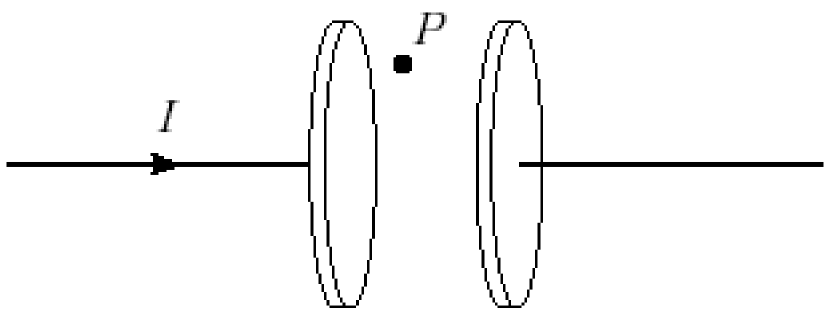
CPS lesson
Maxwell's Equations
ANSWER KEY

1.
As the capacitor charges up with a constant current, at point P there is a:



A. constant electric field

B. changing electric field

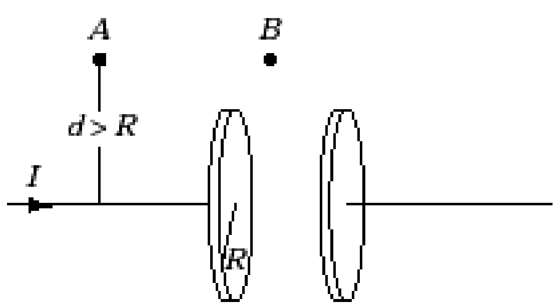
C. constant magnetic field

D. changing magnetic field

* E. more than one of the above

2.

As the capacitor charges up, the magnetic field at A is:



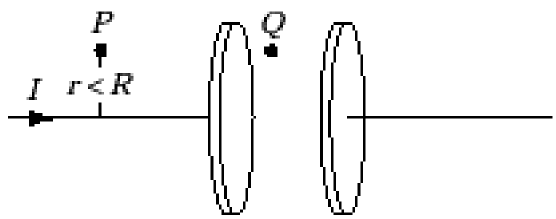
A. bigger than that at B

* B. equal to that at B

C. smaller than the magnetic field at B

3.

As the capacitor charges up, the magnetic field at P is:



* A. bigger than that at Q

B. equal to that at Q

C. smaller than the magnetic field at Q

4.

The displacement current between the plates of a charging capacitor is equal to:

A. zero

* B. the conduction current bringing charge onto the plates

C. The answer depends on the Amperian loop chosen.

5.

Maxwell's modification of Ampere's law is analogous to:

A. Gauss's law

B. the Lorentz equation

*   C. Faraday's law

6.

Electromagnetic waves do NOT carry:

A. energy

*   B. charge

C. momentum

D. power

7.

An electromagnetic wave polarized in the +y direction propagates in the -z direction. What is the direction of the magnetic field?

*   A. +x

B. -y

C. -x

D. +z

8.

In a plane wave, the magnetic field has maximum value when the electric field is:

*   A. a maximum

B. a minimum

C. zero

D. It depends.

9. The 1D electromagnetic wave equation is $d^2E/dx^2=em\ d^2E/dt^2$. Using dimensional analysis, the speed of light dx/dt is found to be:

A. c = em

B. c = 1/em

C. c = (em)1/2

* D. c = 1/(em)1/2

10.
Which of the following represents a spherical wave propagating radially outward?

* A. E0 sin (kr - wt)

B. E0 sin (kr + wt)

C. E0 sin (k.r - wt)

D. E0 sin (k.r + wt)

11.
Which frequency and wavelength pairs could describe an electromagnetic wave in vacuum?

A. f = 300 Hz and l = 1 m

B. f = 300 kHz and l = 1 km

C. f = 150 MHz and l = 2 m

* D. two of the above

E. all three of the above

12.

A plane wave has electric field E_0 cos (kz - wt) i. Its magnetic field is:

A. B0 cos (kz - wt) i

* B. B0 cos (kz - wt) j

C. -B0 cos (kx + wt) j

D. B0 sin (kz - wt) j

E. -B0 cos (ky - wt) k

13.

At a point in space, the electric and magnetic fields due to a passing wave oscillate at angular frequency w. At what angular frequency does the Poynting vector oscillate at this point in space?

A. w/2

B. w

* C. 2w

14.

A paddle wheel is balanced on a pin inside a partially evacuated tube. The paddles are painted black on one side and white on the other side. What happens when a bright light shines on the wheel?

A. The black sides heat up more than the white sides, so that the hotter gas molecules on the black sides push the wheel.

B. The white sides experience a stronger radiative pressure than the black sides, so the light pushes on the white sides.

* C. The wheel rotates in a direction determined by the competition between effects A and B.

15. The intensity of a light bulb drops with the inverse square of the distance from the bulb.

How does the electric field vary as you move away from the bulb?

A. it remains constant

* B. inversely proportional to the distance

C. inverse square of the distance

16.

Which case would give your book the best illumination?

* A. A 50-W bulb that is 1 m away.

B. A 100-W bulb that is 2 m away.

C. A 200-W bulb that is 3 m away.