MEGA LECTURE

AQA (GCSE Notes)

Chapter 1: Energy

Q1. Describe the energy transfers that occur when an object is thrown vertically upwards.

Q2. What happens to the energy stored in an object when it falls freely under gravity?

Q3. Explain the changes in energy when a moving ball hits a wall and comes to a stop.

Q4. A person lifts a box from the floor to a shelf. Describe the energy changes in the system.

Q5. How does the energy store of a moving vehicle change when it brakes suddenly?

Q6. Describe the energy transfers that happen when you boil water in an electric kettle.

Q7. What energy changes occur when a ball is dropped from a height and bounces?

Q8. A car engine does work to speed up the car. Describe the changes in the way energy is stored.

Q9. Explain the energy transfers involved when a person pushes a trolley and it starts moving.

Q10. What are the energy changes when a child swings back and forth on a swing?

Q11. How is energy redistributed when a heater warms a room?

Q12. Explain what happens to energy when a light is turned on in a dark room.

Q13. Describe the changes in energy when a cyclist goes up a hill.

Q14. A ball is kicked across a flat field. What happens to its energy stores?

Q15. What energy transfers occur when a stretched elastic band is released?

Q16. Describe the energy changes when you slide a book across a table and it stops.

Q17. A roller coaster descends from the top of a track. What happens to its energy?

Q18. What energy changes occur when water is heated using a gas stove?

Q19. A battery powers a fan. Describe how the energy is transferred and stored.

Q20. Explain how energy is transferred and stored when an electric bulb is lit.

Q21. A person runs up a flight of stairs. Describe the energy changes that take place.

Q22. Describe the changes in energy when a kettle is switched off after boiling.

Q23. What energy changes occur when a spring is compressed by a force?

Q24. A pendulum swings to and fro. Explain the energy stores involved in each part of the motion.

Q25. A bus slows down as it approaches a traffic light. Describe the energy changes.

Q26. How is energy transferred when a person does a bungee jump?

Q27. What are the changes in energy when a metal rod is heated at one end?

Q28. A toy car is wound up and released. Describe the energy transfers.

Q29. What happens to energy when a person jumps into a swimming pool?

Q30. A rock is rolled up a slope. Explain the energy changes involved.

Q31. Describe the energy transfers when a mobile phone is charged.

Q32. What happens to the energy when an electric motor lifts a weight?

Q33. A student pushes a box across the floor at constant speed. Describe the energy transfers.

Q34. What are the energy changes when a torch is switched on?

Q35. Explain the energy redistribution when a kettle is used to heat water and some energy is lost to the surroundings.

Q36. A parachutist jumps from a plane. What happens to the energy stores during the fall?

Q37. Describe the changes in energy when an electric bell rings.

Q38. What happens to the energy when a balloon rises and then pops?

Q39. A stretched spring is released. Explain how energy is transferred.

Q40. What energy transfers occur when a hot pan is placed in cold water?

Q41. Describe the energy changes when a cyclist brakes going downhill.

Q42. A moving car crashes into a barrier. What are the energy changes in this situation?

Q43. Explain how energy is transferred when a current flows through a resistor.

Q44. What are the energy changes when a ball rolls down a ramp?

Q45. Describe how energy is redistributed when a machine lifts and then drops a weight.

Q46. What happens to energy when a light bulb is left on in a room?

Q47. Explain the energy transfers when an electric heater warms a metal rod.

Q48. A fan is powered by a battery. Describe the way energy is stored and transferred.

Q49. What energy changes occur when a battery is used to power a motor that lifts an object?

Q50. Describe how energy is redistributed in a system when a person slides down a slide.

Q51. Calculate the kinetic energy of a 1200 kg car moving at 20 m/s.

Q52. A 5 kg object is lifted to a height of 10 m. Calculate the gravitational potential energy gained.

Q53. How much elastic potential energy is stored in a spring with spring constant 150 N/m when extended by 0.3 m?

Q54. A cyclist and bicycle together have a mass of 80 kg and are moving at 10 m/s. Calculate their kinetic energy.

Q55. A spring stretches 0.25 m when a force is applied. The spring constant is 200 N/m. Calculate the energy stored.

Q56. An object of mass 2 kg is dropped from a height of 15 m. Calculate the gravitational potential energy at the top.

Q57. A van with a mass of 2500 kg moves at 15 m/s. Work out its kinetic energy.

Q58. A 70 kg person climbs 3.5 m up a staircase. Find the gravitational potential energy gained.

Q59. A spring with a spring constant of 100 N/m is stretched 0.4 m. Calculate the elastic potential energy.

Q60. A ball of mass 0.5 kg is travelling at 8 m/s. Calculate the kinetic energy of the ball.

Q61. How high must a 3 kg object be lifted to gain 90 J of gravitational potential energy?

Q62. A compressed spring stores 36 J of energy. Its spring constant is 300 N/m. Calculate its extension.

Q63. A 600 kg roller coaster car is at the top of a 25 m hill. Calculate its gravitational potential energy.

Q64. A lorry of mass 4000 kg is moving at 12 m/s. Calculate its kinetic energy.

Q65. A spring with spring constant 75 N/m is compressed by 0.2 m. Calculate the energy stored.

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Q66. An object falls from a height of 20 m. Its mass is 2.5 kg. Calculate the potential energy lost.

Q67. A ball with a kinetic energy of 18 J is moving at 3 m/s. Find its mass.

Q68. A spring stores 9 J of energy when stretched. Its spring constant is 120 N/m. Find the extension.

Q69. A 2 kg stone is thrown upwards at 6 m/s. Calculate its kinetic energy.

Q70. A diver with a mass of 65 kg climbs to a 10 m platform. Calculate the gravitational potential energy at the top.

Q71. A metal block of mass 3 kg is heated from 20°C to 80°C. Calculate the thermal energy gained if the specific heat capacity of the metal is 450 J/kg°C.

Q72. A 2 kg substance cools down from 75°C to 25°C. Its specific heat capacity is 380 J/kg°C. Calculate the energy released.

Q73. A copper block of mass 1.5 kg is heated and absorbs 2700 J of energy. If the specific heat capacity of copper is 385 J/kg°C, calculate the temperature change.

Q74. Calculate the mass of a substance that absorbs 9600 J of thermal energy when its temperature rises by 20°C. Its specific heat capacity is 400 J/kg°C.

Q75. A metal block of unknown specific heat capacity is heated by 5000 J, causing its temperature to rise by 25°C. The mass of the block is 4 kg. Calculate its specific heat capacity.

Q76. A 10 kg object is heated and gains 15000 J of energy. If its temperature increased by 15°C, find its specific heat capacity.

Q77. A student heats a sample and measures a temperature increase of 30°C after supplying 7200 J of energy. The sample has a mass of 2 kg. Calculate the specific heat capacity.

Q78. How much energy is required to heat 5 kg of water by 25°C? The specific heat capacity of water is 4200 J/kg°C.

Q79. A 3 kg aluminium block is cooled from 90°C to 30°C. Calculate the energy lost. The specific heat capacity of aluminium is 900 J/kg°C.

Q80. A 0.5 kg block is supplied with 1800 J of energy and its temperature increases by 12°C. Find the specific heat capacity.

Q81. A kettle heats 2 kg of water from 20°C to 100°C. Calculate the total thermal energy required.

Q82. How much energy is transferred when 4 kg of oil is cooled from 80°C to 40°C, if the specific heat capacity is 2100 J/kg°C?

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Q83. A student investigates the thermal energy needed to heat 1.2 kg of glass by 50°C. The specific heat capacity of glass is 840 J/kg°C. Calculate the energy needed.

Q84. A 6 kg object requires 7200 J to raise its temperature by 10°C. Find its specific heat capacity.

Q85. An electric heater supplies 1500 J of energy to a 0.5 kg sample. The temperature increases by 5°C. Calculate the specific heat capacity.

Q86. A scientist cools a 2.5 kg material and measures a drop in temperature from 100°C to 60°C. If 10,000 J of energy is released, find the specific heat capacity.

Q87. How much energy is released when a 1.2 kg block is cooled from 50°C to 10°C? The specific heat capacity is 500 J/kg°C.

Q88. A 1 kg block is heated with a power supply for 5 minutes. If the energy supplied is 6000 J and the temperature change is 20°C, find the specific heat capacity.

Q89. A machine transfers 300 J of energy every 2 seconds. Calculate the power of the machine.

Q90. A motor does 5000 J of work in 25 seconds. Calculate the power.

Q91. A device uses 900 J in 10 seconds. What is the power output of the device?

Q92. A machine works at 200 W power. How much energy does it transfer in 30 seconds?

Q93. An electric heater transfers 7200 J in 60 seconds. Calculate its power rating.

Q94. How much time is required for a 150 W device to transfer 4500 J of energy?

Q95. A 2 kW kettle boils water in 3 minutes. How much energy is transferred?

Q96. A person lifts weights using 600 J of energy in 4 seconds. Calculate the power used.

Q97. A 100 W bulb is on for 2 hours. How much energy does it use in joules?

Q98. A car engine produces 500000 J of work in 50 seconds. What is the power output of the engine?

Q99. A drill operates at 120 W. How long does it take to do 3600 J of work?

Q100. A power tool uses 18000 J in 60 seconds. Calculate the power of the tool.

Q101. A washing machine uses 2000 W of power. How much energy does it use in 5 minutes?

Q102. A crane lifts a load using 60000 J of energy in 20 seconds. Calculate its power.

Q103. A microwave uses 900 W. How much energy does it transfer in 45 seconds?

Q104. What happens to the total energy in a closed system when energy is transferred between stores?

Q105. Give an example of energy transfer in a closed system and explain why the total energy remains unchanged.

Q106. When a moving object comes to a stop, how is its kinetic energy transferred and where is it stored?

Q107. Describe how energy is dissipated when a phone charger warms up during use.

Q108. Explain what is meant by ‘wasted energy’ with an example from a household appliance.

Q109. Why is the energy transferred to the thermal store of surroundings considered less useful?

Q110. A pendulum swings in a vacuum. How does this demonstrate energy transfer in a closed system?

Q111. How is energy transferred and dissipated when a light bulb is turned on?

Q112. What role does friction play in unwanted energy transfers in machines?

Q113. How can lubrication reduce energy losses in a moving mechanical system?

Q114. Why is insulation used in hot water pipes?

Q115. Describe how cavity wall insulation reduces unwanted energy transfers in a building.

Q116. Explain why carpets and curtains help keep a house warm in winter.

Q117. Describe two ways to reduce energy loss through windows.

Q118. What properties should a good insulating material have?

Q119. What is the relationship between thermal conductivity and the rate of heat transfer?

Q120. How does wall thickness affect the rate of cooling of a building?

Q121. Why do materials with high thermal conductivity cool down or heat up quickly?

Q122. A house has thick walls made from low thermal conductivity material. What does this mean for heat transfer?

Q123. Give an example of a material with low thermal conductivity and explain its use in homes.

Q124. Why do thin metal walls allow heat to escape more quickly than thick brick walls?

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Q125. What is meant by efficiency in the context of energy transfer?

Q126. State the equation to calculate efficiency using energy values.

Q127. State the equation to calculate efficiency using power values.

Q128. How is efficiency expressed as a percentage?

Q129. An appliance uses 2000 J of energy and transfers 1400 J usefully. Calculate its efficiency as a decimal.

Q130. An electric motor has a total power input of 500 W and a useful output of 350 W. Calculate its efficiency as a percentage.

Q131. Why can't any machine be 100% efficient?

Q132. In an electric fan, where is most of the wasted energy transferred?

Q133. A bulb is 25% efficient. What happens to the other 75% of the energy?

Q134. How can the efficiency of a machine be increased?

Q135. Describe a method to reduce energy losses in an electric motor.

Q136. What is the advantage of using LED lights over filament bulbs in terms of efficiency?

Q137. Why are modern kettles more energy efficient than older ones?

Q138. How do double-glazed windows reduce energy transfer?

Q139. What is the purpose of foil-backed radiators in a home?

Q140. How can reducing air drafts improve the efficiency of heating a room?

Q141. What is the main reason energy is dissipated in power tools?

Q142. Describe one change in appliance design that increases energy efficiency.

Q143. Explain how loft insulation slows down the rate of heat loss in a house.

Q144. Why does wrapping a hot water tank in insulation help retain energy?

Q145. An electric heater transfers 4000 J in 10 s but only 3200 J is useful. Calculate efficiency as a decimal.

Q146. An engine has 800 W input and 640 W useful output. Calculate its efficiency as a percentage.

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Q147. What is meant by ‘useful output energy’ in an energy transfer?

Q148. Why is energy that warms the air usually considered wasted?

Q149. What two factors must be considered when choosing wall materials for energy efficiency?

Q150. Suggest two ways schools can reduce unwanted energy transfers during winter.

Q151. What is meant by a renewable energy resource?

Q152. What is a non-renewable energy resource? Give two examples.

Q153. List three fossil fuels and explain why they are considered non-renewable.

Q154. Give two examples of renewable energy resources and explain why they are renewable.

Q155. What energy resource is produced from decaying plant and animal material?

Q156. Name the energy resource that uses moving air to generate power.

Q157. Which energy resource uses heat from underground rocks?

Q158. Which energy resource is powered by the gravitational pull of the Moon?

Q159. Name two energy resources that depend on water movement.

Q160. Why is the Sun considered the ultimate source for most renewable energy?

Q161. Which energy resource relies on splitting atoms?

Q162. What is the main use of petrol and diesel?

Q163. Which energy resources are commonly used for electricity generation?

Q164. What energy resources are mainly used for heating in homes?

Q165. Compare the use of gas and solar panels for home heating.

Q166. Which energy resources are currently used in vehicles?

Q167. What is the environmental impact of burning coal?

Q168. Why is carbon dioxide a problem when released from fossil fuel combustion?

Q169. How does nuclear energy affect the environment during operation?

Q170. What is one major environmental risk of nuclear power?

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Q171. Why is wind power considered environmentally friendly?

Q172. How does hydro-electric power affect local wildlife?

Q173. Describe an environmental disadvantage of using bio-fuels.

Q174. Why can large-scale solar farms cause land use problems?

Q175. Explain how tidal power could affect marine ecosystems.

Q176. What makes geothermal energy a clean source of energy?

Q177. Which energy resources are most reliable for constant electricity supply?

Q178. Why can wind and solar energy be unreliable?

Q179. How does energy demand vary with time of day and season?

Q180. Why is it important to have a mix of energy resources?

Q181. Describe one social issue related to the location of wind farms.

Q182. Give an example of a political reason why a country might choose fossil fuels over renewables.

Q183. Why might economic reasons slow down the switch to renewable energy?

Q184. How do ethical views affect decisions about nuclear energy?

Q185. What is the trend in the UK's use of coal over the past 50 years?

Q186. How has the use of renewable energy in the UK changed in recent years?

Q187. Why has gas become more popular than coal for electricity generation?

Q188. What role do energy storage systems play in managing supply?

Q189. Explain why transport is harder to switch to renewable energy than electricity generation.

Q190. What are the benefits of using electric vehicles instead of petrol cars?

Q191. Why might developing countries rely more on non-renewable resources?

Q192. How can government policies help reduce fossil fuel use?

Q193. Why is international cooperation important for solving energy issues?

Q194. How can science help identify environmental issues from energy use?

Q195. Why can science not always solve energy-related problems?

Q196. Explain how public opinion can affect the choice of energy resources.

Q197. Why is nuclear waste a long-term issue?

Q198. How does mining for fossil fuels damage the environment?

Q199. What is the impact of oil spills on marine life?

Q200. Suggest one way to reduce energy use in transport.