AP BIOLOGY: Summer Work

Welcome to AP Biology here are the assignments you need to complete before school starts back.

1. Watch two video clips below on macromolecules and the scientific method.
2. Define the key science terms.
3. Complete the worksheet/readers

Due on the first day of the new school year.

Macromolecule videos to watch:

https://www.youtube.com/watch?v=iyGYWrBC4cU 8:00

https://www.youtube.com/watch?v=YO244P1e9QM 9:00

Important Science terms to define:

1. Element-

2. Compound-

3. Trace element-

4. Atom-

5. Ionic bond-

6. Covalent bond-

7. Polar covalent bond-

8. Single bond-

9. Double bond-

10. pH-

11. Reactant-

12. Product-

13. Hydroxyl group-

14. Carboxyl group-

15. amino acids-

16. proteins-

17. monosaccharides-

18. Nucleic acids-

19. Nucleotides-

20. Carbohydrates-

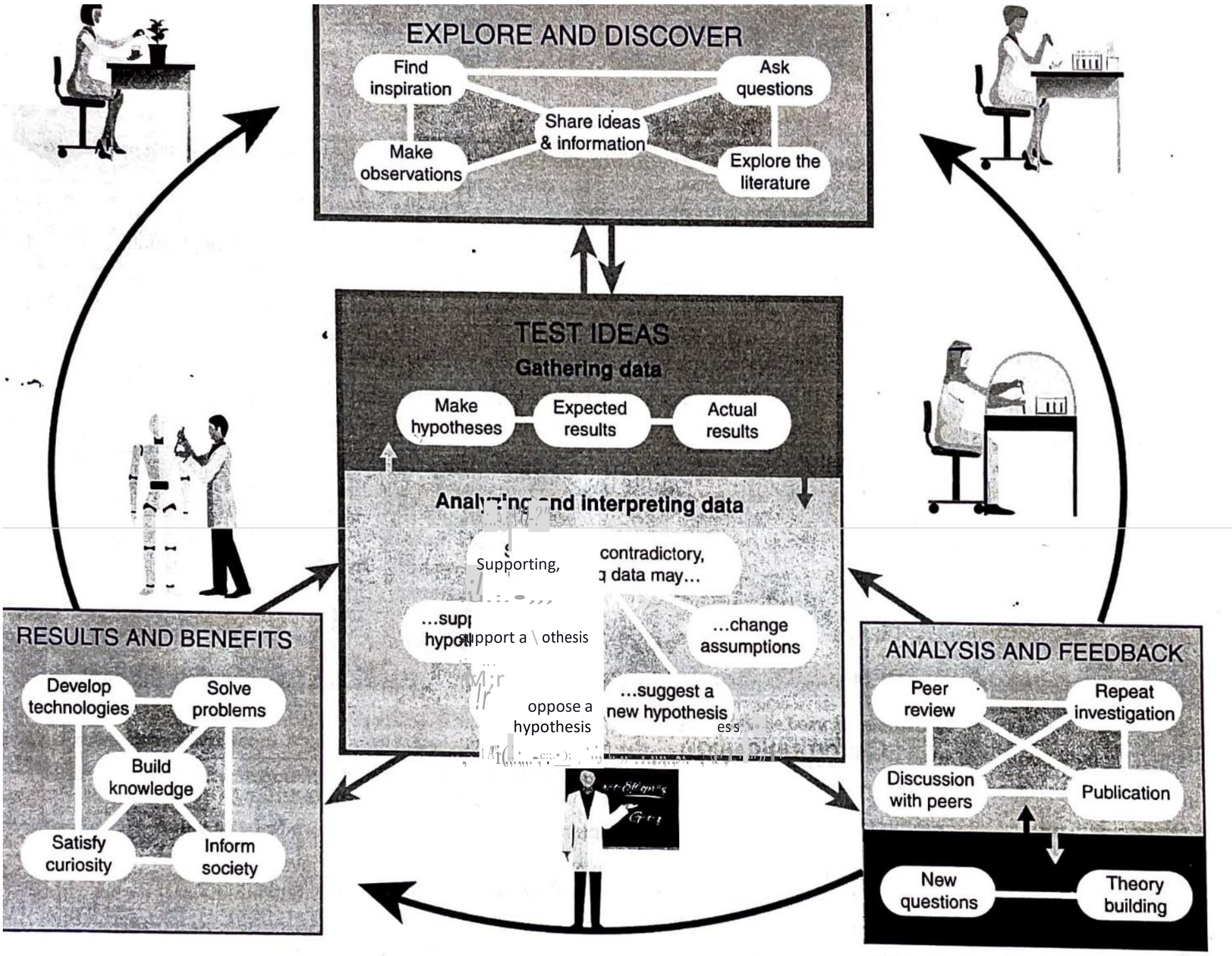
21. Adenosine triphosphate-

22. Hydrocarbons-

Worksheet/ Readers to Answer:

II How Do We Do Science?

Key Idea: The scientific method is a rigorous process of observation, measurement, and analysis that helps us to explain phenomena and predict changes in a system.
Scientific knowledge is gained through a non-linear, dynamic process called the **scientific method.** The scientific method is not a strict set of rules to be followed, but rather a way of approaching problems in a rigorous, but open-minded **way.** It involves inspiration and creativity, it is dynamic and context dependent, and usually involves collaboration. The model below is one interpretation of the scientific method.

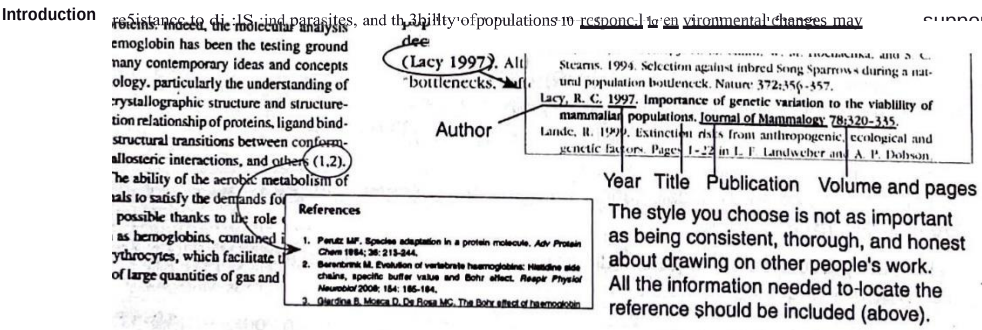


Citation and references

All scientific work acknowledges sources of information through citationand a list of references. Citations support the statements made in the text in ...nd all citations are then listed ...cally, or identifiedand referenced ...lly by number. Internet sites are dated ...uthor acknowledged. ... and accurate citation and ...g shows you have ...he topic, have evidence to support your ... you are not taking credit for work that is ...own. Each publication sets its own particular ...ng style and these can vary widely. In your ..., it is most important to be consistent.

Citation and referenceby numbers

Citation and referenceby authors



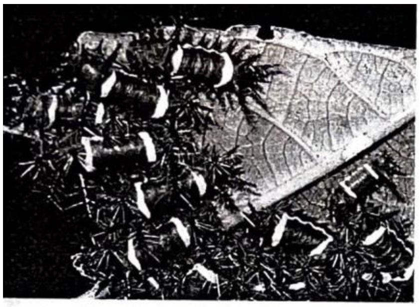
1. What is the role of citation and correct referencing when reporting on scientific investigations? _ _ _ _ _ _ _ _ _ _

2. Study the diagram an write a paragraph on the scientific process and the role of surprising results in the progression ofscience. Staple 11 to this page. At the end of your course, reexamine what you wrote. Have your ideas changed?

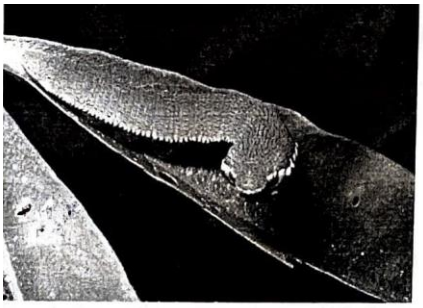
Observations, questions, and hypotheses

Observation is the beginning of any scientific investigation. Often the best investigations are based on a series of fortuit0us or specific observations. For example, in 1765 Edward Jenner developed the first vaccination for smallpox after hearing that milkmaids who contracted cowpox (a harmless disease) never got smallpox. After observing a phenomenon, questions must be asked: What causes the phenomenon? Is it linked to other observations? Can it be manipulated? Questions and observations lead to a hypothesis that can be tested by using a repeatable method. For every hypothesis, there is a corresponding null hypothesis, i.e. a hypothesis of no difference or no effect. Creating a null hypothesis enables a hypothesis to be tested in a meaningful way using statistical tests. If the results of an experiment are statistically significant, the null hypothesis can be rejected. If a hypothesis is accepted, anyone should be able to test the predictions with the same methods and get a similar result each time.

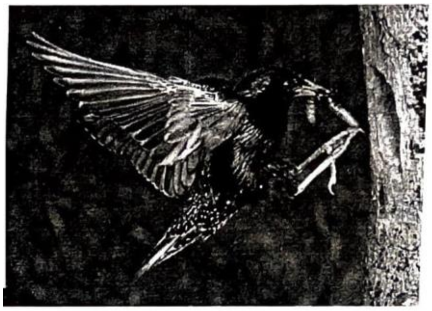
Example: Two observations were made, as described below and used to produce a hypothesis:



Observation 1: Some caterpillar species are brightly colored and appear to be conspicuous to predators (e.g. insectivorous birds). Predators appear to avoid these species. These caterpillars are often found ingroups, rather than being solitary.



Observation 2: Some caterpillar species are cryptic in their appearance or behavior.Their camouflage is so convincing that, when alerted to danger, they are difficult to see against their backgroundSuch caterpillars are usually found alone.



Hypothesis: Bright color patterns might signal to predators that the caterpillars are distasteful. The corresponding **null hypothesis** would be there is no differencein palatability between the bright and cryptically colored caterpillars.

Assumptions

Any biological investigation requires you to make **assumptions** about the biological system you are working with. Assumptions are features of the system (and your investigation) that you assume to be true but do not (or cannot)test. Possible assumptions about the biological system above are described in the box right:

- Insectivorous birds have color vision.
- Caterpillars that look bright or cryptic to us, also appear that way to insectivorous birds.
- Insectivorous birds can learn about the palatability of prey by tasting them.

3. Based on the hypothesis above, generate a prediction about the behavior of insectivorous birds towards caterpillars:

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4. During a routine preparation of bacterial colonies on agar plates, a laboratory assistant noticed that the colonies left overnight on the side of a bench near a heating unit grew faster than those left on the opposite side of the bench. The assistant decided to test this observation by experiment:

   (a) State a hypothesis for the investigation: ____

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   (b) Generate a prediction based on the hypothesis: ____

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   (c) Formulate a possible design for the experiment to test the observation: ____

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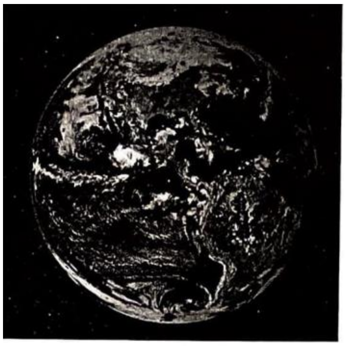
Systems and Models

Key Idea: Systems are assemblages of interrelated components working together. Models can be mathematical or visual representations of these systems.

An example of a system is our eight-planet solar system. Each of the planet's orbits represents a single component of the system. The driving force of the system is gravity from the Sun. Modeling systems helps to understand how they work. A **model** is a representation of an object or system that shares important characteristics with the object or system being studied. A model does not necessarily have to incorporate all the characteristics or be fully accurate to be useful. It depends in the level of understanding required.



Open systems can exchange matter, energy and information with their surroundings. This causes them to be constantly changing, although the overall processes and outcomes remain relatively constant. Open systems are the most common type in natural systems. Examplesinclude ecosystems, living organisms, and the ocean.

Closed systems exchange energy with their surroundings, but not matter. Closed systems are uncommon on Earth, although the cycling of certain materials, such as water and nitrogen, approximates them. The Earth itself is essentially a closed system. It receives energy from the Sun but exchangesvirtually no matter with the universe (apart from the occasional meteorite).

Isolated systems exchange no energy, information, or matter with their surroundings. No such systems are known to exist. Some natural systems approximate isolated systems, at least for certain lengths of time. The solar system is essentially isolated, as is the Milky Way galaxy if gravity from nearby stars or galaxies is ignored.

Models are extremely important when trying to understand how a system operates. Modelsare useful for breaking complex systems or organizations down into manageable parts and often only part of a system is modelled at a time. As understanding of the system progresses, more and more data can be built into the model so that it more closely represents the real-world system or object. A common example is the use of models to represent atoms. The three illustrations (right) become more complex from left to right.

Atomic model. showing position of charge

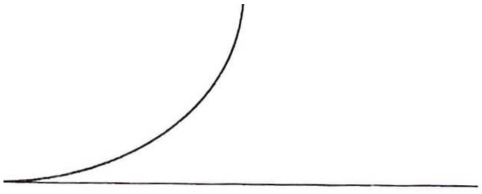
Atomic model showing 2D·electronorbitals

Atomic model showing3D electron clouds

Feedback loops

A feedback loop is a system in which the output is fed back into the system as input.

Time



Time

Negative feedback loops

Negative feedback loops are probably the most common in natural systems and counteract change in an equilibrium. As one component of the equilibrium changes, it causes changesin a second component, which returns the first component to its original state. Examples include predator, prey cycles, , population changes in K-selected species, and the regulationof body systems in living organisms.

Positive feedback loops

These are less common in natural systems than negative feedback loops because they accelerate or each rate change and are therefore destabilizing. A change in one part of the system causes change in a second part which increases the magnitude of the first. Examples include exponential population growth, certain possible aspects of global warming, and some physiological systems in animals,with the intent of achieving a purpose, e.g. childbirth.

1. Identify each of the following as either an open, closed, or isolated system:

(a) Reef ecosystem: ________________________

(b) Nitrogen cycle: ________________________

(c) Earth: ________________________

(d) Biosphere: ________________________

(e) Solar system: ________________________

(f) Digestive system: ________________________

(g) A National Park: ________________________

(h) A large lake: ________________________

2. Identify each of the following examples as a negative or positive feedback loop:

(a) Alarm leading to panic: ________________________

(b) Temperature regulation:

(c) Hormonal changes during childbirth

(d) x = (x+1): ________________________

(e) Predator prey oscillation:

(f) Exponential population growth:

3. Explain why the water cycle approximates a closed system: ________________________

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4. Explain why there are no known isolated systems: ________________________

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5. (a) Explain why there are generally few positive feedback loops in the physiological systems of living organisms

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b) Explain the purpose of positive feedback in physiological systems: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

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6. Explain why models are never 100% accurate representations of the system being studied: ________________________

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7. Discuss the advantages and disadvantages of using models to explain a system: ________________________

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