cookie

Practice paper

GCSE Physics Higher, practice paper 2 (AQA style)

In the style of AQA GCSE Physics (8463) Paper 2 Higher

Practice paper written by cookie in the style of AQA GCSE Physics (8463) Paper 2 Higher. Not an AQA paper; not affiliated with or endorsed by AQA.

Time allowed: 1 hour 45 minutes

Total marks: 100

Name _____

Instructions

- This is a practice paper written by cookie in the style of AQA GCSE Physics Paper 2 Higher. It is not an AQA paper.
- Topics: forces; waves; magnetism and electromagnetism; space physics.
- Answer all questions in the spaces provided.
- You may use a calculator.
- In all calculations, show clearly how you work out your answer, and give the unit where asked.
- The equations sheet is printed at the end of the paper. Equations not on the sheet must be recalled.
- Take the gravitational field strength, g, to be 9.8 N/kg.
- The maximum mark for this paper is 100. The marks for each part are shown in brackets.
- Questions marked with 6 marks are extended responses: you will be assessed on your ability to give a clear, logically structured answer.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this paper is 100.
- An equations sheet is on the last page.

Do it online, timed and marked:
cookie.education/past-papers/gcse/cookie/physics-aqa-style

Answer all questions in the spaces provided.

0 1 This question is about forces.

0 1 . 1 Which of these quantities is a vector? Choose one answer.

A distance ☐

B mass ☐

C speed ☐

D displacement ☐

[1 mark]

0 1 . 2 A child pulls a sledge across flat snow. The child pulls the sledge forwards with a horizontal force of 46 N. A friction force of 18 N acts on the sledge in the opposite direction. Determine the resultant force on the sledge. Give its size and its direction.

[2 marks]

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0 1 . 3 The child pulls the sledge a distance of 25 m with the 46 N force. Calculate the work done by the child on the sledge.

[2 marks]

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0 1 . 4 Two children sit on a see-saw that is pivoted at its centre. Child A has a weight of 320 N and sits 1.5 m from the pivot. Child B has a weight of 400 N and sits on the other side of the pivot. The see-saw is balanced. Calculate the distance of child B from the pivot. Ignore the weight of the see-saw.

[3 marks]

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0 2 A student investigated how the extension of a spring depends on the force applied to it. She hung the spring from a clamp, fixed a pointer to the bottom of the spring and measured the length of the spring with a vertical metre ruler. She added 1.0 N weights one at a time. The table shows her results.

Force in N	**0.0**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**
Length of spring in cm	12.0	14.5	17.0	19.5	22.0	24.5	27.6

0 2 . 1 Use the results to calculate the spring constant of the spring, in N/m.

[3 marks]

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0 2 . 2 The spring went past its limit of proportionality during the investigation. Identify the force at which the limit of proportionality had been exceeded. Use data from the table to explain your answer.

[2 marks]

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0 2 . 3 Calculate the work done in stretching the spring when the force on it was 4.0 N. Use the equations sheet.

[2 marks]

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0 2 . 4 Suggest why the student read the position of the pointer with her eye level with the pointer.

[1 mark]

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0 2 . 5 When the 6.0 N of weights were removed, the length of the spring was 12.4 cm. Which word describes how the spring was deformed? Choose one answer.

A elastic ☐

B inelastic ☐

C proportional ☐

D compressive ☐

[1 mark]

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0 3 This question is about Newton's laws of motion.

0 3 . 1 A student wants to investigate how the acceleration of a trolley depends on the resultant force acting on it. The student has a trolley, a long bench, a pulley, string, a set of slotted masses on a hanger, and two light gates connected to a data logger. Describe a method the student could use. Your method should keep the mass of the system constant, and explain how the results would show the relationship.

[6 marks]

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0 3 . 2 The weight of the trolley is the gravitational force of the Earth on the trolley. Which force forms a Newton's third law pair with the weight of the trolley? Choose one answer.

A the normal contact force of the bench on the trolley ☐

B the gravitational force of the trolley on the Earth ☐

C the tension in the string ☐

D the friction force of the bench on the trolley ☐

[1 mark]

0 3 . 3 A skydiver jumps from a high aircraft and falls for some time before opening the parachute. Explain why the skydiver reaches a terminal velocity.

[3 marks]

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0 4 This question is about motion and stopping distances. A tram accelerates away from a stop along a straight track. The table shows how its velocity changed with time.

Time in s	**0**	**2**	**4**	**6**	**8**	**10**	**12**
Velocity in m/s	0.0	3.0	6.0	9.0	11.0	12.0	12.0

0 4 . 1 The acceleration of the tram from 0 s to 6 s was uniform. Calculate the acceleration of the tram from 0 s to 6 s.

[2 marks]

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0 4 . 2 Determine the distance the tram travelled from 0 s to 6 s.

[2 marks]

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0 4 . 3 A car is travelling at 24 m/s. The driver sees a hazard ahead. The driver's reaction time is 0.70 s. Calculate the thinking distance.

[2 marks]

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0 4 . 4 The car then brakes with a constant deceleration of 6.0 m/s^2 until it stops. Calculate the stopping distance of the car. Use the equations sheet.

[3 marks]

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0 4 . 5 Give one factor that could increase the driver's reaction time.

[1 mark]

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0 5 This question is about momentum.

0 5 . 1 Write down the equation that links mass (m), momentum (p) and velocity (v).

[1 mark]

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0 5 . 2 A railway truck of mass 2400 kg moves along a straight, level track at 3.5 m/s. It collides with a stationary truck of mass 1800 kg, and the two trucks couple together. Calculate the velocity of the two trucks just after the collision. Assume the trucks form a closed system.

[3 marks]

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0 5 . 3 A footballer kicks a stationary ball of mass 0.43 kg. The ball leaves the footballer's foot at 18 m/s. The foot is in contact with the ball for 0.012 s. Calculate the average force of the foot on the ball. Use the equations sheet.

[3 marks]

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0 5 . 4 A cycle helmet contains a layer of foam that crushes in a collision. Explain how the foam reduces the risk of injury to the cyclist's head in a collision.

[3 marks]

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0 6 This question is about pressure in fluids. Take the density of sea water to be 1030 kg/m^3.

0 6 . 1 A diver swims 12 m below the surface of the sea. Calculate the pressure due to the sea water at this depth. Use the equations sheet.

[2 marks]

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0 6 . 2 Explain why the pressure due to the water is greater at greater depths.

[2 marks]

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0 6 . 3 An object is fully under water. Explain why there is an upwards force (upthrust) on the object.

[2 marks]

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0 6 . 4 A solid block of weight 30 N is held completely under water. The upthrust on the block is 42 N. The block is then released. Give the size and direction of the resultant force on the block just after it is released.

[1 mark]

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0 7 This question is about waves. A student used a ripple tank to investigate water waves. A vibrating bar made waves on the water surface, and a lamp above the tank showed the wave crests as bright lines on a sheet of paper below.

0 7 . 1 Which of these is a longitudinal wave? Choose one answer.

A light ☐

B sound ☐

C a ripple on water ☐

D microwaves ☐

[1 mark]

0 7 . 2 The student counted 12 waves passing a point on the paper in 8.0 s. Calculate the frequency of the waves.

[1 mark]

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0 7 . 3 The distance from the 1st bright line to the 11th bright line was 18 cm. Each bright line shows one wave crest. Calculate the speed of the waves. Give your answer in m/s.

[3 marks]

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0 7 . 4 Explain why the student measured the distance across ten wavelengths, instead of measuring one wavelength.

[1 mark]

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0 7 . 5 A ray of light passes from air into a glass block. It strikes the block at an angle to the normal. Explain, in terms of wave fronts, why the light changes direction as it enters the glass.

[3 marks]

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0 7 . 6 Ultrasound is used to make images of organs inside the body. A pulse of ultrasound is sent into the body. It is partly reflected at the boundary of an organ, and the reflected pulse is detected 0.13 ms after the pulse was sent. The speed of ultrasound in soft tissue is 1540 m/s. Calculate the depth of the boundary below the skin.

[3 marks]

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0 8 This question is about electromagnetic waves.

0 8 . 1 Give one use of microwaves and one use of infrared radiation.

[2 marks]

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0 8 . 2 All electromagnetic waves travel at 3.0×10^8 m/s in air. A radio station broadcasts at a frequency of 98.4 MHz. Calculate the wavelength of the radio waves.

[2 marks]

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0 8 . 3 A student investigated how the type of surface affects the infrared radiation it emits. She filled a metal cube with hot water. Each vertical face of the cube had a different surface. She held an infrared detector close to each face in turn. The table shows her results. Which surface is the best emitter of infrared radiation? Give one variable the student should keep the same.

Surface	Reading on the detector (arbitrary units)
matt black	92
shiny black	78
matt white	55
shiny silver	21

[2 marks]

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0 8 . 4 Over a long period, the average temperature of a planet stays the same. Explain this in terms of the radiation the planet absorbs and emits.

[2 marks]

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0 8 . 5 A convex lens is used as a magnifying glass to look at an insect 1.4 cm long. The image of the insect is 4.2 cm long. Calculate the magnification. Use the equations sheet.

[2 marks]

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0 9 This question is about magnetism and electromagnetism.

0 9 . 1 A student makes an electromagnet by wrapping insulated wire around a wooden rod and connecting the wire to a battery. Give two ways the student could make the electromagnet stronger.

[2 marks]

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0 9 . 2 A wire 12 cm long carries a current of 2.5 A. The wire is at right angles to a magnetic field of flux density 0.040 T. Calculate the force on the wire. Use the equations sheet.

[2 marks]

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0 9 . 3 Fleming's left-hand rule is used to find the direction of the force on the wire. What does the first finger represent in Fleming's left-hand rule? Choose one answer.

A the current ☐

B the force on the wire ☐

C the magnetic field ☐

D the potential difference ☐

[1 mark]

0 9 . 4 An alternator is a generator that produces an alternating potential difference. It has a coil that rotates in a magnetic field. Explain how the alternator produces an alternating potential difference.

[3 marks]

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0 9 . 5 A transformer in a phone charger changes the 230 V mains supply to 12 V. The primary coil has 4600 turns. Calculate the number of turns on the secondary coil. Use the equations sheet.

[2 marks]

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0 9 . 6 The current in the secondary coil is 2.3 A. Assume the transformer is 100% efficient. Calculate the current in the primary coil. Use the equations sheet.

[2 marks]

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10 This question is about space physics.

1 0 . 1 Describe the life cycle of a star that is much more massive than the Sun. Your answer should include how the star forms and what happens at the end of its life.

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1 0 . 2 A satellite moves in a stable circular orbit around the Earth at a constant speed. Explain why the velocity of the satellite is changing even though its speed is constant.

[2 marks]

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1 0 . 3 The satellite is moved into a different stable circular orbit in which it moves faster. How is the radius of the new orbit different from the radius of the old orbit?

[1 mark]

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1 0 . 4 Light from distant galaxies shows red-shift. Explain how observations of red-shift support the Big Bang theory.

[3 marks]

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END OF QUESTIONS

Equations sheet

pressure due to a column of liquid = height of column × density of liquid × gravitational field strength ($p = h \rho g$)

(final velocity)^2 − (initial velocity)^2 = 2 × acceleration × distance ($v^2 - u^2 = 2 a s$)

force = change in momentum ÷ time taken ($F = m \Delta v \div \Delta t$)

elastic potential energy = 0.5 × spring constant × (extension)^2 ($Ee = ½ k e^2$)

period = 1 ÷ frequency ($T = 1 \div f$)

magnification = image height ÷ object height

force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length ($F = B I l$)

potential difference across primary coil ÷ potential difference across secondary coil = number of turns in primary coil ÷ number of turns in secondary coil ($Vp \div Vs = np \div ns$)

potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil ($Vp\ Ip = Vs\ Is$)