# **Physics Scheme of Learning**

# <u>Year 10 – Term 1 - P4 – Electric Circuits (Covid Modified)</u>

## <u>Intent – Rationale</u>

This chapter of lessons is the first in the sequence on "Particles at Work" covering P4-Electric Circuits, P5-Electrcity in the Home, P6 Molecules and mat

All substances are made of atoms. Most atoms are stable and remain stable. Without this, the world as we know it wouldn't exist, and neitl

Every atom contains a nucleus surrounded by tiny particles called electrons. Atoms can lose electrons, with different results. In this chapter we will consider how metal electrons that have broken away from atoms inside the metal. The key questions are: What is an electric current? How do series and parallel

| Sequencing – what prior learning does this topic build upon?   | Sequencing – what subsequent learning o  |  |  |
|--|--|--|--|
| This chapter of lessons is the first in the sequence on "Particles at Work" covering P4-Electric Circuits, P5-Electrcity in the Home, P6 Molecules and matter and P7-Radioactivity.  | • The electricity you use at home is produced by generators in motors in appliances such as washing machines. You will learn Electromagnetism  |  |  |
| KS3 Topic 1 - Energy   |  |  |  |
| KS3 Topic 3 – Electric Circuits  |  |  |  |
| GCSE Chapter P1-Conservation and dissipation of Energy   |  |  |  |
| What are the links with other subjects in the curriculum?  | What are the links to SMSC, British \  |  |  |
| Technology - Electronics   | Discussion morals and ethics – heart transplant ADD code   |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| What are the opportunities for developing literacy skills and developing learner confidence and<br>enjoyment in reading?   | What are the opportunities for developi  |  |  |
| What are the opportunities for developing literacy skills and developing learner confidence and<br>enjoyment in reading?<br>FROM THE LIBRARY   | What are the opportunities for developi     Mean average   |  |  |
| What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?         FROM THE LIBRARY         Physics First; G Bethall-530  | What are the opportunities for developi     Mean average     Algebra   |  |  |
| What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?         FROM THE LIBRARY         Physics First; G Bethall-530         Electricity; Louise Spilsbury-537  | <ul> <li>What are the opportunities for developi</li> <li>Mean average</li> <li>Algebra</li> <li>Standard form</li> </ul>  |  |  |
| What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?         FROM THE LIBRARY         Physics First; G Bethall-530         Electricity; Louise Spilsbury-537         Electronics; R Bridgeman-621.38  | <ul> <li>What are the opportunities for developi</li> <li>Mean average</li> <li>Algebra</li> <li>Standard form</li> <li>Unit prefixes</li> </ul>   |  |  |
| What are the opportunities for developing literacy skills and developing learner confidence and<br>enjoyment in reading?<br>FROM THE LIBRARY<br>Physics First; G Bethall-530<br>Electricity; Louise Spilsbury-537<br>Electronics; R Bridgeman-621.38<br>A Dictionary of Physics; A Isaacs-530.03                                 | <ul> <li>What are the opportunities for developi</li> <li>Mean average</li> <li>Algebra</li> <li>Standard form</li> <li>Unit prefixes</li> <li>Interpreting IV graphs</li> </ul>   |  |  |
| What are the opportunities for developing literacy skills and developing learner confidence and<br>enjoyment in reading?<br>FROM THE LIBRARY<br>Physics First; G Bethall-530<br>Electricity; Louise Spilsbury-537<br>Electronics; R Bridgeman-621.38<br>A Dictionary of Physics; A Isaacs-530.03<br>Energy; Louise Spilsbury-530 | <ul> <li>What are the opportunities for developi</li> <li>Mean average</li> <li>Algebra</li> <li>Standard form</li> <li>Unit prefixes</li> <li>Interpreting IV graphs</li> <li>Vectors fields (electric fields)</li> </ul> |  |  |



| tter and P7-Radioactivity.  |
|---|
| her would we.   |
| ls conduct electricity because they contain<br>l circuits differ?                   |
|   |
| oes this topic feed into?   |
| n power stations and is used by electric<br>n how generators and motors work in P15 |
|   |
| alues and Careers?  |
| 2   |
| ng mathematical skills?   |
|   |

\_\_\_\_\_

2

# **KESTEVEN AND SLEAFORD HIGH SCHOOL**

# **Physics Scheme of Learning**

# Year 9 – P4 – Electric Circuits

## Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?

- Understand what causes static electricity and how electrons can be transferred due to friction. Recognise the force between charged objects is a non-contact force. Be able to draw the electric field around a charged sphere. Explain what current, potential difference and resistance are and use models to describe. Understand Ohm's law. Understand how potential different and current are distributed around a series and parallel circuit. Recognise the IV •
- characteristics of different electrical components.
- Apply Ohm's law to solve DC circuit problems for both series and parallel circuits.
- ٠ Required practical activity 3: use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: the length of a wire at constant temperature, combinations of resistors in series and parallel.
- Required practical activity 4: use circuit diagrams to construct appropriate circuits to investigate the I-V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at •
- constant temperature.

•

• Recognise the strengths a weakness of different models for electric circuits.

| What subject specific language will be used and developed in this topic?   | What opportunities are available for assessing t   |
|--|--|
| <ul> <li>diode - a non-ohmic conductor that has a much higher resistance in one direction (its reverse direction) than in the other direction (its forward direction)</li> <li>electric field - a charged object (X) creates an electric field around itself, which causes a non-contact force on any other charged object in the field</li> <li>electrons - tiny negatively charged particles that move around the nucleus of an atom</li> <li>ion - a charged atom or molecule</li> <li>light-depending resistor (LDR) - a resistor whose resistance depends on the intensity of the light incident on it</li> <li>light-emitting diode (LED) - a diode that emits light when it conducts</li> <li>line of force in an electric field - line along which a free positive charge moves long in an electric field</li> <li>neutrons - uncharged particles of the same mass as protons. The nucleus of an atom consists of protons and neutrons</li> <li>Ohm's law -the current through a resistor at constant temperature is directly proportional to the potential difference across the resistor</li> <li>parallel - components connected in a circuit so that the potential difference is the same across each one</li> <li>potential difference - a measure of the work done or energy transferred to the lamp by each coulomb of charge that passes through it. The unit of potential difference is the volt (V)</li> <li>protons - positively charged particles with an equal and opposite charge to that of an electron</li> <li>resistance - resistance (in ohms, Ω) = potential difference (in volts, V) ÷ current (in amperes, A)</li> <li>series - components connected in a circuit in such a way that the same current passes through them</li> </ul> | <ul> <li>P4 Isaac Physics question – developing students' mastery of application</li> <li>P4 summative test – overall understanding of content and the ability to</li> </ul> |

## <u>Know</u>

# Apply

### Extend



## he progress of students?

equations apply to unfamiliar contexts.

• thermistor - a resistor whose resistance depends on the temperature of the thermistor

## Intent – Concepts

| Lesson | Resources Booking   | Physics<br>Only | Text<br>Book | Lesson Title       | Learning<br>Objectives   | Resources |
|--------|---|-----------------|--------------|--------------------|--|-----------|
| 1      | 12x(Perspex and poly rods, dusters, hangers, clamp & stands) + Van de graff | Physics<br>Only | P4.1         | Static Electricity | I can explain<br>insulating<br>materials can<br>become<br>charged when<br>rubbed<br>together and<br>electrons are<br>transferred<br>I can explain<br>like charged<br>objects repel,<br>opposite<br>charges attract   |           |
| 1b     | Van de graff generator and accessories                                      | Physics<br>Only | P4.1         | Electric Fields    | I can explain<br>how static<br>shock occurs<br>when a charged<br>object is<br>earthed<br>I can explain<br>draw the<br>electric field<br>around a<br>sphere<br>I can explain<br>why static<br>electricity can<br>be hazardous<br>and how it can<br>be made safe |           |
| 2      |   |                 | P4.2         | Current and Charge | I can explain<br>what an<br>electric current<br>is<br>I can use the<br>equation; Q=IT  |           |



| 3       |  |        |  | I can explain    |  |
|---------|--|--------|--|------------------|--|
|         |  |        |  | what is meant    |  |
|         |  |        |  | by potential     |  |
|         |  |        |  | difference (or   |  |
|         | Ohms law, 12x(PSU, ammeter, voltmeter, rheostat,<br>multmeter, 12v bulb)                         |        |  | voltage)         |  |
|         |  | P4.3   | Potential Difference and<br>Resistance | I can explain    |  |
|         |  |        |  | what effect      |  |
|         |  |        |  | resistance has   |  |
|         |  |        |  | on current       |  |
|         |  |        |  | I can use Ohm's  |  |
|         |  |        |  | law (V=IR)       |  |
|         |  |        |  | I can explain    |  |
|         |  |        |  | how to           |  |
|         |  |        |  | investigate the  |  |
|         |  |        |  | relationship     |  |
|         |  |        |  | between          |  |
|         |  |        |  | voltage and      |  |
| 4 (CP)  | Core practical - Resistance of wire, 12x(wire on   | R.Prac | Resistance of a wire                   | current in a     |  |
| . (0. ) | meter rule, ammeter, voltmeter, PSU)   | 3      |  | circuit          |  |
|         |  |        |  | I can explain    |  |
|         |  |        |  | how the          |  |
|         |  |        |  | lengths of a     |  |
|         |  |        |  | wire effects its |  |
|         |  |        |  | resistance       |  |
|         |  |        |  | I can explain    |  |
|         |  |        |  | how the          |  |
|         |  |        |  | current.         |  |
|         |  |        |  | potential        |  |
|         |  |        |  | difference, and  |  |
|         |  |        |  | resistance for   |  |
|         |  |        | Series Circuits                        | series circuits  |  |
|         | Series circuits, 12x(2x 12v bulbs, ammeters, voltmeters, PSU, component holder, 3x 1k resistors, |        |  | affect each      |  |
| 5       |  | P4.5   |  | other            |  |
|         | multimeter, 3x 'D' cell in holder)   |        |  | L can explain    |  |
|         |  |        |  | how to           |  |
|         |  |        |  | calculate the    |  |
|         |  |        |  | potential        |  |
|         |  |        |  | difference of    |  |
|         |  |        |  | several cells in |  |
|         |  |        |  | series           |  |
|         |  |        |  | I can recognise  |  |
|         | Parallel circuits, 12x(2x 12v bulbs, ammeters,<br>voltmeters, 15 ohm rheostats, PSU)             |        |  | how potential    |  |
| 6       |  |        |  | difference and   |  |
|         |  |        |  | current is       |  |
|         |  | DIE    | Parallel Circuits                      | distributed in a |  |
|         |  | F4.0   |  | narallel circuit |  |
|         |  |        |  |                  |  |
|         |  |        |  | the effect of    |  |
|         |  |        |  | nlacing          |  |
|         |  |        |  | placing          |  |





|         |  |   |             |                                  | resistors in      |  |
|---------|--|---|-------------|----------------------------------|-------------------|--|
|         |  |   |             |                                  | parallel on total |  |
|         |  |   |             |                                  | resistance        |  |
|         |  |   |             |                                  | I can use Ohm's   |  |
| 6b      |  |   |             | Electricity Summary              | Law to solve      |  |
|         |  | P | P4.3&0      |                                  | circuit           |  |
|         |  |   |             |                                  | problems          |  |
|         |  |   |             | IV Characteristics of a Resistor | I can recognise   |  |
|         | Core Practical - Component characteristics -<br>12x(100ohm(high power) resistor, ammeter,<br>multimeter)         |   | R.Prac<br>4 |                                  | the Current –     |  |
| 7a (CP) |  | F |             |                                  | Voltage (IV)      |  |
|         |  |   |             |                                  | characteristics   |  |
|         |  |   |             |                                  | of a resistor     |  |
|         |  |   |             |                                  | I can recognise   |  |
|         | Core Practical - Component characteristics - 12x(<br>ammeter, voltmeter, 500 ohm resistor, diode)                |   |             | c IV Characteristics of a Diode  | the Current –     |  |
| 7h (CD) |  | F | R.Prac      |                                  | Voltage (IV)      |  |
| 76 (CP) |  |   | 4           |                                  | characteristics   |  |
|         |  |   |             |                                  | of a diode        |  |
|         |  |   |             |                                  |                   |  |
|         |  |   | R.Prac<br>4 | IV Characteristics of a Bulb     | I can recognise   |  |
| 7c (CP) | Core Practical - Component characteristics - 12x(  | F |             |                                  | the IV            |  |
|         | ammeter, voltmeter, 12v bulb)  |   |             |                                  | characteristics   |  |
|         |  |   |             |                                  | of a bulb         |  |
|         | Sensor circuits, 12x(Multimeter, Thermistors, LDR,<br>component holders, resistors, 200ml beaker) 2 x<br>kettles |   |             |                                  | I understand      |  |
|         |  |   |             |                                  | how the           |  |
|         |  |   |             |                                  | resistance of a   |  |
|         |  |   |             |                                  | thermistor and    |  |
| 8       |  |   | P4.4        | The Thermistor and LDR           | light dependant   |  |
|         |  |   |             |                                  | resistor (LDR)    |  |
|         |  |   |             |                                  | change with       |  |
|         |  |   |             |                                  | temperature       |  |
|         |  |   |             |                                  | and light levels  |  |
|         |  |   |             |                                  | Summative         |  |
| Test    | Class set of test  |   |             |                                  | assessment        |  |
|         |  |   |             |                                  |                   |  |
|         |  |   |             |                                  |                   |  |



| 1.525 |
|-------|
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |