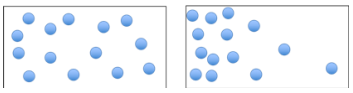
How to write good science questions – by Pritesh Raichura @Mr_Raichura

#	Principle	Example	Non-example
1	To build understanding, the stem of the question should contain lots of cues. *Start a series of questions with these sorts of questions.*	Which cell organelle contains the genetic material?	What is the function of the nucleus?
2	To maximise retrieval, the stem of the question should contain as little of the science as possible. *These types of questions should come towards the end of a sequence of questions, tying together various bits of knowledge.*	What is the function of the nucleus?	Which cell organelle contains the genetic material?
3	If you expect a set number of responses, say so in the question.	Give three reasons the cell cycle takes place.	Explain why the cell cycle takes place.
4	Be precise about the nature of the answer required in the question. Underline this cue where possible.	What is a medical advantage of therapeutic cloning?	What is an advantage of therapeutic cloning?
5	Where appropriate, use 'what' or 'where' questions, to avoid clunky questions. Do not hesitate to use command words where necessary.	Where are stem cells found in plants?	Name the location of the stem cells in plants.
6	'Define' questions should be preceded with questions the ensure pupils understand the constituent ideas.	Define concentration gradient. Define diffusion. *However, this is still too abstract. See next point.*	Define diffusion. *With no further questions.*
7	Start with concrete questions before asking abstract ones. In other words, show them meaningful ideas before asking questions that describe these ideas in abstract ways.	The diagrams show the particles of a gas. Which diagram shows a concentration gradient? How do you know? A B  What is a concentration gradient? What is diffusion?	What is a concentration gradient? What is diffusion?
8	Don't be afraid to repeat questions, change the cue in the stem as the questions progress.	Name the green pigment found in plant cells. Which substance in plant cells absorbs sunlight?	Just because the answer to one of the questions is 'chlorophyll' does not mean other questions with the same answer cannot be used in a particular set of questions.

9	Avoid starting questions with information; start with commands or question words.	Which gases enter and exit the stomata during photosynthesis?	During photosynthesis, which gases enter and exit the stomata?
10	If a pupil needs to know *how* to do something, do not try to describe the step using complicated language. The question should simply ask them to *do* it.	Q: Write the chemical symbol for potassium. **A: K** Q: Which element is 'Na' the chemical symbol for? **A: Sodium**	Q: What do you call the shortened version of an element? A: Chemical symbol *Such questions are unnecessary.*
11	Use matching activities where you would like pupils to consider contrasting information, or tackle knowledge that is commonly confused with other bits of knowledge. Such questions are best used earlier in a sequence of questions because they require less effortful retrieval.	Match the following structures to their functions: **Structures**: Root hair cell Xylem cell Phloem cell **Functions**: Absorb water and mineral ions from the soil Carry water and dissolved mineral ions up the plant Carry dissolved sugars from the leaves to the rest of the plant **Diagrams** *You could also have diagrams to match*	
12	Categorising activities force pupils to make comparative decisions: - Venn diagrams - Making tables to populate	Copy and complete the Venn diagram and fill in the cell organelles found either in eukaryotic cells only, prokaryotic cells only, or both: Ribosomes, nucleus, linear DNA, cytoplasm, plasmids, cell membrane, loop of DNA.	
13	Questions requiring pupils to construct sentences can be used to help pupils practice using scientific words correctly in full sentences.	Unjumble the sentence: cell specialised many differentiate stem types of a cells can into. A stem cell can differentiate into many types of specialised cells.	Don't do this for longer multi-clause sentences. e.g. A stem cell is an undifferentiated cell that can give rise to many types of specialised cells or give rise to more stem cells.

14	For questions whose answer consists of several distinct points that form a coherent explanation: Sequencing activities isolate the practice of relationships between facts, and do not require pupils to retrieve. Missing one or more steps in a sequence forces pupil to identify and retrieve gaps in the explanation. Full retrieval is requires pupils to recall facts and correct sequencing.	Processes: Put the following steps in the correct order: Heart rate, breathing rate and breath volume all increase. This causes an increase in energy demand. Muscles contract more during exercise. The rate of respiration increases, lowering the amount of available reactants (glucose and oxygen). More glucose and oxygen and transported to the exercising muscles.	If there are multiple plausible answers, consider specifying to pupils which one you'd like first or last to make feedback easier. Alternatively, ask pupils to sequence only pairs of clauses.
15	To help pupils write better sentences connecting cause and effect, we can isolate the steps needed to do this well. First, pupils need to be able to correctly identify and eventually write clauses that describe either a cause or an effect. Second, pupils need to learn about different conjunctions. Give pupils cause and effect clauses and instruct them to write sentences with given conjunctions. You can ask pupils to write two or more sentences using the same clauses, noting that the order of the clauses changes depending on the conjunction. E.g. 'results in' vs 'as a result of'.	Label the clause as either 'cause' or 'effect' in each pair. Fewer plants being available More herbivores dying. Write a sentence with the two clauses and the phrase a) 'results in' b) 'is a result of' The heart contracting Blood circulating around the body	

