**Paragraph structure, topic sentences and transitions**

**Pre-Class Activities**

**Paragraphs**

Paragraphs are extremely important components of an effectively structured piece of writing because they organize material in a way that makes it easier to follow for your readers. Without them, even the most fascinating piece of work will fail to attract the attention it deserves. Structuring your writing into clear, effective paragraphs that address individual ideas will help you organize your work, which in turn gives your readers the best possible chance of understanding the points you are trying to make.

Scientists and researchers often find themselves communicating the results of important studies in an attempt to convince others that they have discovered a new piece of knowledge that will have implications for future research and/or immediate real-world applications. As such, it is even more crucial that they are able to tell a story effectively because they have to convince their audience that their arguments are valid.

The three golden rules below will help you to write clear paragraphs, although you should note that these are just the main ones that you will need to focus on; there are plenty of others that will improve your writing as well. To begin with, try to make sure that you:

**1.** Make one main point per paragraph. It is good practice to tell your reader in one clear, concise sentence (called a topic sentence) at the beginning of each paragraph what you will be expanding upon in that particular paragraph.

**2.** Funnel information from general to specific. Treat each paragraph as a mini-essay, each with its own topic sentence. It is a good idea to start by providing general information before making the information that follows more specific.

**3.** Provide evidence to fully support each paragraph. Although it is a good idea to make most paragraphs roughly similar in terms of word count, it is more important to make each paragraph similar in terms of content completeness. You must provide evidence to back up the general statement(s) made early in each paragraph.

**Question 1 (1 mark)**

Imagine that you have been working on a chemistry project and have drafted a short report to detail what you have learned. Read this draft below. Which of the five sentences contains information that does not relate very closely to the rest of the text?

(**1**) Helium, neon, argon, krypton, xenon and radon are the six noble gases that together make up a group of elements with very similar properties. (**2**) Some people still hold an old misconception that noble gases will not react with other elements because they do not have "spare" electrons in their outer shells that are free to interact with electrons of other elements. (**3**) An example of an industrial use involving a noble gas is that of manned blimps, which used to use hydrogen before it was considered too dangerous due to the chance of explosion; these now use helium instead. (**4**) Noble gases are alike in the sense that none of them have any colour, smell, or taste, and, in normal circumstances, they are not flammable. (**5**) Although noble gases do not interact easily with other elements, the heavier ones are less stable and do sometimes react to form compounds.

**Question 2 (4 marks)**

Re-read the draft of writing about noble gases (above, question 1) and use the **three golden rules** described on the first page to restructure the writing into effective paragraphs. *Hint: You should split the text into three different paragraphs and will need to reorder the sentences. You can copy and paste the text as you do this to save time.*

**Question 3 (3 marks)**

To give you some more practice in following the three golden rules of paragraph formation, read the following information drafted by a colleague ahead of a conference about noble gases, and condense it into *fewer* paragraphs. This exercise should help show you that it is just as possible to split information into too many paragraphs as it is to use too few, but that by following the **three** **golden rules**, you should be able to improve any piece of writing.

Read the draft below and use the **three golden rules** to restructure the writing into effective paragraphs. *Hint: You should condense the text into three different paragraphs. You can copy and paste the text to save time.*

(**1**) Scientists believe that helium is the second-most common element in the universe.

(**2**) They think it accounts for almost one-quarter of all the elements by fraction of weight.

(**3**) Research has suggested most of it originally came from the Big Bang.

(**4**) However, the relative proportion is still increasing because other elements are decaying.

(**5**) Things are very different on Earth.

(**6**) The gravitational field is too weak to prevent helium from escaping our atmosphere. (**7**) As a result, it is not even the most common noble gas on our planet, which is argon. (**8**) All noble gases are used in laboratory experiments.

(**9**) Perhaps unsurprisingly, the more common they are in our atmosphere, the cheaper they are to buy.

(**10**) Xenon, which is very rare, can cost around 100 times as much as helium!

**Topic Sentences**

Remember from the previous section that an effective topic sentence must inform your reader what the paragraph is about, and it should also link the flow of your argument from the previous paragraph to the current one. It is usually a good idea to make the first sentence of your paragraph the topic sentence.

As a rough indicator of whether you have written clear topic sentences, a reader in a real hurry should be able to read these, and these only (i.e. avoid the detailed information in all the paragraphs), and still be able to understand the backbone of the argument you are making.

**Some example errors and improvements**

A1 (topic sentence missing):

“When cornered by a pack of wolves, even the most terrified hare will run within the closing circle, desperately seeking an escape route. Fish caught in a trawler net will swim round and round, looking for a way out. Even primitive micro-organisms will move as far away as possible from a negative stimulus, somehow conditioned to flee from impending death.”

**B1 (with effective topic sentence):**

**“There is a huge diversity of life on earth, but all organisms display a common desire to survive.** When cornered by a pack of wolves, even the most terrified hare will run within the closing circle, desperately seeking an escape route. Fish caught in a trawler net will swim round and round, looking for a way out. Even primitive micro-organisms will move as far away as possible from a negative stimulus, somehow conditioned to flee from impending death.”

**A2 (topic sentence does not relate closely enough to paragraph):**

“There is a huge diversity of life on earth, but all organisms display a common desire to survive. When cornered by a pack of wolves, even the most terrified hare will run within the closing circle, desperately seeking an escape route. Wolves co-ordinate their hunting efforts so as to increase their chances of catching prey, but those with higher social ranks earn the right to eat before their inferiors. Hares, on the other hand, typically forage for food on their own. Although they do not benefit from the increased awareness of where food might be, which would come from searching with others, they never have to share their food when they find it.”

**B2 (topic sentence relates directly to paragraph):**

**“Wolves and hares use different foraging strategies, and there are positives and negatives associated with each.** Wolves co-ordinate their hunting efforts so as to increase their chances of catching prey, but food must be shared and wolves with higher social ranks earn the right to eat before their inferiors. Hares, on the other hand, typically forage for food on their own. Although they do not benefit from the increased awareness of where food might be, which would come from searching with others, they never have to share their food when they find it.”

**Questions 4, 5 and 6 (1 mark each, 3 marks total)**

Study the following paragraphs and the three different options for a topic sentence. Choose the most suitable one for each.

**Question 4 (1 mark):** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.The blue whale can grow to lengths of 100ft and weigh as much as 180 tons, whereas the dwarf sperm whale does not grow to be longer than 9ft and weighs as little as 250kg.

1: There is huge variation in the size of different whale species.

2: The blue whale is much more powerful than the dwarf sperm whale.

3: Despite living in the sea, whales are mammals and are unable to breathe underwater.

**Question 5 (1 mark):**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.Viruses are made up of genetic material surrounded by a coat of protein. They must ‘hi-jack’ a host cell and use its physiological machinery to reproduce. Conversely, bacteria are much larger than viruses and are capable of independent reproduction. 

1: Viruses and bacteria differ in their method of reproduction.

2: Viruses and bacteria both cause serious illness in people but reproduce differently.

3: Viruses and bacteria are very different organisms.

**Question 6 (1 mark):**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.For example, many parents have refused to give their children the triple vaccine of measles, mumps and rubella because of the suggestion that it increases the risk of developing autism. This is despite independent research finding no evidence to support a link between the two. Further independent research shows that there has been an alarming increase in the number of measles cases in children that did not receive the vaccine in recent years. Despite this fact, a high proportion of parents are still reluctant to administer the triple vaccine to their kids.

1: Some inoculations are still poorly trusted despite tests confirming their safety.

2: Measles has affected a high proportion of children that have not been vaccinated against it.

3: Parents often rely on rumours to make poor health decisions on behalf of their kids.

**Questions 7 and 8 (1 mark each, 2 marks total)**

Now try to apply the rules of structuring your writing with effective topic sentences from the other perspective; try to select the most appropriate sentences to follow the topic sentences below.

**Question 7 (1 mark)**

In the natural world, sexual attraction is often based on male individuals displaying colourful features. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1: For example, male peacocks, male perch, male grouse, and some male spiders all follow this pattern. In these same examples, the females in each species are typically less colorful.

2: For example, male peacocks with the biggest and brightest tails tend to attract more females than those with duller appendages. Similarly, male perch with the brightest orange bellies and striking dorsal fins win more mates than their less colorful peers.

3: For example, specific genes in male peacocks and male perch code for certain proteins that, when expressed at high levels, cause the animals to develop extreme colors and win mates. This phenomenon is true for some bird and fish species.

**Question 8 (1 mark)**

Drugs and medicines can save lives, but also destroy them. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1: The word ‘drug’ has a negative association for many people but ‘medicine’ has a much more positive one. For example, Penicillin is lauded as one of the greatest discoveries in human history as its use saved millions of people from diseases like diphtheria and scarlet fever. On the other hand, recreational drugs do not save people from such diseases.

2: Because medicines can be so important in saving lives, the pharmaceutical industry is worth trillions of dollars. Non-medicinal drugs, sold illegally, are also extremely valuable. Medicines have traditionally saved millions of people from diseases such as syphilis, diphtheria, typhoid and malaria but drugs often have negative associations because people know how damaging they can be to people that become addicted.

3: Many life-threatening diseases, such as diphtheria and malaria, can be successfully treated with the correct antibiotics and antiviral drugs. For people afflicted by these diseases, drugs are wonderful commodities. However, people that take recreational drugs can often develop serious addictions to them; because these drugs are often extremely damaging to the body, addicts are in serious danger of developing major health issues that can ultimately lead to death.

**Questions 9 and 10 (1 mark each, 2 marks total)**

For the following two questions, read the **bolded** topic sentence (and paragraph that follows it) before deciding which **one** of the following problems makes each one a **poor** topic sentence:

A) It is **too broad**, and it is therefore hard to cover in sufficient detail in one paragraph

B) It is **too narrow**, and there is therefore too little to expand on in the paragraph

C) It **lacks focus**, and is therefore hard to link it to the support of one idea

D) The language is **too specialist**, and therefore might not make sense to everyone

**Question 9 (1 mark)**

**Many students prefer one distinct scientific discipline to others**. Although many people categorize students as 'science students' from an early stage of their academic careers, there are many biologists that do not involve themselves in learning chemistry or physics, and vice versa.

**Question 10 (1 mark)**

**Parametric statistical methods are preferable to their non-parametric equivalents because they increase power in hypothesis-testing analyses**. This is important because statistical analysis of data essentially provides support for the existence (or non-existence) of a significant effect. As such, a parametric method might highlight an important pattern that could be missed by a non-parametric test, which has great relevance in the field of research.

**Making Smooth Transitions**

We have already seen that a piece of writing containing interesting, important information will fail to get the message across if it is not structured into clear paragraphs. In the same way, such information will not make an impact on a reader if the flow of ideas does not transition seamlessly from sentence to sentence, or from paragraph to paragraph.

When reading over your work, ask yourself whether the flow of information is smooth. Although it is often difficult to remember everything that you have just read, it is a bad sign if you find yourself having to jump backwards again and again to fully understand something.

Before you get used to making smooth transitions, it is a good idea to ask a friend or classmate to read your work and tell you whether they followed your thought process from the first sentence to the last. If they found it difficult, you probably need to work on your transitions.

An effective transition should do at least two of three things. It should:

**1.** Act as a preparatory signpost for what is coming up next

**2.** Explain to the reader how each idea is connected

**3.** Signal the point at which you are shifting to another idea

**Two examples**

**A1 (Poor transitions):**“Global warming will have negative consequences for polar bears. As temperatures rise they will have a smaller habitat in which to live. Also, there will be less food available for them because there will be smaller populations of krill. Polar bear populations are thus affected by the amount of ice available.”

**B1 (Good transitions):**“Global warming will have negative consequences for polar bears for two main reasons. Firstly, because increased temperatures cause increased melting of ice on which the bears live, there will be a reduced area in which they can live. Secondly, many species that polar bears rely on for food will be less numerous than in the past because their main food source, krill, can only breed successfully underneath ice. Therefore, the reduction of ice is the key factor in limiting polar bear populations.”

B1 is better than A1 because:

**1.** **Each sentence begins with a ‘signpost’ that links it to the next one**

**2.** **Each transition connects the points made in the whole text with one another**

**3.** **Each transition informs the reader that a new idea is about to be elaborated on**

**Question 11 (5 marks)**

Imagine that you conducted a detailed experiment to see whether certain plant species were more effective than others at suppressing the spread of an invasive plant species that has negative consequences for British Columbia grasslands. In less than 250 words you had to describe (1) why your research was important, (2) what your main results were, and (3) why they might have important implications.

Read the ‘original’ draft below and use the three transition pointers above to fill in the gaps suitably.

The spread of *Bromus tectorum*(cheatgrass) throughout grasslands in British Columbia (BC) has many negative effects on these habitats. For [?????], cheatgrass reduces biodiversity, leads to more frequent wildfires, and causes health problems for cattle that eat it. [?????], negative effects on ecosystems are also financially costly; it costs a lot of money to restore a habitat after fire and it is expensive to buy food for lots of cattle.

I grew cheatgrass plants in different treatment groups each featuring one other plant species that was common in BC grasslands, [??????] I wanted to see which species had the greatest negative effect on cheatgrass growth rate. [?????] this method, I tested three other species and found that crested wheatgrass significantly reduced the growth rate of cheatgrass; it reduced growth rate by approximately 65%. Bluebunch wheatgrass did not significantly affect cheatgrass growth rate, whereas Idaho fescue significantly increased the growth rate of cheatgrass by approximately 39%. As a [?????], I recommend grassland managers promote the growth of crested wheatgrass and discourage the growth of Idaho fescue.

**Choosing Effective Transition Words and Phrases**

Good transitions link ideas from sentence to sentence to build a compelling argument, and for this reason it is vital that an effective transition word or phrase is used in each scenario to achieve this. For example, the transition ‘for example’ will only work when you have just made a statement and are about to back it up with some specific evidence.

The following list is by no means extensive, but it provides some excellent transition words and phrases that will help you link sentences and develop, logical, flowing arguments:

* But/however
* Nevertheless
* For example
* Firstly/secondly/finally etc.
* Therefore/thus
* As a result
* In contrast
* And/also
* Furthermore/moreover

**Some examples**

* Rabbits regulate their own body temperature. **In contrast,** snakes rely on the external environment to warm them.
* The vast majority of fertilized eggs released by salmon are eaten by other animals or drift away to unsuitable habitats. **However,** a small number hatch into young fish each year and these fish eventually go on to produce eggs of their own.
* Prey species are at their most vulnerable when they are temporarily distracted when drinking. **As a result**, predators have learned to lurk around water sources and wait for their prey to come to them.

The following list includes some words that you should pay extra attention to when using as transitions. These words can be very effective when used correctly, but they can also confuse readers in certain situations:

* Since
* It
* For
* They
* Naturally
* Clearly/obviously

**Some examples**

* A major medical breakthrough was made approximately 80 years ago when Alexander Fleming discovered Penicillin. **Since** it has helped to greatly reduce the number of people dying from diseases such as syphilis and diphtheria.

**In the above example, it is not clear whether the writer is suggesting that fewer people have died from these diseases in the years that have passed since the breakthrough was made, or whether he/she is using ‘since’ to mean that it was a major breakthrough ‘because’ fewer people died from the diseases after its discovery.**

* As rabbit populations grow to something approaching carrying capacity, the chance that any one individual will die increases. **They** are more at risk from the effects of competition and disease in these circumstances.

**In the above example, it is not clear whether the individuals are more at risk, or if the rabbit population as a whole is more at risk.**

* **Clearly**, the results show that as temperature increases, mouse heart rate does likewise.

**In the above example, the writer assumes his/her reader will come to the same conclusion. Not everyone interprets things the same way and it can come across as rude to suggest a pattern or conclusion is obvious.**

**Question 12 (5 marks)**

There are eight transition words or phrases in the body of text below (these have been **bolded** for you). Five of these are poor transitions. Underline the five poorly chosen transitions. *Hint: If you underline more than five, you will have marks taken away!*

It is a common misconception that scientists do not use creativity in their research because it might interfere with their objectivity. **Nevertheless**, some people think that following the scientific method of designing a hypothesis, then an experiment, analyzing the results, and then writing them up means there is no room for being an individual. **As a result**, if scientists did not use imagination and creativity many breakthroughs would not have been made. **To highlight this point**, in 1878, A.A Michelson calculated the speed of light by designing an ingenious experiment. **To begin**, he placed mirrors a long way apart. **Ultimately**, he made sure that one was spinning and then focused light on the other, which reflected back onto the spinning one. **Thankfully**, the spinning meant the returning beam was deflected. **Finally**, he measured the deflection before calculating the speed with a formula. **Furthermore**, technology has improved since then but the accepted speed of light is very similar to the value he originally calculated.

**Questions 13, 14, 15, 16, 17 (1 mark each, 5 marks total)**

Read the following paragraph. There are blanks where effective transitions need to be added. Each blank represents one question, for which you must choose the best transition from a set list of options.

When designing an experiment, there are a lot of things you need to think about. [**Q13**], it is important that you consider how to control variables other than the ones you are interested in. [**Q14**], there is no point asking whether temperature impacts swimming speed in fish if other things such as water depth, current, and light intensity are not held constant, because it is not possible to know which of these factors influenced the results. [**Q15**], it is important to design an experiment that can be easily repeated. [**Q16**] you need to make sure results did not occur by chance, you should aim to repeat the same experiment at least a few times so as to see whether an effect is consistent. Failing to control other variables or to plan for experimental repeats are two of the biggest mistakes that inexperienced researchers make. [**Q17**], the most common error of all involves taking more than one measurement from the same organism, test tube, or chemical mixture and failing to see that this can provide a biased estimate of your sample population.

**Choose one transition word/phrase for each question from:**

**Q13:** Firstly, Obviously, Naturally

**Q14:** For example, As a result, Secondly

**Q15:** In addition, Nevertheless, Consequently

**Q16:** Because, Since, Likewise

**Q17:** However, In summary, Meanwhile

**Question 18: Bringing it all together (10 marks)**

Choose a complicated subject or topic that you are very interested in (it can be anything, but try to choose something that most people will know little about). **In 150-200 words, write a total of five sentences that are split into two paragraphs.** **Try to explain two separate aspects of this subject and ensure that:**

1. **Each topic sentence is clear and suitable**
2. **Your paragraphs are organized appropriately and information flows logically from sentence to sentence**
3. **Each sentence transitions smoothly to the next**

Once you have written your sentences/paragraphs, try to ask a friend with no background knowledge about the subject whether they have understood how each element (sentence) relates to the next one, and to the argument as a whole. Their input will likely help you write a strong, cohesive piece of writing.

**\*\*\* Make sure you make a copy of your answer (copy and paste into a file on your computer). You will return to this piece of writing in the post-class activities. \*\*\***