Physics Paper 2

Model Exam Question Booklet

Physics Paper 2	
Topics in the Paper:	
P8	Forces
P9	Motion
P10	Force and Motion
P11	Force and Pressure
P12	Waves
P16	Space
RP9	Reflection and Refraction

Essential Content for the Higher Separate Science Exam (PBT/FKI)

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

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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?
17. When is work done on an object?
18. What is the equation that links distance, force and work done?
19. What is the unit for work done?
20. What is the unit for force?
21. What is the unit for distance?
22. How many newton-metres is 1 joule?
23. What is the relationship between the extension of an elastic object and the force applied?
24. What is the equation that links extension, force and spring constant?
25. What is the unit for spring constant?
26. What is the unit for extension?
27. What happens when a force squashes a spring?

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.
17. When a force causes a displacement of an object.
18. Work Done = Force x Distance
19. Joules, J
20. Newtons, N
21. Metres, m
22. 1 newton-metre
23. It is directly proportional, provided the limit of proportionality is not exceeded.
24. Force = Spring Constant x Extension
25. Newtons per metre, N/m
26. Metres, m
27. Work is done and elastic potential energy is stored in the spring.

P9: Motion

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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 3.3×10^2 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

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1. What is the equation that links mass, momentum and velocity?
2. What is the symbol for momentum?
3. What is the unit for momentum?
4. What is the symbol for mass?
5. What is the unit for mass?
6. What is the symbol for velocity?
7. What is the unit for velocity?
8. What is the conservation of momentum?
9. When does a change in momentum occur?
10. What is $m\Delta v$?
11. Why is momentum not always conserved in a collision?
12. Why does moving your hand back when catching something reduce the force?
13. What are some examples of events in which the conservation of momentum applies?

1. Momentum = Mass x Velocity
2. *p*
3. Kilograms metre per second kgm/s
4. *m*
5. Kilograms kg
6. *v*
7. Metres per second m/s
8. When in a closed system the total momentum before an event is equal to the total momentum after the event.
9. When a force acts on an object that is moving or able to move.
10. Change in momentum.
11. External forces are acting on the colliding objects.
12. It increases the time to change momentum.
13. Collisions and explosions

P11: Force and Pressure

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1. What are examples of fluids?
2. What is the equation that links area, force normal to a surface and pressure?
3. What is the unit for pressure?
4. What is the unit for force?
5. What is the unit for area?
6. What is the unit for height of the column?
7. What is the unit for density?
8. How is upthrust generated?

9. What is the atmosphere?
10. What happens to the atmosphere when altitude is increased?
11. What causes atmospheric pressure?
12. Why does atmospheric pressure decrease as altitude increases?

1. Liquid or a gas.
2. Pressure = Force Normal To Surface / Area

3. Pascals, Pa
4. Newtons, N
5. Metres squared, m^2
6. Metres, m
7. Kilograms per metre cubed, kg/m^3
8. A submerged object experiences a greater pressure on the bottom surface than on the top, this generates a resultant force upwards.
9. A thin later of gas around the Earth.
10. It gets less dense.

11. Air molecules colliding with a surface.
12. The number of air molecules above a surface decrease as height increases so there is less air above a surface which causes pressure to decrease.

P12: Wave Properties

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1. What type of wave are ripples on a water surface?
2. What type of wave are sound waves?
3. What is amplitude?
4. What is wavelength?
5. What is frequency?
6. What is the unit for period?
7. What is the unit for frequency?
8. What is wave speed?
9. What is the equation that links frequency, wavelength and wave speed?
10. What is the unit for speed?
11. What is the unit for wavelength?
12. What can happen to waves at the boundary between two different materials?
13. How do sound waves travel through a solid?
14. How does the ear work so that we can sense sound?
15. Why is the limit of human hearing restricted?
16. What is the range of normal human hearing?
17. What are ultrasound waves?
18. How can ultrasound waves be used for medical and industrial imaging?
19. How are seismic waves produced?
20. What type of wave are P-Waves?
21. What type of wave as S-Waves?
22. What can P-Waves travel through?
23. What can S-waves travel through?
24. What can echo sounding be used for?

1. Transverse
2. Longitudinal waves
3. The maximum displacement of a point on a wave away from its disturbed position.
4. The distance from a point on one wave to the equivalent point on the adjacent wave.
5. The number of waves passing a point each second.
6. Seconds, s
7. Hertz, Hz
8. The speed at which the energy is transferred through the medium.
9. Wave Speed = Frequency x Wavelength
10. Metres per second, m/s
11. Metres, m
12. It can be reflected, absorbed or transmitted.
13. They cause a vibration of the particles.
14. Sound waves cause the ear drum and other parts to vibrate.
15. The conversion of sound waves to vibrations of solids works over a limited frequency range.
16. 20Hz to 20kHz
17. Waves that have a frequency higher than the upper limit of hearing for humans.
18. Ultrasound waves are partially reflected when they meet a boundary between two media, the time taken for the reflections to reach a detector can be used to determine how far away each boundary is. This can be used to make an image.
19. Earthquakes
20. Longitudinal
21. Transverse
22. Solids and liquids
23. Solids
24. Detect objects in deep water and measure water depths.

P16: Space

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Separate Science Only

1. What is within our solar system?	1. One star, the Sun, the eight planets and dwarf planets. Natural satellites, moons, orbit these planets.
2. What galaxy is our solar system part of?	2. Milky Way
3. What happens at the start of a star's life cycle?	3. A cloud of dust and gas called a nebula is pulled together by gravitational attraction.
4. What determines the life cycle of a star?	4. The size of the star.
5. What is the life cycle of a star much larger than the size of our Sun?	5. Nebula → Prostar →Main Sequence Star → Red Super Giant → Supernova → Neutron Star or Black Hole
6. What is the life cycle of a star around the same size as our Sun?	6. Nebula → Prostar → Main Sequence Star → Red Giant → White Dwarf → Black Dwarf
7. How are all the naturally occurring elements produced?	7. Fusion in a star.
8. How are elements heavier than iron produced?	8. A supernova.
9. How are the elements throughout the universe distributed?	9. A supernova.
10. Why do planets and satellites maintain their circular orbits?	10. Gravity
11. How can the force of gravity lead to changing velocity but unchanged speed.	11. Velocity is a vector, whereas speed is a scalar. If an object has a circular orbit it will have a change in direction and so a change in velocity, even if speed doesn't change.
12. What element did the early universe only contain?	12. Hydrogen
13. Why has the amount of hydrogen in the universe decreased over time?	13. It was converted into helium.
14. What property of a star does the range of wavelengths emitted depend on?	14. Temperature
15. Why is the moon classed as a natural satellite?	15. It orbits a planet
16. What can orbit a star?	16. Planets, dwarf planets, comets and asteroids.
17. How is a protostar different to a main sequence star?	17. It is at a lower temperature as fusion has not started.
18. What is nuclear fusion?	18. When nuclei of small atoms fuse together to make larger atoms.
19. Why is energy released during nuclear fusion?	19. The mass of the large nucleus is smaller than the mass of the small nuclei that formed it, this mass is converted into energy.
20. What is a black hole?	20. When gravity is so strong that light cant escape it.
21. What is red shift?	21. An observed increase in the wavelength of light from most distant galaxies.
22. What does red shift provide evidence for?	22. The Big Bang and the idea that the universe is expanding.
23. How does the Big Bang theory suggest the universe began?	23. From a small region that was extremely hot and dense that exploded.
24. What happens to red shift when an galaxy is moving away faster?	24. Red shift is more.
25. Which galaxies are moving away from Earth the fastest?	25. The ones further away.
26. What do new observations suggest is happening to the universe?	26. It is expanding at a greater rate.

Topic	P8 Forces in Balance
Qu	Explain you would determine the centre of mass of a piece of card. Explain how you could check that the centre of mass point is accurate. 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.** *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.** *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.** ***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. Compare velocity and speed. 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.** *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.** *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.** *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.

Topic	P10 Forces and Motion
Qu	Explain how a _____ works.
Info	You could be asked to explain how different safety features work in terms of momentum. Some examples that could come up include: • A seat belt • Air bags • A gym crash mat • Cycled helmets • Cushioned areas in playgrounds • Eggs dropped into polystyrene foam. • A padded vest for a horse rider • Polystyrene on the base of a flying toy. To answer this question, you will need to: 1. Identify that the safety feature increases the time taken to stop. 2. Identify that this decreases the rate of change in momentum. 3. Identify that this decreases the forces acting on the object.
Top Tip	. **Key phases to use include:** **Time to Stop, Forces, Momentum and Rate of Change.**
Model Answer	**Explain how an egg dropped into polystyrene foam prevents the egg from breaking.** *The soft foam increases the time that it takes for the egg to come to a stop. This therefore decreases the rate at which momentum changes which reduces the force on the egg. As the force is reduced the egg does not crack.*
Practice	1. Learn and practice the model answers above. 2. Prepare and learn model answers to explain how a seat belt, air bag, helmet, crash mats and cushioned mats in playgrounds work.

Topic	P11 Force and Pressure
Qu	Identify and explain what happens to pressure with increasing altitude. Identify and explain what happens to pressure with increasing depth. Explain how upthrust occurs.
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	**Identify and explain what happens to pressure with increasing altitude.** *At altitude increases, **pressure** decreases. This is because it is the air molecules **colliding** with a surface create pressure. As altitude increases the **distance** between molecules increases and so at a higher altitude there are fewer molecules. This means that the number of collisions with a surface decreases.*
Model Answer	**Identify and explain what happens to pressure with increasing depth.** *As depth increases pressure increases. This is because the increasing depth increases the **height of water** above. This increases the **force of water** from above.*
Model Answer	**Explain how upthrust occurs.** *An object that is in water will experience **more pressure** at the bottom compared to the top. This is because the part of the boat that is deeper under water will have a greater height of water above it exerting a force. This **difference in pressure** creates a **resultant force** known as upthrust.*
Practice	1. Learn and practice the model answers above.

Topic	P12 Waves
Qu	Compare sound waves and _____
Info	You could be asked to compare sound waves which are a longitudinal wave to any named transverse wave. This means that you could be asked to compare sound waves and any part of the electromagnetic spectrum. To answer this question, you will need to: 1. State that a sound wave is a longitudinal wave, and that the oscillation of the wave is parallel to the direction of energy transfer. 2. State what type of wave the other wave in the question is and state the direction of energy transfer. 3. Compare the ability of each to travel through a vacuum. 4. Compare the speed of each wave. 5. Compare the frequency of each wave.
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 sound waves and X-Rays.** *1. Sound waves are a longitudinal wave. The direction of the oscillation of the wave is parallel to the direction of energy transfer.* *2. <u>However,</u> X-Rays are transverse waves. The direction of the oscillation of the wave is perpendicular to the direction of energy transfer.* *3. Sound waves are unable to travel through a vacuum <u>while</u> X-Rays can.* *4. <u>Compared</u> to X-Rays sound rays travel at a slow<u>er</u> speed.* *5. Finally, X-rays have a great<u>er</u> frequency that sound waves.*
Practice	1. Learn and practice the model answers above. 2. Prepare and learn model answers to compare the sound waves and: Radiowaves, microwaves, infrared, visible light, ultraviolet and gamma rays.

Topic	P16 Space
Qu	Explain why a star remains stable. Describe what will happen to a small star when it leaves the main sequence. The Universe now contains a large variety of different elements. Describe how.
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 why a star remains stable** *The expansion of the star due to **fusion** is in **equilibrium** with **gravitational collapse**. This means that the forces acting inwards and in balance with the forces acting outwards.*
Model Answer	**Describe what will happen to a small star when it leaves the main sequence group.** *The star will turn into a **red giant**. When this happens the **surface temperature** will decrease and the **relative luminosity** will increase. The sun then changes into a **white dwarf**. When this happens the surface temperature increases and the relative luminosity decreases. This then fades out, goes cold and eventually becomes a **black dwarf**.*
Model Answer	**The Universe now contains a large variety of different elements. Describe how this happened.** ***Fusion** takes place within stars and **hydrogen** is turned into **helium**. This fusion continued and formed larger elements. The elements heavier than **iron** were formed in **supernova**, these heavy elements were then scattered by the **supernova explosion**.*
Practice	1. Learn and practice the model answers above.

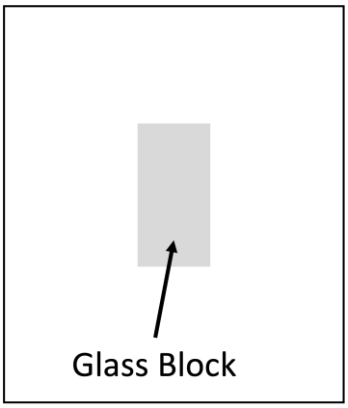
Topic	P16 Space
Qu	Describe how our sun formed. Describe how a massive star will change at the end of the main stable period. Explain why the Sun will not undergo a supernova.
Info	At least one of these questions is likely to come up. The examiner is going to be looking for a clear answer written in 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	**Describe how our sun formed.** *Our sun formed from **dust and gas** which were pulled together by **gravity**. As more mass was pulled together it got very **hot**. When it got hot enough **hydrogen nuclei fused together** releasing energy in the form of heat and light. This energy caused expansion which balanced the gravitational pull*
Model Answer	**Describe how a massive star will change at the end of the main stable period.** *The star will turn into a **red super giant**. This red super giant will then become a **supernova** before then either forming a **dense neutron star** or shrinking to form a **black hole**.*
Model Answer	**Explain why the Sun will not undergo a supernova.** *The sun is not a **massive star.** It is only massive stars that undergo a **supernova**. Instead the sun will form a red giant and then a white dwarf before becoming a black dwarf.*
Practice	1. Learn and practice the model answers above.

Topic	P16 Space
Qu	Explain the evidence for the big bang theory. Explain how the light of an approaching galaxy may appear changed on Earth. Explain what the size of red-shift tells us.
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 the evidence for the big bang theory.** *Galaxies show a **red-shift** and the more distant the galaxy from us the bigger the red-shift. This means that **galaxies are moving away** from Earth and that the **Universe is expanding**. However distant galaxies moving away faster and so the **Universe began once in one place**.*
Model Answer	**Explain how the light of an approaching galaxy may appear changed on Earth.** *The light will appear to have a **shorter wavelength** and the **frequency** will have **decreased**. The light will have undergone **blue-shift**.*
Model Answer	**Explain what red-shift and the size of the red-shift tells us about a galaxy.** *The red-shift tells us that the object is **moving away** from Earth. The size of the red-shift tells gives us an idea of how **fast and how distant the galaxy is**. The greater the red-shift the **more distant the galaxy** is and the **faster** it is moving away from Earth.*
Practice	1. Learn and practice the model answers above.

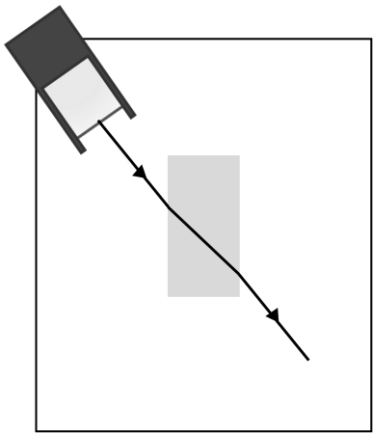
RP9 Reflection and Refraction of Light

Investigating the Refraction of Light By Different Substances

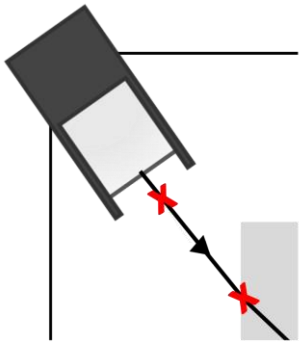
1.
Place a block on a piece of paper and draw around it.



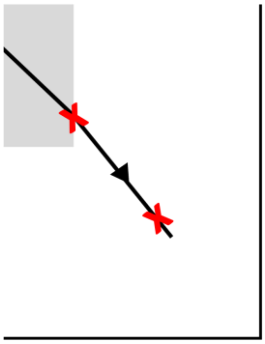
2.
Shine a ray of light through the block.



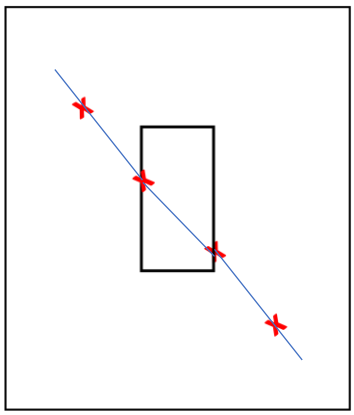
3.
Mark the ray of light close to the point it leaves the ray box and where it enters the block.



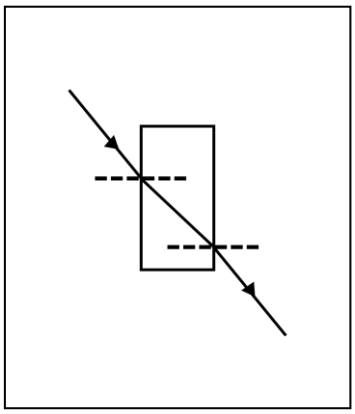
4.
Mark the ray of light at the point it leaves the block and further along this ray of light.



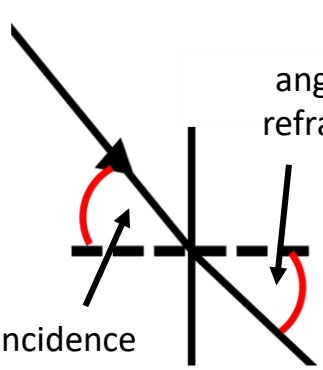
5.
Join the points together to show the path of the light.



6.
Draw the normal lines at 90° to the surface.



7
Use a protractor to measure the angle of incidence and angle of refraction.

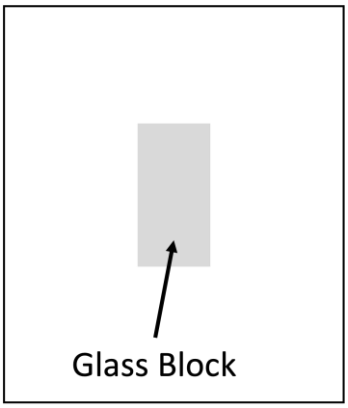


8
Shine the light from the ray box at different angles by increasing the angle of incidence at 10° intervals.

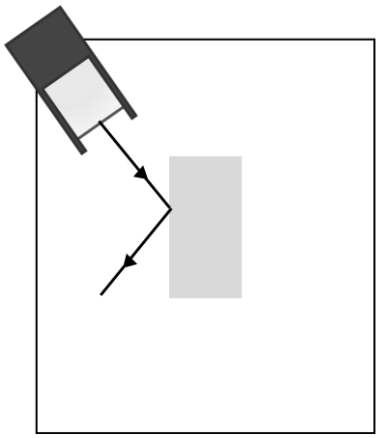
RP9 Reflection and Refraction of Light

Investigating the Reflection of Light By Different Substances

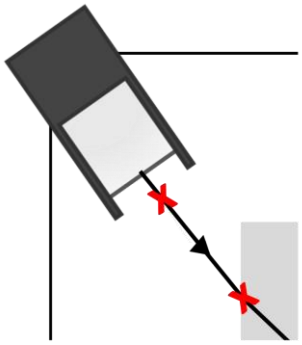
1.
Place a block on a piece of paper and draw around it.



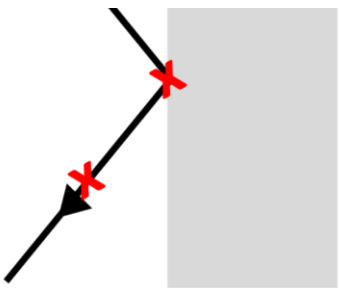
2.
Shine a ray of light through the block.



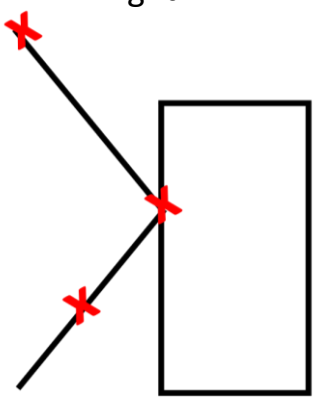
3.
Mark the ray of light close to the point it leaves the ray box and where it hits the block.



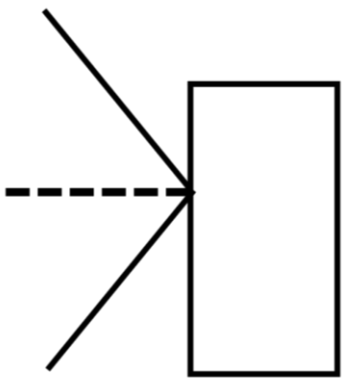
4.
Mark along the reflected ray of light.



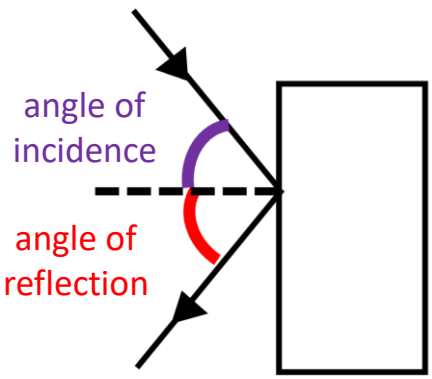
5.
Join the points together to show the path of the light.



6.
Draw the normal lines at 90° to the surface.



7
Use a protractor to measure the angle of incidence and angle of reflection.



8
Shine the light from the ray box at different angles by increasing the angle of incidence at 10° intervals.

RP9: Reflection and Refraction of Light

Fold page here

1. Why should a narrow ray of light be used?
2. What are the problems of using a wide incident ray?
3. What piece of apparatus would you use to generate an incident ray?
4. What a the potential hazard in the experiment?
5. What pieces of apparatus would you use to draw your rays of light?
6. What would you use to measure angles?
7. What property of light changes when it is refracted?
8. What is the normal?
9. Why can you not investigate refraction through an opaque substance?
10. When investigating different materials and the angle of refraction what needs to be kept the same?
11. Why is light refracted as it travels from one material to another?
12. What is refraction?
13. What is the angle of incidence?
14. What is the angle of refraction?
15. What is the angle of reflection?
16. What happens to light when it passes into a denser material?
17. What happens to light when it passes into a less dense material?
18. What is the critical angle?
19. What type of error will have an angle measured to have a range of values?
20. Why should the lights be turned off when investigating light?
21. What is reflection from a smooth surface called?
22. What does the law of reflection state?

1. Easier to judge where the centre of the ray is making results more accurate.
2. Harder to judge where the centre of the ray is, causing a larger uncertainty and so results are less accurate.
3. A ray box.
4. Ray box getting hot
5. Pencil and ruler
6. Protractor
7. Its velocity.
8. A dashed line drawn at a 90° angle to the surface.
9. Light will not pass through.
10. The angle of the incident rays.
11. It changes speed.
12. The change of direction of light when it travels from one medium to another.
13. The angle between the incident ray and the normal.
14. The angle between the refracted ray and the normal.
15. The angle between the reflected ray and the normal.
16. Its speed slows down and so it bends towards the normal.
17. It speeds up and so bends away from the normal.
18. The angle of incidence beyond which rays of light passing through a denser medium to the surface of a less dense medium are no longer refracted but totally reflected.
19. Random error
20. Makes it easier to see the ray of light and determine where its centre is.
21. Specular reflection.
22. The angle of incidence is equal to the angle of reflection.

Topic	RP9 Reflection and Refraction of Light
Qu	Describe a method the student could have used to investigate the relationship between the angle of incidence and _____.
Info	You could be asked this question for different materials. Some that have come up in the past include: • Investigating the relationship between the angle of incidence and refraction in a Perspex block. • Investigating the relationship between the angle of incidence and refraction in a glass block. • Investigating the relationship between the angle of incidence and reflection. To answer this question, you will need to do the following: 1. Describe how to set up the equipment. 2. Identify the measurements you will take. 3. 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 the student could have used to investigate the relationship between the angle of incidence and refraction in a Perspex block.** *1. Place a Perspex block on a piece of paper and draw around it in pencil.* *2. Turn off the lights and turn on the ray box.* *3. Draw some crosses along both the incident and refracted ray, including the points the ray of light enters and leaves the block.* *4. Remove the block and connect the crosses using a pencil and ruler.* *5. Draw on the normal at a 90° to the surface.* *6. Measure the angle of incidence and refraction using a protractor.* *7. Repeat for different angles of incidence, increasing the angle from 10° in intervals of 10 up to 70°.*
Practice	1. Learn and practice the model answer above. 2. Prepare and learn model answer to explain how you would investigate the relationship between the angle of incidence and refraction in a glass block **AND** how to investigate the relationship between the angle of incidence and reflection.