Applied Science- New Student Day Activity

Biology

TASK 1

Activity: Microscopes

1. Use the link remind yourself how to use a microscope to view cells
   https://www.bbc.co.uk/bitesize/guides/z84jtv4/revision/4

2. Produce a table to compare
   - a light microscope
   - a transmission electron microscope
   - a scanning electron microscope

   You could include how they work, advantages and disadvantages.

Extension

What rules do you need to follow to produce a biological drawing of what you see down the microscope?

Now that we've done a little work on microscopes, it's time to think about what we can use them to view by creating your own cell.

TASK 2

Activity: Making a cell

Make a model cell containing the following parts:
- cell-surface membrane
- nucleus
- mitochondria
- Golgi apparatus and Golgi vesicles
- lysosomes (a type of Golgi vesicle that releases lysozymes)
- ribosomes
- rough endoplasmic reticulum and smooth endoplasmic reticulum

Extension
What parts would you need to add to transform your creation into a plant cell?
In complex multicellular organisms, cells become specialised for specific functions. Specialised cells are then organised.
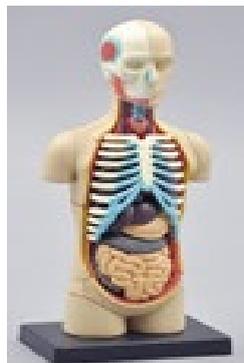
TASK 3

Activity: Organisation
Research the following questions
1. Define tissue, organ and organ system
2. Give an example from the body of each
3. Produce a fact sheet on the digestive system

Extension
There are many different areas that nurses can specialise in, if you were to become a nurse which area would interest you and why?

Chemistry
Incredible Materials

Did you know... that the incredible material graphene was discovered and isolated right here in Manchester? But here's the real surprise, it was isolated using nothing more advanced than a piece of sticky tape!

Task 1: Properties of the allotropes of carbon
Keywords: Allotropes,   atoms, bonding, structure, physical properties, covalent, isotopes

Aim: To find out the properties of diamond, graphite and graphene and how they relate to each structure

1. Write a glossary of each of the keywords listed above. What does each word mean? Where possible, can you give an example?

2. Here is the entry for carbon from the periodic table:
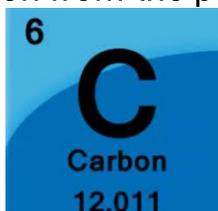
    One of the isotopes of carbon has a mass number of 12. Draw one atom of carbon-12, including the proton, neutrons and electrons.
3. When carbon atoms bond together, a covalent bond is formed. Draw a dot and cross diagram to show one atoms of carbon bonding to another. How many covalent bonds can a carbon atom normally make?

4. All of the allotropes of carbon have the same type of structure. Which type of structure is this?

5. Describe (you can use diagram if you prefer) the structure of each of the two allotropes: graphite and diamond.

6. Describe the difference in physical properties ie melting point and electrical conductivity of diamond and graphite?

Task 2: Tremendous transition metals

If you look around and find an item made of metal, it will almost always be made from a transition metal. Think about it, you wouldn't make a knife from liquid mercury or a spoon from exploding caesium! So what are transition metals and why are they so useful?

Task 2: Finding out about more about transition metals

Aim: To understand what properties transition metals have and why they are so useful

1. Watch the following YouTube clip about metallic bonding and structure

    https://www.youtube.com/watch?v=S08qdOTd0w0

    Use what you learnt to describe (you will need both diagrams and pictures) both the bonding and structure of metals.

2. Comment on the electric conductivity of transition metals?

3. Describe the difference between group 1 metal elements and transition metals.

Extension

What about the chemical properties of transition metals? Find out some of the chemical reactions that transition metals are able to do. Can you write chemical reactions for some of these?

Physics

TASK 1
Falling from space!

On October 14th 2012 Felix Baumgartner jumped from the record height of **38,969.3 meters**. During this time he achieved a maximum speed of **1,357.64 km/h.**

He was accelerated to this speed only under the force of gravity.

Here are some questions which will help you understand acceleration. Use your knowledge from GCSE and internet research to answer them.

Task Questions:

1. Here is the formula for acceleration.
   Define all the symbols used. What are the units of acceleration? (2 marks)

$$a = \frac{v - u}{t}$$

2. The acceleration due to gravity on Earth is approximately 9.81 m/s^2. If an object freefall under gravity for a time of 10 seconds, estimate the change in speed of the object. (2 marks)

3. Here is a video of the space jump https://www.youtube.com/watch?v=vvbN-cWe0A0 . Watch this and notice that after 25 m/s, Felix is moving at 806 km/h.
   i) Convert 806 km/h to meters per second. (1 mark)

   ii) Use the formula for acceleration to provide a value for the acceleration he experienced. (2 marks)
   iii) Explain why does his acceleration decrease as he travels deeper into the atmosphere? (2 marks)

4. *Challenge:*
   Can you use the video and formula for acceleration to show that his acceleration has decreased as he goes into the atmosphere. *Hint: At 30 seconds his speed is 945 km/h. At 34 seconds his speed is 1044 km/h. Convert these speeds to m/s and use the acceleration formula for these 4 seconds to calculate his acceleration.*

5. How do we know that the acceleration due to gravity is 9.81 m/s^2? Use the internet to research and describe one experiment to determine the acceleration of gravity on Earth. Provide a diagram if needed.

   What are the experimental limitations of the experiment you have chosen?

6. The value of g can vary on different locations on Earth and on other planets. Research why that is and provide examples. Reference your sources