Paper 1:

Topic 1 – Energy Retrieval Starters

6.1.1.1 Energy stores and systems

1. What is meant by a system in physics?
2. What happens to energy stores when a system changes?
3. Describe the energy store changes when an object is projected upwards.
4. Describe the energy store changes when a moving object hits an obstacle.
5. Describe the energy store changes when water is heated in an electric kettle.
6. Explain why energy cannot be created or destroyed during a system change.

6.1.1.2 Changes in energy

1. A 12 kg object gains 720 J of gravitational potential energy when lifted. Calculate the height it was raised. (Use g = 10 N/kg.)
2. What does each symbol represent in the equation $E_k = \frac{1}{2}mv^2$?
3. A car has a mass of 1000 kg and travels at 20 m/s. Calculate its kinetic energy.
4. A spring stores 0.5 J of elastic potential energy when it is stretched by 0.1m. Calculate the spring constant of the spring. .
5. A 5 kg object is lifted 3 m above the ground. Calculate the gravitational potential energy gained by the object. (Gravitational field strength = 10 N/kg)
6. A 2 kg object is lifted 5 m. Calculate the gravitational potential energy gained. (Use g = 10 N/kg.)

6.1.1.3 Energy changes in systems

1. What is meant by the specific heat capacity of a material?
2. What units are used for specific heat capacity?
3. A 2 kg block with a specific heat capacity of 500 J/kg°C is heated by 10°C. Calculate the energy transferred.
4. Explain what happens to the energy stores when a substance is heated

5. A metal block of mass 4 kg absorbs 12 000 J of energy and its temperature increases by 15°C. Calculate the specific heat capacity of the metal. .
6. Describe how an experiment can be carried out to determine the specific heat capacity of a material.

6.1.1.4 Power

1. What is meant by power in physics?
2. A device transfers 18 000 J of energy with a power output of 600 W. Calculate the time taken for the energy transfer.
3. What is the unit of power?
4. A device transfers 600 J of energy in 30 seconds. Calculate its power.
5. Explain why a more powerful device transfers energy faster.
6. Compare two devices that transfer the same amount of energy but have different powers.

6.1.2.1 Energy transfers in a system

1. State the law of conservation of energy.
2. What happens to energy that is not transferred usefully?
3. What is meant by wasted energy?
4. Give one example of energy being dissipated to the surroundings.
5. Explain how lubrication can reduce unwanted energy transfers.
6. Explain how thermal insulation reduces energy transfer from a building.

6.1.2.2 Efficiency

1. Can a machine have an efficiency greater than 100%? Explain why.
2. A machine has a useful output energy of 400 J and a total input energy of 800 J. Calculate its efficiency.
3. A motor transfers 900 J of useful energy from a total input energy of 1500 J. Calculate its efficiency.
4. A device has a useful power output of 80 W and a total power input of 200 W. Calculate its efficiency.
5. Explain why increasing efficiency is important.
6. Give two methods of reducing wasted energy in a system.

6.1.3 National and global energy resources

1. What is a renewable energy resource?
2. What is a non-renewable energy resource?
3. Give three examples of renewable energy resources.

4. Give three examples of non-renewable energy resources.
5. Explain why fossil fuels can have a negative environmental impact.
6. Explain why some renewable energy resources are unreliable.

Topic 1 Review

1. Explain how energy stores change when a system is heated, moved or lifted.
2. Calculate the energy stored in a moving object, stretched spring or raised object using the correct equations.
3. Explain how specific heat capacity relates energy transferred to temperature change.
4. Explain the difference between energy transferred and power.
5. Explain how energy efficiency can be improved in everyday devices.
6. Compare renewable and non-renewable energy resources, including their advantages and disadvantages.

Topic 2 – Electricity Retrieval Starters

6.2.1.1 Standard circuit diagram symbols

1. Draw the circuit symbol for a cell.
2. Draw the circuit symbol for a variable resistor.
3. Draw the circuit symbol for a diode.
4. Draw the circuit symbol for a voltmeter.
5. Draw the circuit symbol for a thermistor
6. Draw the circuit symbol for an ammeter

6.2.1.2 Electrical charge and current

1. What is meant by electric current?
2. A current of 3 A flows through a circuit for 20 seconds. Calculate the charge transferred.
3. A charge of 900 C flows through a circuit in 5 minutes. Calculate the current.
4. A current of 0.8 A transfers 240 C of charge. Calculate the time taken.
5. Explain why a source of potential difference is needed for charge to flow in a circuit.
6. Describe what happens to the current at different points in a single closed loop circuit.

6.2.1.3 Current, resistance and potential difference

1. A resistor has a resistance of 15 Ω and a current of 2 A flows through it. Calculate the potential difference across the resistor.
2. A component has a potential difference of 12 V and a resistance of 4 Ω. Calculate the current through the component.
3. A circuit has a potential difference of 9 V and a current of 0.3 A. Calculate the resistance.
4. A lamp has a resistance of 60 Ω and operates at a potential difference of 240 V. Calculate the current through the lamp.
5. Explain how increasing the resistance of a component affects the current when the potential difference stays the same.
6. Describe how you could investigate how the length of a wire affects its resistance.

6.2.1.4 Resistors

1. What is meant by an ohmic conductor?
2. Explain why the resistance of a filament lamp increases as it gets hotter.
3. Describe how the resistance of a thermistor changes when temperature increases.
4. Describe how the resistance of an LDR changes when light intensity increases.
5. Explain why a diode only allows current to flow in one direction.
6. Describe how I–V graphs can be used to identify whether a component is linear or non-linear.

6.2.2 Series and parallel circuits

1. What is the difference between a series circuit and a parallel circuit?
2. Two resistors of 5 Ω and 12 Ω are connected in series. Calculate the total resistance.
3. A series circuit contains resistors of 8 Ω, 6 Ω and 4 Ω. Calculate the total resistance.
4. Explain how the current behaves in a series circuit.
5. Explain how the potential difference behaves in a parallel circuit.
6. Explain why adding resistors in parallel decreases the total resistance of a circuit.

6.2.3.1 Direct and alternating potential difference

1. What is the difference between direct potential difference and alternating potential difference?
2. Give the frequency of the UK mains electricity supply.
3. Give the approximate potential difference of the UK mains electricity supply.
4. Describe the direction of charge flow in a direct current circuit.
5. Explain why mains electricity is described as an alternating supply.
6. Give one example of a device that uses a battery supply and one that uses mains electricity.

6.2.3.2 Mains electricity

1. What are the three wires in a mains cable?
2. What is the purpose of the earth wire?
3. What is the colour of the live wire in a UK mains cable?
4. Explain why the live wire is dangerous even when an appliance is switched off.
5. Explain why connecting the live wire to the earth wire is dangerous.
6. Describe what happens during an electrical fault when the earth wire carries a current.

6.2.4.1 Power

1. A device operates at a potential difference of 12 V with a current of 3 A. Calculate its power.
2. A motor has a current of 5 A and a resistance of 8 Ω. Calculate the power transferred.
3. A heater transfers energy at a rate of 1500 W when connected to a 230 V supply. Calculate the current.
4. A component has a power of 60 W and a current of 2 A. Calculate the resistance.
5. Explain how increasing the current through a device affects its power output.
6. Explain how power is related to energy transferred over time.

6.2.4.2 Energy transfers in everyday appliances

1. A 1000 W kettle is used for 180 seconds. Calculate the energy transferred.
2. A device transfers 7200 J of energy in 120 seconds. Calculate its power.
3. An appliance transfers 5000 J of energy using a charge flow of 25 C. Calculate the potential difference.

4. A battery-powered device transfers 240 J of energy at a potential difference of 6 V. Calculate the charge transferred.
5. Describe how electrical appliances transfer energy from an electrical supply to useful energy stores.
6. Explain why appliances with higher power ratings transfer more energy each second.

6.2.4.3 The National Grid

1. What is the National Grid?
2. What is the purpose of a step-up transformer?
3. What is the purpose of a step-down transformer?
4. Explain why increasing the potential difference reduces energy losses in transmission cables.
5. Describe how electricity is transferred from power stations to homes.
6. Explain why the National Grid is an efficient method of transferring electrical energy.

Topic 2 Review

1. Explain how charge, current and time are related in an electrical circuit.
2. Calculate the current in a circuit where 480 C of charge flows in 2 minutes.
3. Explain the differences between series and parallel circuits.
4. A heater has a power rating of 2000 W and operates for 5 minutes. Calculate the energy transferred.
5. Explain how thermistors and LDRs are used in electrical circuits.
6. Describe how the National Grid transfers electrical energy efficiently from power stations to consumers.

Topic 3 – Particle Model of Matter Retrieval Starters

6.3.1.1 Density of materials

1. What is meant by density?
2. A metal block has a mass of 2 kg and a volume of 0.0005 m^3. Calculate its density.

3. A liquid has a density of 800 kg/m^3 and a volume of 0.002 m^3. Calculate its mass.
4. A sample has a mass of 5 kg and a density of 2500 kg/m^3. Calculate its volume.
5. Explain why solids usually have a higher density than gases using the particle model.
6. Describe how the arrangement and movement of particles differs between solids, liquids and gases.

Required practical activity: Measuring density

1. Describe how you could measure the density of a regularly shaped solid object.
2. Explain how you could find the volume of an irregular solid object.
3. A student measures a metal cube with sides of 5 cm. Calculate the volume of the cube.
4. A cube has a mass of 0.75 kg and a volume of 0.0003 m^3. Calculate its density.
5. Name suitable equipment that could be used to measure the dimensions of a small solid object accurately.
6. Explain why displacement is used to measure the volume of irregular objects.

6.3.1.2 Changes of state

1. Name the changes of state from solid to liquid and liquid to gas.
2. Explain why mass is conserved when a substance changes state.
3. Explain why melting is a physical change rather than a chemical change.
4. Describe what happens to particles when a substance melts.
5. Explain the difference between evaporation and boiling.
6. Describe what happens to the energy stored in particles during a change of state.

6.3.2.1 Internal energy

1. What is meant by internal energy?
2. What two types of energy make up the internal energy of a system?
3. Explain how heating affects the energy stored by particles.
4. Explain why increasing the temperature of a substance increases its internal energy.
5. Describe the difference between the kinetic energy and potential energy of particles.
6. Explain how a change of state can occur without a temperature change.

6.3.2.2 Temperature changes in a system and specific heat capacity

1. A 2 kg block has a specific heat capacity of 500 J/kg°C. It is heated by 20°C. Calculate the energy transferred.
2. A material receives 12 000 J of energy. Its mass is 3 kg and its specific heat capacity is 400 J/kg°C. Calculate the temperature change.
3. A 5 kg object is heated by 10°C using 20 000 J of energy. Calculate its specific heat capacity.
4. Explain what is meant by specific heat capacity.
5. Explain why different materials require different amounts of energy to increase their temperature by the same amount.
6. Describe how mass affects the temperature change of a substance when the same energy is supplied.

6.3.2.3 Changes of state and specific latent heat

1. What is meant by latent heat?
2. Explain why the temperature stays constant during a change of state.
3. A 2 kg sample melts and requires 680 000 J of energy. Calculate its specific latent heat of fusion.
4. A substance has a specific latent heat of vaporisation of 2 000 000 J/kg. Calculate the energy needed to vaporise 0.5 kg.
5. Explain the difference between specific latent heat of fusion and specific latent heat of vaporisation.
6. Explain what happens to the internal energy of particles during melting.

6.3.3.1 Particle motion in gases

1. Describe the movement of particles in a gas.
2. Explain how temperature affects the kinetic energy of gas particles.
3. Explain why increasing the temperature of a gas increases its pressure when volume is constant.
4. A gas is heated while kept in a fixed container. Explain what happens to the particles.
5. Explain why gas particles exert pressure on the walls of a container.
6. Describe the relationship between temperature, particle motion and gas pressure.

Topic 3 Review

1. Calculate the density of an object with a mass of 4 kg and a volume of 0.002 m^3.
2. Explain the particle model differences between solids, liquids and gases.
3. Explain how energy is transferred during heating and changes of state.
4. Calculate the energy needed to heat a substance using its mass, specific heat capacity and temperature change.
5. Calculate the energy needed for a change of state using specific latent heat.
6. Explain how the temperature of a gas affects its pressure when the volume is unchanged.

Topic 4 – Atomic Structure Retrieval Starters

6.4.1.3 The development of the model of the atom

1. Describe the model of the atom before the discovery of the electron.
2. Explain how the discovery of electrons changed the model of the atom.
3. Describe the plum pudding model of the atom.
4. Explain why the results of the alpha particle scattering experiment caused the nuclear model to replace the plum pudding model.
5. State the main difference between the plum pudding model and the nuclear model of the atom.
6. Explain how scientific models can change when new experimental evidence is discovered.

6.4.2.1 Radioactive decay and nuclear radiation

1. What is radioactive decay?
2. Why do some atomic nuclei undergo radioactive decay?
3. What is meant by activity of a radioactive source?
4. Name the unit used to measure radioactive activity.
5. Describe the composition of an alpha particle, beta particle and gamma ray.
6. Compare alpha, beta and gamma radiation in terms of penetration and ionising power.

6.4.2.2 Nuclear equations

1. What happens to the mass number and atomic number during alpha decay?
2. What happens to the mass number and atomic number during beta decay?
3. Complete the nuclear equation: $^{238}_{92}U \rightarrow {}^{4}_{2}He$ + _____
4. Complete the nuclear equation: $^{14}_{6}C \rightarrow {}^{0}_{-1}e$ + _____
3. Explain why gamma radiation does not change the mass number or atomic number of a nucleus.
4. A nucleus emits an alpha particle. Explain how the nucleus changes after the decay.

6.4.2.3 Half-lives and the random nature of radioactive decay

1. What is meant by the half-life of a radioactive isotope?
2. Explain why radioactive decay is described as a random process.
3. A radioactive sample has a count rate of 800 counts per minute. After one half-life, what is the count rate?
4. A sample has an initial activity of 1600 Bq and a half-life of 5 years. Calculate its activity after 15 years.
5. A radioactive isotope has a half-life of 10 days. Explain how the number of undecayed nuclei changes over time.
6. Explain why half-life can be used to identify the stability of a radioactive isotope.

6.4.2.4 Radioactive contamination

1. What is meant by radioactive contamination?
2. Explain why radioactive contamination is dangerous.
3. What is irradiation?
4. Explain the difference between contamination and irradiation.
5. Explain why an object that has been irradiated does not become radioactive.
6. Explain why research into the effects of radiation should be shared and checked by other scientists.

Topic 4 Review

1. Explain how evidence from experiments changed the atomic model over time.
2. Compare the properties and uses of alpha, beta and gamma radiation.
3. Complete a nuclear equation showing alpha or beta decay.
4. Calculate the remaining activity of a radioactive source after several half-lives.
5. Explain the difference between radioactive contamination and irradiation.
6. Evaluate why radioactive sources must be carefully controlled when used.

Paper 2:

Topic 5 – Forces Retrieval Starters

6.5.1.1 Scalar and vector quantities

1. State whether distance is a scalar or vector quantity.
2. State whether displacement is a scalar or vector quantity.
3. State whether speed is a scalar or vector quantity.
4. State whether velocity is a scalar or vector quantity.
5. State whether force is a scalar or vector quantity.
6. Explain the difference between a scalar quantity and a vector quantity.

6.5.1.2 Contact and non-contact forces

1. Give two examples of contact forces.
2. Give two examples of non-contact forces.
3. Explain the difference between contact and non-contact forces.
4. Describe the interaction between two objects when friction acts.
5. Describe the interaction between two magnets that repel each other.
6. Explain why force is a vector quantity.

6.5.1.3 Gravity

1. A box has a mass of 8 kg. Calculate its weight if the gravitational field strength is 10 N/kg.
2. A suitcase weighs 180 N on a planet where the gravitational field strength is 9 N/kg. Calculate its mass.
3. Explain the difference between mass and weight.
4. Describe where the weight of an object acts.
5. Explain why an astronaut's mass stays the same but their weight changes on the Moon.
6. Name the instrument used to measure weight.

6.5.1.4 Resultant forces

1. Two forces of 18 N and 7 N act in the same direction. Calculate the resultant force.
2. Two forces of 25 N and 9 N act in opposite directions. Calculate the resultant force.
3. Explain what is meant by a resultant force.
4. Describe what happens when the resultant force on an object is zero.
5. Draw a free-body diagram for a book resting on a table.
6. Describe how a vector diagram can be used to determine a resultant force. (HT)

6.5.2 Work done and energy transfer

1. A force of 45 N moves an object 6 m. Calculate the work done.
2. A machine does 720 J of work using a force of 90 N. Calculate the distance moved.
3. A force of 15 N moves an object 12 m. Calculate the work done.
4. Explain what happens to energy when work is done.
5. Explain why work done against friction causes an increase in temperature.
6. Convert 650 N m into joules.

6.5.3 Forces and elasticity

1. A spring has a spring constant of 300 N/m and extends by 0.08 m. Calculate the force applied.
2. A spring extends by 0.25 m when a force of 100 N is applied. Calculate the spring constant.
3. A spring has a spring constant of 180 N/m and is stretched by 0.20 m. Calculate the elastic potential energy stored.
4. Explain the difference between elastic and inelastic deformation.

5. Explain what happens if the limit of proportionality is exceeded.
6. Describe how you would investigate the relationship between force and extension for a spring in the required practical.

6.5.4.1.1 Distance and displacement

1. Explain the difference between distance and displacement.
2. A runner completes one lap of a 400 m track and finishes where they started. State the distance travelled and displacement.
3. Give an example of a vector quantity used to describe motion.
4. Give an example of a scalar quantity used to describe motion.
5. Describe how displacement should always be stated.
6. Explain why displacement can never be greater than distance travelled.

6.5.4.1.2 Speed

1. A cyclist travels 5400 m in 300 s. Calculate the average speed.
2. A car travels at 20 m/s for 45 s. Calculate the distance travelled.
3. A runner covers 600 m at an average speed of 5 m/s. Calculate the time taken.
4. State the typical speed of a person walking.
5. State the typical speed of sound in air.
6. Explain why average speed is used for most journeys.

6.5.4.1.3 Velocity

1. Explain the difference between speed and velocity.
2. Give an example where an object has constant speed but changing velocity. (HT)
3. Explain why velocity is a vector quantity.
4. State whether velocity or speed includes direction.
5. Describe the velocity of a car travelling north at 15 m/s.
6. Explain why travelling in a circle involves changing velocity. (HT)

6.5.4.1.4 The distance–time relationship

1. What does the gradient of a distance–time graph represent?
2. Describe the appearance of a distance–time graph for a stationary object.
3. Describe the appearance of a distance–time graph for an object moving at constant speed.

4. Explain what a steeper gradient on a distance–time graph shows.
5. Calculate the speed of an object if the gradient of its distance–time graph is 6 m/s.
6. Explain how a tangent can be used to estimate instantaneous speed. (HT)

6.5.4.1.5 Acceleration

1. A car increases its velocity from 8 m/s to 28 m/s in 5 s. Calculate its acceleration.
2. An object accelerates at 4 m/s^2 for 7 s from rest. Calculate its final velocity.
3. A car accelerates from 12 m/s to 28 m/s over 80 m. Calculate its acceleration.
4. What does the gradient of a velocity–time graph represent?
5. What does the area under a velocity–time graph represent? (HT)
6. Explain what terminal velocity means.

6.5.4.2.1 Newton's First Law

1. State what happens to an object if the resultant force acting on it is zero.
2. Explain why a car travelling at constant speed has zero resultant force.
3. Explain why an object changes velocity only when a resultant force acts.
4. Define inertia. (HT)
5. Give an example of Newton's First Law in everyday life.
6. Explain why passengers move forwards when a car brakes suddenly.

6.5.4.2.2 Newton's Second Law

1. A force of 180 N acts on a mass of 12 kg. Calculate its acceleration.
2. A 5 kg object accelerates at 3.6 m/s^2. Calculate the resultant force.
3. A force of 48 N causes an object to accelerate at 6 m/s^2. Calculate its mass.
4. Explain how increasing mass affects acceleration for a constant force.
5. Describe the required practical investigating force, mass and acceleration.
6. Explain what inertial mass means. (HT)

6.5.4.2.3 Newton's Third Law

1. State Newton's Third Law.
2. Give an example of an action–reaction force pair.
3. Explain why action and reaction forces do not cancel each other out.
4. Describe the forces acting when a person pushes against a wall.

5. Explain how a rocket launches using Newton's Third Law.
6. Explain why recoil occurs when firing a gun.

6.5.4.3.1 Stopping distance

1. Explain what is meant by stopping distance.
2. State the two parts of stopping distance.
3. Explain why stopping distance increases as speed increases.
4. Describe how thinking distance differs from braking distance.
5. Explain why doubling speed more than doubles braking distance.
6. Explain why understanding stopping distance is important for road safety.

6.5.4.3.2 Reaction time

1. State the typical range of human reaction times.
2. Describe one method used to measure reaction time.
3. State two factors that increase reaction time.
4. Explain why distractions increase thinking distance.
5. Explain how alcohol affects reaction time.
6. Describe how the reaction time required practical could be carried out.

6.5.4.3.3 Factors affecting braking distance

1. Explain how wet roads affect braking distance.
2. Explain how icy roads affect braking distance.
3. Explain why worn tyres increase braking distance.
4. Explain why worn brakes increase braking distance.
5. Explain why braking distance increases with speed.
6. Describe two ways drivers can reduce stopping distance.

6.5.4.3.4 Factors affecting braking distance 2

1. Explain why the brakes become hot when a vehicle stops.
2. Explain why a larger braking force causes a greater deceleration.
3. Explain why excessive braking can cause loss of control.
4. Explain why brakes may overheat after repeated heavy braking.
5. Estimate the braking force needed to stop a vehicle of known mass and deceleration. (HT)
6. Explain why kinetic energy increases rapidly as speed increases.

6.5.5.1 Momentum (HT only)

1. A 1200 kg car travels at 18 m/s. Calculate its momentum.
2. A ball has a momentum of 16 kg m/s and a mass of 0.8 kg. Calculate its velocity.
3. A cyclist has a mass of 75 kg and a momentum of 450 kg m/s. Calculate the velocity.
4. Explain what is meant by momentum.
5. State the units of momentum.
6. Explain why a faster object has greater momentum if its mass stays the same.

6.5.5.2 Conservation of momentum (HT only)

1. A 2 kg trolley moving at 4 m/s collides with a stationary trolley and they stick together. Calculate their combined velocity after the collision.
2. Explain what is meant by conservation of momentum.
3. State the condition required for momentum to be conserved.
4. Explain why momentum is conserved during a collision in a closed system.
5. Describe one experiment used to investigate conservation of momentum.
6. Explain why momentum is useful when analysing collisions.

Topic 5 Review

1. A force of 250 N acts on an object with a mass of 50 kg. Calculate its acceleration.
2. A spring with a spring constant of 400 N/m extends by 0.12 m. Calculate the elastic potential energy stored.
3. A car travels 180 m in 9 s. Calculate its average speed.
4. A force of 80 N moves an object 15 m. Calculate the work done.
5. Explain the difference between thinking distance and braking distance.
6. Explain how Newton's three laws can be used to describe the motion of a car.

Topic 6 – Waves Retrieval Starters

6.6.1.1 Transverse and longitudinal waves

1. State one difference between a transverse wave and a longitudinal wave.
2. Give one example of a transverse wave.
3. Give one example of a longitudinal wave.

4. What are the regions of high and low pressure in a longitudinal wave called?
5. Explain why sound cannot travel through a vacuum.
6. Explain why ripples on water transfer energy but not water across the surface.

6.6.1.2 Properties of waves

1. Define amplitude.
2. Define wavelength.
3. Define frequency.
4. A wave has a frequency of 8 Hz. Calculate its period.
5. A wave travels at 24 m/s and has a wavelength of 6 m. Calculate its frequency.
6. Describe how you could measure the speed of sound in air.

6.6.2.1 Types of electromagnetic waves

1. List the electromagnetic spectrum in order from longest wavelength to shortest wavelength.
2. Which part of the electromagnetic spectrum is visible to the human eye?
3. State one similarity shared by all electromagnetic waves.
4. State one example of energy being transferred by an electromagnetic wave.
5. Which electromagnetic wave has the highest frequency?
6. Explain the relationship between wavelength and frequency across the electromagnetic spectrum.

6.6.2.2 Properties of electromagnetic waves 1

1. What can happen to electromagnetic waves when they meet a different material?
2. Explain why light changes direction when it enters a different medium.
3. What is meant by refraction?
4. Explain why waves slow down when travelling through some materials.
5. Describe how a ray diagram shows refraction.
6. In the required practical investigating infrared radiation, what variable is changed and what is measured?

6.6.2.3 Properties of electromagnetic waves 2

1. Which electromagnetic waves are ionising?
2. Which electromagnetic wave is produced by changes in the nucleus of an atom?
3. State one harmful effect of ultraviolet radiation.
4. State one harmful effect of X-rays or gamma rays.
5. Explain why ionising radiation is more dangerous than visible light.
6. Explain why radiation dose affects the risk of harm.

6.6.2.4 Uses and applications of electromagnetic waves

1. Which electromagnetic wave is used for satellite communications?
2. Which electromagnetic wave is used in fibre optic communication?
3. Which electromagnetic waves are commonly used for medical imaging and treatment?
4. Explain why infrared radiation is suitable for thermal imaging cameras.
5. Explain why microwaves are suitable for satellite communication.
6. Explain why X-rays are useful for medical imaging but must be used carefully.

Topic 6 Review

1. Compare transverse and longitudinal waves.
2. A wave has a speed of 340 m/s and a frequency of 170 Hz. Calculate its wavelength.
3. A wave has a period of 0.02 s. Calculate its frequency.
4. Explain why electromagnetic waves can travel through space but sound waves cannot.
5. Compare the properties and hazards of ultraviolet, X-rays and gamma rays.
6. Explain why different parts of the electromagnetic spectrum are suited to different applications.

Topic 7 – Magnetism and Electromagnetism Retrieval Starters

6.7.1.1 Poles of a magnet

1. What happens when two north poles are brought close together?
2. What happens when a north pole and a south pole are brought close together?
3. What is meant by a non-contact force?
4. Explain the difference between a permanent magnet and an induced magnet.
5. Why does an induced magnet lose its magnetism when removed from a magnetic field?
6. Explain why an induced magnet is always attracted to a permanent magnet.

6.7.1.2 Magnetic fields

1. What is a magnetic field?
2. Which materials are magnetic?
3. Where is the magnetic field strongest around a bar magnet?
4. In which direction do magnetic field lines point?
5. Describe how you would use a plotting compass to map the magnetic field around a bar magnet.
6. Explain why a compass needle points north.

6.7.2.1 Electromagnetism

1. What happens around a wire when an electric current flows through it?
2. Explain how increasing the current affects the magnetic field around a wire.
3. Explain why a solenoid produces a stronger magnetic field than a straight wire.
4. Explain why adding an iron core increases the strength of an electromagnet.
5. Draw and label the magnetic field pattern around a solenoid.
6. Describe how you could demonstrate the magnetic field around a current-carrying wire.

6.7.2.2 Fleming's left-hand rule (HT only)

1. What is meant by the motor effect?
2. What does Fleming's left-hand rule predict?
3. A wire carrying a current of 4 A is placed at right angles to a magnetic field of 0.5 T. If the wire is 0.30 m long, calculate the force acting on it.
4. A conductor 0.40 m long carries a current of 5 A and experiences a force of 2 N. Calculate the magnetic flux density.
5. State two factors that increase the force on a current-carrying wire in a magnetic field.
6. Explain why there is no motor effect if the current is parallel to the magnetic field.

6.7.2.3 Electric motors (HT only)

1. Explain why a current-carrying coil rotates in a magnetic field.
2. What is the purpose of the split-ring commutator in a DC motor?
3. What is the function of the carbon brushes in an electric motor?
4. Explain why the current in the coil must reverse every half turn.
5. Describe the energy transfers that occur in an electric motor.
6. Explain how increasing the current or magnetic field strength affects the turning force on the motor.

Topic 7 Review

1. Compare permanent magnets and induced magnets.
2. Explain how to plot the magnetic field around a bar magnet.
3. Describe how a solenoid becomes an electromagnet.
4. A wire 0.25 m long carries a current of 8 A in a magnetic field of 0.6 T. Calculate the force acting on the wire.
5. Explain how Fleming's left-hand rule is used to predict the direction of the force on a current-carrying wire.
6. Explain how an electric motor converts electrical energy into kinetic energy.