

Biology

Task 1

Make a poster on the following:

- Eukaryotic vs prokaryotic cells
- What is a cell surface membrane and what is it made of?
- How substances can move across a cell membrane
- Protein structure – including enzymes
- Structure and function of the heart and lungs.

Resources to support you are:

<https://www.physicsandmathstutor.com/biology-revision/a-level-aqa/cells/>

<https://www.physicsandmathstutor.com/biology-revision/a-level-aqa/biological-molecules/>

<https://www.physicsandmathstutor.com/biology-revision/a-level-aqa/organisms-exchange-substances/>

<https://www.youtube.com/@Freesciencelessons/featured> (scroll down to Year 12 Biology)

<https://www.revisely.com/alevel/biology/aqa/notes>

Task 2 – Biology and Maths

Analysing tables

Lung cancer, chronic bronchitis and coronary heart disease (CHD) are associated with smoking. Tables 1 and 2 give the total numbers of deaths from these diseases in the UK in 1974.

Table 1 Men

Age/years	Number of deaths (in thousands)		
	lung cancer	chronic bronchitis	coronary heart disease
35-64	11.5	4.2	31.7
65-74	12.6	8.5	33.3
75+	5.8	8.1	29.1
Total (35-75+)	29.9	20.8	94.1

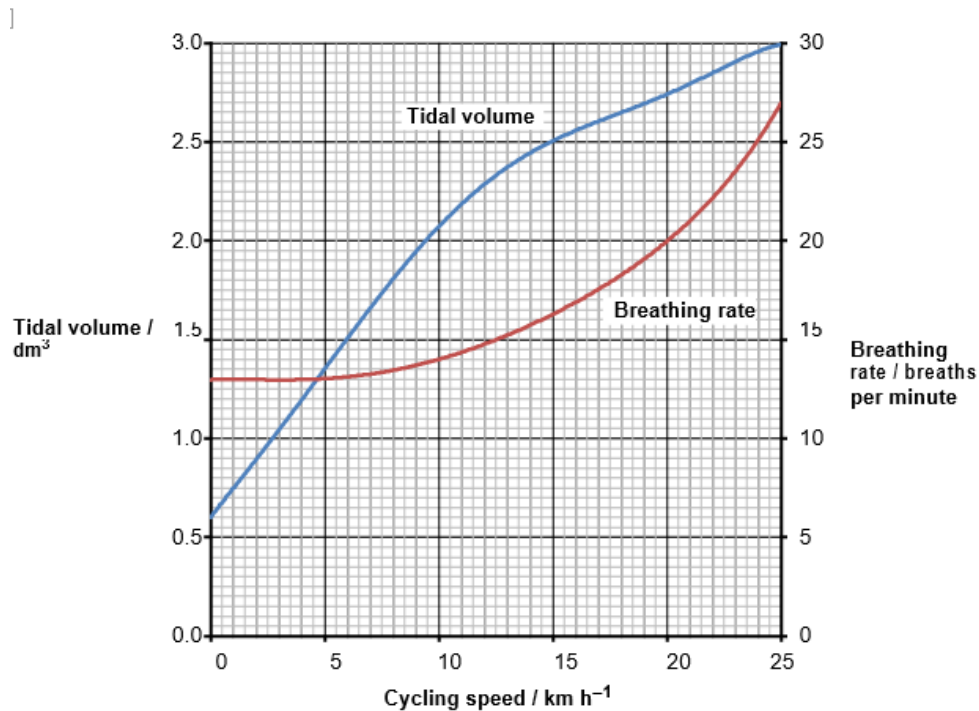
Table 2 Women

Age/years	Number of deaths (in thousands)		
	lung cancer	chronic bronchitis	coronary heart disease
35-64	3.2	1.3	8.4
65-74	2.6	1.9	18.2
75+	1.8	3.5	42.3
Total (35-75+)	7.6	6.7	68.9

1. Of the men who died aged 35-64 from one of these three causes, what percentage of them died of lung cancer?
2. What percentage of deaths from chronic bronchitis in women happened to women aged 65-74?
3. Deaths from lung cancer drop as people get older. Is there a bigger percentage difference for men or women from 35-64 to 75+?
4. What fraction of coronary heart disease deaths of men over 34 are in the 75+ bracket? What about for women?

Analysing Graphs

The volume of air breathed in and out of the lungs during each breath is called the tidal volume. The breathing rate and tidal volume were measured for a cyclist pedaling at different speeds. The graph shows the results.



1. What was the tidal volume when the cycling speed was 17 km h⁻¹?
2. What was the breathing rate when the cycling speed was 8 km h⁻¹?
3. What was the change in breathing rate when the cyclist changed from 10 to 20 km h⁻¹? Express this as a percentage.
4. At what speed did the breathing rate start to increase?

Task 3

SI units

Every measurement must have a size (eg 2.7) and a unit (eg metres or °C). Sometimes, there are different units available for the same type of measurement. For example, ounces, pounds, kilograms and tonnes are all used as units for mass.

To reduce confusion, and to help with conversion between different units, there is a standard system of units called the SI units which are used for most scientific purposes.

These units have all been defined by experiment so that the size of, say, a metre in the UK is the same as a metre in China.

The seven SI base units are:

Physical quantity	Usual quantity symbol	Unit	Abbreviation
mass	m	kilogram	kg
length	l or x	metre	m
time	t	second	s
electric current	I	ampere	A
temperature	T	kelvin	K
amount of substance	N	mole	mol
luminous intensity	(not used at A-level)	candela	cd

All other units can be derived from the SI base units.

For example, area is measured in square metres (written as m^2) and speed is measured in metres per second (written as ms^{-1}).

It is not always appropriate to use a full unit. For example, measuring the width of a hair or the distance from Manchester to London in metres would cause the numbers to be difficult to work with.

Prefixes are used to multiply each of the units. You will be familiar with centi (meaning 1/100), kilo (1000) and milli (1/1000) from centimetres, kilometres and millimetres.

There is a wide range of prefixes. The majority of quantities in scientific contexts will be quoted using the prefixes that are multiples of 1000. For example, a distance of 33 000 m would be quoted as 33 km.

The **most common** prefixes you will encounter are:

Prefix	Symbol	Multiplication factor		
kilo	k	10^3	1000	
deci	d	10^{-1}	0.1	1/10
centi	c	10^{-2}	0.01	1/100
milli	m	10^{-3}	0.001	1/1000
micro	μ	10^{-6}	0.000 001	1/1 000 000
nano	n	10^{-9}	0.000 000 001	1/1 000 000 000

Which SI unit and prefix would you use for the following quantities?

1. The time between heart beats
2. The length of a leaf
3. The distance that a migratory bird travelled each year
4. The width of a cheek cell
5. The mass of a rabbit
6. The mass of iron in the body
7. The volume of the trunk of a large tree

Put the following in order of size:

Transition Task



height of an elephant; length of DNA strand; width of a hair; height of a tree; width of a sodium ion; length of a nerve cell; length of a heart; width of a red blood cell; size of a virus; length of a finger; length of a mosquito; length of a human digestive system; width of a field; length of a water molecule.