FREE REVISION PACK

Diffraction & Diffraction Gratings

AQA A-level Physics · 7407 / 7408 · Specification 3.3.2.2

Easy Medium Hard **Multiple choice · past-paper questions**

8	8	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Wavelength from a third-order line	AQA June 2018 · A-level Paper 1 · Q17	1 mark
2	Easy	Highest order from a grating	AQA June 2019 · AS Paper 2 · Q19	1 mark
3	Easy	White light through a single slit	AQA June 2016 · AS Paper 2 · Q15	1 mark
4	Medium	Widening a single slit	AQA June 2023 · A-level Paper 1 · Q17	1 mark
5	Medium	Wavelength from the angle between second orders	AQA November 2020 · A-level Paper 1 · Q19	1 mark
6	Medium	Total number of maxima	AQA June 2022 · A-level Paper 1 · Q21	1 mark
7	Hard	Lines per mm from screen measurements	AQA June 2018 · AS Paper 2 · Q18	1 mark
8	Hard	Angle between the two second-order maxima	AQA June 2017 · AS Paper 2 · Q27	1 mark

Key ideas to have ready

- Single slit: a wide central maximum, twice the width of the fainter side maxima. A wider slit or a shorter wavelength gives a narrower central maximum.
- With white light the central maximum is white and the side fringes are coloured, because each wavelength diffracts by a different amount.
- Grating: $d \sin\theta = n\lambda$, where $d = 1 \div$ (lines per metre). The highest order is the largest whole number $n \leq d / \lambda$.
- Total number of maxima = $2n_{max} + 1$ (both sides plus the zero order).

How to use this pack

1. The questions are grouped into levels (Easy, Medium and Hard). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in AQA's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

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Easy

Definitions and one-step ideas. Most students get these right.

Questions 1–3

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

AQA June 2018 · A-level Paper 1 · Q17

1 A diffraction grating has 500 lines per mm. When monochromatic light is incident normally on the grating the third-order spectral line is formed at an angle of 60° from the normal to the grating.

What is the wavelength of the monochromatic light?

[1 mark]

A 220 nm ⬭

B 580 nm ⬭

C 960 nm ⬭

D 1700 nm ⬭

AQA June 2019 · AS Paper 2 · Q19

2 Monochromatic electromagnetic radiation of wavelength 5.8×10^{-7} m is incident normally on a diffraction grating with 3.0×10^{5} lines per metre.

What is the highest order maximum produced?

[1 mark]

A 5 ⬭

B 6 ⬭

C 10 ⬭

D 13 ⬭

AQA June 2016 · AS Paper 2 · Q15

3 White light passes through a single narrow slit and illuminates a screen.

What is observed on the screen?

[1 mark]

A a set of equally spaced white fringes ⬭

B a central maximum made up of a spectrum surrounded by white fringes ⬭

C a white central maximum surrounded by coloured fringes ⬭

D a single narrow white line ⬭

Medium

Two or three steps. Roughly a third to a half of students get these right.

Questions 4–6

AQA June 2023 · A-level Paper 1 · Q17

4 A single narrow slit is illuminated with monochromatic light and a diffraction pattern is produced.

The slit width is increased.

What happens to the width and brightness of the central maximum of the diffraction pattern?

[1 mark]

	Width of central maximum	Brightness of central maximum	
A	increases	increases	⬭
B	increases	decreases	⬭
C	decreases	increases	⬭
D	decreases	decreases	⬭

AQA November 2020 · A-level Paper 1 · Q19

5 Monochromatic light is incident normally on a diffraction grating that has 4.50×10^5 lines m^{-1}.
The angle between the second-order diffraction maxima is $44°$.

What is the wavelength of the light?

[1 mark]

A 208 nm ⬭

B 416 nm ⬭

C 772 nm ⬭

D 832 nm ⬭

AQA June 2022 · A-level Paper 1 · Q21

6 Monochromatic light of wavelength 5.8×10^{-7} m is incident normally on a plane transmission diffraction grating that has a slit separation of 2.5×10^{-6} m.

How many maxima are produced by the grating?

[1 mark]

A 4 ⬭

B 5 ⬭

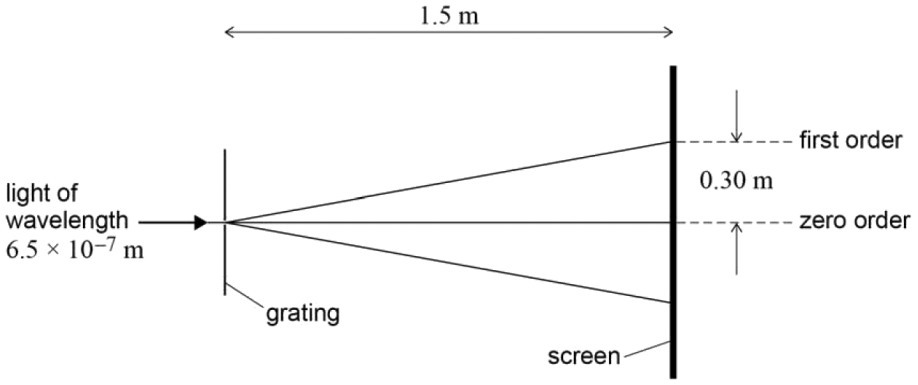
C 8 ⬭

D 9 ⬭

Hard Several steps, often with a trap built in. Fewer than 3 in 10 students get these right. **Questions 7–8**

AQA June 2018 · AS Paper 2 · Q18

7 A diffraction grating is illuminated normally with light of wavelength 6.5×10^{-7} m
When a screen is 1.5 m from the grating, the distance between the zero and first-order maxima on the screen is 0.30 m



What is the number of lines per mm of the diffraction grating?

[1 mark]

A 3.3×10^{-6} ⬭

B 3.3×10^{-3} ⬭

C 3.0×10^{2} ⬭

D 3.0×10^{5} ⬭

AQA June 2017 · AS Paper 2 · Q27

8 Light of wavelength 500 nm is passed through a diffraction grating which has 400 lines per mm.

What is the angular separation between the two second-order maxima?

[1 mark]

A $11.5°$ ⬭

B $23.1°$ ⬭

C $23.6°$ ⬭

D $47.2°$ ⬭

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition:
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