AQA GCSE Physics | 8463

SPECIFICATION POINT 4.7.3.3

Microphones (HT only)

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**3**
Available paper years	**2019–2024**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.7.3.3 Microphones (HT only)

Answer 01 · Mark scheme June 2019 | 8463/2H | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9.1	chicken	allow a correct answer indicated in Table 3 provided the answer space in blank	1	AO3
9.2	2×10^{-6}		1	AO1/1 4.5.6.1.2 WS4.4
9.3		an answer 0.025 (m) scores **4** marks		AO2/1 4.6.1.5 4.5.6.1.2
	time = 8μs = 8×10^{-6} (s) or 4 × their answer to 9.2	subsequent marks may be scored if the number of squares is miscounted or t = 2μs is used	1	
	distance = ½ × 6300 × 8×10^{-6}	allow 8×10^{3} or 8×10^{-3} or 8×10^{-9} for 8×10^{-6}	1	
	distance = 0.0252 (m)	allow a correctly calculated answer using 8×10^{3} or 8×10^{-3} or 8×10^{-9}	1	
	distance = 0.025 (m)	allow a calculated value correctly rounded to 2 sig figs an answer 0.050 (m) scores **3** marks an answer 0.05 or 0.0504 (m) scores **2** marks	1	
9.4	to convert (the pressure variations in) sound (waves) into variations in current / p.d	allow electrical signal for variations in current / p.d. do not accept amplifies sound	1	AO1/1 4.7.3.3

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Answer 01 · Mark scheme

June 2019 | 8463/2H | Original Q9

9.5	sound (waves) cause the diaphragm to vibrate the diaphragm causes the coil / wire to vibrate the coil / wire moves through the magnetic field **or** the coil / wire cuts magnetic field lines a potential difference is induced (across the ends of the coil / wire)	diaphragm moves is insufficient do not accept moves the coil / wire up and down if m.p.1 and m.p.2 do not score, allow sound (waves) cause the coil / wire to vibrate for **1** mark allow induced current for induced p.d.	1 1 1 1	AO1/1 4.7.3.3
Total			**11**	

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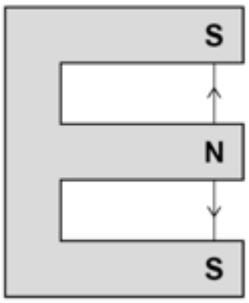
Answer 02 · Mark scheme

June 2023 | 8463/2H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	current **or** potential difference	allow charge flow	1	AO1 4.7.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2			1	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	an induced magnet is a material that becomes a magnet when it is placed in a magnetic field **or** an induced magnet loses most / all of its magnetism (quickly) when removed from a magnetic field	allow ‘when close to another magnet’ for ‘when it is placed in a magnetic field’ allow ‘no magnets are nearby’ for ‘removed from a magnetic field’ ‘temporary magnet’ alone is insufficient	1	AO1 4.7.1.1

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Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	motor effect		1	AO1 4.7.2.2 4.7.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	16 mA = 0.016 A	allow 1.6×10^{-2} (A)	1	AO2 4.7.2.2
	$0.013 = B \times 0.016 \times 6.5$	allow correct substitution using incorrectly / not converted current	1	
	$B = \frac{0.013}{0.016 \times 6.5}$	allow correct re-arrangement using incorrectly / not converted current	1	
	$B = 0.125$ (T)	allow correct calculation using incorrectly / not converted current allow 0.13 (T)	1	

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Answer 02 · Mark scheme

June 2023 | 8463/2H | Original Q4

Question	Answers	Mark	AO / Spec. Ref.
04.6	**Level 2**: Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3-4	AO3 4.6.1.4
	Level 1: Relevant features are identified and differences noted.	1-2	
	No relevant content	0	
	Indicative content: • for all three people, the minimum sound level that can be heard increases as frequency increases **Age** • the minimum sound level that can be heard increases with age • between 2000 and 3000 Hz the minimum sound level that can be heard increases more in **B** compared to **C** • **C** has very little variation in the minimum sound level that can be heard at all frequencies **Working in a loud environment:** • increases the minimum sound level that can be heard at all frequencies above 2000 Hz compared to working in a quiet environment • the minimum sound level that can be heard increases more as frequency increases from 2000 to 4000 Hz compared to working in a quiet environment • doesn't affect the minimum sound level that can be heard at 2000 Hz to access **level 2** the answer must include at least **one** comparison for age **and one** comparison for working in a loud environment, using supporting data/information from the graph		

Total Question 4	**12**

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Answer 03 · Mark scheme

June 2024 | 8463/2H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	generator (effect)	allow electromagnetic induction	1	AO1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	wire cuts through the magnetic field (between the magnets) a potential difference was <u>induced</u> (across the wire) as it was part of <u>complete circuit</u> (there was a current in the circuit)		1 1 1	AO1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	the needle will deflect to –0.4 mA		1	AO3 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	(the pressure variations in) the sound (waves) cause the diaphragm to vibrate the diaphragm causes the coil / wire to vibrate (the coil repeatedly changes direction) <u>inducing</u> an alternating current (in the circuit)	allow air particles collide with diaphragm causing it to vibrate diaphragm moves is insufficient do not accept moves the diaphragm up and down do not accept moves the coil / wire up and down if MP1 and MP2 do not score, allow sound (waves) cause the coil / wire to vibrate for **1** mark	1 1 1	AO1 4.7.3.3

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Answer 03 · Mark scheme

June 2024 | 8463/2H | Original Q8

Total Question 8	**8**

4.7.3.3 Microphones (HT only)

Answer 01 · Examiner comments June 2019 | 8463/2H | Original Q9

Question 9 (Standard and standard/high and high demand)

09.1 Just over 80% of the students correctly chose ‘chicken’.

09.2 Just over 60% of the students gave the correct answer.

09.3 Whilst only just over 7% of the students gave the correct value of 0.025 m as their final answer, there were a whole host of alternative wrong answers that gained at least one mark. Many students did not appear to realise that the distance between the pulses showed the time taken for the ultrasound to travel to the crack in the aluminium and back; others appeared to misinterpret the third pulse as the crack in the aluminium and not the edge of the block. A significant proportion of the students made no attempt to give their calculated answer to 2 significant figures.

09.4 Only just over 13% of the students were able to give the function of a microphone. Most incorrect answers were in terms of amplifying sound. Some answers referred to converting sound into a current but did not indicate that the current would be varying.

09.5 Nearly half of the students scored zero or did not attempt the question. Only around 3% of the students gave a clear, complete and correct answer. The idea that the sound waves would cause the diaphragm and coil to vibrate was often given but so were vague terms such as ‘moves’. Many students described the motor effect, starting with a current and eventually producing sound from the diaphragm. There were also answers that included referred to spinning coils, electromagnets, split-ring commutators, reversing magnetic fields and occasionally primary and secondary coils.

Answer 02 · Examiner comments June 2023 | 8463/2H | Original Q4

04.1

31% of students gained this mark. Many students responded with a selection of random Physics terms.

04.2

74% of students recognised the direction of the magnetic field.

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Answer 02 · Examiner comments

June 2023 | 8463/2H | Original Q4

04.3

51% of students knew what an induced magnet is. Responses sometimes confused magnets and magnetic materials. Most correct answers were to do with placing a material into a field to become a magnet, compared with removing the material from the field.

04.4

88% of students knew that it is the motor effect that causes the coil to move..

04.5

46% of students scored all 4 marks for this calculation. There were a wide variety of incorrect conversions of mA, which gained 3 out of the 4 marks.

04.6

Most students were able to make generic statements about how age and environment affect hearing. 35% of students were able to use the data in the graph to support their statements. Some responses just gave information about person A, B and C, without any comparisons. Students did not use the patterns in the graph to back up conclusions. There was some confusion over sensitivity, and a number tried to explain the variables to the extent that the response became incorrect. Examples of this included saying that a higher minimum sound level shows better hearing.
A proportion of the responses mentioned ideas about being "used to a loud sound" so "could hear loud sounds better" and younger people not having had the experience of a full range of frequencies due to their age. Alternatively, the idea that being in a quiet environment means you can only hear quiet sounds was another misunderstanding which was often seen.

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Answer 03 · Examiner comments June 2024 | 8463/2H | Original Q8

08.1
Just under 50% of students were able to identify this as the generator effect. Common errors were ‘motor effect’ or ‘motor and generator effect’.

08.2
Well answered for a normally difficult topic about the generator effect. 8% of students scored all 3 marks and 37% gained at least 1 mark. Many failed to explain that the wire was cutting the magnetic field lines or thought there was already a current in the wire.

08.3
80% of students were able to work out which way the ammeter needle would deflect.

08.4
The students' understanding of the operation of a microphone was often good, although some did describe the operation of a speaker. Knowledge of the term 'inducing' was widespread although many students failed to appreciate that an alternating current was induced in the circuit. Some students did not appreciate the longitudinal nature of sound waves and described oscillations in the wrong direction as a result. Most students attempted this item, although a thorough knowledge and understanding of the principles was not always evident in their answers. Only 4% achieved full marks, but 49% scored at least one mark.

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Answer 03 · Examiner comments

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Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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