Physics
Leaving Certificate
Higher Level

Past Exam Questions on
Light

Q5 Part (c) Section B 2013

(*c*) Explain why heat does **not** travel through solids by means of convection.

Q5 Part (e) Section B 2013

(*e*) If a diamond has a refractive index of 2.42, what is the speed of light in the diamond?

Q12 Part (b) Section B 2013

(*b*) A narrow beam of light undergoes dispersion when it passes through either a prism or a diffraction grating.

What is meant by dispersion? (6)

Give two differences between what is observed when a narrow beam of light undergoes dispersion as it passes through a prism, and what is observed when a narrow beam of light undergoes dispersion as it passes through a diffraction grating. (6)

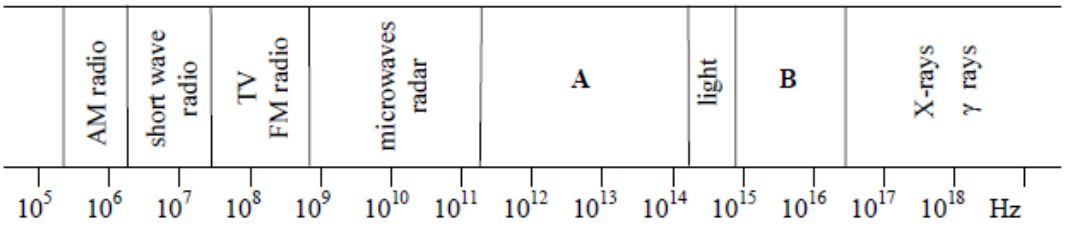
Give another example of light undergoing dispersion. (4)

Yellow light of wavelength 589 nm is produced in a low-pressure sodium vapour lamp. What causes the sodium atoms to emit this light? (3)

Calculate the highest order image that could be produced when a beam of light of this wavelength is incident perpendicularly on a diffraction grating that has 300 lines per mm. (9)

Q7 Section A 2012

7.



The diagram shows a simplified version of the electromagnetic spectrum.
Name the sections labelled **A** and **B** in the diagram.
Describe how to detect each of these radiations. (15)

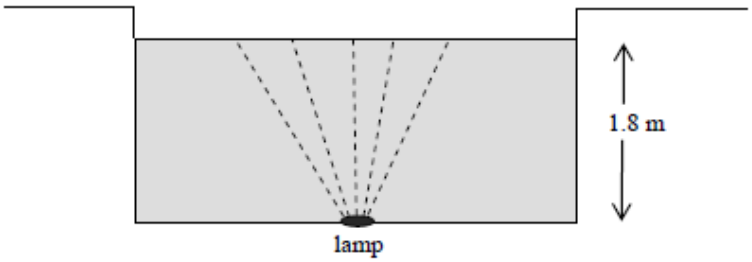
An electromagnetic radiation has a wavelength of 4 m.
Name the section of the electromagnetic spectrum in which this radiation is located. (9)

Distinguish between interference and diffraction.
Can a diffraction grating which diffracts light also diffract X-rays? Justify your answer. (21)

Light travels as a transverse wave. Name another type of wave motion and give two differences between these two types of wave motion. (11)

Q12 Part (b) Section B 2011

(*b*) State the laws of refraction of light. (6)



A lamp is located centrally at the bottom of a large swimming pool, 1.8 m deep.

Draw a ray diagram to show where the lamp appears to be, as seen by an observer standing at the edge of the pool. (7)

At night, when the lamp is switched on, a disc of light is seen at the surface of the swimming pool. Explain why the area of water surrounding the disc of light appears dark.

Calculate the area of the illuminated disc of water. (15)

(refractive index of water = 1.33)

Q7 Section B 2009

7. When light shines on a compact disc it acts as a diffraction grating causing diffraction and dispersion of the light. Explain the underlined terms. (12)

Derive the diffraction grating formula. (12)

An interference pattern is formed on a screen when green light from a laser passes normally through a diffraction grating. The grating has 80 lines per mm and the distance from the grating to the screen is 90 cm. The distance between the third order images is 23.8 cm.

Calculate

(i) the wavelength of the green light;

(ii) the maximum number of images that are formed on the screen. (21)

The laser is replaced with a source of white light and a series of spectra are formed on the screen.

Explain

(iii) how the diffraction grating produces a spectrum;

(iv) why a spectrum is **not** formed at the central (zero order) image. (11)

Q12 Part (c) Section B 2009

(*c*) Information is transmitted over long distances using optical fibres in which a ray of light is guided along a fibre. Each fibre consists of a core of high quality glass with a refractive index of 1.55 and is coated with glass of a lower refractive index.

Explain, with the aid of a labelled diagram, how is a ray of light guided along a fibre. (9)

Why is each fibre coated with glass of lower refractive index? (6)

What is the speed of the light as it passes through the fibre? (7)

Light passing through optical fibres must travel through an enormous length of glass. Impurities in the glass reduce the power transmitted by half every 2 km. The initial power being transmitted by the light is 10 W.

What is the power being transmitted by the light after it has travelled 8 km through the fibre? (6)

(speed of light in air = 3.0×10^8 m s^{-1})

Q3 Section A 2008

3. In an experiment to measure the wavelength of monochromatic light, a diffraction pattern was produced using a diffraction grating with 500 lines per mm.
The angle between the first order images was measured.
This was repeated for the second and the third order images.

The table shows the recorded data.

Angle between first order images	Angle between second order images	Angle between third order images
34.2°	71.6°	121.6°

Draw a labelled diagram of the apparatus used in the experiment. (12)

Explain how the first order images were identified.
Describe how the angle between the first order images was measured. (12)

Use the data to calculate the wavelength of the monochromatic light. (16)

Q5 Part (d) Section B 2008

(*d*) Why does diffraction **not** occur when light passes through a window? (7)

Q5 Part (e) Section B 2008

(*e*) Why is a fluorescent tube an efficient source of light? (7)

Q2 Section A 2006

2. In an experiment to measure the wavelength of monochromatic light, a narrow beam of the light fell normally on a diffraction grating. The grating had 300 lines per millimetre. A diffraction pattern was produced. The angle between the second order image to the left and the second order image to the right of the central bright image in the pattern was measured. The angle measured was 40.6°.

Describe, with the aid of a labelled diagram, how the data was obtained. (9)

How was a narrow beam of light produced? (6)

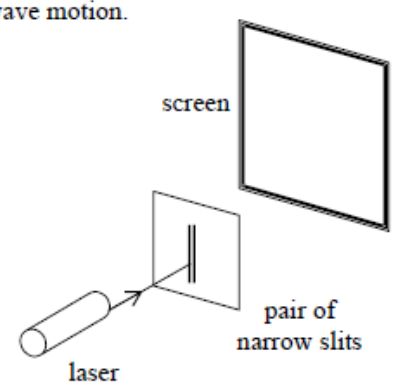
Use the data to calculate the wavelength of the monochromatic light. (15)

Explain how using a diffraction grating of 500 lines per mm leads to a more accurate result. (6)

Give another way of improving the accuracy of this experiment. (4)

Q7 Section B 2005

7. A student used a laser, as shown, to demonstrate that light is a wave motion.



(i) Name the two phenomena that occur when the light passes through the pair of narrow slits. (6)

(ii) A pattern is formed on the screen. Explain how the pattern is formed. (12)

(iii) What is the effect on the pattern when
(a) the wavelength of the light is increased.
(b) the distance between the slits is increased. (8)

Describe an experiment to demonstrate that sound is also a wave motion. (12)

Sound travels as longitudinal waves while light travels as transverse waves. Explain the difference between longitudinal and transverse waves. (9)

Describe an experiment to demonstrate that light waves are transverse waves. (9)