# Applied Science Bridging Course

Name: _____

Which course did you do at GCSE? Combined F ◯ Combined H ◯ Triple ◯

Congratulations on choosing to study Applied Science in our Sixth Form. We hope that you really enjoy the subject and your time in our lessons.

To give you an idea of the main topics that you will be studying at the start of your course we would like you to prepare the following material to show that you are prepared to do some work before joining us in September. This work will form part of your Applied Science notes. You will need to research the topics using websites, textbooks and revision guides. If you get stuck then email us at sthomas@stjosephs.uk.net for Biology or twillis@stjosephs.uk.net for Chemistry & Physics.

**Please complete your work in this booklet and bring to your first Applied Science lesson in September.**

We look forward to meeting and working with you.

Mr S B Thomas Head of Science

Mr T M Willis Head of Biology

# Unit 1 Biology

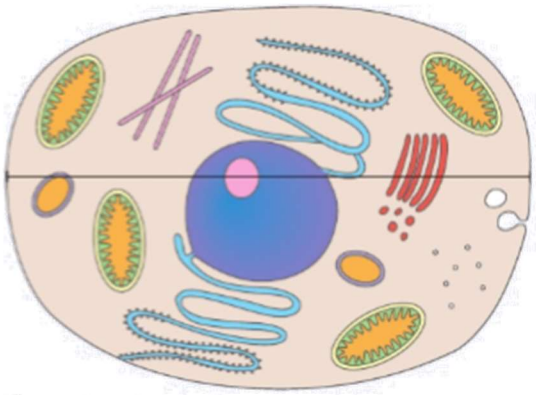
1. Draw a large, labelled diagram of an animal cell as seen under an electron microscope. **Do not print out a copy from the internet – you need to hand draw it.** Your diagram should have the following labels on it:
    a. Nucleus
    b. Mitochondria
    c. Smooth endoplasmic reticulum
    d. Rough endoplasmic reticulum
    e. Lysosome
    f. Golgi body/apparatus
    g. Ribosomes
    h. Cell surface membrane
2. Make a table explaining the **function** of each of the above structures.
3. Show all your working out for the following question:

Work out the magnification for the diagram.
The actual size of the cell shown in the image is 200 µm.

**1** Use your ruler to measure the size of the cell shown in the image in mm.

**2** The actual size of the cell is 200 µm. You need to convert this to mm so they are both in the same units.

**3** Put both figures into the magnification equation and work out the magnification.



4. Copy & complete the table below to compare prokaryotic & eukaryotic cells:

| Prokaryotic | Eukaryotic |
|---|---|
| 1 ..... ..... | ..... ..... |
| 2 ..... ..... | ..... ..... |
| 3..... ..... | ..... ..... |

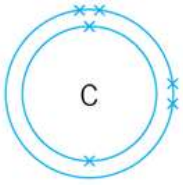
5. Draw labelled diagrams of the following cells & describe & explain how they are adapted for their functions:
    a. Palisade mesophyll cell
    b. Root hair cell
    c. Sperm cell
    d. Egg cell
    e. Red blood cell
    f. White blood cell
6. Describe each of these types of tissue: epithelial, endothelial, muscular & nervous.

# Unit 1 Biology – space for answers

# Unit 1 Chemistry

A copy of the periodic table is found on the last page of the booklet to help you.

1. Draw the electron structures of the first 20 elements in the periodic table using Bohr Theory. For example here is carbon:




2. Research how to write the electron structures of the first 20 elements to show the subshells. For example here is carbon:

$1s^2 2s^2 2p^2$

3. Create a table like the one below to describe different types of bonding:

| | Found | Bonding | Properties | Examples |
|---|---|---|---|---|
| Ionic | | | | |
| Simple Molecular (covalent) | | | | |
| Giant Covalent | | | | |
| Metallic | | | | |

4. Draw dot & cross diagrams for the molecules: sodium chloride & carbon dioxide.
5. Write balanced symbol equations for the reactions of these elements with oxygen: magnesium, carbon, aluminium & sodium.
6. Plot a graph to show the melting points of the first 20 elements:

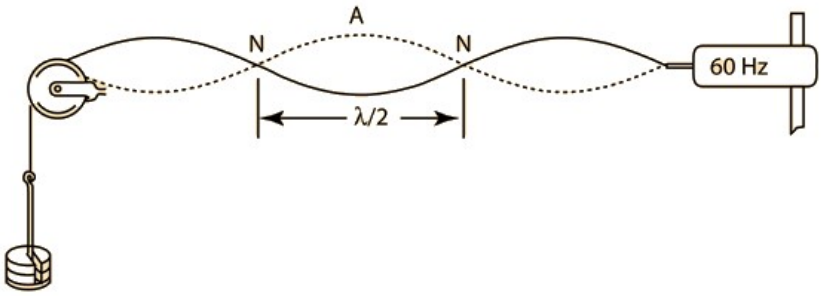
| Element | Melting Point (°K) | Element | Melting Point (°K) |
|---|---|---|---|
| Hydrogen | 14 | Sodium | 371 |
| Helium | 1 | Magnesium | 922 |
| Lithium | 454 | Aluminium | 933 |
| Beryllium | 1551 | Silicon | 1683 |
| Boron | 2573 | Phosphorus | 317 |
| Carbon | 3823 | Sulphur | 386 |
| Nitrogen | 64 | Chlorine | 173 |
| Oxygen | 55 | Argon | 84 |
| Fluorine | 54 | Potassium | 336 |
| Neon | 25 | Calcium | 1112 |

# Unit 1 Chemistry – space for answers

# Unit 1 Physics

A copy of the physics equations is found below to help you.

1. Draw a transverse & a longitudinal wave.
   Label the key features of each wave & describe them.
2. Using the correct equation, show all working out to calculate:
   a. Wavespeed when the frequency is 50Hz & wavelength is 1.5m.
   b. Frequency when wavespeed is 306ms$^{-1}$ & wavelength is 18m.
   c. Wavelength when wavespeed is 14.76ms$^{-1}$ & frequency is 3.6Hz.
3. Describe & explain how to create a standing wave:




4. Draw labelled light ray diagrams with a pencil & ruler to show the following:
   a. Reflection in a mirror.
   b. Refraction as light passes through a rectangular glass block.
   c. Total internal reflection in a fibre optic cable.
5. Research how an endoscope works & why this is useful in medicine.
6. Draw a labelled diagram of the electromagnetic spectrum & describe uses for each part of the spectrum.

**Formulae sheet**

Wave speed $v = f\lambda$

Speed of a transverse wave on a string $v = \sqrt{\frac{T}{\mu}}$

Refractive index $n = \frac{c}{v} = \frac{\sin i}{\sin r}$

Critical angle $\sin C = \frac{1}{n}$

Inverse square law in relation to the intensity of a wave $I = \frac{k}{r^2}$

# Unit 1 Physics – space for answers

# The Periodic Table of Elements

| 1 | 2 | | | | | | | | | | | 3 | 4 | 5 | 6 | 7 | 0 (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.0 H hydrogen 1 | | | | | | | | | | (18) 4.0 He helium 2 |
| (1) | (2) | | Key | | | | | | | | | (13) | (14) | (15) | (16) | (17) | |
| 6.9 Li lithium 3 | 9.0 Be beryllium 4 | | relative atomic mass<br>**atomic symbol**<br>name<br>atomic (proton) number | | | | | | | | | 10.8 B boron 5 | 12.0 C carbon 6 | 14.0 N nitrogen 7 | 16.0 O oxygen 8 | 19.0 F fluorine 9 | 20.2 Ne neon 10 |
| 23.0 Na sodium 11 | 24.3 Mg magnesium 12 | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | 27.0 Al aluminium 13 | 28.1 Si silicon 14 | 31.0 P phosphorus 15 | 32.1 S sulfur 16 | 35.5 Cl chlorine 17 | 39.9 Ar argon 18 |
| 39.1 K potassium 19 | 40.1 Ca calcium 20 | 45.0 Sc scandium 21 | 47.9 Ti titanium 22 | 50.9 V vanadium 23 | 52.0 Cr chromium 24 | 54.9 Mn manganese 25 | 55.8 Fe iron 26 | 58.9 Co cobalt 27 | 58.7 Ni nickel 28 | 63.5 Cu copper 29 | 65.4 Zn zinc 30 | 69.7 Ga gallium 31 | 72.6 Ge germanium 32 | 74.9 As arsenic 33 | 79.0 Se selenium 34 | 79.9 Br bromine 35 | 83.8 Kr krypton 36 |
| 85.5 Rb rubidium 37 | 87.6 Sr strontium 38 | 88.9 Y yttrium 39 | 91.2 Zr zirconium 40 | 92.9 Nb niobium 41 | 95.9 Mo molybdenum 42 | [98] Tc technetium 43 | 101.1 Ru ruthenium 44 | 102.9 Rh rhodium 45 | 106.4 Pd palladium 46 | 107.9 Ag silver 47 | 112.4 Cd cadmium 48 | 114.8 In indium 49 | 118.7 Sn tin 50 | 121.8 Sb antimony 51 | 127.6 Te tellurium 52 | 126.9 I iodine 53 | 131.3 Xe xenon 54 |
| 132.9 Cs caesium 55 | 137.3 Ba barium 56 | 138.9 La* lanthanum 57 | 178.5 Hf hafnium 72 | 180.9 Ta tantalum 73 | 183.8 W tungsten 74 | 186.2 Re rhenium 75 | 190.2 Os osmium 76 | 192.2 Ir iridium 77 | 195.1 Pt platinum 78 | 197.0 Au gold 79 | 200.6 Hg mercury 80 | 204.4 Tl thallium 81 | 207.2 Pb lead 82 | 209.0 Bi bismuth 83 | [209] Po polonium 84 | [210] At astatine 85 | [222] Rn radon 86 |
| [223] Fr francium 87 | [226] Ra radium 88 | [227] Ac* actinium 89 | [261] Rf rutherfordium 104 | [262] Db dubnium 105 | [266] Sg seaborgium 106 | [264] Bh bohrium 107 | [277] Hs hassium 108 | [268] Mt meitnerium 109 | [271] Ds darmstadtium 110 | [272] Rg roentgenium 111 | | | | | | | |

Elements with atomic numbers 112-116 have been reported but not fully authenticated

* Lanthanide series

* Actinide series

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140 Ce cerium 58 | 141 Pr praseodymium 59 | 144 Nd neodymium 60 | [147] Pm promethium 61 | 150 Sm samarium 62 | 152 Eu europium 63 | 157 Gd gadolinium 64 | 159 Tb terbium 65 | 163 Dy dysprosium 66 | 165 Ho holmium 67 | 167 Er erbium 68 | 169 Tm thulium 69 | 173 Yb ytterbium 70 | 175 Lu lutetium 71 |
| 232 Th thorium 90 | [231] Pa protactinium 91 | 238 U uranium 92 | [237] Np neptunium 93 | [242] Pu plutonium 94 | [243] Am americium 95 | [247] Cm curium 96 | [245] Bk berkelium 97 | [251] Cf californium 98 | [254] Es einsteinium 99 | [253] Fm fermium 100 | [256] Md mendelevium 101 | [254] No nobelium 102 | [257] Lr lawrencium 103 |