

Biology IA and EE Preparation

Ms. Harrison Rm. 225 msharrison@gmail.com

Ms. Senicki Rm. 231 senicki_c@surreyschools.ca

Possible tasks include:

- a hands-on laboratory investigation
- using a spreadsheet for analysis and modelling
- extracting data from a database and analysing it graphically
- producing a hybrid of spreadsheet/database work with a traditional hands-on investigation
- using a simulation provided it is interactive and open-ended

Equipment:

- Hot plate/Magnetic stirrer
- Hot water bath
- Electric kettle
- Bunsen burners
- Digital balance (two decimal place)
- GLX sensors
 - pH probe
 - Temperature probe (thermometers)
 - O₂/CO₂ sensors
 - Colorimeter (RGB)
 - EKG
 - Conductivity
 - Absolute pressure
 - Light intensity
- Heart rate monitors - (ours aren't great - you could use a fitbit if you have one)
- Peg test (hand-eye coordination)
- Spirometer - lung capacity
- Potometer - transpiration
- Metronome (online)
- Blood pressure cuffs/sphygmomanometer - digital and cuff/stethoscopes
- Germination cups
- pH paper (small scale)
- Soil testing equipment: can borrow better from City of Surrey with notice
- Dip kits: temperature, dissolved O₂, pH, turbidity, nitrates/nitrites
- Grip strength caliper
- Chromatography paper
- Metre stick (reaction time)

Techniques:

- Quadrat sampling - line transect along a gradient (shade/sun; slope; vegetation type)
- Biodiversity - Simpson's diversity index
- Calorimetry: Measure temperature against time, finding enthalpies of reactions
 - Finding energy of food (pg. 174)
- Colorimeter - needs to be transparent
 - Digestion of protein (e.g. albumin)
- Paper Chromatography: separation of pigments
- Dialysis tubing (pg. 73)
- Osmolarity (pg. 10-11)
- Mitotic index
- Hormones
- Mesocosms - water plants: duckweed, cabomba

Substances (* = limited supply - you may need to buy more)

- Digestive enzymes: papaya enzyme* (papain), pineapple enzyme* (bromelain), invertase, trypsin, renin, pepsin, lactase, lipase, diastase, maltase, amylase
- Yeast
- Starch
- Cornstarch
- Knox gelatin
- Natural supplements*: B2, cinnamon, grape seed, cayenne
- Lemon juice
- Corn syrup, golden syrup, icing sugar, white sugar
- Cheerios; puffed rice
- Oils - canola, olive,
- Albumin (dried egg white)
- Sugars: Fructose, sucrose, lactose, maltose, dextrose
- Iodine
- Phenolphthalein
- Benedict's solution
- Biuret
- Bromothymol blue

Some possible topics:

- *People (informed consent required; no chemicals): reaction time (e.g. online simulations or dropping ruler), heart rate, lung capacity (pg. 78), hand-eye co-ordination, BMI*
- *Enzymes: temperature, pH, substrate concentration, inhibition, lactose-free milk, reaction rate (pg. 99), digestive enzymes*
- *Respiration: respirometer pg.33; yeast (pg. 32)*
- *Taxis - planaria; isopods (wood lice) (pg. 153) - animal experimentation policy!!*
- *Plants:*
 - *Plant growth after germination: plant hormones, minerals,*

- Germination (pg. 120): water, oxygen, temperature
- Plant tropism
- Micropropagation
- Factors affecting rooting in stem cuttings
- Transpiration (pg. 111-113): humidity, temperature, wind speed, plant type (xerophytes, halophytes)
- Photosynthesis: types of light; colour of light (cellophane), temperature, carbon dioxide concentration
- Fruit ripening

Factors to Measure/Vary for Independent/Dependent variables:

- Temperature
- Concentration of solution (color intensity)
- Masses / change in mass / % change in mass
- Surface area
- Volume
- Time
- Catalysis
- pH
- Pressure
- Light intensity
- Colour of light
- Number (of roots, plants, leaves, germinating seeds, organisms, etc)
- Height
- Population density/population size/lincoln index
- Biodiversity index
- Tensile strength (bones/hair/meat)

Simulation/database topic ideas: (links from Biology for Life website)

- Genetics - Hardy-Weinberg, Chi-squared
- Ecology - modelling ecosystems, carbon dioxide concentrations
- Natural selection - melanism, microevolution
- Bacteria*
- Disease: epidemics (pg. 131)/pandemics/vaccinations
- Nutrition databases

Resources:

- Pg. 112 - list of 7 Practicals
- Pg. 188 Advice for IA
- IB Biology lab guidelines handout
- <https://www.biologyforlife.com/internal-assessment.html>
- <https://www.biologyforlife.com/investigation-skills.html>

*For an EE using bacteria: If you want to access labs outside of school, it is **your** responsibility to contact local universities. They will need to attach a letterhead, documenting they were only there to supervise, but did not help you obtain or analyze results

*For an IA using bacteria: Simulations only, unless you already have university lab access due to your Bio EE.

This document is not meant to be a comprehensive list of what can be done, but rather a starting point to help you come up with a topic. If you find something that is not listed here, you can pursue it as long as results can be **quantified**. You need to collect enough data (e.g. 5 X 5; 3 X 8-10; 2 X 10-15).

If you choose to do a virtual lab it would be good to find various simulation platforms in order to compare your results and comment on reliability.