GCSE AQA Physics Calculation Practice Paper 1

For every question: **write out (rearranged) equation → substitute in values → calculate answer**

Section A – Recall Equations

Q1 a) Write down the equation that links force, work done and distance (along the line of action of the force).

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b) A force of 25 N is used to push a trolley over a distance of 3 m. Calculate the work done.

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c) A force of 15 N is used to pull a window blind shut.
Calculate the distance the blind is pulled when 14 J of work are done.

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d) A toy car moves a distance of 30 m when its motor does 230 J of work.
Calculate the force required to move the car.

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Q2 a) Write down the equation that links mass, kinetic energy and velocity.

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b) Calculate the kinetic energy of the car of mass 450 kg and velocity 4.2 m/s.

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c) The car of mass 450 kg gains 3600 J of kinetic energy.
Calculate by how much the velocity of the car increases.

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d) A second car also gains 3600 J of kinetic energy but it speeds up by 5 m/s.
Calculate the mass of the car.

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Q3 a) Write down the equation that links gravitational potential energy, gravitational field strength, mass and height.

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b) Calculate the gravitational potential energy of a 12kg box at a height of 2.5m above the floor.
gravitational field strength = 9.8 N/kg

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c) The 12kg box is lifted further so it now has 882 J of gravitational potential energy.
Calculate the new height of the box above the floor.
gravitational field strength = 9.8 N/kg

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d) A second box is at a height of 8.5 m and has 400 J of gravitational potential energy.
Calculate the mass of the second box.
gravitational field strength = 9.8 N/kg

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Q4 a) Write down the equation that links power, energy transferred (work done) and time taken.

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b) A motor is used to drive a toy car. The motor transfers 200 J of energy in 20 s.
Calculate the power of the motor.

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c) The motor is then used to transfer 1200 J of energy as it lifts a weight.
Use the power you calculated in part b) to calculate the time it takes the motor to lift the weight.

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d) Calculate the amount of energy the motor can transfer in 1 min.
Again, use the power you calculated in part b).

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Q5 a) A solar panel is able to output 120 kJ of electrical energy for every 200 kJ of light energy that it collects from the Sun. Calculate the efficiency of the solar panel.

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b) An improved panel has an efficiency of 0.75. Calculate the electrical energy output that 80 kJ of light energy will generate.

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c) A new solar panel has an efficiency of 0.8
Calculate the amount of light energy required for it to produce 1200 J of electrical energy.

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Q6 a) A wind turbine has an efficiency of 0.45.
Calculate the power output when the power input is 25 kW.

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b) Calculate the power input required for the same wind turbine to output of 35 kW.

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c) An improved wind turbine can output a power of 45 kW when the input power is 80 kW.
Calculate the efficiency of the improved turbine.

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Q7 a) Write down the equation that links current, charge flow and time.

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b) A light bulb draws a current of 0.12 A from a battery.
Calculate the amount of charge that flows through the bulb in 2 min.

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c) A bulb that draws a current of 0.12 A is connected to a battery that can supply 21.6 C of charge.
Calculate how long the bulb will stay lit.

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d) A charge of 240 C passes through a bulb in 30 s.
Calculate the current drawn by the bulb.

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Q8 a) Write down the equation that links potential difference, current and resistance.

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b) A toaster draws a current of 11.5 A from the mains which has a potential difference of 230 V.
Calculate the resistance of the toaster.

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c) A lamp has a resistance of 80 Ω.
Calculate the current it will draw from the 230V mains supply.

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d) An electric heater in a lorry has a resistance of 1.2 Ω. It draws a current of 20 A.
Calculate the potential difference of the lorries electrical supply.

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Q9 a) Write down the equation that links potential difference, current and power.

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b) Calculate the power of a motor that operates with a potential difference of 30 V and draws a current of 5 A.

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c) A 2.5 kW kettle is connected to the 230 V mains supply.
Calculate the current drawn by the kettle.

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d) In the USA a 1500 W kettle draws a current of 12.5 A.
Calculate the potential difference of the electrical supply in the USA.

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Q10 a) Write down the equation that links power, current and resistance.

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b) Calculate the power of a street lamp with a resistance of 25 Ω as it draws a current of 4 A.

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c) Calculate the resistance of a toaster with a power of 2000W that draws a current of 8.7 A

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d) A hair drier with a power of 1200 W that has a resistance of 44 Ω.
Calculate the current drawn by the hair drier.

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Q11 a) Write down the equation that links energy transferred, charge flow and potential difference.

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b) A heater operates at a potential difference of 12 V.
Calculate the energy transferred as 120 C of charge flow through the heater.

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c) A lamp operates at a potential difference of 230 V.
Calculate the charge flow as the lamp transfers 20 kJ of electrical energy.

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d) The motor in a blender transfers 200 J of electrical energy as a charge of 1.67 C flows through it.
Calculate the potential difference the blender is operating at.

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Q12 a) Write down the equation that links mass, volume and density.

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b) Calculate the density of a box of mass 200kg and volume 0.85 m^3

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c) Air has a density of 1.2 kg/m^3
Calculate the mass of air in a small room that measures 3m x 4m x 2.5m

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d) Gold has a density of 19 g/cm^3
Calculate the volume of 1 kg of gold.

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Section B – Provided Equations

Q13 **elastic potential energy = 0.5 x spring constant x (extension)^2**

a) A spring with a spring constant of 12 N/m was stretched from a length of 12cm to a length of 25cm. Calculate the elastic potential energy stored in the spring.

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b) As a piece of elastic was extended by 0.12 m its elastic potential energy store increased by 25.2mJ. Calculate the spring constant of the elastic.

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c) A spring of initial length 25cm and spring constant 12 N/cm has an elastic potential energy store of 150 J. Calculate the stretched length of the spring.

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Q14 **change in thermal energy = mass x specific heat capacity x temperature change**

a) A metal block of specific heat capacity 380 J/kg°C and mass 2.5 kg was heated from 20°C to 85°C. Calculate the change in thermal energy of the block.

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b) Calculate the temperature change when 200 kJ of thermal energy is transferred to 1.2 kg of water. The specific heat capacity of water is 4200 J/kg°C.

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c) A container of water was supplied with 50 MJ of thermal energy.
The temperature of the water increased from 20°C to 45°C.
The specific heat capacity of water is 4200 J/kg°C.
Calculate the mass of water in the container.

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Q15 **thermal energy for a change of state = mass x specific latent heat**

a) Calculate the energy change when 0.4 kg of ice is melted without any change in temperature. The specific latent heat of fusion of water is 334,000 J/kg

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b) Calculate the mass of water at 100°C that can be turned to steam at 100 °C by 1 MJ of thermal energy. The specific latent heat of vaporisation of water is 2.26 MJ/kg

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c) A can containing 0.45kg of solid wax at its melting point was heated until the wax had just melted. The thermal energy supplied to the wax was measured as 250 kJ
Calculate the specific latent heat of the wax.

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Q16 **For gases: pressure x volume = constant**

a) A balloon contains 0.02 m^3 of helium at a pressure of 100kPa
Calculate the volume of the balloon when the pressure is 12KPa

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b) A gas cylinder of volume 0.12 m^3 can supply 2.4 m^3 of oxygen at an atmospheric pressure of 101 kPa. Calculate the pressure inside the cylinder.

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