2 nd period.

Circular Motion and Rotation

Claire Brianna Taylor Audrey Brooke

Circles Cheat Sheet

If everyone on the earth ran to the **east** the earth would spin **slower**.

Centrifugal force- Center fleeing (fake)

Centripetal force- Center seeking

If you're going in a circle at a constant speed you're **accelerating.**

-Satellite moving w/ constant speed around earth: direction of acceleration is **inward**

**-**you **can move at a constant speed and still accelerate** because the direction of the velocity can be changing

-when you hit a patch of ice turning in a car on a circular path you move **along a straight line path tangent to the circle**

-when going around circular curve in car the direction of friction **is perpendicular to the curve inward**

-when an elephant goes around a circular curve at a constant speed, **the friction from the road causes it to follow a circular path**

**-**water **does not** stay in a bucket going in a circle because of the outward force balancing the pull of gravity

-two cats on a merry-go-round one is further away from the axis of rotation, **they both have the same non-zero angular speed, the one further away has a greater tangential speed**

-**rotational inertia** measures an object’s resistance to changes in rotational motion

-a disk, a sphere, and a hoop are all released at the same time on an inclined plane, they reach the bottom from first to last as **sphere, disk, hoop**

-A person weighs less at the equator than at the poles because of the spin of the earth

-the resistance an object has in its rotational state of motion is called **rotational inertia.**

-A girl running with her legs straight has **more rotational inertia** than a girl running with her legs bent.

Rotational inertia

-less mass close to axis=more rotational inertia

-more mass close to axis=less rotational inertia

-any disk beats any hoop regardless of matter

-Objects with small rotational inertia roll down an incline with the greatest acceleration.

-When an ice skater pulls in his hands to turn faster his **rotational speed changes, angular momentum is conserved, and his moment of inertia changes.**

-If a planet had a gravitational collapse, its rate of rotation about its axis would increase.

**Vt(tangental velocity)=Angular Velocity(w)xRadius**

**g=ac=V^2/r 4g=ac(2v)^2/r**

**Vc= (circle/time)=(2pir/T(period))**

**Ac=(Vc^2/r)**

**Centripetal Force Fc=mAc**

**T(s)=seconds/cycle**

**f(Hz)=cycles/second**

**Torque=Force(F)xLever Arm(d)=Fd** the more torque the faster something will rotate

Gravitation

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* Physics P.2
* 2-22-17
* Space Cheat Sheet
* -Nuclear fusion keeps the sun hot
* -Gravity keeps the sun from exploding
* **Tides:**
* -Moon causes the tides (pulls harder on the front than the back)
* -if there was no moon there would only be 1 high tide and 1 low tide caused by the sun
* -2 bulges: One tidal bulge is because of moon's pull, and one because of inertia
* -Spring tides: highest high, lowest low Neap tides: least high, least low
* **Four main forces of the universe: 1.**Gravity(weak) **2.**Strong Nuclear **3.**Weak Nuclear **4.**Electromagnetism(Strong- Basis of human experience)
* -at the center of the earth gravity is 0
* -gravity and electromagnetism are the only two field forces that we experience
* -If the masses of two planets are each somehow doubled the force of gravity between them quadruples.
* -If the mass of one planet is cut in half and the radius is cut in half the acceleration of gravity is doubled
* **Black Holes: (not holes)**
* -when a star collapses all of its mass is now concentrated in a smaller radius
* -Gravitational force on the surface increases (when d decreases F increases)
* -Escape speed of black holes is greater than the speed of light
* -Spaghettification: as you get close to black holes your feet accelerate faster than your head and you get stretched
* -if you double x, y decreases by ¼
* -if you cut x in half, y quadruples
* -Law of Universal Gravity: **mass and weight are directly proportional, weight and distance squared are inversely proportional**
* -massive objects warp space time
* -the seasons are caused by the tilt of the earth
* -**F=G(m1m2/d^2)**
* **-G= 6.67 x 10^-11 Nm^2/kg^2**

Bouancy

Heat, Temperature, & Expansion

Landen Sill Julien Roskam ( frenchy )

● Why does Green Bay, WI have a colder winter than Anchorage, AL?

○ Green Bay is colder because it is in the center of the landmass. The air moving toward Green Bay goes over a landmass that has a low specific heat, allowing the air to get cold. The air moving toward Anchorage travels over the ocean which has a high specific heat, making the air warm.

● Why doesn’t a paper cup burn if it is filled with water over a flame?

○ The flashpoint of paper is 400℉, but the water will only get to 212℉ (boiling); the water will not “allow the paper to reach its flash point.

● When a sample of 0℃ water is heated, it first…

○ CONTRACTS

● When a sample of 4℃ water is cooled, it…

○ EXPANDS

○ Water is kind of “attracted” to itself, so it forms hexagonal patterns when in the form of ice

● Why do pigs roll in the mud?

○ They don’t sweat; mud evaporates off their skin and cools them off

● What would happen if all water molecules had the same jiggling speed (internal energy) at… 100℃? 0℃?

○ 100℃ → flash boil

○ 0℃ → flash freeze

● Which would make a more painful burn? 100℃ water or 100℃ steam?

○ Steam because it condensates on your skin

● When water vapor condenses on the inside of the window, the window becomes…

○ Warmer because condensating warms you up

● What does melting snow do to the surrounding air?

○ Cools it because it takes energy from the air to melt the snow

● If you’re walking on hot coals, do you want wet or dry feet?

○ Wet because the water has a high specific heat

● What are the bubbles in boiling water made of?

○ Steam/vapor because boiling is a rapid form of evaporation

● If you put warm food in a cooler, the energy goes…

○ Into the ice, changing the ice from solid to liquid water; temperature doesn’t change until all ice is melted

● Grandfather’s root cellar

○ Prevent freezing by placing giant tub of water in cellar because as the water froze, it would release energy into the cellar and warm the cellar, preventing the jars from freezing and breaking

● What is the temperature of the water at the bottom of a very cold lake?

○ Temperature is 4℃ because water is its densest at 4℃ with its greatest volume (regardless of outside temperature)

● How does styrofoam keep things cold?

○ By preventing energy from getting in; it prevents heat transfer

● How to blankets keep you warm?

○ Keep your body heat in; prevent heat transfer

● Why is the East coast not as temperate as the West?

○ Because the air travels over land before it reaches the East Coast (see Green Bay/Anchorage problem)

● If you mix 1L of 80℉ water with 5L of 20℉ water, the resulting temperature of the total 6L of water would be…

○ (⅙ x 80℉) + (⅚ x 20℉) = 30℉

● If you have 1L of water in a bucket, 3L of water in another bucket, and they both receive the same amount of heat…

○ The 1L of water will get to a higher average kinetic energy per particle because there are less particles, and both buckets will receive the same amount of heat

● Evaporation is a cooling process and condensation is a…

○ Warming process

● The higher the altitude, the \_\_\_\_\_\_\_\_\_ the boiling point of water.

○ Lower

● Ball and hole lab

○ The hole gets bigger as it warms up because all particles expand equally and the outside expands more because it has a larger circumference.

● Power lines should be hung \_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_ because…

○ Loosely in the summer because they will become taught in the winter

● The reason pressure cookers cook food faster is because they…

○ Trap vapor causing the pressure inside the pressure cooker to increase. The boiling point of water in this high pressure environment is higher. The water boils at a higher temperature thus cooking the food faster.

NOTES:

● **Heat**: Transferred thermal energy. Always goes from HOT→Cold

○ Because there is no such thing as cold, only a lack of heat

● **Temperature**: Kinetic Energy per Particle “Jiggling” kinetic energy not motion

● **Total Internal Energy**: Total Kinetic Energy per particle: Every particle all added up.

○ No upper limit of total energy

○ There **IS** a lower limit: Absolute zero. Because you can’t make something stoppeder.

■ The Arctic Ocean has more IE than a match

○ *Not all particles are created equal*

● **Specific Heat**: Amount of energy per gram needed to raise the Temp. by 1oC

○ Water has a very high specific heat=4.18 J/goC

■ Means it is hard to heat up; Hard to cool down

● Celsius is based on Freezing (0oC) and Boiling (100oC)

● Degrees C + 273 = Kelvin

● K - 273= Degrees C

● 273 K Freezing 373 K Boiling

● 32oF Freezing 212oF Boiling

● 4.18J=1 calorie (small c)

● 1000 calories (small c)= 1 Calorie (Big C)

● Q=mc∆t

○ Q= Thermal energy (Joules)

○ m= Mass (grams)

○ c= Specific Heat (J/goC) **or** (Calories)

○ ∆t= Change in temperature (Final-initial)

● Islands are not too hot AND not too cold

● **Thermal Expansion**: Particles jiggle faster so they move farther apart

● Low energy can’t move

● When Ice melts: Object GAINS energy→Surroundings LOSE energy

● When Ice Freezes: Object LOSES energy→Surroundings GAIN energy

● Sweat Evaporates off of you→Sweat GAINS energy from you, making you loose energy cooling you down

● Evaporation=Boiling REALLY fast

● Frozen= Being solid, not necessarily cold

● Ice can get WAY colder than 0oC

● **Latent Heat of Fusion**: Energy required to change one gram from Solid to Liquid or Liquid to Solid

○ Hf= 334 J/g

● **Latent Heat of Vaporization**: Energy required to change one gram from Liquid to Gas or Gas to Liquid

○ WAY WAY harder to boil water off than to freeze it

○ Hv= 2,230 J/g

● LHF and LHV change STATE not TEMPERATURE

● SHA

● How Refrigerators Work

1. Compressor compresses high energy gas into liquid

2. High energy liquid goes into condenser coils and cools, becoming low energy liquid

a. All the heat from inside the fridge is going to the back of the fridge

3. Low energy liquid goes through the expansion valve and vaporizes (vaporizes inside fridge)

a. Vaporization sucks energy from inside of fridge

4. High energy gas goes back to the compressor

5. Repeat

● Burning Gas can make a fridge cold.

● Sublimation: phase change from solid to gas

Electricity

By Gabriel a. Marin, MacKyla Delsid & Vance Noble

Two types of Circuits: Series and Parallel

A **series circuit** is a circuit in which the components are connected in a line, one after the

other, like railroad cars on a single track. There is only **one path** for the current to flow

along.

**1**. **Current** (**I**) is the **same** in all parts of the circuit. In the diagram below, the current

flowing through **R1** is the same as the current through **R2**, is the same as the current

through **R3**, and is the same as the current supplied by the power source.

**2.** When the **resistances are connected in series**, the total resistance (**RT**) in the circuit is

equal to **the sum of the resistances of all the paths** of the circuit. The formula for solving

for total series resistance is:

**RT = R1 + R2 + R3 …**

**3.** The **total voltage** across a series circuit is equal to the **sum of the voltages across**

**each resistance** of the circuit. The formula for the total voltage in a series circuit is:

**VT = V1 + V2 + V3 …**

**4.** Ohm’s Law

a. May be applied to an entire series circuit.

b. May be applied to the individual parts of the circuit.

When Ohm’s Law is used on a particular part of a circuit, the voltage across that part is

equal to the current in that part multiplied by the resistance of that part.

Remember that in a **series circuit**, the **same current flows in every part** of the circuit.

A **parallel circuit** is a circuit in which two or more components are connected across the

same voltage source. The current has multiple paths to follow.

**1.** The **voltages** across each component of the circuit **will be the same**. The voltage

across **R1** will be the same as **R2**, will be the same as **R3**. The voltage across each

component will be the same as the voltage provided by the supply.

**2.** When the resistances are connected in parallel, the total resistance (**RT**) in the circuit is

less that the resistor with the least value.

**3.** The **current** flowing in each part of the circuit **will be different**. When the total current **IT**

leaves the voltage source **V**, part I1 will flow through **R1**, part I2 will flow through **R2**, and part

**I3** will flow through **R3**.The currents from each part of the circuit can be **added together** to

find the **total current** flowing in the circuit. The following formula applies if the parallel

resistances are the same, or different.

**IT = I1 + I2 + I3**

**4.** Ohm’s Law:

Each branch current equals the applied voltage divided by the resistance between the two

points where the voltage is applied.

With the same applied voltage, any branch that has less resistance allows more current

through it than a branch with higher resistance. Remember that in a **parallel circuit**, the

**same voltage flows across every part** of the circuit. **Do not** add the voltages in each part

of the circuit to solve for **V**.

**If the earth shrank to half the size, but maintained the same mass, what would happen to its orbit around the sun?**

1. Its orbit would shrink
2. The orbit would become larger
3. The orbit would remain unchanged

**Two cups are filled to the exact same level but one has ice cubes floating in it. Which cup weighs more?**

1. The cup with ice
2. The cup without ice
3. They are the same
4. Why does it matter?

**How would the gravitational force between the earth and the mood change if the moon were ½ as far as it is now?**

1. Would stay the same
2. Would decrease
3. Would increase
4. The earth would explode

**Two students are arguing. Student 1 says that tides are caused by the sun’s gravitational pull, but student 2 says the tides are caused by the moon. Student 1 thinks the sun pulls stronger than the moon and that’s why there are tides, and student 2 thinks that the moon causes the tides because of the difference in distance between the front and back of the moon. Who is right?**

1. Student 1
2. Student 2
3. Both are right

**You are entering a race in a racecar. In order to win, or drive safest, would you want the track to be angled towards the center or the outside?**

1. Towards the center because the angle helps your turbo engines last longer
2. Towards the center because the inward force will keep you on the track
3. Towards the outside because that will make less distance

**If a potato is floating in water, what causes the pressure difference from the top of the potato vs. the bottom?**

1. Density
2. Buoyant Force
3. Depth
4. Apparent weight loss