# Physics Paper 2

# Model Exam Question Booklet

| Physics Paper 2 | |
|---|---|
| Topics in the Paper: | |
| **P8** | Forces |
| **P9** | Motion |
| **P10** | Force and Motion |
| **P13** | Electromagnetic Waves |
| **P15** | Electromagnetism |
| **RP21** | Radiation and Absorption |

## Essential Content for the Higher Trilogy Science Exam (KSP/CPA)

**This booklet is split into 3 parts:**

**Part 1**
The first part is a selection of short response questions and answers that are likely to come in your Physics exams this summer. Spend time learning the answers to these questions, for example you could produce flash cards. You should self quiz yourself on these questions regularly!

**Part 2**
Selection of extended response questions (4 to 6 marks) that are likely to be on your paper this year, either because they have not been assessed in the last couple of years, or because they come up most years in exams. Prepare and practice your responses to these questions.

**Part 3**
Required practical section. In this section you will find step by step guidance for each practical. This is followed by a page of short response questions and answers to learn for each of the practicals. There are also some extended response questions (4 to 6 marks) that are very likely to be on the exam paper this year.

# P8: Forces

Fold page here

1. What is the difference between scalar and vector quantities?
2. How can a vector quantity be represented?
3. What is a force?
4. What are examples of contact forces?
5. What are examples of non-contact forces?
6. What type of quantity is force?
7. What is weight?
8. What causes the force of gravity close to Earth?
9. What does the weight of an object depend on?
10. What is the equation that links gravitational field strength, mass and weight?
11. What is the unit for weight?
12. What is the unit for mass?
13. What is the unit for gravitational field strength?
14. What is an objects centre of mass?
15. What is weight measured with?
16. What is the resultant force?

1. Scalar quantities have magnitude only, vector quantities have magnitude and direction.
2. An arrow.
3. A push or pull that acts on an object due to the interaction with another object.
4. Friction, air resistance, tension, normal contact forces.
5. Gravitational force, electrostatic force and magnetic force.
6. Vector
7. The force acting on an object due to gravity.
8. The gravitational field around the Earth.
9. The gravitational field strength at the point where the object is at.
10. Weight = Mass x Gravitational Field Strength
11. Newtons, N
12. Kilograms, kg
13. Gravitational Field Strength, N/kg
14. The point at which the weight of an object acts through.
15. A Newtonmeter
16. It is a single force that is the result of all the different forces acting on the object.

# P9: Motion

**Fold page here**

| | |
|---|---|
| 1. What is the equation that links distance travelled, speed and time? | 1. Distance Travelled = Speed x Time |
| 2. Why is speed a scalar quantity? | 2. It does not involve direction. |
| 3. What can the speed a person walks, runs or cycles at depend on? | 3. Age, terrain, fitness and distance travelled. |
| 4. What is a typical walking speed? | 4. 1.5 m/s |
| 5. What is a typical running speed? | 5. 3 m/s |
| 6. What is a typical cycling speed? | 6. 6 m/s |
| 7. What is the typical speed of sound? | 7. 330 m/s or $3.3 \times 10^2$ m/s |
| 8. What is the unit for distance? | 8. m |
| 9. What is the unit for speed? | 9. m/s |
| 10. What is the unit for time? | 10. s |
| 11. What is velocity? | 11. It is speed in a given direction. |
| 12. Why is velocity a vector? | 12. It has direction. |
| 13. How is velocity different from speed? | 13. Velocity has direction, speed doesn't. |
| 14. When can a distance travelled be represented by a distance time graph? | 14. When the object moves along a straight line. |
| 15. How can the speed of an object be calculated from using a distance time graph? | 15. Calculating the gradient of the line on the distance-time graph. |
| 16. How can you tell on a distance-time graph when an object is travelling the fastest? | 16. It would have the steepest line going up. |
| 17. What is the equation that links acceleration, change in velocity and time? | 17. Acceleration = Change in Velocity / Time |
| 18. What is the unit for acceleration? | 18. $m/s^2$ |
| 19. What is the unit for change in velocity? | 19. m/s |
| 20. How can acceleration be calculated using a velocity-time graph? | 20. Calculating the gradient of the line on the velocity-time graph. |
| 21. If an object is falling near the Earth's surface freely under gravity what would its acceleration be? | 21. $9.8 m/s^2$ |
| 22. What happens to an object as it falls through a fluid such as air or water? | 22. The object initially accelerates due to the force of gravity. As it increases in speed resistance acting in the opposite direction increases. Eventually the force due to gravity and force due to resistance are equal and the object reaches terminal velocity. |
| 23. What is displacement? | 23. This is the distance travelled in a given direction. |
| 24. What is deceleration? | 24. It is negative acceleration when an object slows down. |

# P10: Force and Motion

Fold page here

1. What is the equation that links acceleration, change in velocity and time taken?
2. What is the unit for acceleration?
3. What is the unit for change in velocity?
4. What is the unit for time?
5. What is deceleration?
6. What is the unit for distance?
7. What is the acceleration of an object falling freely under gravity near the Earth?
8. If the resultant force is 0 on a stationary object what happens to the motion of the object?
9. If the resultant force is 0 on a moving object what happens to the motion of the object?
10. What happens if a resultant force is acting on an object?
11. What does Newtons second law state?
12. What is the equation that links acceleration, mass and resultant force?
13. What is the unit for force?
14. What is the unit for mass?
15. What is inertial mass? (HT Only)
16. What is the symbol for an approximate answer?
17. What does Newtons third law state?
18. What is the equation that links mass, momentum and velocity?
19. What is the symbol for momentum?
20. What is the unit for momentum?
21. What is the symbol for mass?
22. What is the unit for mass?
23. What is the symbol for velocity?
24. What is the unit for velocity?
25. What is the conservation of momentum?

1. Acceleration = Change in Velocity / Time Taken
2. Metres, pre second squared ,$m/s^2$
3. Metres per second, m/s
4. Seconds, s
5. An object slowing down.
6. Metres, m
7. 9.8 $m/s^2$
8. The object remains stationary.
9. The object continues to move at the same velocity.
10. The velocity of the object will change. This means that speed and/or direction could change.
11. The acceleration of an object is proportional to the resultant force acting on the object, and inversely proportional to the mass of the object.
12. Resultant Force = Mass x Acceleration
13. Newtons, N
14. Kilograms, kg
15. The ration of force over acceleration.
16. ~
17. Whenever two objects interact, the forces they exert on each other are equal and opposite.
18. Momentum = Mass x Velocity
19. *p*
20. Kilograms metre per second kgm/s
21. *m*
22. Kilograms kg
23. *v*
24. Metres per second m/s
25. When in a closed system the total momentum before an event is equal to the total momentum after the event.

# P10: Force and Motion

Fold page here

| | |
|---|---|
| 1. What is the equation that links acceleration, change in velocity and time taken? | 1. Acceleration = Change in Velocity / Time Taken |
| 2. What is the unit for acceleration? | 2. Metres, pre second squared ,$m/s^2$ |
| 3. What is the unit for change in velocity? | 3. Metres per second, m/s |
| 4. What is the unit for time? | 4. Seconds, s |
| 5. What is deceleration? | 5. An object slowing down. |
| 6. What is the unit for distance? | 6. Metres, m |
| 7. What is the acceleration of an object falling freely under gravity near the Earth? | 7. 9.8 $m/s^2$ |
| 8. If the resultant force is 0 on a stationary object what happens to the motion of the object? | 8. The object remains stationary. |
| 9. If the resultant force is 0 on a moving object what happens to the motion of the object? | 9. The object continues to move at the same velocity. |
| 10. What happens if a resultant force is acting on an object? | 10. The velocity of the object will change. This means that speed and/or direction could change. |
| 11. What does Newtons second law state? | 11. The acceleration of an object is proportional to the resultant force acting on the object, and inversely proportional to the mass of the object. |
| 12. What is the equation that links acceleration, mass and resultant force? | 12. Resultant Force = Mass x Acceleration |
| 13. What is the unit for force? | 13. Newtons, N |
| 14. What is the unit for mass? | 14. Kilograms, kg |
| 15. What is inertial mass? (HT Only) | 15. The ration of force over acceleration. |
| 16. What is the symbol for an approximate answer? | 16. ~ |
| 17. What does Newtons third law state? | 17. Whenever two objects interact, the forces they exert on each other are equal and opposite. |
| 18. What is stopping distance? | 18. The sum of the thinking distance and braking distance. |
| 19. What is thinking distance? | 19. The distance a vehicle travels during the driver's reaction time. |
| 20. What is braking distance? | 20. The distance a vehicle travels under a braking force to stop. |
| 21. What is the typical reaction time of a person? | 21. Between 0.2 and 0.9 seconds. |
| 22. What can a driver's reaction time be affected by? | 22. Tiredness, drugs, alcohol and distractions. |
| 23. What can the braking distance of a vehicle be affected by? | 23. Adverse weather conditions and poor condition of the vehicle. |
| 24. What are examples of adverse road conditions? | 24. Wet or icy conditions. |
| 25. What are examples of poor condition of the vehicle? | 25. Poor conditions of the brakes and tyres. |
| 26. What happens when a force is applied to the breaks? | 26. Work is done by the friction force between the brakes and the wheel to reduce kinetic energy of the vehicle. The temperature of the brakes increase. |
| 27. What happens to the braking force required when speed is increased? | 27. It needs to increase |
| 28. What problems can large decelerations cause? | 28. Brakes overheating and loss of control. |

# P13: Electromagnetic Waves

Fold page here

1. What are electromagnetic waves?
2. How are waves of the EM spectrum grouped?
3. What is the order of the EM spectrum from long to short wavelengths?
4. What do our eyes detect?
5. How do gamma rays originate?
6. Which parts of the electromagnetic spectrum can cause harm to the body?
7. What is radiation dose?
8. What is the unit for radiation dose?
9. How many millisieverts are in a sievert?
10. What harm can UV light cause?
11. What harm can X-Rays cause?
12. What harm can gamma rays cause?
13. What uses do we have for radio waves?
14. What uses do we have for microwaves?
15. What uses do we have for infrared?
16. What uses do we have for visible light?
17. What uses to we have for ultraviolet?
18. What uses do we have for X-Rays?
19. What uses do we have for gamma rays?

1. Transverse waves that transfer energy from the source of the waves to an absorber.
2. In terms of their wavelengths.
3. Radiowaves → Microwaves → Infrared → Visible Light → Ultraviolet → X-Rays → Gamma Rays
4. Visible light.
5. Changes in the nucleus of the atom.
6. Ultraviolet, W-rays and gamma rays.
7. It is a measure of the risk of harm resulting from the exposure of the body to the radiation.
8. Sieverts (Sv)
9. 1000
10. Can cause skin to age prematurely and increase the risk of skin cancer due to it being ionising.
11. Ionising radiation can cause the mutation of genes and cancer.
12. Ionising radiation can cause the mutation of genes and cancer.
13. Television and radio.
14. Satellite communication and cooking food.
15. Electrical heaters, cooking food and infrared cameras.
16. Fibre optic communications
17. Energy efficient lamps and sun tanning
18. Medical imaging and treatments
19. Medical imaging and treatments

# P15: Electromagnetism

Fold page here

| | |
|---|---|
| 1. When is a magnetic field produced? | 1. When a current flows through a conducting wire. |
| 2. What does the strength of a magnetic field depend on? | 2. The current through the wire and the distant from the wire. |
| 3. How can the strength of a magnetic field be increased? | 3. Shaping the wire to form a solenoid. |
| 4. What is the magnetic field inside a solenoid like? | 4. Strong and uniform. |
| 5. What is the shape of a magnetic field inside a solenoid like? | 5. A similar shape to a bar magnet. |
| 6. How can the strength of a magnetic field be increased inside a solenoid? | 6. Adding an iron core. |
| 7. What is an electromagnet? | 7. A solenoid with an iron core. |
| 8. What is the motor effect | 8. When a conductor carrying a current is placed in a magnetic field the magnet producing the field and the conductor exert a force on each other. |
| 9. What is the unit for force? | 9. Newtons |
| 10. What is the unit for the magnetic flux density? | 10. Tesla, T |
| 11. What is the unit for current? | 11. Amperes, A |
| 12. What is the unit for length? | 12. Metres, m |

| | |
|---|---|
| **Topic** | P8 Forces in Balance |
| **Qu** | Explain you would determine the centre of mass of a piece of card.<br>Explain how you could check that the centre of mass point is accurate.<br>Explain when an object will topple over. |
| **Info** | At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence. |
| **Top Tip** | Be careful that you use key words/phrases accurately (these are in bold in your model answers below). |
| **Model Answer** | **Explain how you would determine the centre of mass of a piece of card.**<br><br>*Place three **holes** in the card, with each hole in a different place and close to the edge of the card. Then place a **pin** through the first hole and hold the pin in place using a boss in a clamp stand to suspend the card. Tie a **weigh**t to a piece of **string** and suspend this string from the same pin. This is a **plumb line**. Draw a line on the card marking where the string was. Repeat this for the two other holes. The point the lines **intersect** is the centre of mass.* |
| **Model Answer** | **Explain how you could check that the centre of mass point is accurate.**<br><br>*Put another **hole** in the card near to the edge. **Suspend** it using a pin and use a string on a weight to create a **plumb line**. Draw a line of the card marking where the string was. If this line **intersects** the **centre of mass** then the centre of mass is accurate.* |
| **Model Answer** | **Explain when an object will topple over.**<br><br>***Centre of mass** is the point at which the **weight** of an object acts through. An object will topple over when the centre of mass falls **outside the base** of the object.* |
| **Practice** | 1. Learn and practice the model answers above. |

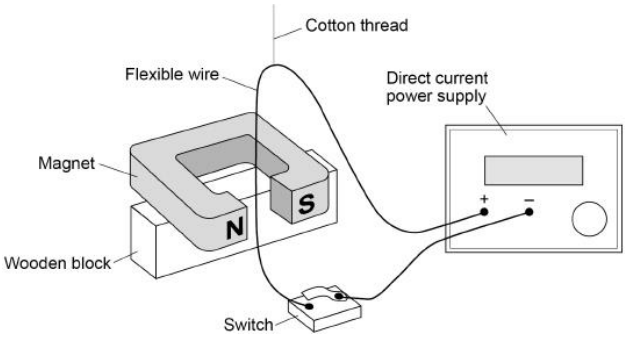
| | |
|---|---|
| **Topic** | P9 Motion |
| **Qu** | Explain how you use a distance time graph to find velocity at a certain time.<br>Compare velocity and speed.<br>Explain how you use a velocity time graph to find acceleration at a certain time. |
| **Info** | At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence. |
| **Top Tip** | Be careful that you use key words/phrases accurately (these are in bold in your model answers below). |
| **Model Answer** | **Explain how you use a distance time graph to find velocity at a certain time.**<br><br>*To find **velocity** at a given time you would draw a **tangent** at this time. A tangent is a straight line drawn to touch a point on a curve so it has the same gradient as the curve at that point. You would then determine the **gradient** of this tangent by dividing the change in **distance** of the tangent by the change in **time.*** |
| **Model Answer** | **Compare velocity and speed.**<br><br>*Both velocity and speed can be calculated by dividing the distance an object travelled by the time that it took. Velocity and speed also have the same unit which is **m/s**. However velocity is a **vector** and has **direction**, while speed is a **scalar** and does not have **direction**.* |
| **Model Answer** | **Explain how you use a velocity time graph to find acceleration at a certain time.**<br><br>*To find **acceleration** at a given time you would draw a **tangent** at this time. A tangent is a straight line drawn to touch a point on a curve so it has the same gradient as the curve at that point. You would then determine the **gradient** of this tangent by dividing the **change in velocity** of the tangent by the change in **time taken**.* |
| **Practice** | 1. Learn and practice the model answers above. |

<table>
<tr><td>Topic</td><td>P10 Force and Motion</td></tr>
<tr><td>Qu</td><td>Calculating a value using the equation:<br>Momentum = Mass x Velocity</td></tr>
<tr><td>Info</td><td>There is frequently a question in which you will need to use formulas. Marks vary between 3 and 6 marks depending on how much processing of the information you need to do.<br><br>To answer this question, you will need to do the following:<br>1. Check for any unit conversions you may need to do.<br>2. Write down the formula you will be using.<br>3. Substitute in the values.<br>4. Rearrange.<br>5. Do the calculation.<br>6. Round to the correct number of significant figures.<br>7. Add units.</td></tr>
<tr><td>Top Tip</td><td>You do not need to learn these formulas as they will both be given on a data sheet this year. Always write down the formula you are using, substitute numbers and then rearrange. Avoid writing a rearranged formula as its easy to make mistakes and can lose you marks.</td></tr>
<tr><td>Model Answer</td><td>Calculate the mass of a bowling ball that has a momentum of 26kgm/s and a velocity of 5.0m/s
<table>
<tr><td>-</td><td>Check for unit conversions.</td></tr>
<tr><td>Momentum = Mass x Velocity</td><td>Formula to be used.</td></tr>
<tr><td>26 = Mass x 5.0</td><td>Substitute values.</td></tr>
<tr><td>26 / 5.0 = Mass</td><td>Rearrange.</td></tr>
<tr><td>Mass = 5.2</td><td>Do the calculation</td></tr>
<tr><td>-</td><td>Round to correct number of sig fig.</td></tr>
<tr><td>5.2kg</td><td>Answer with units</td></tr>
</table></td></tr>
</table>

| Topic | P10 Force and Motion |
|---|---|
| **Practice** | Practice using the formula for momentum by answering the questions below:<br>1. Determine velocity when momentum is 150kgm/s and mass is 2.5kg<br>2. Determine velocity when momentum is 12kgm/s and mass is 1.25kg<br>3. Determine momentum when mass is 1500kg and velocity is 8m/s.<br>4. Determine momentum when mass is 150kg and velocity is 3m/s<br>5. A car of mass 1200 kg is travelling with a velocity of 35 m / s. Calculate the momentum of the car. Give the unit.<br>6. Calculate the momentum of a 175kg motorbike when it travels at 14 m/s.<br>7. A skater travels with a velocity of 3.2 m/s and has a momentum of 200 kg m/s. Calculate the mass of the skater.<br>8. A glider has a mass of 0.14 kg and a velocity of 17 cm/s. Calculate the momentum of the glider in kg m/s (3 marks)<br>9. The gun fires the paintball forwards at a velocity of 90 m / s. The paintball has a mass of 0.0030 kg. Calculate the momentum of the paintball just after the gun is fired in kgm/s. |

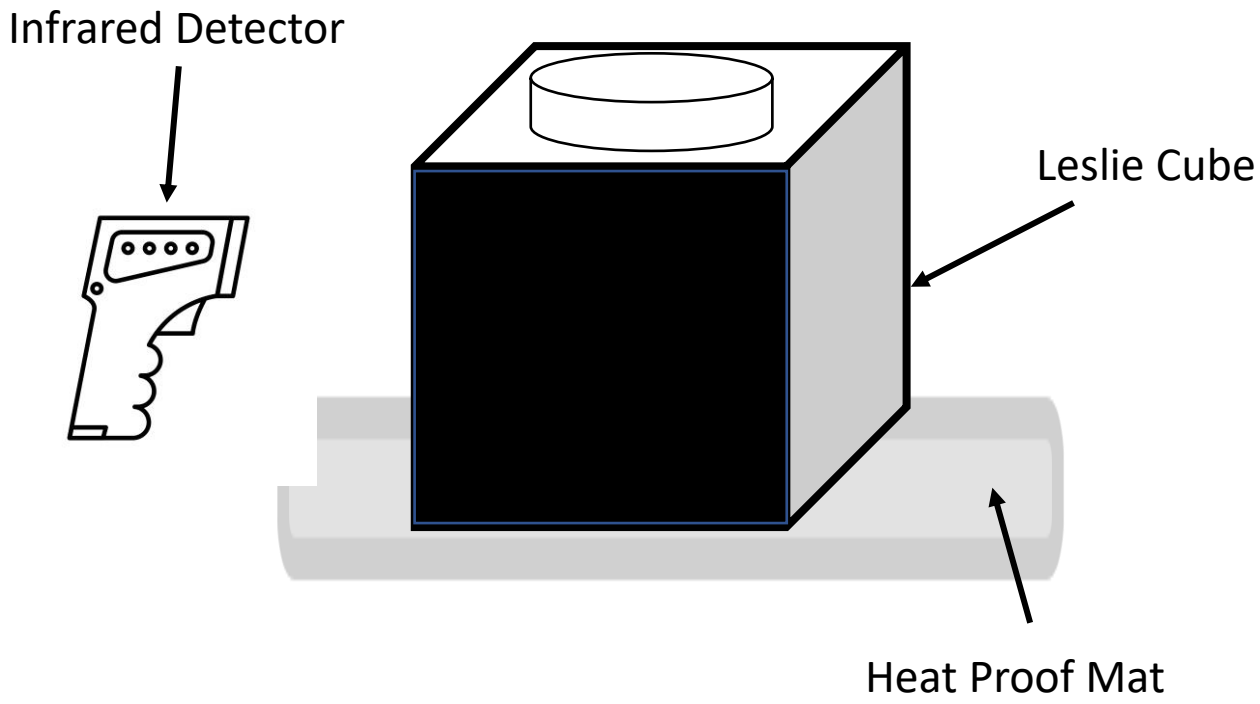
| | |
|---|---|
| **Topic** | P10 Force and Motion |
| **Qu** | Explain why _____ when it _____ using the idea of conservation of momentum. |
| **Info** | Conservation of momentum is often assessed by asking you to explain what happens to the momentum of two objects during different events.<br>Some examples from exam questions in the past include:<br>• A bowling ball slowing down when it hits a pin.<br>• Bumper cars stopping after they hit into each other face on.<br>• An ice skater bumping into another ice skater from behind.<br>• A person diving from a stationary boat.<br>• A bullet fired from a gun.<br>• An ice skater throwing a bag forwards to a friend.<br>• A skateboard as a skateboarder jumps forward off it<br>• A car bumping into a minivan from behind.<br>To answer this question, you will need to:<br>1. State that the momentum before = the momentum after<br>2. Identify what happens to the momentum and velocity of the 1st object.<br>3. Identify what happens to the momentum and velocity of the 2nd object. |
| **Top Tip** | **If the objects were both stationary before the event, then total momentum was 0. This means that if one object moves in one direction, the other object will move in the opposite direction.** |
| **Model Answer** | **Explain in terms of conservation of energy what will happen when a person dives from a stationary boat.**<br><br>*The momentum before will be equal to the momentum after. Before diving the momentum of the boat and diver is 0kgm/s and so after diving the momentum must be 0kgm/s also. After diving the person has a small velocity and small momentum in the forwards direction. Therefore, the boat will have a small momentum and velocity in the opposite direction.* |
| **Practice** | 1. Learn and practice the model answers above.<br>2. Prepare and learn model answers to explain what will happen in terms of conservation for the other examples given above. |

| | |
|---|---|
| **Topic** | P13 Electromagnetic Waves |
| **Qu** | Compare the uses of _____ and _____. |
| **Info** | You could be asked to compare the uses for any of the parts of the electromagnetic spectrum including radio waves, microwaves, infrared, visible light, ultraviolet, x-rays and gamma rays:<br><br>To answer this question, you will need to:<br>1. Identify the uses for the first named part of the electromagnetic spectrum.<br>2. Identify the uses for the second named part of the electromagnetic spectrum.<br>3. Describe the risks of the first named part of the electromagnetic spectrum<br>4. Describe the risks of the second named part of the electromagnetic spectrum. |
| **Top Tip** | Make sure that when you have a compare question you use comparative language. Examples of comparative language have been underlined in the model answer below. |
| **Model Answer** | **Compare the uses of X-Rays and Ultraviolet**<br>*1. X-Rays can be used to detect broken bones and to detect dental problems. X-Rays can also be used to kill cancer cells.*<br>*2. <u>In comparison</u> ultraviolet can be used in pre-natal scanning, removing plaque from teeth, removing kidney stones and helping to repair scar damage.*<br>*3. X-Rays are ionising and can mutate DNA and damage cells which can lead to cancer.*<br>*4. Ultraviolet light can <u>also</u> pose a risk and <u>like</u> X-Rays it is <u>also</u> ionising and can mutate DNA damaging cells which can lead to cancer.* |
| **Practice** | 1. Learn and practice the model answers above.<br>2. Prepare and learn model answers to compare the uses and risks of: Gamma and X-Rays, Visible Light and Infrared, Microwaves and Radiowaves |

| | |
|---|---|
| **Topic** | P15 Electromagnetism |
| **Qu** | Explain why the wire moves when the switch is closed.<br>Describe how to build and test an electromagnet.<br>Describe how Fleming's left-hand rule can be used to determine the direction ____will move when the switch is closed. |
| **Info** | At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in a logical sequence. |
| **Top Tip** | Be careful that you use key words/phrases accurately (these are in bold in your model answers below). |
| **Model Answer** |  <br>**Explain why the wire moves when the switch is closed.**<br><br>*When the switch is closed the wire has a **current** in it which causes a **magnetic field** around the wire. This interacts with the **permanent field of the magnet** causing a **force** on the wire which causes it to move.* |
| **Model Answer** | **Describe how to build and test an electromagnet.**<br><br>*To make the electromagnet **wrap a coil of wire around an iron nail**. Connect the wire to the **power supply** using crocodile clips and switch the power supply on. To change the strength of the electromagnet you could change the **number of turns on the coil, change the current** through the coil or **change the separation of the turns**. To test the electromagnet you would suspend **paperclips** from it, the more paperclips attached to the electromagnet the greater its strength.* |
| **Model Answer** | **Describe how Fleming's left-hand rule can be used to determine the direction _____will move when the switch is closed.**<br><br>*The **thumb, index finger and third finger** are to be held mutually at **right angles**. The index finger shows the **direction of the magnetic field** from North to South and the third finger shows the **direction of the current** from positive to negative terminal. The thumb will show the **direction of the force** acting on (the object given in the question) and so it will move (insert direction thumb is pointed towards)* |
| **Practice** | 1. Learn and practice the model answers above. |

# RP21 Radiation and Absorption

**Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.**




**1**

Place the Leslie Cube on a heat proof mat.

**2**

Fill the Leslie Cube with very hot water and replace the lid.

**3**

Use an infrared detector to record the amount of radiation from each surface. The detector should be the same distance from each surface.

**4**

Construct bar chart to display the results.

# RP21: Radiation and Absorption

Fold page here

1. What are the 4 surfaces on a Leslie Cube?
2. What piece of apparatus would you use to measure distance from the surface of the cube?
3. What piece of apparatus would you use to measure the infrared radiation emitted?
4. When investigating radiation and absorption using a Leslie cube what is the independent variable?
5. When investigating radiation and absorption using a Leslie cube what is the dependent variable?
6. When investigating radiation and absorption using a Leslie cube what are the control variables?
7. Which colour surface will emit infrared radiation at the greatest rate?
8. Why should a Leslie cube be placed on a heat proof mat?
9. What should the lid be replaced once the Leslie cube has been filled with water?
10. Are matt or shiny surfaces better emitters?
11. Are matt or shiny surfaces better absorbers?
12. Which colour surface will emit infrared radiation at the slowest rate?
13. Why should you leave the Leslie cube for a minute after placing hot water in it before you take any readings?
14. What is the risk of using hot water?
15. What is a Leslie cube?

1. Matt white, shiny black, matt black and shiny silver.
2. Ruler
3. Infrared detector
4. Type of surface
5. Temperature measured by infrared detector.
6. Distance between the detector and surface of the cube, starting temperature of the water inside the cube, size of the cube, volume of hot water in cube
7. Black
8. To reduce heat loss through the base.
9. To reduce heat loss.
10. Matt
11. Matt
12. White shiny surface
13. To allow the surfaces to heat up to the temperature of the water.
14. Burns and scalds
15. A hollow metal container with painted sides.

| | |
|---|---|
| **Topic** | RP21 Radiation and Absorption |
| **Qu** | Describe a method to investigate which surface emits infrared radiation at the greatest rate. |
| **Info** | You could be asked this question for different surfaces. Some that have come up in the past include:<br>• A mixture of different colours including green, red, blue and black.<br>• Shiny and matt surfaces of the same colour.<br>• A Leslie cube with a matt black surface, a shiny black surface, a shiny silver surface and a matt white surface.<br><br>To answer this question, you will need to do the following:<br>1. Describe how to set up the equipment.<br>2. Identify the dependent and independent variable<br>3. State that to collect valid results you will have control variables.<br>4. Identify what the control variables are.<br>5. Describe what you will do with your results. |
| **Top Tip** | **Check your method and make sure you have discussed the dependent, independent and control variables.** |
| **Model Answer** | Describe a method to investigate which colour of surface emits infrared radiation at the greatest rate. The test colours are orange, blue, black and white.<br><br>*1. Paint the 4 sides of a hollow metal cube the 4 test colours.*<br>*2. Place the cube on a heat proof mat, fill with water that has just been boiled and replace the lid.*<br>*3. Wait 1 minute.*<br>*4. Using an infrared detector measure the temperature of each side painted a different colour.*<br>*5. To collect valid data there need to be control variables. Control variables include the thickness of each layer of paint and the distance the detector is from the cubes surface.*<br>*6. Plot a bar chart of results.* |
| **Practice** | 1. Learn and practice the model answer above.<br>2. Prepare and learn model answers to explain how you would investigate matt and shiny surfaces. Then construct another model answer to explain how you would investigate radiation and absorption for the surfaces of a Leslie cube. |