Zig Zag Education

Physics AS and A Level | AQA | 7407/7408

Revision Grids
for AS and A Level Year 1
AQA Physics
Sections 1 and 2

zigzageducation.co.uk **POD 8075**

Contents

Teacher's Introduction

These Revision Grids are a tool designed to help you deliver **A Level AQA Physics Section 3.1: Measurements and Their Errors** and **Section 3.2: Particles and Radiation**. The concept is that your students are assigned a set of pages to read from their notes or a textbook, possibly for homework, and then asked to complete the relevant Revision Grids. These activities may be particularly useful for your weaker learners, who may benefit from both the requirement to read all the notes to find the information and the act of writing the answers down.

The grids are designed to ask questions in sufficient detail that your students are able to study the relevant sections and find the correct answers. Completed grids are provided so that your students' answers can be marked or checked. It may also be useful to hand them out to students during their revision to assist them with answers they do not know.

Advantages of using these Revision Grids are:

- Some students will find this method of studying of great value, particularly if they find it difficult to absorb information in class.
- Resulting grids contain a bullet point summary that may be useful for revision.
- They are an easy to set yet valuable homework.
- They are a useful catch-up tool to help students who have missed a lesson.
- They can be used as a basis for cover lessons that require minimal preparation and no interaction from the cover teacher.
- They are an independent learning resource.

This resource directly references:

AQA Physics A Level Year 1 Student Book;
2nd edition;
Breithaupt;
Oxford, 2015

AQA A Level Physics Year 1 and AS Student Book ;
Kelly;
HarperCollins, 2015

AQA A Level Physics Student Book 1 (AQA A level Science);
England, Davenport, Pollard, Thomas;
Hodder Education, 2015

You may want to photocopy the sheets onto A3 paper, particularly for students with reading or writing difficulties.

Selected Question and Answer Pages

For demonstration only, the sample answer pages immediately follow their corresponding question pages

	Questions	Answers		
3.1.1 Use of SI units and their prefixes	**Convert 0.0004 m into:** **a) cm** **b) mm** **c) μm**	**a)**	**b)**	**c)**
	Convert 1 cm^3 into: **a) m^3** **b) mm^3**	**a)**	**b)**	
	Convert 2000 mm^2 into: **a) cm^2** **b) m^2 – give your answer in standard form**	**a)**	**b)**	
	Convert 50 m s^{-1} into km h^{-1}.			
	Convert 0.5 m^3 into: **a) cm^3** **b) mm^3 – give your answer in standard form**	**a)**	**b)**	

	Questions	Answers		
3.1.1 Use of SI units and their prefixes	**Convert 0.0004 m into:** **a) cm** **b) mm** **c) μm**	**a)** $(\times 100) = 0.04$ cm	**b)** $(\times 1000) = 0.4$ mm	**c)** $(\times 10^6) = 400$ μm
	Convert 1 cm^3 into: **a) m^3** **b) mm^3**	**a)** 1×10^{-6} m^3 or 0.000001 m^3	**b)** 1×10^3 mm^3 or 1000 mm^3	
	Convert 2000 mm^2 into: **a) cm^2** **b) m^2 – give your answer in standard form**	**a)** $(\div 10^2) = 20$ cm^2	**b)** $(\div 1000^2) = 2 \times 10^{-3}$ m^2	
	Convert 50 m s^{-1} into km h^{-1}.	$\frac{50 \div 1000}{1 \div 3600} = 180$ km h^{-1}		
	Convert 0.5 m^3 into: **a) cm^3** **b) mm^3 – give your answer in standard form**	**a)** 5×10^5 cm^3 or 500 000 cm^3	**b)** 5 × 1(	

	Questions	Answers
3.1.2 Limitations of physical measurements	**A digital voltmeter was used to measure the voltage across a component. The voltage was measured to be 10.0 V.** **a) Write down the uncertainty in the measurement.** **b) Calculate the percentage uncertainty in the voltage.**	**a)** **b)**
	Resistance is calculated using the equation: $$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$ **The voltage was measured to be 5.2 V using a voltmeter with an uncertainty of ±0.1 V. The current was measured to be 0.9 A using an ammeter with an uncertainty of ±0.1 A.** **Calculate the percentage uncertainty of the resistance.**	
	Power can be calculated using the equation: $$\text{power} = \text{current} \times \text{voltage}$$ **The voltage was measured to be 9.6 V using a voltmeter with an uncertainty of ±0.1 V. The current was measured to be 8.6 A using an ammeter with an uncertainty of ±0.1 A.** **Calculate the percentage uncertainty of the power.**	

3.1.2 Limitations of physical measurements	Questions	Answers
	A digital voltmeter was used to measure the voltage across a component. The voltage was measured to be 10.0 V. **a) Write down the uncertainty in the measurement.** **b) Calculate the percentage uncertainty in the voltage.**	**a)** The uncertainty in the measurement is ±0.1 V. **b)** The percentage uncertainty is: $\text{percentage uncertainty} = \frac{0.1}{10} \times 100\ \% = 1\ \%$
	Resistance is calculated using the equation: $\text{resistance} = \frac{\text{voltage}}{\text{current}}$ **The voltage was measured to be 5.2 V using a voltmeter with an uncertainty of ±0.1 V. The current was measured to be 0.9 A using an ammeter with an uncertainty of ±0.1 A.** **Calculate the percentage uncertainty of the resistance.**	Percentage uncertainty in the voltage: $percentage\ uncertainty = \frac{0.1}{5.2} \times 100\ \% = 1.9\ \%$ Percentage uncertainty in the current: $percentage\ uncertainty = \frac{0.1}{0.9} \times 100\ \% = 11.1\ \%$ Percentage uncertainty in the resistance: $percentage\ uncertainty = 1.92 + 11.11 = 13.0\ \%$
	Power can be calculated using the equation: $\text{power} = \text{current} \times \text{voltage}$ **The voltage was measured to be 9.6 V using a voltmeter with an uncertainty of ±0.1 V. The current was measured to be 8.6 A using an ammeter with an uncertainty of ±0.1 A.** **Calculate the percentage uncertainty of the power.**	Percentage uncertainty in the voltage: $percentage\ uncertainty = \frac{0.1}{9.6} \times 100\ \% = 1.0\ \%$ Percentage uncertainty in the current: $percentage\ uncertainty = \frac{0.1}{8.6} \times 100\ \% = 1.2\ \%$ Percentage uncertainty in the power: $percentage\ uncertainty = 1.04 + 1.16 = 2.2\ \%$

	Questions	Answers
3.2.2.4 Wave–particle duality	**a) What evidence is there for the wave nature of particles?** **b) How does this phenomenon show the wave nature?**	**a)** **b)**
	What evidence is there for the particle nature of waves?	
	State what is meant by wave–particle duality.	
	What is meant by the de Broglie wavelength?	
	Calculate the de Broglie wavelength of: **a) an electron moving at 4.8×10^5 m s^{-1}** **b) a 1200 kg car moving at 10 m s^{-1}**	**a)** **b)**

3.2.2.4 Wave–particle duality

Questions	Answers
a) What evidence is there for the wave nature of particles? **b) How does this phenomenon show the wave nature?**	**a)** Electron diffraction **b)** Particles are unable to diffract; however, waves can diffract when they move through a gap or obstacle whose size is comparable to its wavelength.
What evidence is there for the particle nature of waves?	The photoelectric effect.
State what is meant by wave–particle duality.	Particles of matter have both a wave nature and a particle nature.
What is meant by the de Broglie wavelength?	The wave-like behaviour of a particle of matter has a property called a de Broglie wavelength, which is given by: $$\lambda = \frac{h}{mv}$$ where λ is the de Broglie wavelength, h is Planck's constant and mv is momentum.
Calculate the de Broglie wavelength of: **a) an electron moving at 4.8×10^5 m s^{-1}** **b) a 1200 kg car moving at 10 m s^{-1}**	$\lambda = \frac{h}{p} = \frac{h}{mv}$ **a)** $\lambda = \frac{6.63 \times 10^{-34}}{9.11 \times 10^{-31} \times 4.8 \times 10^5} = 1.5 \times 10^{-9}\text{m} = 1.5\text{ nm}$ **b)** $\lambda = \frac{6.63 \times 10^{-34}}{1200 \times 10} = 5.5 \times 10^{-38}\text{ m}$

Additional Selected Question Pages

3.2 Particles and Radiation

Oxford: pp. 4–29 Collins: pp. 24–81 Hodder: pp. 1–41

3.2.1.1 Constituents of the atom

Question	Answer
Describe the simple model of the atom.	
The element fluorine can be described using the notation: $^{19}_{9}F$ **State the number of protons, neutrons and electrons.**	
Complete the table:	see table A
Complete the table:	see table B
Write down an equation used to calculate specific charge.	

Table A:

Particle	Relative Charge (e)	Relative Mass (u)
Proton		
Neutron		
Electron		

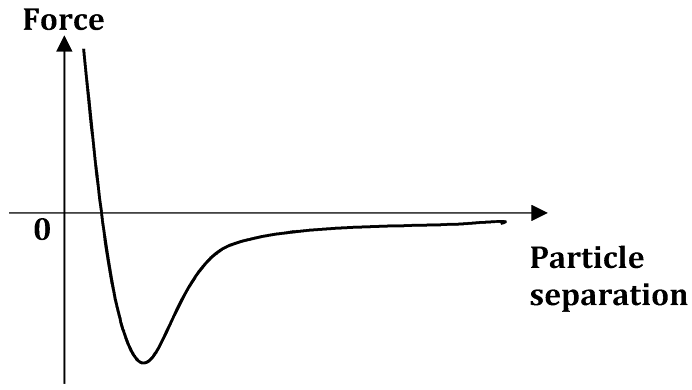
Table B:

Particle	Charge (C)	Mass (kg)
Proton		
Neutron		
Electron		

	Question	Answer		
3.2.1.1 Constituents of the atom	**Calculate the specific charge of:** **a) a proton** **b) an electron**	**a)** **b)**		
	Calculate the specific charge of: **a) a $^{12}_{6}C$ nucleus** **b) an alpha particle** **c) an O^{2-} ion of the $^{16}_{8}O$ nucleus**	**a)**	**b)**	**c)**
	Calculate the charge of an ion with a specific charge of 9.58×10^{7} C kg^{-1} and a mass of 1.67×10^{-27} kg.			
	Calculate the mass of an ion of charge 3.20×10^{-19} C and a specific charge of 1.20×10^{7} C kg^{-1}			

	Question	Answer	
3.2.1.1 Constituents of the atom	$^{A}_{Z}X$ What is represented by: a) A? b) Z?	a)	b)
	Why does an atom have zero charge?		
	What is a nucleon?		
	What are isotopes?		
	Element X has a relative abundance of 40 % of the isotope with mass 14 u and a relative abundance of 60 % of the isotope with mass 15 u. Calculate the relative atomic mass.		

Oxford: pp. 6–7 Collins: pp. 31–38, 73–75 Hodder: pp. 6–10

	Questions	Answers
3.2.1.2 Stable and unstable nuclei	What is the strong nuclear force and what is its importance?	
	Describe how the strong nuclear force changes with range. Label the graph opposite with significant values and regions to show this.	
	What does alpha radiation consist of?	
	State a way in which alpha particles could be detected in the lab.	
	What is beta radiation?	