

EXAM SOLUTIONS

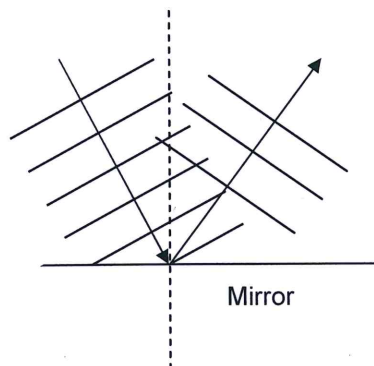
Chapter 7.1 - Light as a Wave

Answer 1 2010:1:1

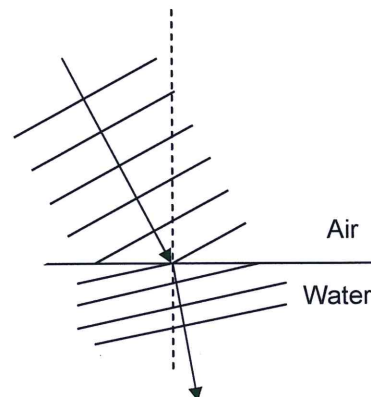
(4 marks)

The diagrams below show wavefronts of light incident on two different surfaces. In diagram (a) the wavefronts are incident on a mirror. In diagram (b) the wavefronts are incident on an air-water interface. In both diagrams a dotted line at 90° to the surface has been drawn. Complete the diagrams showing how the wavefronts behave as they interact with the surface. In both cases you should draw four wavefronts. The direction of travel of the wavefronts is included.

(a)



(b)



Description	Marks
Reflection reflected wavelength same as incident wavelength	1
angle of reflection (roughly) equal to angle of incidence.	1
Refraction, direction of wavefront in correct direction	1
wavelength of refracted wavefront less than the incident wavelength.	
Direction of wavefronts must be shown.	1
Note: If have the direction away from normal but wavefronts larger get 1 mark out of 2	
	Total 4

Answer 2 2010:1:6

(4 marks)

Until about 50 years ago, astronomers used visible light to observe the Universe. They now use a variety of types of electromagnetic radiation to make their observations. With reference to the properties of electromagnetic radiation, explain the potential advantages to an astronomer of studying the Universe using:

(a) radio waves

(b) X-rays

Description	Marks
<ul style="list-style-type: none"> Radio waves have long wavelengths (~ 1 m) compared to visible; tend to pass through gas and dust that obscure visible sources; typical radio sources include our galactic core; pulsars; neutron stars; quasars. (note: 1 mark for appropriate property & 1 mark for advantage) 	1-2
<ul style="list-style-type: none"> X rays have short wavelengths (~ 1 nm) compared to visible; usually associated with high energy sources such as: material falling into black holes; supernovae; material falling from one star to another more massive one; active galactic centres. 	1-2
	Total 4

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Answer 3 2014:1:1

(2 marks)

Astronomers study stars use a variety of electromagnetic frequencies. Place the following sections of the electromagnetic spectrum in order from longest wavelength to smallest:

visible, infra red, X-ray and radio.

Description	Marks
radio infra red visible X-ray Only 1 for the opposite order	1-2
Total	2

Answer 4 2014:1:2

(4 marks)

Electromagnetic radiation (emr) is said to have both wave and particle properties. State and describe an example of each of these properties of emr.

Description	Marks
Wave – states one of the following: diffraction; refraction; passing through one another; other wave properties. Then gives a description of that term as applied to emr.	1-2
Particle – states one of the following: affected by gravity; photoelectric effect; does not require a medium; exerts pressure; quanta. Then gives a description of that term as applied to emr.	1-2
Total	4