TeachEngineering

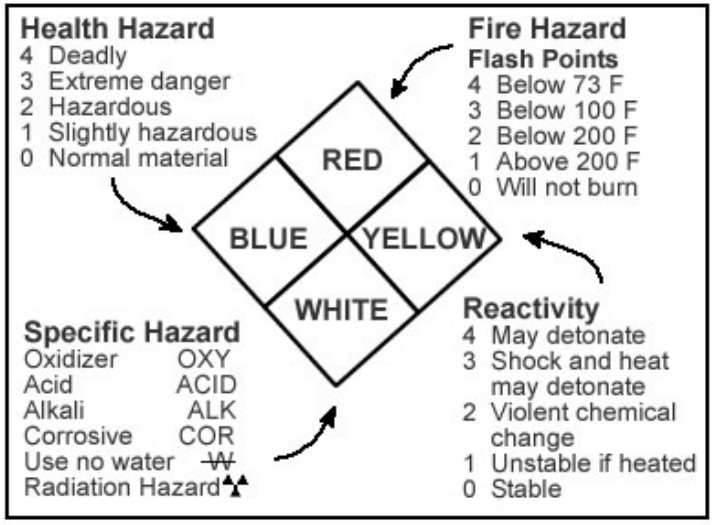
STEM Curriculum for K-12

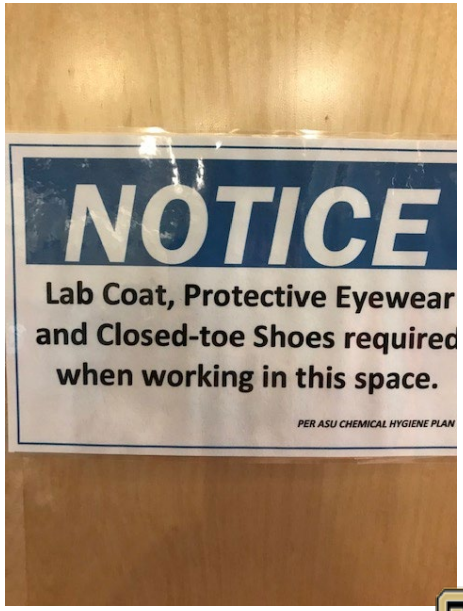
BACTERIA SAYS WHAT!

Nanotechnology

SAFETY SLIDE

- Lab Coat
- Safety Glasses
- Gloves
- Close-Toed Shoes
- Long hair tied back





TeachEngineering

Brought to you by Engineering UNIVERSITY OF COLORADO BOULDER

Let's PPE!

High Hazard PPE

"PERSONAL PROTECTIVE EQUIPMENT (PPE) WORN IN HIGH HAZARD AREAS"

EYE PROTECTION

must always be worn in designated laboratory areas
·Safety glasses that meet ANSI and OSHA specifications are required for work with chemical, biological, radioactive materials and physical hazards

GOGGLES and CHEMICAL RESISTANT FACE SHIELD
should be used when…
·working with large volumes of corrosive liquids, organic solvents, hazardous chemicals, water or air reactive chemicals or flammable compounds
·splash is a hazard
·working with an apparatus with contents under pressure or vacuum
·performing tasks such as sanding or grinding
·working with power tools and other cutting devices

Eye protection and Face Shield is used for protecting eyes and face from flying particles, airborne dust, poisonous and corrosive materials

SHADED GOGGLES / GLASSES

should be worn when…
performing activities that expose eyes to intense UV light or lasers and lenses must be appropriately shaded with optical density based on beam parameters

WELDING HELMET

should be worn with safety glasses
for work with hot materials and open flames such as welding soldering and brazing

HALF FACE AIR PURIFYING RESPIRATOR

·must be worn for work with chemical vapors or particulates
·must be properly fit tested every year - facial hair may impede proper seal
·medical evaluation and training is required
·air purifying respirator with appropriate filter cartridge protects against various particulates, vapors, dust, mists, fumes
·respirators should be worn as a last resort when other engineering controls (flame hood) are not available

CHEMICAL RESISTANT SHOE COVER

For work with large amounts of chemicals or during spill clean-up

FLAME RESISTANT LAB COAT (such as Nomex® fiber)

should be worn when working…
·with welding equipment
·in environments where quick fires are a threat
·with small quantities of pyrophoric or other highly flammable materials

RUBBER APRON

should be worn…
·for work with large volumes of corrosive liquids, solvents or flammable compounds
·when working with apparatus under pressure
·when working with water or air reactive chemicals

GLOVES

must be selected specifically for the type of hazard
·to protect hands from chemicals, radiation, biological hazards, abrasions, cutting, heat and cold.
·skin contact is a potential source of exposure to toxic materials
·chemical resistant gloves may be made of rubber, neoprene, polyvinyl chloride, nitrile, butyl, etc.
·select glove material based on industry best practice with regards to chemical resistance to substance(s) being handled
·wear gauntlet length gloves to protect forearms
·go to www.safety.nmsu.edu for guidance on glove selection

What to Do and Not to Do with Gloves

·replace gloves periodically
·contaminated gloves should be rinsed and carefully removed
·do not wear gloves out of lab
·do not use gloves when touching common surfaces such as telephones, computers, door knobs
·do not wear gloves around moving machinery

LONG PANTS

required to cover the legs for work in laboratory
If fire is a threat, fire resistant clothing is required

CLOSED-TOE SHOES

must always be worn
Should have slip resistant soles for work in wet or slippery areas

EMPLOYEES MUST BE TRAINED ON HOW TO SELECT, PROPERLY WEAR, CARE FOR, CLEAN, AND MAINTAIN PPE.
INFORM SUPERVISOR OF NEED TO REPAIR OR REPLACE PPE.
CONTAMINATED PPE MAY BE A HAZARDOUS WASTE, AND SHOULD NEVER BE TAKEN HOME.

NMSU ENVIRONMENTAL HEALTH & SAFETY 646-3327 GO TO NMSU SAFETY WEB AT safety.nmsu.edu

Minimum Lab PPE

PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR THE LABORATORY WORKER

EYE PROTECTION

must always be worn in designated laboratory areas
Safety glasses that meet ANSI Z87.1-1989 standards are required as minimum PPE for work in a laboratory

HAIR CARE

·long hair should be tied back to prevent contamination
·must use hair net to prevent entanglement in rotating equipment

LAB COAT

LAB COAT should be …
·selected to assure proper fit
·worn buttoned/snapped and sleeves rolled down
·made of a material which is suitable for your work; some synthetic fabrics are extremely vulnerable to particular chemicals
·fire resistant (synthetic fabrics can burn and melt and must not be worn in areas where open flames or other sources of fire might present the potential of igniting the coat)

LAB COAT should be removed when…
there is reasonable chance that it is contaminated by chemical, radioactive material or biological material

LAB COAT should be worn…
to prevent splatter and spills from contacting skin and/or contaminating your street clothes
to prevent non-obvious contamination and impede saturation of regular clothes and skin
·when operations involve harmful liquids or toxic solid materials, even in tiny quantities.

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INSULATED CRYOGEN

Use to protect against ultra-cold temperatures when working with liquid nitrogen and other cryogenic hazards

LEATHER

Use to guard against injuries from sparks or scraping against rough surfaces

ALUMINIZED

METAL MESH

Use gloves to insulate hands from intense heat such as molten materials

Use gloves when using cutting tools or other sharp instruments

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·do not wear gloves around moving machinery

Care and Maintenance:

·Protective equipment that has been used in a laboratory and is potentially contaminated with hazardous materials should NOT be taken home.
·When lab coats become contaminated with hazardous materials they should be cleaned on site at the university or sent out for cleaning by professionals who have been informed of the potential hazards or disposed of as hazardous waste.

LONG PANTS

·are required as minimum PPE for work in a laboratory

CLOSED-TOE SHOES

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Introduction

Why is it you wash your hands before you eating and after using the bathroom?

How many times do you think you have you touched your face today?

Is there anything on the table in front of you?

Is there bacteria in front of you on the table??

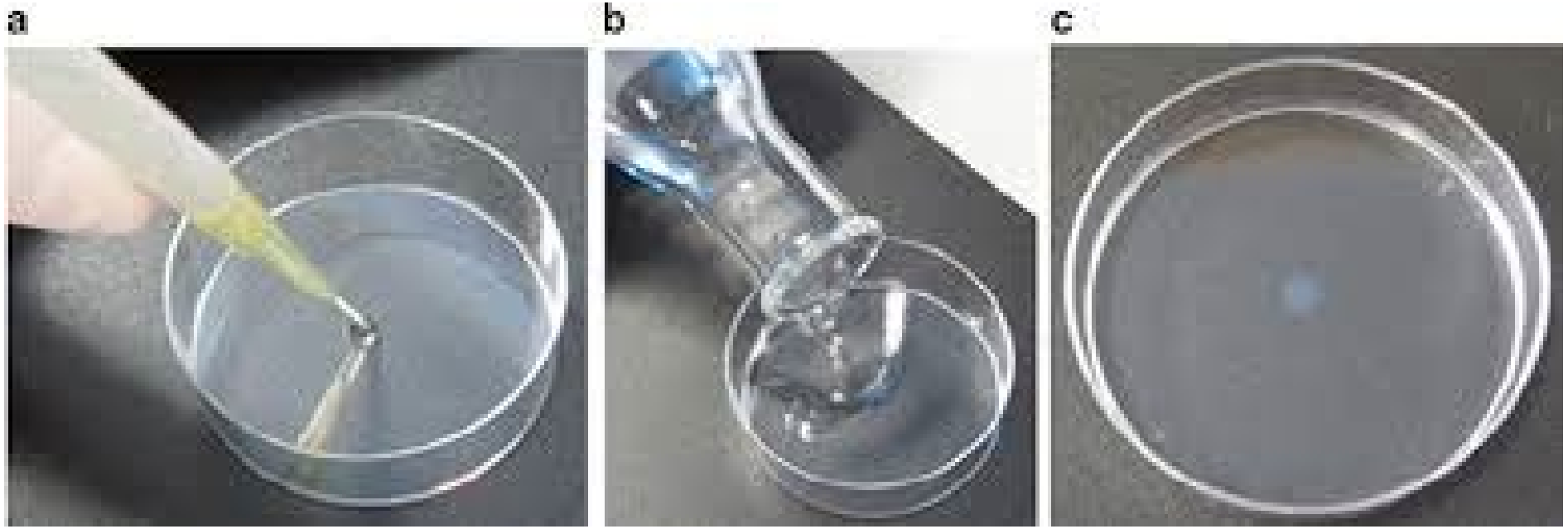
Synopsis

Children are getting sick on a regular basis even though we could prevent many of these incidents. They need to know what is around them and how to handle the things around them they cannot see.

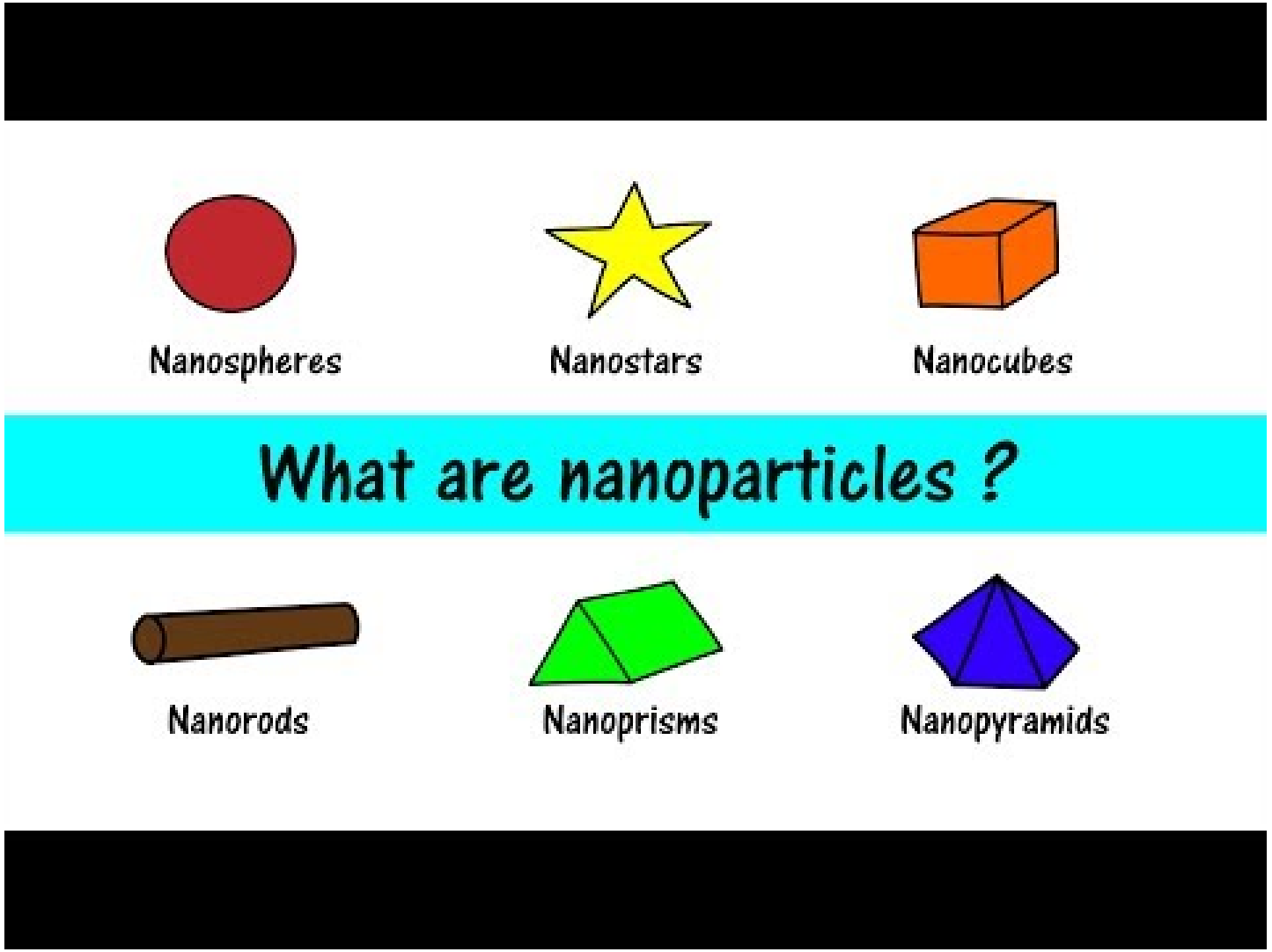
Making Agar Dishes

15 minutes to set:

On the bottom of the petri dish, draw a line dividing it in half and label the sides for each partner



Nanoparticles



Our Nanoparticles!

Titanium Dioxide - Absorbs ultraviolet light

Places you can find titanium dioxide: sunscreen, paper, makeup, food, plastics, and rubber.

Zinc Oxide - Pain relief

Places you will find zinc oxide: rubbers, plastics, ceramics, glass, cement, lubricants, paints, ointments, adhesives, sealants, pigment, food, batteries, ferrites, and bandages.

Acquiring your sample:

Flip petri dish over and draw a line cutting the dish into fourths and label each side with initials.

Students will use their swab to take a sample of one item in the classroom. Each partner will then streak their half the dish.

Divide the dish into quarters. Apply a pinch of titanium dioxide to one quarter. On the other side put zinc oxide.

Close the petri dish and apply parafilm to seal the dish.

Place dish in incubator.

Making Observations

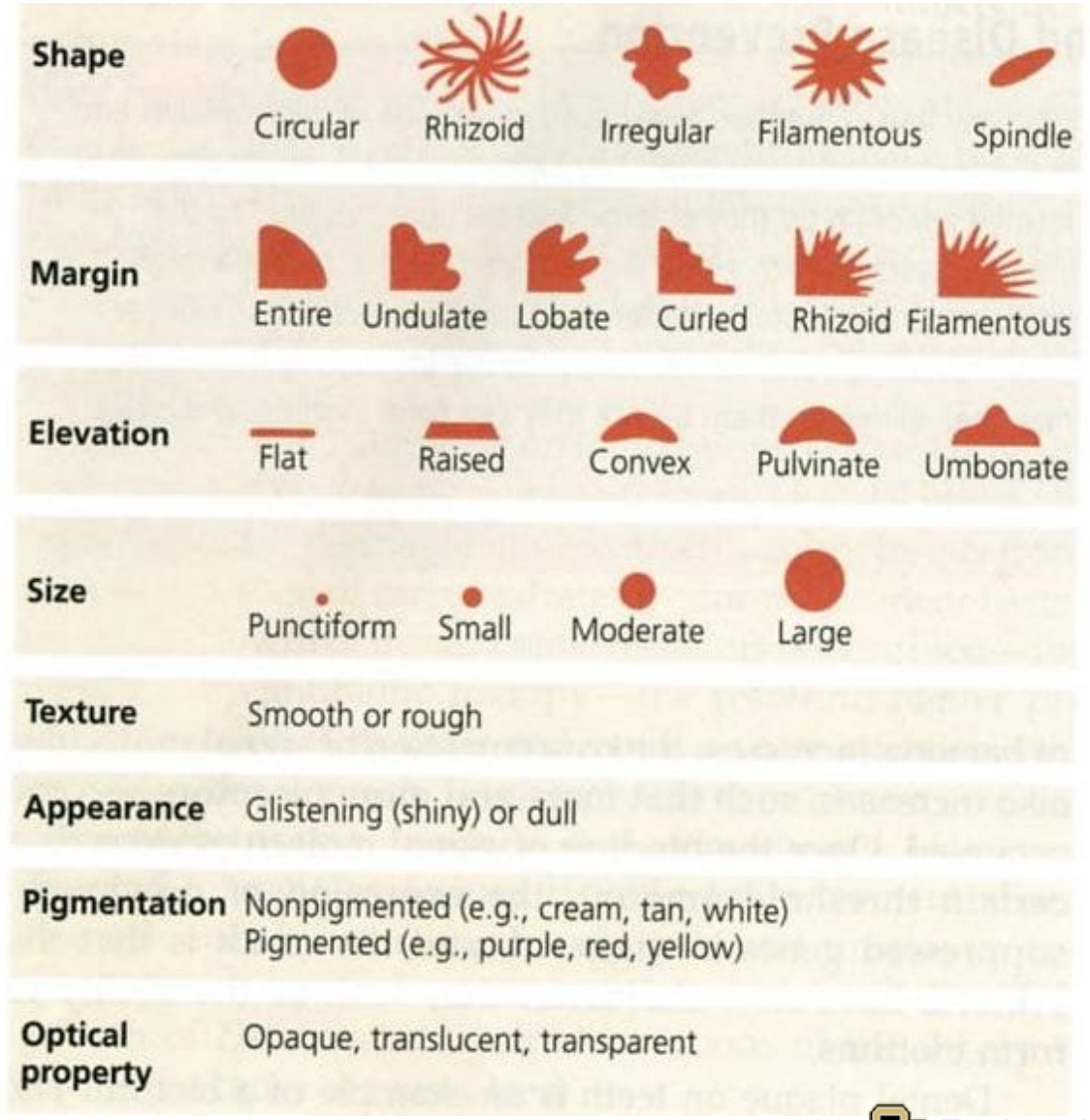
Create a data table in your notebooks.

Record observations of your petri dish.

- Observations should include color, shape, size, and any other interesting characteristics

Use the image to the right to assist with descriptions.

Compare your quarters with and without titanium dioxide/zinc oxide.



Discuss your Bacteria!

Compare your bacteria to your partners, including how are they alike, how are they different, and how the titanium dioxide affected their samples.

Find another pair oto share and discuss their results.

Complete the Exit Ticket!

Bacteria Links

Quick Follow-up Article #1 – The Five Dirtiest Things You Touch Everyday

Follow-up Article #2 – Your Towels Are Way Dirtier Than You Think

Follow-up Video – Cell-like nanorobots!