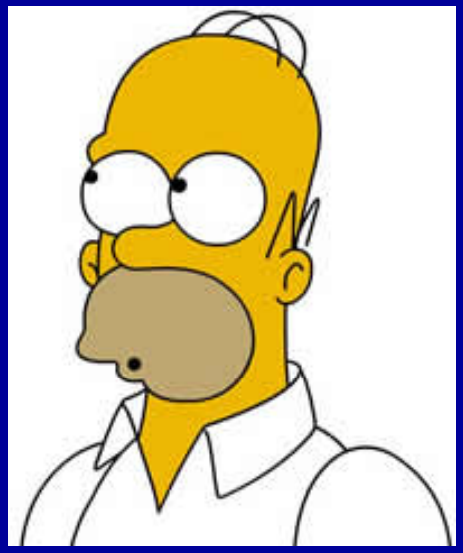
TOPIC # 9 (cont.)
THERMODYNAMICS:

What you need to know about

PHASE CHANGES & THERMAL ENERGY TRANSFER

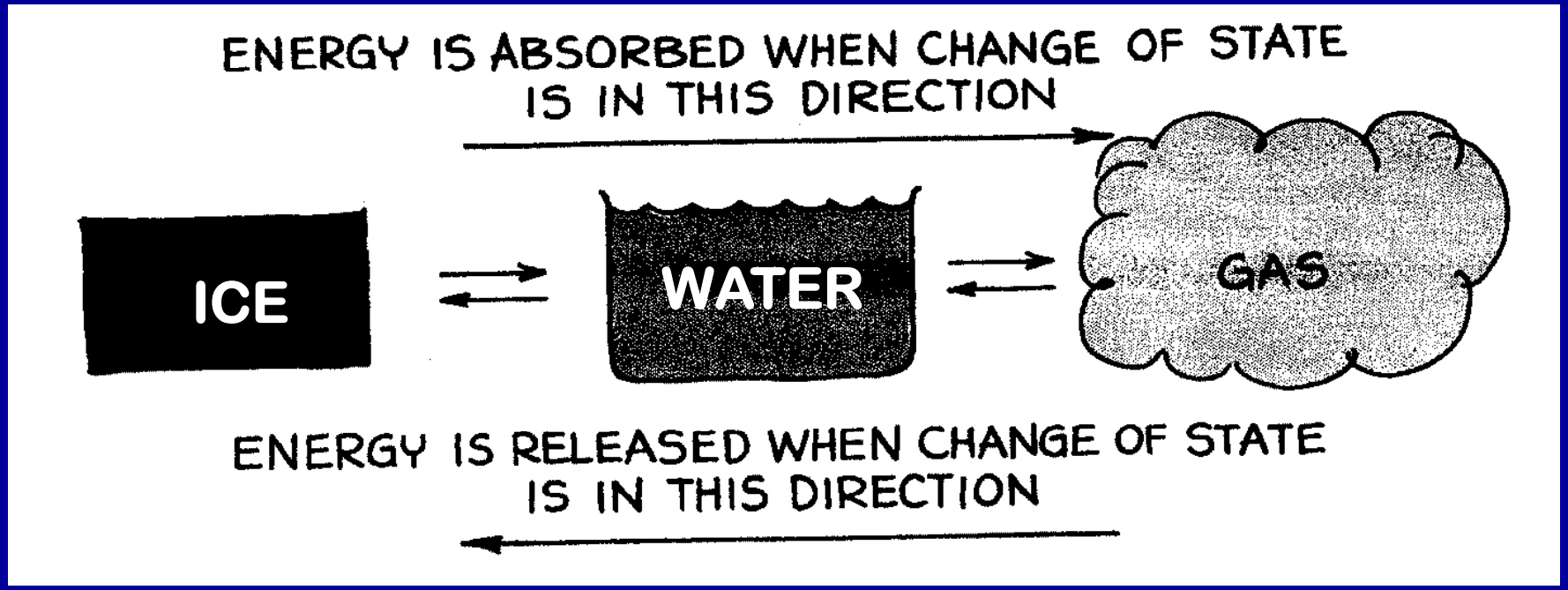


CLASS NOTES: pp 44 - 45

THERMODYNAMICS & PHASE CHANGES IN H_2O

Energy stored as LATENT ENERGY

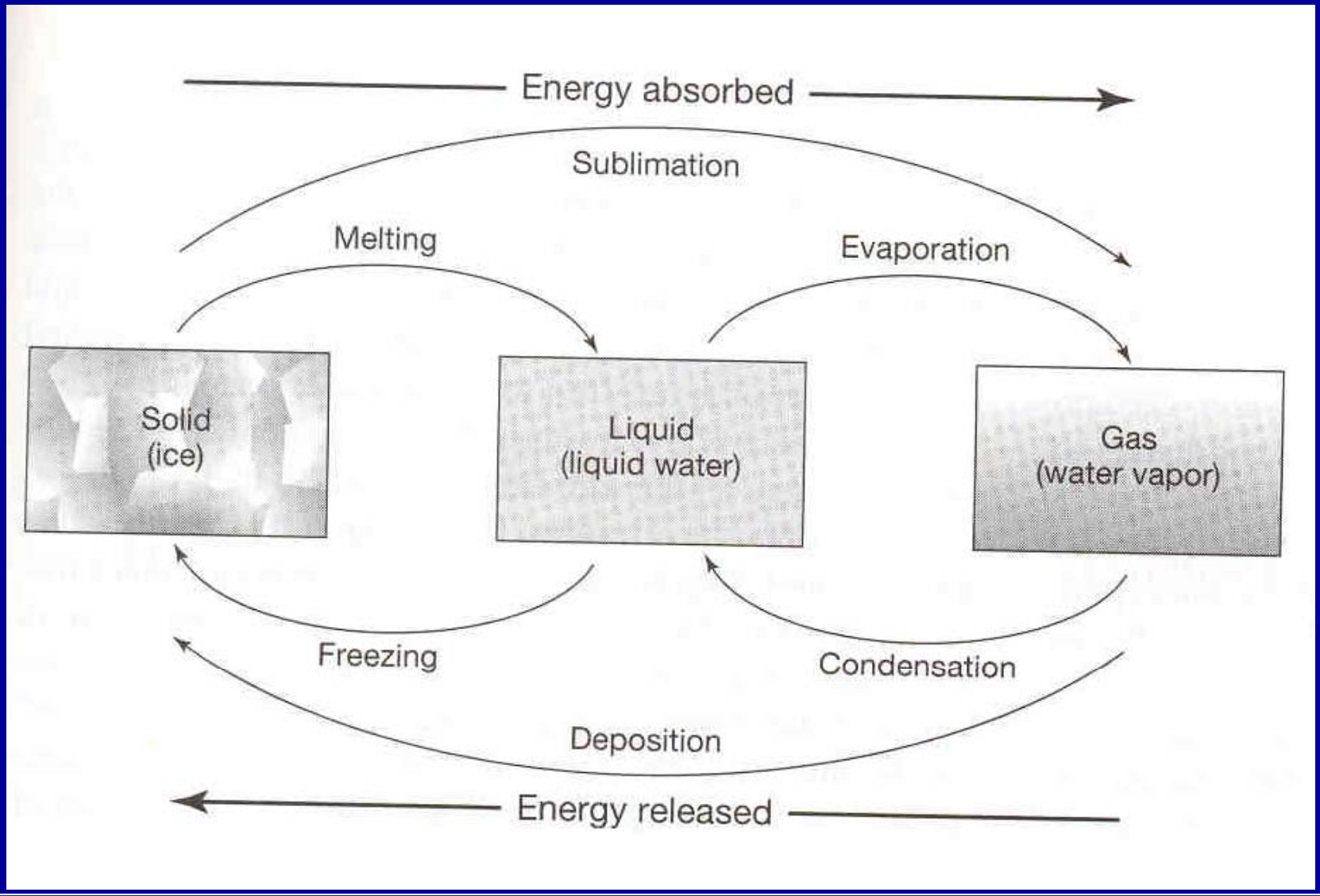
(energy is “hidden” & not sensed)



Energy released as SENSIBLE HEAT

(i.e. the warmth can be “sensed”)

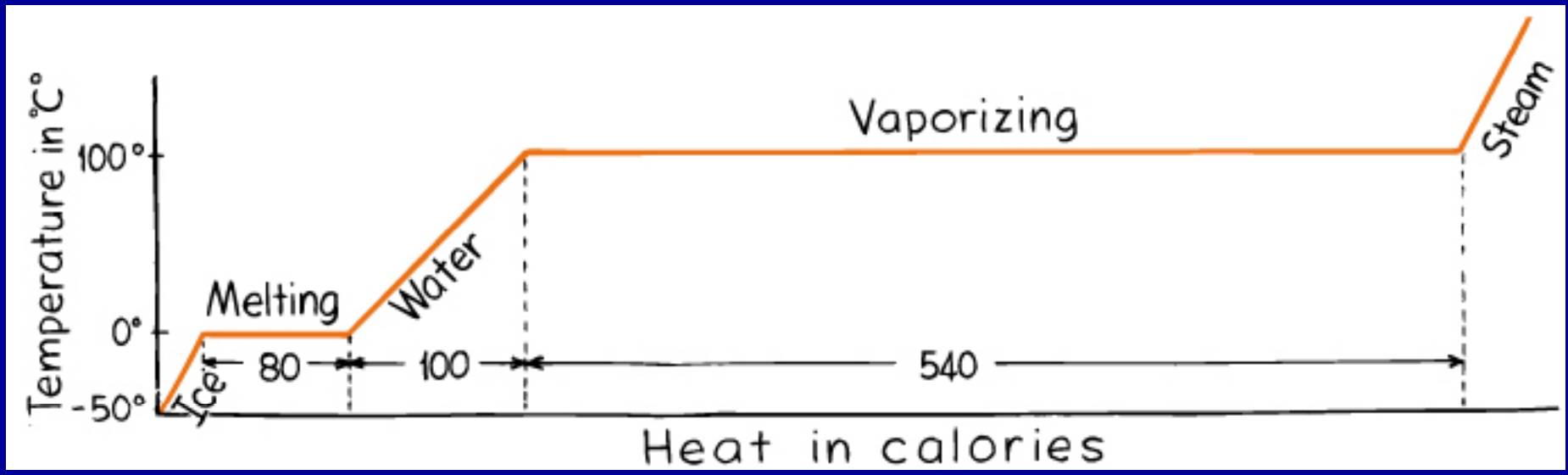
PHASE CHANGES (another view)



This is in your textbook: Fig 4-23 p 76 in SGC- I text

THOUGHT QUESTION:

In this graph, what's happening to the energy in the portions where the graph is <u>horizontal</u>?



HINT: it has to do with

SENSIBLE HEAT (H)

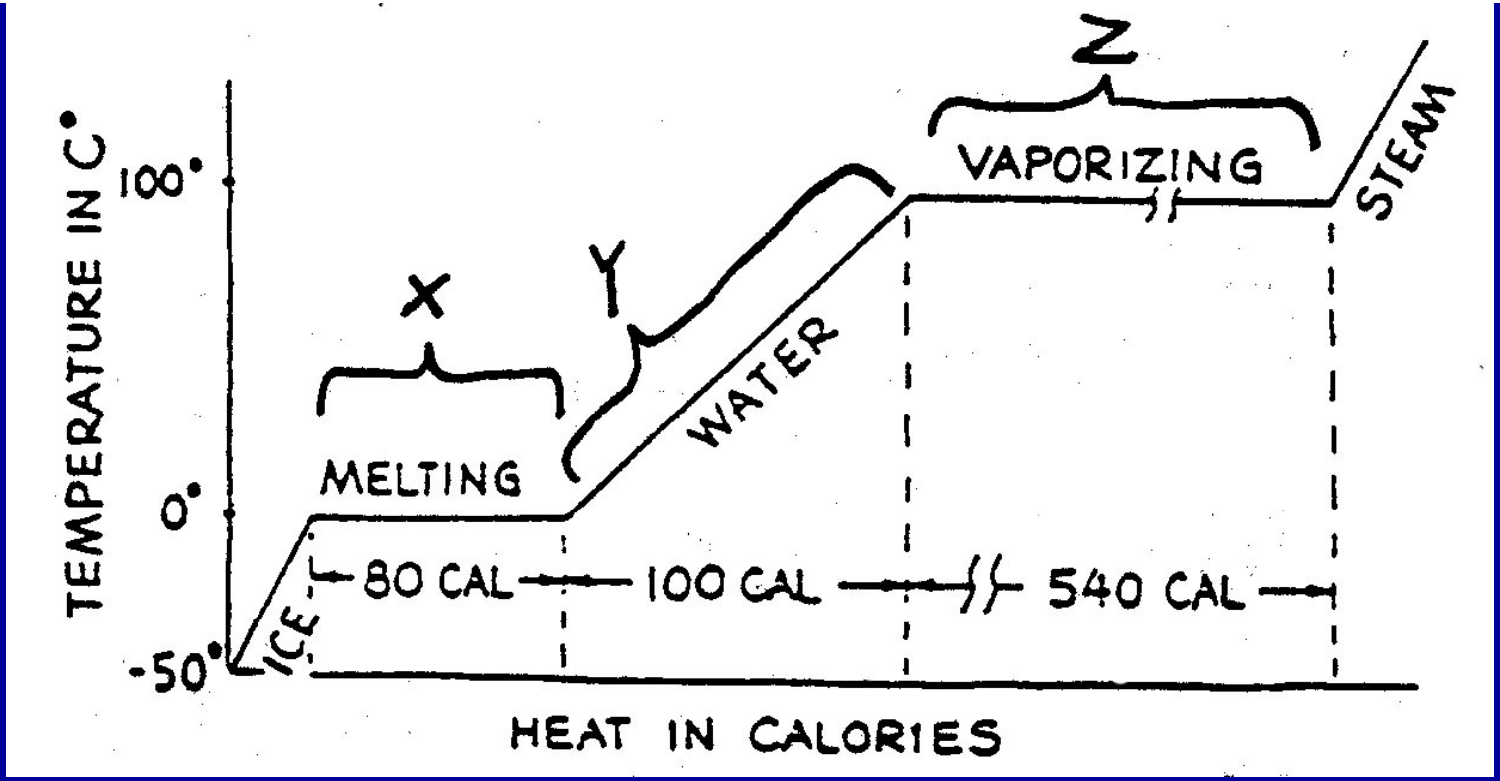
&

LATENT HEAT (LATENT ENERGY) LE

REVIEW / BACKGROUND:

SENSIBLE = the energy can be SENSED (e.g., with a thermometer, by the environment, etc.)

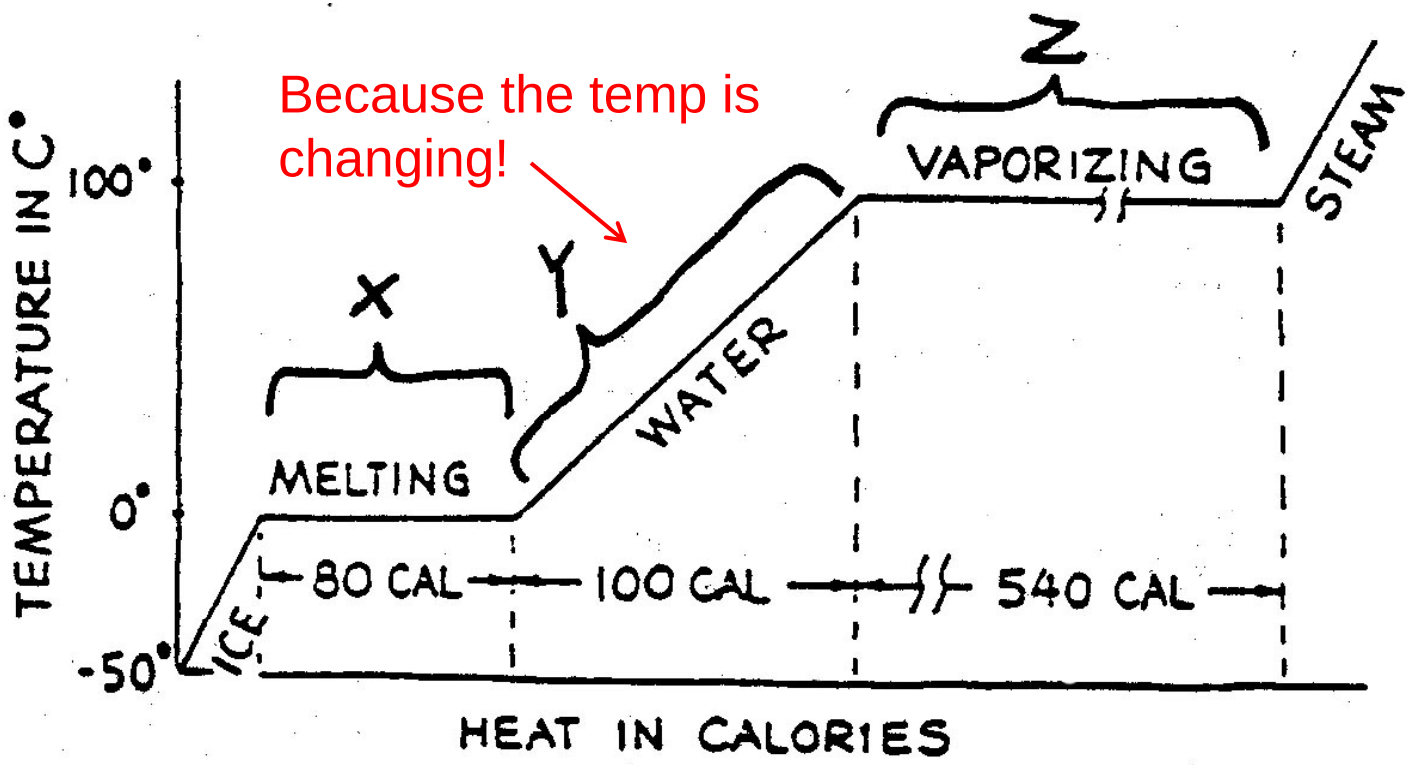
LATENT (means “HIDDEN”) = the energy is there, but it is NOT SENSED by the environment, a thermometer . . . or YOU!



Which segment or segments of the graph represent(s) **SENSIBLE HEAT (H)** ?

1 = X & Z **3 = Y only**

2 = X only **4 = Z only**



Which segment (s) of the graph represent **SENSIBLE HEAT (H)**?

1 = X & Z

3 = Y only

2 = X only

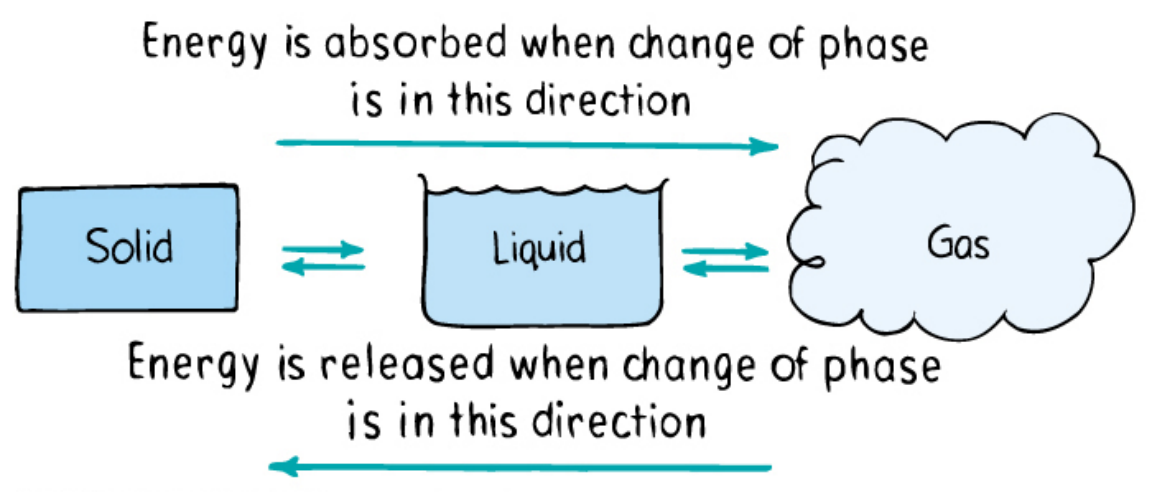
4 = Z only

In a phase change from ice to water or water to water vapor, WHAT is absorbing the energy?

1 = the surrounding environment

2 = the H_2O molecules

3 = both the environment & the H_2O

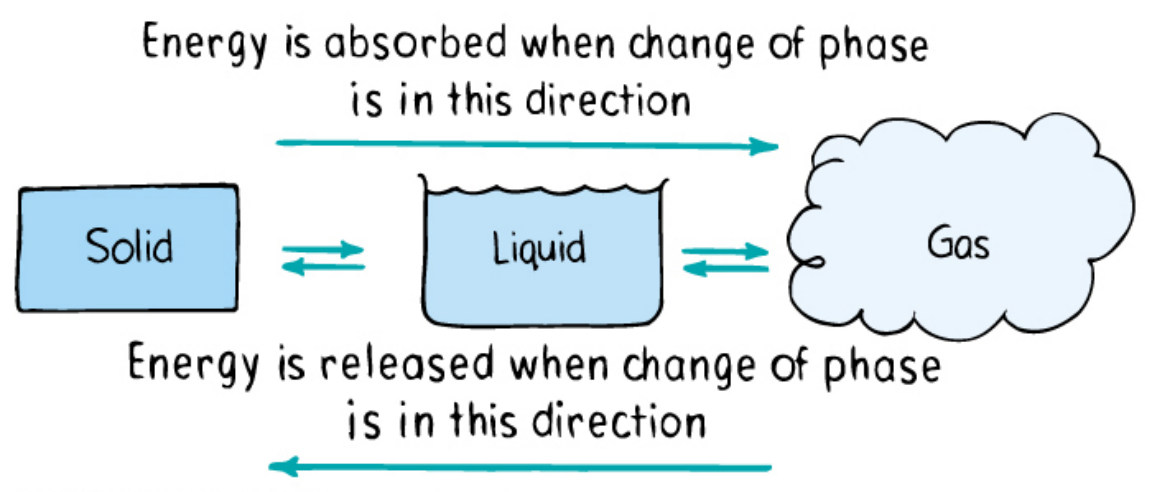


In a phase change from ice to water or water to water vapor, WHAT is absorbing the energy?

1 = the surrounding environment

2 = the H_2O molecules

3 = both the environment & the H_2O

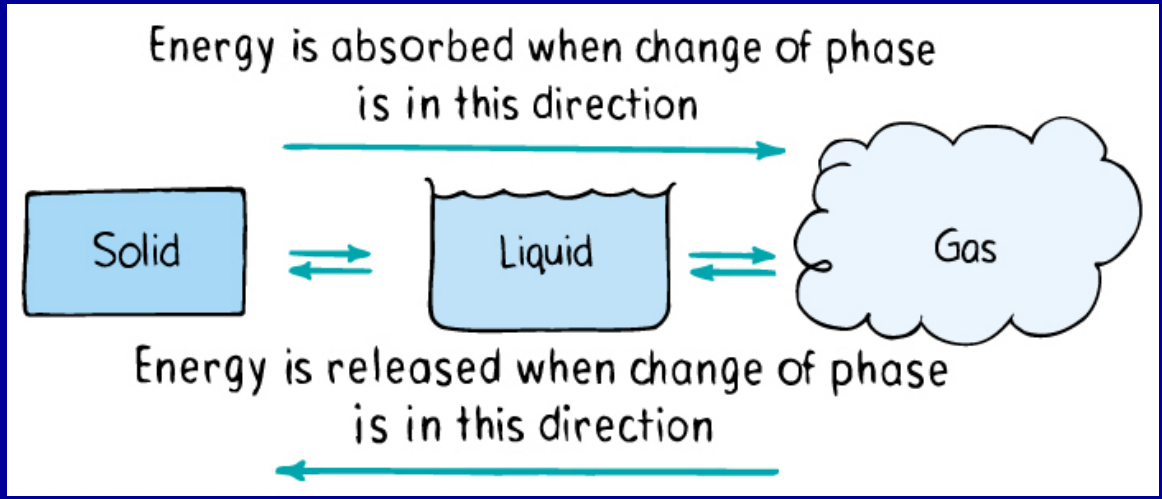


In a phase change from water vapor to liquid water or liquid water to ice, <u>TO WHERE</u> is the energy being released?

1 = into the surrounding environment

2 = into the H_2O molecules

3 = into both the environment & the H_2O

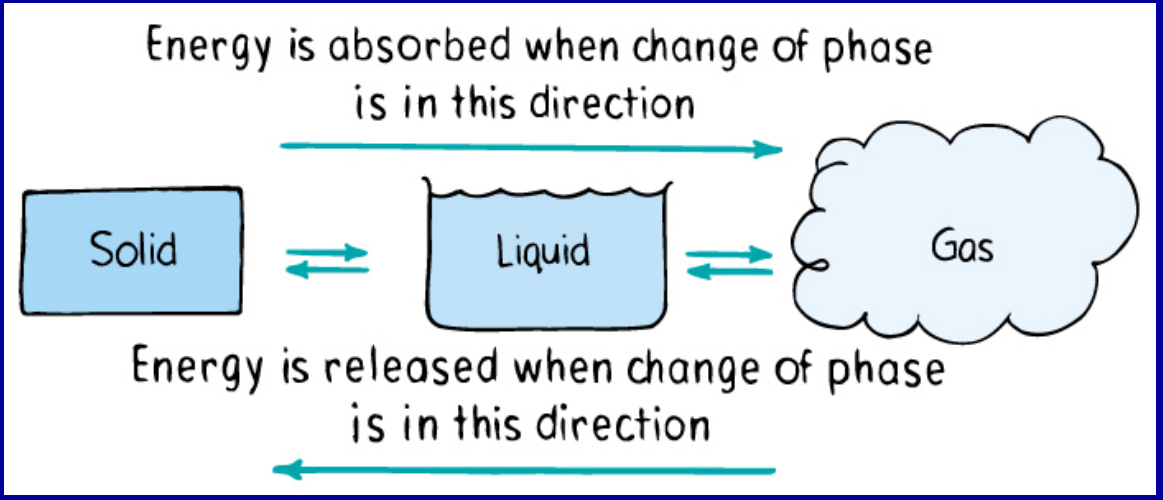


In a phase change from water vapor to liquid water or liquid water to ice, <u>TO WHERE</u> is the energy being released?

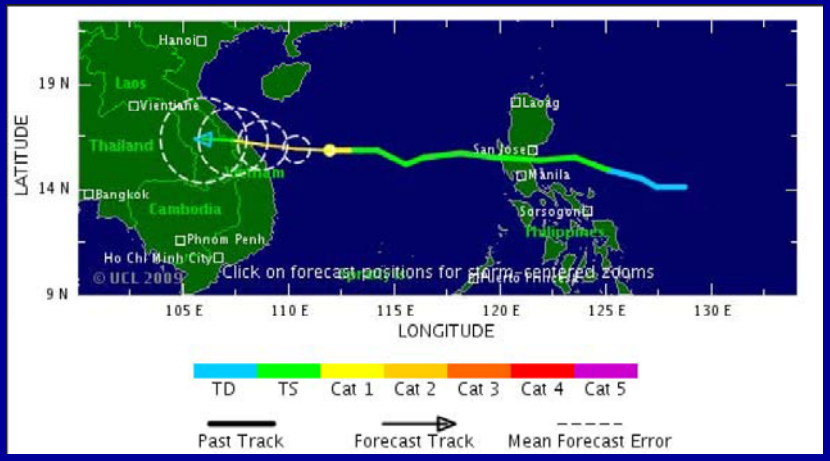
1 = into the surrounding environment

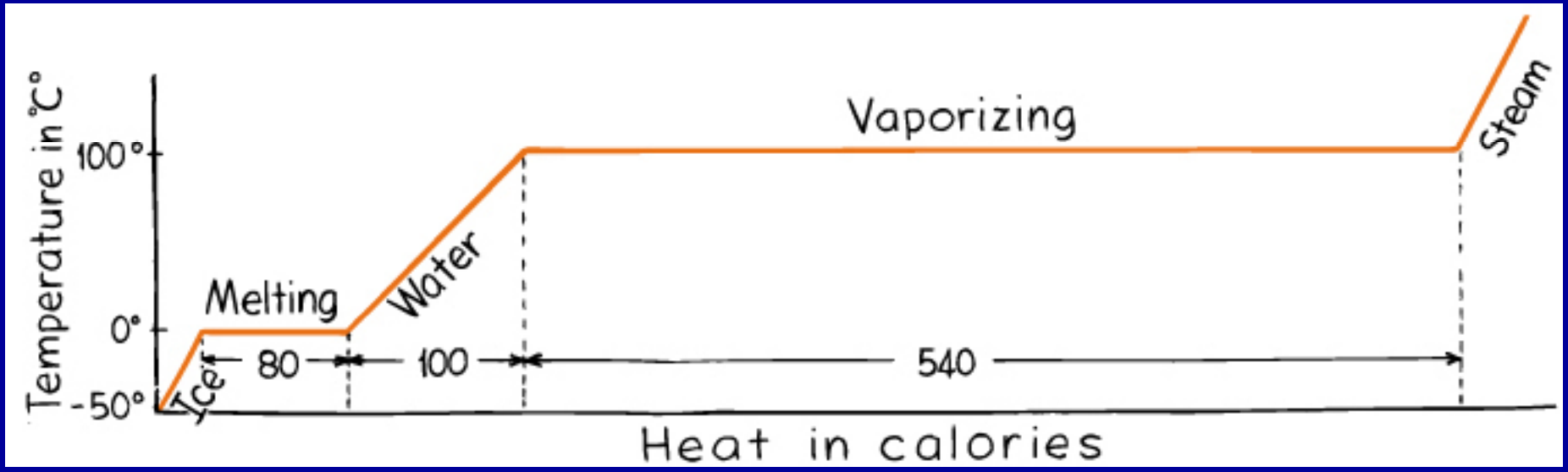
2 = into the H_2O molecules

3 = into both the environment & the H_2O



What drives tropical systems like Typhoon Ketsana??





THERMAL ENERGY TRANSFER

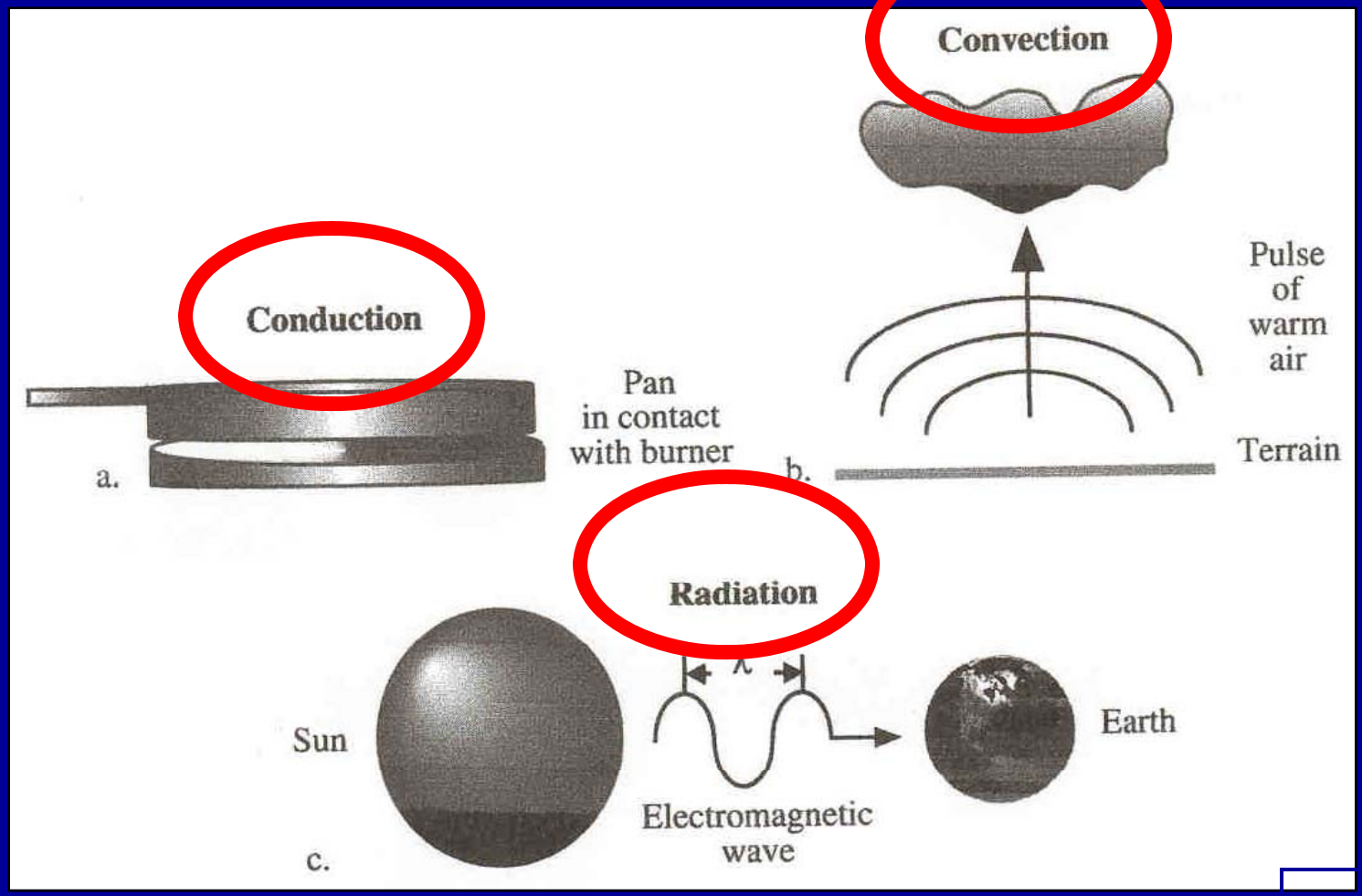
(aka “Heat Transfer”)

CONDUCTION = passage of thermal energy through a body **without large-scale movement** of matter within the body. Most effective in SOLIDS.

CONVECTION = passage of thermal energy through a fluid (liquid or gas) **by means of large-scale movements** of material within the fluid, as in a convection cell. Most effective in GASES & LIQUIDS.

RADIATION = the transfer of thermal energy by ***electromagnetic radiation*.** The only one of the three mechanisms of heat transfer that does not require atoms or molecules to facilitate the transfer process, i.e., **does not even need MATTER as a medium to transfer energy!**

HEAT TRANSFER = the process by which thermal energy moves from one place to another

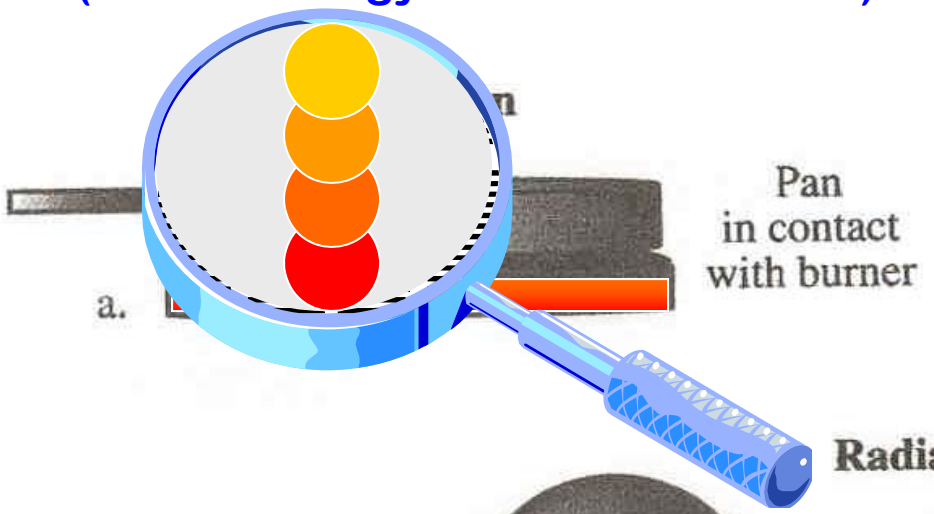


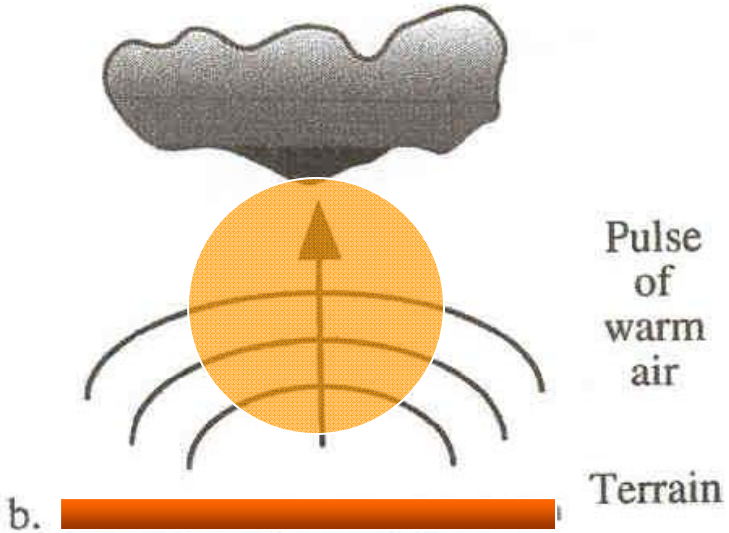
CONVECTION

Mass of warm air or liquid heats, expands, rises

CONDUCTION

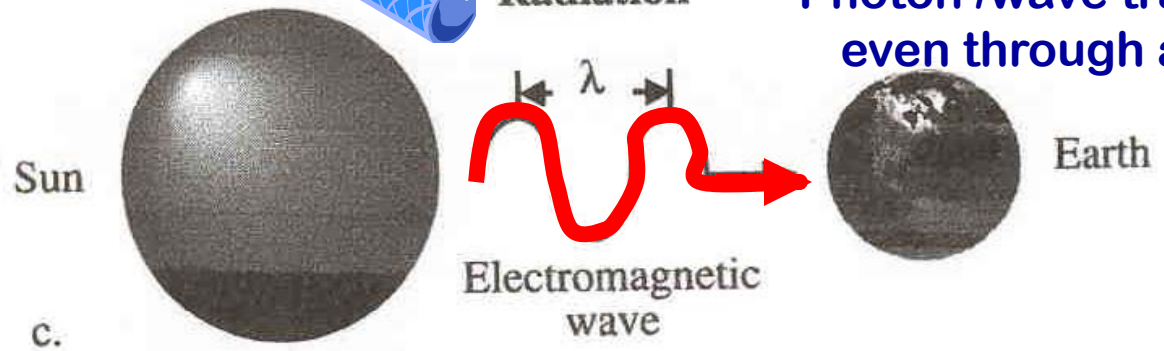
Jiggling molecule ➔ jiggling molecule
transfer of heat
(kinetic energy at molecular scale)





RADIATION

Photon /wave transport:
even through a void!



Electromagnetic Radiation

(a KEY POINT about it!)

Electromagnetic energy (radiation) is not heat energy.

It does not become heat (jiggling molecules) until it strikes an object, is absorbed by the object and sets the molecules in the object in motion, thereby heating up the object.

KEY CONCEPT:

The sun's energy comes in as radiant (electromagnetic) energy, and is converted to measurable heat only after it is absorbed (e.g., by the surface of the earth, a gas in the atmosphere, etc.).

A SNOOZER?

on to KINETIC ENERGY
& THE LAWS OF MOTION