cookie

Practice paper

GCSE Physics Higher, practice paper 1 (AQA style)

In the style of AQA GCSE Physics (8463) Paper 1 Higher

Practice paper written by cookie in the style of AQA GCSE Physics (8463) Paper 1 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 1 Higher. It is not an AQA paper.
- Topics: energy; electricity; particle model of matter; atomic structure.
- 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 energy stores.

0 1 . 1 Which energy store increases when a spring is stretched? Choose one answer.

A chemical ☐

B elastic potential ☐

C kinetic ☐

D nuclear ☐

[1 mark]

0 1 . 2 Write down the equation that links gravitational field strength (g), gravitational potential energy (Ep), height (h) and mass (m).

[1 mark]

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0 1 . 3 A climber of mass 62 kg climbs a vertical height of 18.0 m. Calculate the increase in the climber's gravitational potential energy store. Give your answer to 3 significant figures.

[2 marks]

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0 1 . 4 A ball of mass 0.058 kg is dropped from a height of 2.4 m. Assume that no energy is transferred to the surroundings. Calculate the speed of the ball just before it hits the ground. Give your answer to 2 significant figures.

[3 marks]

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0 1 . 5 A toy launcher contains a spring with a spring constant of 160 N/m. When the spring is compressed, it stores 0.72 J of elastic potential energy. Calculate the compression of the spring. Use the equations sheet. Give your answer in metres.

[3 marks]

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0 2 An electric motor is used to lift loads on a building site. Later in the question, a government compares two ways of generating electricity; the table gives information about them.

Feature	**Gas-fired power station**	**Offshore wind farm**
Maximum power output in MW	900	900
Average output as a percentage of maximum	55	40
Time to start generating from cold	about 30 minutes	depends on the wind
Carbon dioxide released while generating	yes	none
Fuel cost	changes with the price of gas	none

0 2 . 1 Write down the equation that links efficiency, total input energy transfer and useful output energy transfer.

[1 mark]

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0 2 . 2 The motor lifts a load of mass 15 kg through a vertical height of 4.0 m in 8.0 s. The input power to the motor is 120 W. Calculate the efficiency of the motor.

[4 marks]

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0 2 . 3 Describe one way the efficiency of the motor could be increased. Give a reason for your answer.

[2 marks]

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0 2 . 4 Evaluate the use of the gas-fired power station and the offshore wind farm for generating the country's electricity. Use the information in the table and your own knowledge.

[4 marks]

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0 3 A student measured the specific heat capacity of aluminium. The student used an aluminium block of mass 1.00 kg with two holes in it. An electric heater was placed in one hole and a thermometer in the other. An ammeter measured the current through the heater and a voltmeter measured the potential difference across it. The heater was switched on for 10.0 minutes. The table shows the temperature of the block every 2 minutes.

Time in minutes	**0**	**2**	**4**	**6**	**8**	**10**
Temperature in °C	19.5	25.2	31.2	37.3	43.4	49.5

0 3 . 1 The potential difference across the heater was 12.0 V and the current was 4.0 A. Calculate the power of the heater.

[2 marks]

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0 3 . 2 Calculate the energy transferred by the heater in 10.0 minutes.

[2 marks]

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0 3 . 3 Calculate the specific heat capacity of aluminium using the student's results. Use the equations sheet. Give the unit.

[3 marks]

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0 3 . 4 The accepted value for the specific heat capacity of aluminium is 900 J/kg °C. Explain why the student's value is higher than the accepted value.

[2 marks]

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0 3 . 5 An electric kettle heats 0.80 kg of water from 20 °C to 95 °C. The specific heat capacity of water is 4200 J/kg °C. The power of the kettle is 2.2 kW. Calculate the minimum time taken. Give your answer to 3 significant figures.

[3 marks]

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0 4 A circuit contains a 12 V battery, a switch, an ammeter and two resistors, all connected in series. Resistor R1 has a resistance of 4.0 Ω and resistor R2 has a resistance of 8.0 Ω. A voltmeter is connected across R2. Assume the potential difference of the battery stays at 12 V.

0 4 . 1 Which statement about this circuit is correct? Choose one answer.

A The current in R1 is greater than the current in R2. ☐

B The current is the same in R1 and R2. ☐

C The potential difference across R1 is equal to the potential difference across R2. ☐

D The total resistance of the circuit is less than 4.0 Ω. ☐

[1 mark]

0 4 . 2 Calculate the reading on the voltmeter.

[3 marks]

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0 4 . 3 The switch is closed for 2.5 minutes. Calculate the charge that flows through the battery in this time.

[2 marks]

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0 4 . 4 Calculate the energy transferred by the battery in this time.

[2 marks]

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0 4 . 5 A third resistor is connected in parallel with R2. Explain what happens to the reading on the ammeter.

[2 marks]

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0 5 A student investigated how the current in a filament lamp depends on the potential difference across it. The table shows the results.

Potential difference in V	**0.0**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**
Current in A	0.00	0.20	0.32	0.40	0.46	0.51	0.55

0 5 . 1 Write down the equation that links current (I), potential difference (V) and resistance (R).

[1 mark]

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0 5 . 2 Calculate the resistance of the lamp when the potential difference across it is 6.0 V. Give your answer to 2 significant figures.

[3 marks]

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0 5 . 3 The resistance of the lamp at 2.0 V is 6.25 Ω. Explain why the resistance of the lamp increases as the potential difference across it increases.

[3 marks]

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0 5 . 4 Describe a method the student could use to investigate how the length of a wire affects its resistance. Describe the circuit in words.

[6 marks]

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0 6 This question is about mains electricity, the National Grid and static electricity.

0 6 . 1 Mains electricity in the UK is an alternating current supply. Give the frequency and the potential difference of the UK mains supply.

[2 marks]

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0 6 . 2 What colour is the insulation on the earth wire in a UK three-core cable? Choose one answer.

A blue ☐

B brown ☐

C green and yellow stripes ☐

D grey ☐

[1 mark]

0 6 . 3 A transmission cable has a resistance of 2.5 Ω. The current in the cable is 400 A. Calculate the power transferred by heating the cable.

[2 marks]

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0 6 . 4 Explain why the National Grid transmits electricity at a very high potential difference.

[3 marks]

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0 6 . 5 A student rubs a polythene rod with a cloth. The rod becomes negatively charged. Explain how the rod becomes negatively charged and why the cloth becomes positively charged.

[3 marks]

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0 7 This question is about the particle model of matter.

0 7 . 1 A student wants to find the density of a small, irregularly shaped stone. Describe how the student could measure the volume of the stone using a displacement (eureka) can and a measuring cylinder.

[3 marks]

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0 7 . 2 The stone has a mass of 54.0 g and a volume of 20.0 cm^3. Calculate the density of the stone in kg/m^3.

[3 marks]

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0 7 . 3 A kettle boils away 0.12 kg of water. The specific latent heat of vaporisation of water is 2.26×10^6 J/kg. Calculate the energy needed. Use the equations sheet. Give your answer to 2 significant figures.

[2 marks]

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0 7 . 4 Explain, using the particle model, why the pressure of a gas in a sealed container increases when the temperature of the gas increases.

[3 marks]

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0 7 . 5 A sealed syringe contains 240 cm^3 of air at a pressure of 100 kPa. The plunger is pushed in slowly until the volume is 80 cm^3. The temperature of the air does not change. Calculate the new pressure of the air. Use the equations sheet.

[2 marks]

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0 8 This question is about radioactive decay. In nuclear notation, the mass number is written at the top left of the symbol and the atomic number at the bottom left. The table shows how the activity of a sample of a radioactive isotope changes with time.

Time in hours	**0**	**2**	**4**	**6**	**8**	**10**
Activity in Bq	1600	1131	800	566	400	283

0 8 . 1 Radon-222 decays by emitting an alpha particle and forms polonium (Po). Complete the nuclear equation by giving the mass number and atomic number of the polonium nucleus: $^{222}_{86}Rn \rightarrow ?Po + {}^{4}_{2}He$

[2 marks]

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0 8 . 2 Carbon-14, $^{14}_{6}C$, decays by emitting a beta particle and forms nitrogen (N). Write the nuclear equation for this decay.

[2 marks]

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0 8 . 3 Describe what happens in the nucleus when a beta particle is emitted.

[2 marks]

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0 8 . 4 Use the table to determine the half-life of the isotope.

[1 mark]

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0 8 . 5 Calculate the activity of the sample after 24 hours.

[2 marks]

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0 9 This question is about uses and hazards of nuclear radiation. A doctor needs a radioactive isotope to use as a medical tracer. The isotope will be injected into a patient so that an organ can be imaged by a detector outside the body. The table shows four isotopes the doctor could use.

Isotope	Type of radiation emitted	Half-life
W	alpha	6 hours
X	gamma	6 hours
Y	gamma	30 years
Z	beta	14 days

0 9 . 1 Evaluate which isotope, W, X, Y or Z, is the most suitable to use as the tracer. Use the information in the table and your knowledge of alpha, beta and gamma radiation.

[6 marks]

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0 9 . 2 Explain the difference between radioactive contamination and irradiation.

[2 marks]

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0 9 . 3 Nuclear fission is used in nuclear power stations. Describe how a chain reaction happens in nuclear fission.

[3 marks]

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END OF QUESTIONS

Equations sheet

elastic potential energy = 0.5 × spring constant × (extension)^2 ($E_e = \frac{1}{2} k e^2$)

change in thermal energy = mass × specific heat capacity × temperature change ($\Delta E = m c \Delta\theta$)

thermal energy for a change of state = mass × specific latent heat ($E = m L$)

for a fixed mass of gas at a constant temperature: pressure × volume = constant ($p V$ = constant)