GCSE AQA Physics Calculation Practice Paper 2

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

Section A – Recall Equations

Q1 a) Write down the equation that links the moment of a force, force and the distance (normal to the direction of the force)

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b) A force of 30 N is applied to a spanner of length 0.25 m. Calculate the moment of the force.

_____

c) A nut on a car wheel requires a moment of 120 Nm loosen it.
Calculate the force that will need to be applied to a spanner of length 0.3 m to loosen the nut.

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d) If the maximum force that can be applied to loosen the same nut is 240 N how long must the spanner be in order to loosen it?

_____

Q2 a) Write down the equation that links speed, time and distance travelled.

_____

b) A cat runs after a ball. It travels a distance of 4.0 m in a time of 2.5 s.
Calculate the speed of the cat.

_____

c) Calculate how long would it take the cat to cover a distance of 91 m at a speed of 7 m/s.

_____

d) The cat walks at 0.9 m/s. Calculate how far can it walk in 5 min.

_____

Q3 a) Write down the equation that links acceleration, change in velocity and time taken.

_____

b) During an overtaking manoeuvre a car accelerates from 12m/s to 18m/s over a time of 1.2 s. Calculate the acceleration of the car during the manoeuvre.

_____

c) When breaking the car can accelerate at -20 m/s^2.
Calculate the time it would take the car to come to a stop from a speed of 45 m/s.

_____

d) Calculate the final speed of a car that is initially travelling at 16 m/s and then accelerates at 6 m/s^2 for 3.4s

_____

Q4 a) Write down the equation that links mass, weight and gravitational field strength.

_____

b) Calculate the weight of a rock with mass of 5kg on the surface of Mars.
The gravitational field strength on Mars is 3.8 N/kg.

_____

c) A rover has a weight of 5500 N on Mars. Calculate the mass of the rover.

_____

d) A boulder on the surface of Mars's moon Phobos has a mass of 2300 kg and a weight of 13.8 N. Calculate the gravitational field strength on the surface of Phobos.

_____

Q5 a) Write down the equation that links the force applied to a spring, its spring constant and extension.

_____

b) A spring with a spring constant of 20N/cm is stretched from a length of 25 cm to a length of 40 cm. Calculate the force applied to the spring.

_____

c) Calculate the extension of spring with spring constant 20 N/m when a force of 12 N is applied.

_____

d) A different spring required a force of 30 N to compress it by 4 cm. Calculate its spring constant.

_____

Q6 a) Write down the equation that links mass, resultant force and acceleration.

_____

b) A car of mass 800 kg accelerates at 3 m/s.
Calculate the resultant force acting on the car.

_____

c) Calculate the acceleration of the 800 kg car when a resultant force of 2.4 kN is applied to it.

_____

d) A second car accelerates at 2.4 m/s^2 when the resultant force acting on it is 1560 N.
Calculate the mass of the car.

_____

Q7 a) Write down the equation that links mass, momentum and velocity.

_____

b) Calculate the momentum of a 800kg car travelling at 4.5 m/s.

_____

c) A car with momentum of 2500 kgm/s has a velocity of 4 m/s
Calculate the mass of the car.

_____

d) A second car also has a momentum of 2500 kgm/s but a mass of 650 kg.
Calculate the velocity of the car.

_____

e) A car of mass 450 kg and velocity 4.2 m/s runs into the back of a stationary car of mass 350kg.
Calculate the velocity of the two cars as they move together after the collision.

_____

Q8 a) Write down the equation that links pressure, force and area.

_____

A cube shaped box of weight 300 N and sides of length 0.2 m rests on the floor.

b) Calculate the area of each face of the box. _____

c) Calculate the pressure the box exerts on the floor in N/m^2

_____

d) The box can withstand a pressure of 12000 N/m^2 on its top surface.
Calculate the weight the box can support.

_____

e) A second box has a weight of 80 N and exerts a pressure of 320 N/m^2 on the floor.
Calculate the area of contact the box makes with the floor.

_____

Q9 a) Write down the equation that links wave speed, frequency and wavelength.

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b) A loudspeaker produces sound waves with a frequency of 2000 Hz and a wavelength of 0.15 m.
Calculate the speed of the sound waves.

_____

c) Ultrasound travels through body tissue at 1200 m/s.
An ultrasound scanner produces sound waves with a frequency of 200 kHz.
Calculate the wavelength of the ultrasound waves.

_____

d) The speed of electromagnetic waves through air is 3.0×10^8 m/s
A radio transmitter transmits at 102.3 MHz. Calculate the wavelength of the radio waves.

_____

Section B – Equations Provided

Q10 **(final velocity)^2 – (initial velocity)^2 = 2 x acceleration x distance**

a) A hammer was dropped on the Moon from a height of 1.4 m above the surface.
The acceleration due to gravity on the Moon is 1.6 m/s^2
Calculate the velocity of the hammer as it hits the surface.

_____

_____

b) A car accelerates at 2.5 m/s^2 from an initial velocity of 4 m/s to a final velocity of 22 m/s.
Calculate the distance travelled during this acceleration.

_____

_____

c) A van accelerates from a standing start at a rate of 1.2 m/s^2 over a distance of 250m.
Calculate the final velocity of the van.

_____

_____

Q11 **force = change in momentum / time taken**

a) A toy car of mass 0.25 kg accelerates from a standing start to 3 m/s in a time of 0.45 s.

i) Calculate the change on momentum of the toy car. _____

ii) Calculate the resultant force acting on the toy car.

_____

b) A rabbit of mass 0.65 kg jumps, from a standing start, with a force of 45 N that lasts for 0.12 s.

i) Calculate the change in momentum of the rabbit. _____

ii) Calculate the resulting velocity of the rabbit._____

Q12 **pressure due to a column of liquid = height x density of liquid x gravitational field strength**

a) Calculate the pressure at the bottom of a water tank containing 2.4 m depth of water.
Density of water = 1000 kg/m^3 Gravitational field strength = 9.8 N/kg

_____

b) A mercury barometer contains a column of mercury 760 mm high supported by an atmospheric pressure of 101 kPa. Gravitational field strength = 9.8 N/kg
Calculate the density of mercury.

_____

c) Calculate the height of the mercury column in the barometer if the pressure drops to 97 kPa.

_____

Q13 **period = 1 / frequency**

a) Calculate the period of waves with the following frequencies.

i) 500 Hz _____

ii) 340kHz_____

b) Calculate the frequency of waves with the following periods.

i) 0.0025 s _____

ii) 200 μs _____

Q14 **magnification = image height / object height**

a) A telescope is used to observe a bird of height 22 cm.
The image of the bird it produces appears to be 5.5 m high.
Calculate the magnification.

_____

b) A camera lens forms an image of a 1.8 m tall person on its sensor that is 9 mm tall.
Calculate the magnification.

_____

Q15 **force on a conductor carrying a current = magnetic flux density x current x length**

a) A wire of length 0.25 m is carrying a current of 250 mA in a magnetic field of 2.4 T.
Calculate the force on the wire.

_____

b) A wire of length 2m experiences a force of 0.012 N when it carries a current of 2.5 A.
Calculate the strength of the magnetic field the wire is passing through.

_____

c) A wire with a current of 0.2 A feels a force of 0.55 N in a magnetic field on 200mT.
Calculate the length of the wire.

_____

Q16 **potential difference across primary coil / potential difference across secondary coil = number of turns in primary coil / number of turns in secondary coil**

a) A transformer with a primary coil of 240 turns and a secondary coil od 360 turns is connected to a supply with a potential difference of 230 V. Calculate the potential difference across the secondary coil.

_____

b) a) A transformer with a primary coil of 340 turns is required to step up the mains potential difference of 230 V up to 2500 V. Calculate the number of turns on the secondary coil required.

_____

Q17 **potential difference across primary coil x current in primary coil = potential difference across secondary coil x current in secondary coil**

a) A 230 V mains transformer provides an output from the secondary coil that has a potential difference of 12 V and a current of 3.5 A. Calculate the current drawn by the primary coil.

_____

b) A transformer with a potential difference of 230V across the primary coil and a current of 2.2 A in the primary coil generates a potential difference of 4 V in the secondary coil. Calculate the current in the secondary coil.

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