



PHYSICS

BOOKS - CENGAGE PHYSICS

ELECTROMAGNETIC SPECTRUM AND RADIATIONS

Mandatory Exercise Exercise Set I

1. Which electromagnetic wave is used for generation of heat?



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2. In which range does 'Lasers' lie?



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3. Which electromagnetic wave has the highest penetrating power?



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4. What prevents the ultra violet radiations of the sun from reaching the earth?



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5. Which type of electromagnetic wave causes the green house effect?



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6. Which form of rays is not emitted by the sun?



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Mandatory Exercise Exercise Set II

1. The following are properties of X-rays:

A. They are highly penetrating

B. They produce fluorescence and phosphorescence in the substance, they are incident on

C. They have a range of wavelength from 10 nm to 104 nm.

D. They liberate photoelectrons

Answer: A::B::C::D



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2. Which of the following have very small wavelengths?

A. X-rays

B. γ -rays

C. radio wave

D. UV rays

Answer: A::B::D



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3. Infrared radiations are used for

A. producing heat

B. for short range communications

C. in night photographs

D. in producing dehydrated fruits

Answer: A::B::C::D



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4. The sources for UV radiations are

A. the sun

B. electric arcs of mercury

C. diathermic devices

D. fluorescent lamp

Answer: A::B::D



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5. The following are applications of X-rays:

- A. They are used for analysis of the structure
- B. To detect weakness of structures
- C. To detect internal cracks
- D. They are used in the treatment of abnormal growth of tissues

Answer: A::B::C::D



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6. Which among the following has the highest frequency?

A. Infrared

B. Ultraviolet rays

C. Gamma rays

D. Radio waves

Answer: C



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7. Which electromagnetic wave is used for communication systems?

A. Radio waves

B. Microwave

C. X-rays

D. Gamma rays

Answer: A



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8. Which electromagnetic wave is used for medicinal purposes?

A. Radio waves

B. Ultraviolet rays

C. Infrared

D. X-rays

Answer: D



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9. Which electromagnetic wave is most dangerous?

A. Radio waves

B. Microwave

C. Ultraviolet

D. X-rays

Answer: D



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10. Which of the following wavelengths will be visible to the human eye?

A. 10^2 metres

B. 5×10^{-7} metres

C. α metres

D. 6×10^{-18} metres

Answer: B



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11. If the wavelength of an electromagnetic wave is 2 kilometers. In which category will it lie?

A. Radio waves

B. Visible

C. Microwave

D. Gamma rays

Answer: A



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12. The term electromagnetic spectrum is used for the range of wavelengths of electromagnetic waves from _____ to _____

A. 10^{10} m to 10^4 m

B. 10^6 m to 100 nm

C. 10^4 m to 1 Å

D. 1 m to 1Å

Answer: C



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13. What is the main source of electromagnetic radiation?

A. Sun

B. Earth

C. Moon

D. Stars

Answer: A



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14. Which wave is used to disinfect hospital waste?

A. Radio waves

B. Microwaves

C. UV rays

D. X-rays

Answer: B



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15. Which wave is used for sterilising surgical equipments?

A. IR rays

B. X-rays

C. UV rays

D. Gamma rays

Answer: C



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16. Why are UV rays used in burglar alarm?

Question No.	Choice
16	
17	
18	
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21	
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26	
27	
28	
29	
30	
31	

A. They detect human presence

B. They detect motion

C. They detect photo electrons

D. They detect heat energy

Answer: C



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Mandatory Exercise Exercise Set Iii

1. Propagation of radio waves The behaviour of electromagnetic waves of wavelength 10^{-3} m and higher (called radio waves) in their

propagation through atmosphere is an important consideration in all modern forms of communication, radio, television, microwaves, etc. At low frequencies, radio waves radiated by an antenna near the earth travel directly following the surface of the earth. This is called wave-along-ground propagation.

Radio waves of frequencies 2 MHz-20 MHz are reflected off the ionosphere. So, radio waves in this frequency range radiated from a certain point can be received at another point on the surface after being reflected by the

ionosphere. This is known as skywave propagation.

Television signals have frequencies in the 100-200 MHz range and penetrate ionosphere (no reflection), therefore, their propagation is not possible through sky waves. The reception of such waves is possible only if the receiver antenna directly intercepts the signals. Thus, television broadcasts are made from tall antenna to get larger coverage. This is known as space wave propagation. Answer the following questions.

What is wave-along-ground propagation?



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2. Propagation of radio waves The behaviour of electromagnetic waves of wavelength 10^{-3} m and higher (called radio waves) in their propagation through atmosphere is an important consideration in all modern forms of communication, radio, television, microwaves, etc. At low frequencies, radio waves radiated by an antenna near the earth travel directly following the surface of the earth. This is called wave-along-ground

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antenna directly intercepts the signals. Thus, television broadcasts are made from tall antenna to get larger coverage. This is known as space wave propagation. Answer the following questions.

What is the frequency range of television signals?



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Television signals travel through _____
propagation.



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General Exercise

1. Explain why remote radio stations can be picked up late in the night over great distances?



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2. What are microwaves?



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3. Explain the working of a microwave oven.



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4. Mention uses of radio waves.



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5. Write down four applications of microwaves.



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6. What is the range of wavelength for infrared waves?



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7. What is the range of frequency for radio waves?



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8. Give three applications of infrared rays.



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9. Why are lasers useful?



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10. What are the classifications of ultraviolet radiations?



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11. Write down a few sources of ultraviolet radiation?



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12. How was X-ray discovered?



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13. How are Gamma rays produced?



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14. Write down few applications of Gamma ray.



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Challenging Exercise

1. Why are infrared waves often called heat waves?

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2. Which electromagnetic wave is suitable for radar system and why?

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3. Given below are some famous numbers associated with electromagnetic radiation in different contexts in physics. State the part of the electromagnetic spectrum to which each belongs.

21 cm (wavelength emitted by atomic hydrogen in interstellar space).



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4. Given below are some famous numbers associated with electromagnetic radiation in different contexts in physics. State the part of the electromagnetic spectrum to which each belongs.

1057 MHz (frequency of radiation arising from two close energy levels in hydrogen, known as lamb shift)



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5. Given below are some famous numbers associated with electromagnetic radiation in different contexts in physics. State the part of the electromagnetic spectrum to which each belongs.

5890 Å-5896 Å (doublet lines of sodium).



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6. Given below are some famous numbers associated with electromagnetic radiation in

different contexts in physics. State the part of the electromagnetic spectrum to which each belongs.

2.7 K [temperature associated with isotropic radiation filling all space thought to be a relic of the big-bang origin of the universe).



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7. Given below are some famous numbers associated with electromagnetic radiation in different contexts in physics. State the part of

the electromagnetic spectrum to which each belongs.

14.4 keV [energy of a particular transition in ^{57}Fe nucleus associated with a famous high resolution spectroscopic method (Moss Bauer spectroscopy)].



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8. Explain why X-rays are used to detect bone fractures.



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9. X-ray experiment is the converse of photoelectric effect. Explain.



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Olympiad And Ntse Level Exercises

1. X-rays are produced by jumping of

A. electrons from lower to higher energy

will of atom

B. electrons from higher lower energy orbit
of atom

C. proton from lower to higher energy
orbit of nucleus

D. proton from higher to lower energy
orbit of nucleus.

Answer: B



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2. The range of wavelength of the visible light is

A. 10 \AA to 100 \AA

B. $4,000 \text{ \AA}$ to $8,000 \text{ \AA}$

C. $8,000 \text{ \AA}$ to $10,000 \text{ \AA}$

D. $10,000 \text{ \AA}$ to $15,000 \text{ \AA}$

Answer: B



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3. Which radiation in sunlight causes heating effect?

A. Ultraviolet

B. Infrared

C. Visible light

D. All of these

Answer: B



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4. Which of the following waves have the maximum wavelength?

A. X-rays

B. IR rays

C. UV rays

D. Radio waves

Answer: D



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5. In which one of the following regions of the electromagnetic spectrum will the vibrational motion of molecules give rise to absorption?

A. Ultraviolet

B. Microwaves

C. Infrared

D. Radio waves

Answer: B



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6. The electromagnetic waves do not transport

A. Energy

B. Charge

C. Momentum

D. Information

Answer: B



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7. Read the assertion and reason carefully to mark the correct option.

Assertion: Ultraviolet radiation are of higher frequency waves are dangerous to human being.

Reason: Ultraviolet radiation are absorbed by the atmosphere

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: B



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8. Match List I (Electromagnetic wave type) with List II (Its association / application) and select the correct option from the choices given below the lists:

List I		List II	
(p) Infrared waves	(i) To treat muscular strain		
(q) Radio waves	(ii) For broadcasting		
(r) X-rays	(iii) To detect fracture of bones		
(s) Ultraviolet rays	(iv) Absorbed by the ozone layer of the atmosphere		

Codes:

	p.	q.	r.	s.
(A)	iii	ii	i	iv
(B)	i	ii	iii	iv
(C)	iv	iii	ii	i
(D)	i	ii	iv	iii



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9. Arrange the following electromagnetic radiations per quantum in the order of increasing energy:

A : Blue light B: Yellow light

C: X-ray D: Radio wave

A. D, B, A, C

B. A, B, D, C

C. C, A, B, D

D. B, A, D, C

Answer: A





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10. Which of the following are not electromagnetic waves?

A. cosmic rays

B. β -rays

C. gamma rays

D. X-rays

Answer: C



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