9. Thermodynamics

Weeks 1–6

热力学

They should be able to

1. Describe the pressure a gas exerts on its container in terms of atomic motion within that gas.
2. Describe the temperature of a system in terms of the atomic motion within that system.
3. Describe the properties of an ideal gas.
4. Describe the transfer of energy between two systems in thermal contact due to temperature differences of those two systems.
5. Describe the internal energy of a system.
6. Describe the behavior of a system using thermodynamic processes.
7. Describe the energy required to change the temperature of an object by a certain amount.
8. Describe the rate at which energy is transferred by conduction through a given material.
9. Describe the change in entropy for a given system over time.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 09 (10 questions, answers on sheet 2)	
Teach the new content	Handout 09 Slide deck 09 Vocabulary list 09	
Practice guided then independent	Exercise sheets 9.1, 9.2, 9.3, 9.4, 9.5, 9.6 Past-paper sheets 9.1, 9.2, 9.3, 9.4, 9.5	
Check before they leave	Unit test 9 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

10. Electric Force, Field, and Potential

Weeks 7–11

电力、电场与电势

They should be able to

1. Describe the electric force that results from the interactions between charged objects or systems.
2. Describe the electric and gravitational forces that result from interactions between charged objects with mass.
3. Describe the electric permittivity of a material or medium.
4. Describe the behavior of a system using conservation of charge.
5. Describe the electric field produced by a charged object or configuration of point charges.
6. Describe the electric field generated by charged conductors or insulators.
7. Describe the electric potential energy of a system.
8. Describe the electric potential due to a configuration of charged objects.
9. Describe the relationship between electric potential and electric field.
10. Describe the physical properties of a parallel-plate capacitor.
11. Describe changes in energy in a system due to a difference in electric potential between two locations.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 10 (10 questions, answers on sheet 2)	
Teach the new content	Handout 10 Slide deck 10 Vocabulary list 10	
Practice guided then independent	Exercise sheets 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7 Past-paper sheets 10.1, 10.3, 10.4, 10.5, 10.6, 10.7	
Check before they leave	Unit test 10 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

11. Electric Circuits

Weeks 12–16

电路

They should be able to

1. Describe the movement of electric charges through a medium.
2. Describe the behavior of a circuit.
3. Describe the resistance of an object using physical properties of that object.
4. Describe the electrical characteristics of elements of a circuit.
5. Describe the transfer of energy into, out of, or within an electric circuit, in terms of power.
6. Describe the equivalent resistance of multiple resistors connected in a circuit.
7. Describe a circuit with resistive wires and a battery with internal resistance.
8. Describe the measurement of current and potential difference in a circuit.
9. Describe a circuit or elements of a circuit by applying Kirchhoff's loop rule.
10. Describe a circuit or elements of a circuit by applying Kirchhoff's junction rule.
11. Describe the equivalent capacitance of multiple capacitors.
12. Describe the behavior of a circuit containing combinations of resistors and capacitors.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 11 (10 questions, answers on sheet 2)	
Teach the new content	Handout 11 Slide deck 11 Vocabulary list 11	
Practice guided then independent	Exercise sheets 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8 Past-paper sheets 11.2, 11.3, 11.4, 11.5, 11.6, 11.8	
Check before they leave	Unit test 11 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

12. Magnetism and Electromagnetism

Weeks 17–20

磁学与电磁学

They should be able to

1. Describe the properties of a magnetic field.
2. Describe the magnetic behavior of a material as a result of the configuration of magnetic dipoles in the material.
3. Describe the magnetic permeability of a material.
4. Describe the magnetic field produced by moving charged objects.
5. Describe the force exerted on moving charged objects by a magnetic field.
6. Describe the magnetic field produced by a current-carrying wire.
7. Describe the force exerted on a current-carrying wire by a magnetic field.
8. Describe the induced electric potential difference resulting from a change in magnetic flux.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 12 (10 questions, answers on sheet 2)	
Teach the new content	Handout 12 Slide deck 12 Vocabulary list 12	
Practice guided then independent	Exercise sheets 12.1, 12.2, 12.3, 12.4 Past-paper sheets 12.1, 12.2, 12.3, 12.4	
Check before they leave	Unit test 12 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

13. Geometric Optics

Weeks 21–23

几何光学

They should be able to

1. Describe light as a ray.
2. Describe the reflection of light from a surface.
3. Describe the image formed by a mirror.
4. Describe the refraction of light between two media.
5. Describe the image formed by a lens.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 13 (10 questions, answers on sheet 2)	
Teach the new content	Handout 13 Slide deck 13 Vocabulary list 13	
Practice guided then independent	Exercise sheets 13.1, 13.2, 13.3, 13.4 Past-paper sheets 13.1, 13.3, 13.4	
Check before they leave	Unit test 13 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

14. Waves, Sound, and Physical Optics

Weeks 24–26

波、声音与物理光学

They should be able to

1. Describe the physical properties of waves and wave pulses.
2. Describe the physical properties of a periodic wave.
3. Describe the interaction between a wave and a boundary.
4. Describe the properties of an electromagnetic wave.
5. Describe the properties of a wave based on the relative motion between the source of the wave and the observer of the wave.
6. Describe the net disturbance that occurs when two or more wave pulses or waves overlap.
7. Describe the properties of a standing wave.
8. Describe the behavior of a wave and the diffraction pattern resulting from a wave passing through a single opening.
9. Describe the behavior of a wave and the diffraction pattern resulting from the wave passing through multiple openings.
10. Describe the behavior of light that interacts with a thin film.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 14 (10 questions, answers on sheet 2)	
Teach the new content	Handout 14 Slide deck 14 Vocabulary list 14	
Practice guided then independent	Exercise sheets 14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7, 14.8, 14.9 Past-paper sheets 14.8, 14.9	
Check before they leave	Unit test 14 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

15. Modern Physics

Weeks 27–30

近代物理

They should be able to

1. Describe the properties and behavior of an object that exhibits both particle-like and wave-like behavior.
2. Describe the properties of an atom.
3. Describe the emission or absorption of photons by atoms.
4. Describe the electromagnetic radiation emitted by an object due to its temperature.
5. Describe an interaction between photons and matter using the photoelectric effect.
6. Describe the interaction between photons and matter using Compton scattering.
7. Describe the physical properties that constrain the behavior of interacting nuclei, subatomic particles, and nucleons.
8. Describe the radioactive decay of a given sample of material consisting of a finite number of nuclei.
9. Describe the processes by which individual nuclei decay.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 15 (10 questions, answers on sheet 2)	
Teach the new content	Handout 15 Slide deck 15 Vocabulary list 15	
Practice guided then independent	Exercise sheets 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8 Past-paper sheets 15.1, 15.2, 15.3, 15.5, 15.6, 15.7	
Check before they leave	Unit test 15 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	