SCIENCE IA GUIDE

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For many students, the most challenging aspects of the IB Diploma is the Science IA. Designing and conducting an experiment independently is an inherently daunting prospect! Moreover, it's worth a big chunk of your final grade – 20% for Biology, Chemistry and Physics. Luckily, we found that once we found a question and began researching, the science Internal Assessment became less of a burden.

As with many assignments, getting started is the hardest part of the Science IA. With that in mind, **this guide aims to ease your concerns and help you over that big initial hurdle of starting a science IA. This guide goes through 5 top tips to help you get started, along with topic ideas for your Chemistry, Biology, and Physics IA!**

But first things first, a question every IB student asks once in a while…

Why am I doing this?

Science IAs are a time-consuming and challenging task. So, it's useful to know exactly what the purpose of it is. No, despite popular belief, the IB examiners didn't design the IA as a sadistic ploy to watch you squeal under the pressure of it all. Primarily, t**he IA is a way for you to show off your experimental skills.** After all, experimental science is the driver of progress and discovery. So, teaching science without experimentation is like trying to bake a cake with no flour.

What are the examiners looking for?

The examiners want to see inquisitiveness, interest, and engagement with the subject. The best way to ensure this is by picking a topic you actually find interesting. Something you are genuinely excited to investigate. Do you really care about at what wavelength of light pondweed photosynthesises best? If not, it's probably best you don't try to find out!

5 TOP TIPS

1. Coming up with an Idea

The truth is, you want to choose a relatively simple idea. Something that you are confident will produce results. We recommend starting by making a list of all the experiments you've already done in class. From this, you'll get a feel for what a good experiment entails. Then, pick the one you find most interesting and give it a twist. Think outside the box – you want your idea to be original and even a little wacky! **The best science IAs are those which take a well-established experiment (so you can be confident you'll generate a good amount of data), and put a spin on it.** Beware, you can't just copy an existing experiment. You need to adapt it, personalize it, and come at it from a new angle. Essentially, make it your own! At the end of this guide you'll see a list of potential starting points. All the topics we suggest should be sources of inspiration, not final products!

2. Personal Engagement with your Science IA

One of the five assessment criteria is ***'Personal Engagement'.*** You will be assessed on **how your chosen topic relates to you and your interests.** At first this might seem a bit confusing (we certainly were!). But really, it's looking at how your personal experience has shaped the design of your experiment. So, the way to score highly here is to ensure you are genuinely interested in your project. Rather than looking at the rate of breakdown of hydrogen peroxide

(which I bet doesn't have much relevance or significance to your daily life), measure the caffeine content of your favourite type of coffee compared with others. Your justification for choosing such a topic could be as simple as you're a coffee fiend and have always wondered which type would give you the biggest kick in the morning!

So, when looking through our topics, try to think if there might be a particular topic that has some unique significance to you and your life!

3. Setting your Research Question

So, you've decided on a general topic for your experiment. Now you need to **set a clear, focused research question.** I would argue that the research question is the most important part of the whole assessment. It needs to be concise and informative. Not too broad, but not too narrow. This is a long process and will require many drafts.

Whoever is marking your science IA should be able to tell immediately what you are investigating. Put this to the test by handing it to a friend or family member; see if they're able to quickly grasp the essence of your experiment. A fresh pair of eyes is always good for these things. What may seem obvious to you may be ambiguous out of context.

4. What does a Good Research Question Look Like?

Your research question must include the independent variable (what you are changing) and the dependent variable (what you are measuring). Something like this

"The effect of increasing **temperature** on the **rate of lipid breakdown** by the enzyme lipase"

Independent variable

Dependent variable

As you begin designing your project and carrying out preliminary experiments **(which we would highly recommend!)**, you may find certain parts, procedures and variables need adjusting. This is okay! Tweaking your experiment and/or question demonstrates you've taken time and care to make your experiment as successful as possible. **Check out this video here**, for more guidance on how to come up with a research question.

5. Keeping on Track!

Here is our final piece of advice. **Make sure to record everything you do as you go along.** Each time you set up apparatus, try out a new formulation for your solution, use a specific indicator or accidentally spill some of your mixtures – note it down. Or take photos. This will make it far easier not only to write your Methods and Materials sections, but also to explain any anomalies in your results and evaluate errors more effectively.

Time to look at some topics.

25 IB Chemistry IA Topic Ideas

1. Calculating absolute zero using gas volume
2. Exploring the vitamin content of various healthy foodstuffs
3. Studying the dissolved oxygen content of a water body
4. Investigating the concentration of drugs within tablets (this could even be explored across different brands)
5. Using calorimetry to determine enthalpy changes/the enthalpy of neutralisation
6. Determining the activation energy of a reaction
7. Exploring conditions under which lipase can be denatured
8. Exploring the speed of various chemical reactions using a spectrometer
9. What is the activation energy needed to decompose a compound such as hydrogen peroxide?
10. Find the calcium content of different milk brands
11. Explore the optimal conditions to electroplate metals by considering a variety of external factors
12. Using thermal decomposition try to identify the type of salt present in some compound
13. Explore and distinguish between methanol and ethanol using iodine and sodium hydroxide solutions
14. Use paper chromatography to separate pigments present in a tree leaf
15. Explore the effect of temperature on the strength of a ferromagnet
16. Describe the effect of varying temperature on the formation of rust on steel
17. Measure the amount of free caffeine in different coffee, tea, or other drink brands
18. Can different fruits be used in order to chelate heavy metals from polluted water sources?
19. An analysis into the different EDTA contents of a variety of shower cleaners
20. Speed of denaturation in various animal proteins using UV light
21. Synthesizing the sweetener Dulcin from Paracetamol
22. Considering and exploring the effectiveness of various brands of salts for snow removal

23. Using paper chromatography to analyse the various dyes present in different brands of jelly candy.
24. Measuring the change in iron levels of avocados as they go through different ripening stages
25. Measuring the energy content of a packet of Cheetos

30 IB Biology IA Topic Ideas

1. Look at the genetic similarities and differences between species, kingdoms, phylas, classes, genuses, orders, families, and domains.
2. Testing global warming: How does CO2, water vapour, oxygen, or any other variable affect temperature inside a cutoff bottle exposed to simulated sunlight?
3. Describe how the primary productivity of algae changes with temperature, algae concentration, other aquatic plants, salinity, nutrients, and any other variables you may want to consider.
4. How does varying the gel concentrations of agarose affect DNA migration through a gel?
5. Effect of BMI on skin surface temperature in various body areas on rate of recovery once exposed to cold.
6. How does sudden change in body position affect heart rate and baroreceptor feedback?
7. How do the respiration rates of baker's yeast and wine yeast in various sugar solutions compare?
8. How do the buffering actions of milk, yogurt, juices, detergents etc. compare?
9. Do our reaction times slow down with age?
10. Can we slow down the decaying times of vegetables? Can temperature, humidity, or exposure to sunlight affect how quickly vegetables decay?
11. What is the effect of the salt concentration on germination of different types of seeds?
12. What happens after the best-by date of dairy products?
13. Comparative study between 5 different species of animals using BLAST analysis to determine evolutionary history

14. What is the respective change of allele frequency when initial frequencies are manipulated?
15. Analysing the impact of river pollution on marine life.
16. Determine the effect of glucose concentration on the rate of osmosis.
17. What is the effect of pests on the diversity of plants in a lawn?
18. What is the effect of isotonic drinks on rehydration and recovery after exercise?
19. What is the difference in the CO2 levels exhaled before and after enduring physical exercise?
20. Testing the effectiveness of different types of toothpaste in inhibiting the growth of different types of bacteria.
21. The effect of temperature / light on fruit ripening
22. Exploring stomatal density in a variety of conditions
23. Testing the effectiveness of toothpaste types
24. Investigating the effect of smoke water on the germination and growth of E.pilularis
25. Exploring the effect of sunlight on biomass
26. Exploring effect of light levels on the predation of the peppered moth
27. Investigating the effect of different light intensities on water weeds
28. How do different antibiotics interact with the process of seed germination?
29. Determining the effect of time on the plasmolysis of potatoes
30. Exploring mollusc shapes with regards to an external variable e.g. location on shore

20 IB Physics IA Topic Ideas!

1. How does sugar concentration affect the refractive index of water?
2. How does the number of coils affect the efficiency of an electric motor?
3. How does the thickness of human hair affect the Young Modulus?
4. How does the cross-sectional area of a shuttlecock affect the range of projection?

5. Investigate how the radius of a football affect the impulse on the football when kicked?
6. Exploring the relationship between angle of initial release of a pendulum and the subsequent calculation of 'g' from the pendulum
7. How does temperature affect the flight distance or arc of an elastic band when fired
8. Set up a hydraulics system and change multiple variables to test the impact
9. Investigate the impact of different levels of shade on the power output of a solar panel
10. Investigate the impact of various variables (temperature, concentration, colour) of a liquid on its refractive index
11. What is the 'sweet spot' on a tennis racket that delivers the best hit by calculating the coefficient of restitution
12. Exploring the relationship between suspension length and period of disk rotation
13. Looking into factors that affect the refraction of certain light sources
14. Exploring the resonance of musical instruments within a wave framework
15. Determining the charge of an electron using a computer simulation
16. Investigating the Magnetic field inside a slinky
17. Electromagnetic induction laws and some factors that affect it
18. Investigating properties of light-dependent resistors
19. Looking at how the density of water affects single-slit diffraction patterns of waves
20. An investigation of measuring the permeability of free space constant using simple solenoids and a magnetic field probe

So there we have it! Our top tips for maximising your IB Science IA grade. If you still feel unsure of how to tackle this task, why not ask an elite Lanterna scientist for some more pointers?

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Questions? Email us at info@lanternaeducation.com