = F × S × 0 = 0

∴ Work done = 0 Joules.

Moving from old house to new house, he is applying force but as the force is 90° to displacement, work done becomes zero.

Also, the heights of both the floors are same and W = mgh too, 'm' and 'h' remain the same. Hence, mathematically, no work is done by this calculation as well. as the work done = 0

- This mathematical calculation doesnt mean that we did no work, the friend needs to understand that though the work done mathematically is zero, we still did some physical work. As physically we have been walking to the new address with weight.

2

⇒ Yes, global warming is causing climate changes and becoming a serious threat to life. It has caused the following problems:

Greenhouse effect

Almost all major atmospheric gases which are transparent, they are transparent to both, sunlight and out going infrared. Howeven water vapour, CO_2 methane and other trace gases are opaque to thermal infrared energy. The Earth's surface radiates a lot of solar energy as infrared. However, some escape to space and a fraction of solar energy is transferred to the atmosphere when greenhouse gases absorb this thermal infrared energy. Due to this the temperature rises. Greenhouse gases radiate an increased amount of thermal infrared energy in all directions. Some of this comes in contact with Earth's surface and makes it warmer-than normal. This supplem heating is greenhouse effect

The amount of heat radiated from atmosphere to surface is equivalent to all of the solar energy. Now, naturally these dont effect much, but due to human intervention like burning of fossil fuels, vehicles / factories and houses release greenhouse gases like CO_2 and CH_4 also deforestation adds to it. So these gases trap more heat on Earth which rises global temperatures. As the greenhouse gases are more, more heat traps in the atmosphere. This has increased the global temperatures, depleted the ozone layer. Due to the depletion of ozone layer, the solar radiation has increased as harmful rays pass through ozone layer and enter in the atmosphere. People are suffering from skin cancer as these solar radiations are caranogenic.

3 ... caused the following ....

(4)

Black body :	Grey body
* It is an ideal body / object	* It is a non-ideal body / object.
* Absorbs all incident electromagnetic radiation.	* Emits radiation at each wavelength, whose ratio is less than 1 to that emitted by a black body.
* Planck's law states that the spectrum of black body is determined by temperature of the body.	* Absorptivity doesn't change with temperature and wavelength of the incident radiation
* It is an ideal emitter - emits radiation at all possible frequencies that it can at the same temperature	* Non-ideal emitter as it absorbs some of the energy it receives and reflects as well
* Diffused emitter - emits same frequency at each direction.	

* SIMILARITY

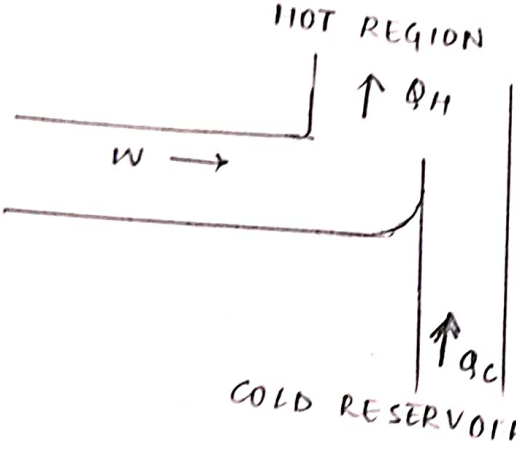
⇒ Both of them are objects which absorb and emit radiation.

A fridge in general reduces the temperature of the contents under the environment. It requires energy to pump the heat out. If the fridge isn't plugged, it comes to a thermal equilibrium with the surrounding.

The second law of Thermodynamics says that processes that involve the transfer or conversion of heat energy are irreversible. It also claims that it is not possible for heat to flow from cold body to hot body spontaneously, and can only take place if some work is done.

As discussed above, refrigerator work by transferring heat from the inside, which is cold to outside, which is comparatively hotter. This makes the cold regions cooler.

This helps refrigirators to keep food inside them cool and they vent our hot air through vents.



All real refrigirators need work to flow heat from cold reservoir to hot region

Spontaneous flow of heat from cold source to a hotter region is forbidden by the second law of thermodynamics.

A perfect refrigerator has a 100% efficiency. That is not possible as spontaneous flow of heat from cold sowa to a hotter region is forbidden by second law of thermodynamics.

WORKING: In the figure, heat from cold reservoir is taken, some work is done and the rejected heat is sent to the hot region. This makes the cold region cooler. So it is a reverse heat engine.

Fractional distillation

- It is a method of isolating crude oil into hydrocarbons of comparable number of carbon atom.
- It is used when there are mixtures of liquids to be separated whose boiling points are similar. ($< 70^{\circ}C$)
- A mixture of liquid is boiled and the vapours travels up in a glass tube which is called a 'fractioning column' and separate at different levels.
- This column is placed between the flask of mixture and a Y shaped adaptor to improve separation.
- Now, the temperature is maximum at the lowest of the column. The liquids condense at different levels according to their density.
- These fractions are then added up to create fuels, lubricants and solvent
- It is a better method than distillation as the glass beads provide surface on which vapour condense and re-evaporate, condense and provide better distillation.

The more volatile liquids move up. whereas high boiling point liquids stay down in the column.

The vapours reach the condenser where it is cooled and then collected in a vessel.