Practice questions for CTO2 growth.

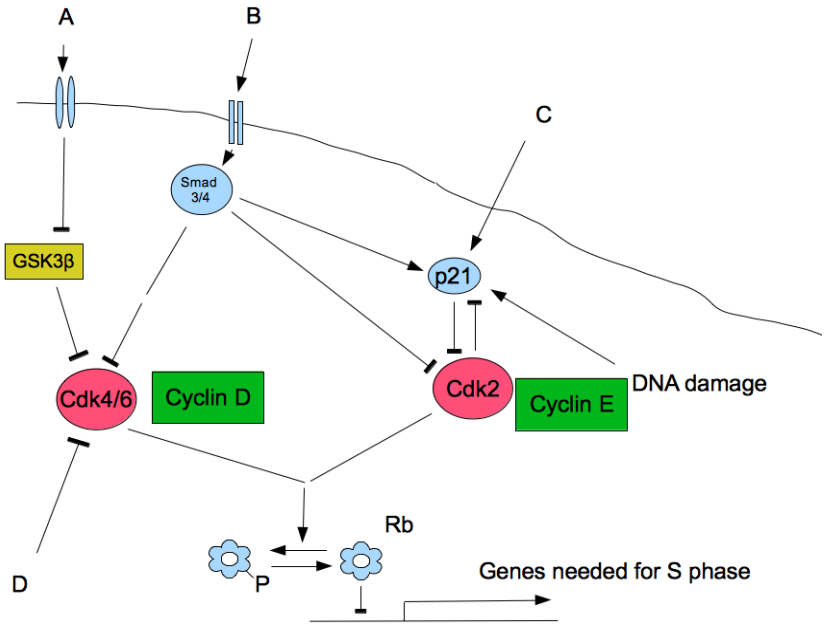
NB – these are not necessarily in the order of the lectures, so you should do the only after the last lecture and the computer workshop.

Q1 The healing of human wounds is a complex process involving many things. One important feature is stimulation of proliferation by cells that surround the wound, so that missing tissue can be replaced. One of the stimuli for skin (dermal) cell proliferation is the release of platelet-derived growth factor (PDGF) by platelets as they form a blood clot. In monkeys, there is a retrovirus that has picked up a copy of the simian PDGF gene, and incorporated it next to a strong viral gene promoter. When this virus infects cells and integrates into them (as retroviruses do), the PDGF gene of the retrovirus is therefore 'on' all the time. What would you expect to be the biological result of a monkey getting such an infection into its dermal cells?

a) Nothing
b) The monkey would be really good (fast) at healing wounds at or near the affected site
c) The monkey's platelets would be activated as they passed through the affected site
d) The monkey would develop a dermal sarcoma (a neoplasm of the dermis)
e) The monkey would develop platelet-type leukaemia (a neoplasm of the blood)

(each question is on a page of its own)

Q2 The following diagram shows the influence of four factors (A-D) on progression through the G1-S transition of the cell cycle. The other named things are proteins we met in a very similar diagram in the lectures.



Factors A, B, C and D could each be things that are needed for entry to S phase to happen, or things that can block entry to S phase. By following the connections of the diagram, determine whether each factor encourages or inhibits entry to S phase, and choose the appropriate row from the tabel below.

	A	B	C	D
a	encourages	encourages	encourages	encourages
b	encourages	encourages	encourages	inhibits
c	encourages	inhibits	inhibits	encourages
d	inhibits	encourages	encourages	inhibits
e	inhibits	encourages	inhibits	inhibits
f	inhibits	encourages	encourages	encourages
g	inhibits	inhibits	encourages	encourages
h	encourages	encourages	inhibits	inhibits
i	encourages	inhibits	inhibits	inhibits

Q3: Condensation (aggregation together) of cells prior to making something new is a common feature of animal development. The accumulation of cells should last long enough for there to be enough cells to make the new thing, but not any longer or too many will be there. One way that cells might arrange this is by each secreting a small amount of a substance ('X') that diffuses poorly through tight aggregates of cells: cells move on to the next phase of development when the local concentration of substance X around the cells reaches a threshold. A researcher investigating a system she thinks works this way has identified X and has developed two drugs, drug M that mimics the action of X on cells, and drug I that inhibits the action of X. If she is right about cells judging when they have formed a large enough aggregate by the local concentration of X, what effect would these drugs have;

a) Both drugs would cause abnormally small aggregates of cells to attempt to move on to the next stage of development

b) Both drugs would cause over-large aggregates to form

c) Drug A would cause abnormally small aggregates to attempt to move on to the next stage, while drug M would cause abnormally large aggregates to form.

d) Drug M would cause abnormally small aggregates to attempt to move on to the next stage, while drug I would cause abnormally large aggregates to form.

e) Neither drug would have any effect on the system

Q4: A partonomic hierarchy of body components could be stated as follows:

body
organs
tissues
cells
molecules
atoms

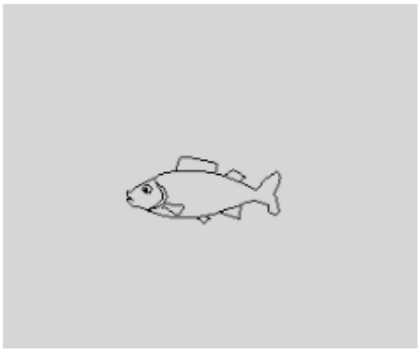
If one compares large and small animals (for example a Great Dane dog and a terrier dog, or an adult Great Dane and a Great Dane puppy), it is clear that the body has 'scaled up'. It is also clear that the atoms of a large dog are the same size as those of a small dog, so not every part of the dog scales with the body. Where, in the above hierarchy, does the boundary between things that scale, and things that do not scale, lie?

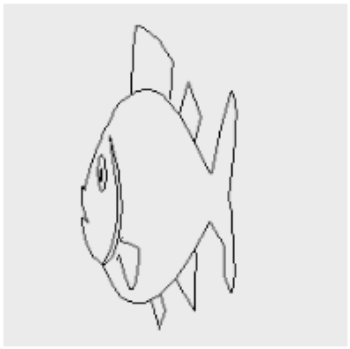
a) between organs and body
b) between tissues and organs
c) between cells and tissues
d) between molecules and cells
e) between atoms and molecules

Q5: The left-hand image below shows the body of a grown fish, in which the rate of growth of a smaller ('starting') version of the fish, in the dorso-ventral plane, is given by the equation

growth = b + mx + e.exp(x) + s.sin(x) + r.y

(where y is the dorsoventral axis, x the cranio-caudal one, and all other letters are constants. To produce the fish on the left, b=1 and all other constants = 0).





The image on the right shows how the same initial fish turns out if ONE of the constants in the equation is increased (and the rest are the same) Which one must it be?

1) b is increased
2) m is increased
3) e is increased
4) s is increased
5) r is increased
6) x is increased