AQA (GCSE Notes)

Chapter 7: Magnetism and Electromagnetism

Q1. What happens when two like poles of a magnet are brought close together?

Q2. What happens when two unlike poles of a magnet are brought close together?

Q3. Why is attraction and repulsion between magnets considered a non-contact force?

Q4. What is meant by the term 'permanent magnet'?

Q5. What is meant by the term 'induced magnet'?

Q6. How does an induced magnet behave when placed in a magnetic field?

Q7. What happens to an induced magnet when it is removed from a magnetic field?

Q8. Why does an induced magnet always produce a force of attraction?

Q9. How can you tell the poles of a magnet?

Q10. What is the region around a magnet where it can exert a force called?

Q11. Which materials are considered magnetic materials?

Q12. What is the direction of magnetic field lines?

Q13. Why is the magnetic field strongest at the poles of a magnet?

Q14. How does the strength of a magnetic field change with distance?

Q15. What kind of force exists between a magnet and a magnetic material?

Q16. Why can magnets exert forces without touching objects?

Q17. How can you show the direction of a magnetic field?

Q18. What is the role of a magnetic compass?

Q19. How does a magnetic compass work?

Q20. Why does a magnetic compass point north?

Q21. What does the compass needle align with?

Q22. What is the evidence that the Earth has a magnetic field?

Q23. How is the Earth's magnetic field related to its core?

Q24. How can plotting the field lines help understand a magnet's field?

Q25. What pattern do magnetic field lines form around a bar magnet?

Q26. How can a magnetic field be mapped using a compass?

Q27. What happens to the direction of a compass needle near a magnet?

Q28. How can you describe the magnetic field between the poles of a magnet?

Q29. What do closely spaced magnetic field lines represent?

Q30. What do widely spaced magnetic field lines represent?

Q31. How can you show the direction of magnetic field lines in a diagram?

Q32. What is the difference between a magnetic field and a gravitational field?

Q33. Can magnetic materials become permanently magnetised? Explain.

Q34. How does distance from the magnet affect magnetic force?

Q35. Why does the force between a magnet and magnetic material not change with the poles?

Q36. How do you test which end of a magnet is the north pole?

Q37. Why do magnetic field lines never cross?

Q38. What happens when you break a bar magnet in two?

Q39. How can you make a magnet lose its magnetism?

Q40. Why do field lines go from north to south?

Q41. What happens to iron filings around a magnet?

Q42. What does the shape of the field lines indicate about a magnet's influence?

Q43. How can magnetic field lines help explain the direction of magnetic forces?

Q44. Why does a compass needle rotate when moved around a magnet?

Q45. How does the compass provide evidence for Earth's magnetic field?

Q46. Why do magnets not attract all metals?

Q47. Why is steel a better choice than iron for permanent magnets?

Q48. Why can magnets attract objects through paper or plastic?

Q49. How does the size of a magnet affect its magnetic field?

Q50. Can you shield a region from a magnetic field? If so, how?

Q51. State two ways to increase the strength of the magnetic field around a straight current-carrying wire.

Q52. Describe how you could use iron filings to show the magnetic field pattern around a current-carrying wire.

Q53. Explain why the magnetic field produced by a wire becomes weaker further from the wire.

Q54. Sketch and label the direction of magnetic field lines around a vertical wire carrying current upwards.

Q55. Why does coiling a wire into a solenoid amplify its magnetic field compared with a straight wire?

Q56. Describe the shape and direction of the magnetic field inside and outside a solenoid.

Q57. How does inserting an iron core into a solenoid affect its magnetic field strength, and why?

Q58. Give two advantages of using an electromagnet instead of a permanent magnet in industrial machinery.

Q59. A solenoid has 500 turns and carries 2 A. State two changes you could make to double the magnetic field at its centre.

Q60. Why is the magnetic field inside a long solenoid considered uniform?

Q61. Outline a method to reverse the polarity of an electromagnet quickly.

Q62. Explain how a relay uses the magnetic effect of a current to switch a high-current circuit.

Q63. What factors determine the magnetic flux density inside a solenoid?

Q64. Describe how Fleming's left-hand rule helps predict the direction of force on a current-carrying conductor in a magnetic field.

Q65. Identify the finger assignment for force, field, and current in Fleming's left-hand rule.

Q66. State the condition under which the equation $F = B\,I\,l$ applies to a conductor in a magnetic field.

Q67. Why does the force on a current-carrying wire become zero when the wire is parallel to the magnetic field?

Q68. How does doubling the current in a conductor affect the force it experiences in a uniform magnetic field?

Q69. A straight wire 0.08 m long carries 3 A at right angles to a 0.5 T field. Calculate the force on the wire.

Q70. Explain why iron cores are laminated in transformer electromagnets.

Q71. Describe how reversing the current direction in a motor coil affects the force on each side of the coil.

Q72. Why is soft iron preferred over steel for the core of an electromagnet used in MRI scanners?

Q73. How can you experimentally verify that the magnetic field strength around a solenoid is proportional to current?

Q74. Explain the role of commutators in a simple d.c. electric motor.

Q75. A conductor in a magnetic field experiences a constant force but does not move. Give two possible reasons.

Q76. Describe how a loudspeaker converts electrical signals into sound using electromagnetism.

Q77. Why must the magnetic field and current be perpendicular for maximum motor effect?

Q78. Give one industrial application that relies on the force exerted on a current-carrying conductor in a magnetic field.

Q79. Explain why increasing the length of wire in the magnetic field increases the force on the conductor.

Q80. How would you plot the magnetic field pattern around a solenoid using a small plotting compass?

Q81. Describe what would happen to the force on a conductor if the magnetic flux density were halved.

Q82. Suggest a safety precaution when demonstrating the magnetic effect of a large current in a laboratory.

Q83. Explain how an electric bell uses an electromagnet to produce sound.

Q84. What happens to the magnetic field inside a solenoid if alternating current is used instead of direct current?

Q85. Why does the iron core of an electromagnet remain magnetised only while current flows?

Q86. State two similarities between the magnetic field of a solenoid and that of a bar magnet.

Q87. Describe how magnetic field strength varies along the axis outside the ends of a solenoid.

Q88. Explain why a wire loop carrying current experiences a torque in a uniform magnetic field.

Q89. How can you increase the turning force in an electric motor without changing the current?

Q90. A 0.12 m conductor experiences a 0.36 N force in a 0.6 T field. Calculate the current flowing.

Q91. Why does reversing both the field direction and current direction leave the force direction unchanged?

Q92. Give one reason why superconducting coils are used in high-field electromagnets.

Q93. Explain how magnetic levitation trains use electromagnetic forces to reduce friction.

Q94. Describe the effect on magnetic field strength when two identical solenoids are placed end-to-end with currents in opposite directions.

Q95. Why does adding more turns per metre on a solenoid increase its magnetic flux density?

Q96. How can Fleming's left-hand rule be used to verify the correct wiring of a motor?

Q97. Suggest one design change to reduce eddy currents in an iron core used with an electromagnet.

Q98. Explain why the force on a current-carrying conductor is greatest at the poles of the magnet producing the field.

Q99. What feature of an electromagnet allows it to be switched on and off rapidly in industrial sorting machines?

Q100. Why is magnetic flux density measured in tesla rather than newtons per ampere-metre in practical calculations?

Q101. What causes a coil to rotate in an electric motor?

Q102. How does the motor effect create motion in an electric motor?

Q103. Why does a coil in a magnetic field experience a turning force when current flows?

Q104. How does the commutator help maintain continuous rotation in a simple electric motor?

Q105. What happens to the direction of rotation if the current in a motor coil is reversed?

Q106. Why does only one side of a coil move up while the other moves down in a magnetic field?

Q107. What role do brushes play in a basic electric motor?

Q108. How can you increase the speed of rotation in an electric motor?

Q109. Why is the force strongest on a coil when it is at 90° to the magnetic field?

Q110. What would happen if there were no magnetic field in a motor circuit?

Q111. How does a loudspeaker convert an electric signal into sound?

Q112. What causes the cone in a loudspeaker to vibrate?

Q113. How do changes in current affect the sound produced by a loudspeaker?

Q114. What part of the loudspeaker is responsible for producing pressure waves?

Q115. Why must the wire coil in a loudspeaker be placed in a magnetic field?

Q116. How does the frequency of the current affect the movement of a loudspeaker cone?

Q117. What would happen if the loudspeaker coil was fixed and could not move?

Q118. What is the function of the diaphragm in a headphone?

Q119. Why is the motor effect essential for a loudspeaker to function?

Q120. How does increasing the current through the coil affect the loudness of the sound?

Q121. What is meant by the generator effect?

Q122. How is a potential difference induced in a wire?

Q123. What two things can cause an induced current in a conductor?

Q124. Why is a current induced only when there is movement or change in the magnetic field?

Q125. What happens when a magnet is pushed into a coil of wire?

Q126. How does moving a conductor through a magnetic field generate electricity?

Q127. What is needed for an induced current to flow in a conductor?

Q128. How does the direction of motion affect the direction of the induced current?

Q129. What rule can be used to determine the direction of the induced current?

Q130. Why does an induced current oppose the motion that caused it?

Q131. How does Lenz's Law explain the direction of an induced current?

Q132. What happens to the induced current if the speed of movement is increased?

Q133. Why is a complete circuit required to produce an induced current?

Q134. What would happen if a conductor moved parallel to a magnetic field?

Q135. How does the strength of the magnetic field affect the size of the induced current?

Q136. What is the difference between the generator effect and the motor effect?

Q137. Why does the generator effect not occur when the conductor is stationary in a steady magnetic field?

Q138. How does a coil rotating in a magnetic field produce alternating current?

Q139. What changes in a coil's movement cause changes in the size of the induced potential difference?

Q140. What is the basic principle behind an alternator?

Q141. How does a dynamo differ from an alternator?

Q142. Why does a dynamo produce direct current?

Q143. Why does an alternator produce alternating current?

Q144. What kind of graph shows the output from an alternator?

Q145. What does the graph of a dynamo's output look like?

Q146. How can you increase the output voltage of an alternator?

Q147. What part of an alternator rotates to produce an induced potential difference?

Q148. What happens to the output if the coil in a generator spins faster?

Q149. Why does reversing the rotation of a generator coil reverse the output polarity?

Q150. How does the number of turns in a coil affect the output from a generator?

Q151. Explain how a moving-coil microphone uses the generator effect to produce an electrical signal.

Q152. Describe what happens inside a moving-coil microphone when sound waves hit the diaphragm.

Q153. Why is an iron core used in a transformer?

Q154. What is meant by the term "step-up transformer"?

Q155. What is meant by the term "step-down transformer"?

Q156. What happens to the voltage when a step-up transformer is used?

Q157. What happens to the voltage when a step-down transformer is used?

Q158. State the equation that links the potential differences and number of turns in the coils of a transformer.

Q159. A transformer has more turns on the secondary coil than on the primary. What effect does this have on the output voltage?

Q160. A transformer has fewer turns on the secondary coil than on the primary. What type of transformer is it?

Q161. Describe how an alternating current in the primary coil of a transformer induces a current in the secondary coil.

Q162. Why must the current in the primary coil of a transformer be alternating?

Q163. Explain what would happen if direct current was used in the primary coil of a transformer.

Q164. State the equation used to calculate the power in a transformer.

Q165. What assumption must be made about a transformer in order to use the equation $V_p \times I_p = V_s \times I_s$?

Q166. Explain why transformers are used in the transmission of electricity across long distances.

Q167. How does using a high voltage reduce energy losses during power transmission?

Q168. What is the role of a step-up transformer in the national grid?

Q169. What is the role of a step-down transformer in the national grid?

Q170. Describe the energy changes that take place in a transformer.

Q171. Why is the core of a transformer made from a magnetic material?

Q172. What is meant by the term "magnetic field"?

Q173. Why is it important that the core of a transformer is not made of a non-magnetic material?

Q174. A transformer has a primary voltage of 230V and a secondary voltage of 23V. What type of transformer is this?

Q175. How can you increase the voltage output of a transformer?

Q176. If a transformer has 100 turns on the primary coil and 500 on the secondary, what kind of transformer is it?

Q177. What happens to the current in the secondary coil of a step-up transformer if the voltage increases?

Q178. Why does increasing the current in power lines lead to energy loss?

Q179. Describe how transformers help reduce the cost of electricity transmission.

Q180. Explain why power stations use step-up transformers before sending electricity into the national grid.

Q181. Why are step-down transformers necessary before electricity enters homes?

Q182. In terms of energy transfer, why do we assume an ideal transformer has 100% efficiency?

Q183. How does the number of turns in a coil affect the voltage in that part of a transformer?

Q184. What safety advantages are there in reducing voltage before electrical energy enters homes?

Q185. A transformer supplies a device that needs 12V. What must be true about the transformer's secondary coil?

Q186. If Vs is greater than Vp, what must be true about ns and np?

Q187. A transformer is needed to power a 100W device from a 230V supply. What current must the transformer draw if it's 100% efficient?

Q188. What effect does increasing the number of turns on the secondary coil have in a step-up transformer?

Q189. How does a changing magnetic field in the transformer core induce voltage?

Q190. Why is it important that the magnetic field in a transformer constantly changes?

Q191. Why does a transformer not work with a battery?

Q192. If a transformer is 100% efficient, how does the power input compare to the power output?

Q193. What is the relationship between current and voltage in an ideal transformer?

Q194. What happens to current when voltage is increased by a step-up transformer?

Q195. A transformer increases voltage from 12V to 120V. What does this mean for the current in the secondary coil?

Q196. Explain how sound waves are converted into an electrical signal by a microphone.

Q197. What role does the coil play in a moving-coil microphone?

Q198. Why does the movement of the coil in a microphone create a current?

Q199. What causes the coil in a microphone to move?

Q200. In what way is a microphone an example of electromagnetic induction?