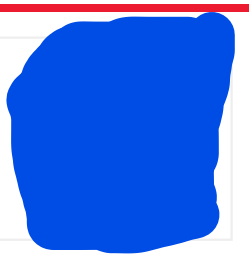

Started on	Wednesday, 3 March 2021, 8:59 AM
State	Finished
Completed on	Wednesday, 3 March 2021, 10:42 AM
Time taken	1 hour 43 mins
Grade	**19.60** out of 35.00 (**56**%)

Question 1

Correct

Mark 1.40 out of 1.40

If a charged particle enters an external magnetic field and it moves in a circular orbit, then

Select one:

- a. Negative work is done by the field on the particle
- b. Positive work is done by the field on the particle
- c. The particle maintains a constant velocity in the field
- d. The particle maintains a constant speed in the field ✓

Your answer is correct.

The correct answer is: The particle maintains a constant speed in the field

Question 2

Correct

Mark 1.40 out of 1.40

The $\vec{E}$ and $\vec{B}$ fields in electromagnetic waves are oriented

Select one:

- a. parallel to the wave's direction of travel, as well as to each other
- b. perpendicular to the wave's direction of travel, and parallel to each other
- c. perpendicular to the wave's direction of travel, and also to each other ✓
- d. parallel to the wave's direction of travel, and perpendicular to each other

Your answer is correct.

The correct answer is: perpendicular to the wave's direction of travel, and also to each other

Question 3

Correct

Mark 1.40 out of 1.40

A thin conducting wire placed along the y-axis carries a current I. The magnetic field produced at a point with coordinates (0,0,z) will have only

Select one:

- a. y-component
- b. Will have x and y components
- c. x-component ✓
- d. z-component

Your answer is correct.

The correct answer is: x-component

Question 4

Incorrect

Mark 0.00 out of 1.40

. A metallic shell with inner and outer radius R_1 and R_2 respectively, has a point charge q kept inside the cavity. The resultant electric field in the region $R_1 < r < R_2$ (where, r is the distance from the center of the sphere) is

Select one:

- a. None of the options
- b. Constant and non-zero
- c. Zero
- d. Dependent on r

Your answer is incorrect.

The correct answer is: Zero

Question 5

Incorrect

Mark 0.00 out of 1.40

Consider a straight cylindrical region of thickness $(b - a)$ and having a circular cross section between inner radius a and outer radius b. A current I flows with a uniform current density through the cross section of the cylinder. The value of $\vec{\nabla} \times \vec{B}$ will be

Select one:

- a. Zero in the region $b < r < \infty$ and non zero everywhere else
- b. Non-zero in the region $a < r < b$ and zero everywhere else
- c. Zero everywhere
- d. Zero in the region $0 < r < a$ and non zero everywhere else

Your answer is incorrect.

The correct answer is: Non-zero in the region $a < r < b$ and zero everywhere else

Question 6

Incorrect

Mark 0.00 out of 1.40

An infinitely long straight wire made of copper with magnetic permeability μ and of radius R carries a current I which is uniformly distributed across its cross section. In such a case within and outside the wire

Select one:

- a. Magnitude of H is the same while the magnitude of B is different
- b. Magnitudes of H and B are both different ✗
- c. Magnitude of B is the same while magnitude of H is different
- d. Magnitudes of H and B are the same

Your answer is incorrect.

The correct answer is: Magnitude of H is the same while the magnitude of B is different

Question 7

Incorrect

Mark 0.00 out of 1.40

A straight cylindrical rod with circular cross section and radius R is magnetized parallel to its axis with a magnetization given by $\vec{M} = M_0\hat{z}$. The bound surface current on the cylindrical surface of the rod will be

Select one:

- a. Along the z-direction parallel to the magnetization ✗
- b. Along the -z direction opposite to the direction of magnetization
- c. Along the azimuthal direction
- d. Zero

Your answer is incorrect.

The correct answer is: Along the azimuthal direction

Question 8

Incorrect

Mark 0.00 out of 1.40

A charge q is embedded at the center of a sphere of linear dielectric material. ρ_b and σ_b represent the bound volume and surface charge densities, respectively. The electric displacement $\vec{D}$ within the sphere at a distance r from the center will be given by

Select one:

a. $\frac{q+\rho_b}{4\pi r^2}\hat{r}$

b. $\frac{q}{4\pi\epsilon_0 r^2}\hat{r}$

c. 0

d. $\frac{q}{4\pi r^2}\hat{r}$

Your answer is incorrect.

The correct answer is: $\frac{q}{4\pi r^2}\hat{r}$

Question 9

Correct

Mark 1.40 out of 1.40

A dielectric cube of side a is centered at the origin. It carries a polarization $\vec{P} = k\vec{r}$, where k is a constant. Find the total bound volume charge.

Select one:

a. $3ka^3$

b. $-ka^3$

c. $-3ka^3$

d. ka^3

Your answer is correct.

The correct answer is: $-3ka^3$

Question 10

Correct

Mark 1.40 out of 1.40

In a certain region of space the electrostatic potential is given by $V(x, y) = 2xy + 4y + 5y^2$. The electric field will be zero at

Select one:

- a. $x = +2, y = 0$
- b. $x = -2, y = 0$ ✓
- c. $x = 0, y = -\frac{1}{3}$
- d. $x = 0, y = 0$

Your answer is correct.

The correct answer is: $x = -2, y = 0$

Question 11

Correct

Mark 1.40 out of 1.40

Two metal plates form a parallel plate capacitor. The distance between the plates is *d*. A metal sheet of thickness *d/2* and of the same area is introduced between the plates. What is the ratio of the capacitance in the two cases?

Select one:

- a. 4:1
- b. 5:1
- c. 2:1 ✓
- d. 3:1

Your answer is correct.

The correct answer is: 2:1

Question 12

Incorrect

Mark 0.00 out of 1.40

A charge Q is placed at the center of a dielectric sphere of radius R and uniform dielectric constant K. Within the sphere the magnitude of $\vec{D}$ would be

Select one:

a. $\frac{Q}{4\pi r^2}$

b. Zero

c. $\frac{Q}{4\pi\epsilon_0 r^2}$

d. $\frac{Q}{4\pi\epsilon_0 K r^2}$

Your answer is incorrect.

The correct answer is:

$\frac{Q}{4\pi r^2}$

Question 13

Correct

Mark 1.40 out of 1.40

A thick spherical shell with inner and outer radius a and b respectively, is made up of a dielectric material with polarization $\vec{P} = \frac{k}{r}\hat{r}$. Here, k is a constant and r is the distance from the center. The bound surface charges at $r = a$ and $r = b$ will respectively be given by

Select one:

a. $0, \frac{k}{b}$

b. $\frac{k}{a}, \frac{k}{b}$

c. $-\frac{k}{a}, \frac{k}{b}$

d. $-\frac{k}{a}, -\frac{k}{b}$

Your answer is correct.

The correct answer is: $-\frac{k}{a}, \frac{k}{b}$

Question 14

Correct

Mark 1.40 out of 1.40

A point charge Q is placed at the center of a dielectric sphere of radius R and dielectric constant K. The value of $\vec{\nabla}.\vec{D}$ at a distance $r > R/2$ will be equal to

Select one:

- a. Zero ✓
- b. $\frac{Q}{\epsilon_0}$
- c. $\frac{Q}{4\pi\epsilon_0(\frac{R}{2})^2}$
- d. $\frac{Q}{4\pi\epsilon_0}$

Your answer is correct.

The correct answer is: Zero

Question 15

Incorrect

Mark 0.00 out of 1.40

A dielectric sphere has a polarization $\vec{P} = P_0\vec{r}$. The bound volume charge density in the dielectric will be

Select one:

- a. $-3P_0$
- b. Zero ✗
- c. $-P_0$
- d. $3P_0$

Your answer is incorrect.

The correct answer is: $-3P_0$

Question 16

Incorrect

Mark 0.00 out of 1.40

Consider a straight cylindrical region of thickness $(b-a)$ and having a circular cross section between inner radius a and outer radius b. . A current I flows uniformly through the cross section of the cylinder. The value of $\vec{\nabla} \times \vec{B}$ at a distance $\frac{a+b}{2}$ from the axis of the cylinder would be

Select one:

a. $\mu_0 \frac{I}{\pi b^2}$

b. $\mu_0 \frac{I}{\pi(b-a)^2}$

c. $\mu_0 \frac{I}{\pi(b^2-a^2)}$

d. $\mu_0 I$

Your answer is incorrect.

The correct answer is: $\mu_0 \frac{I}{\pi(b^2-a^2)}$

Question 17

Correct

Mark 1.40 out of 1.40

Consider an electromagnetic wave propagating in free space described by the following expression for the electric field $E = E_0 cos[(5\pi \times 10^6 x + \omega t)]$, where x is measured in meters. The wavelength of the wave in micrometers is

Select one:

a. 0.4π

b. 5π

c. 0.5π

d. 0.4 ✓

Your answer is correct.

The correct answer is: 0.4

Question 18

Incorrect

Mark 0.00 out of 1.40

A long cylindrical wire with circular cross section and of radius R carries a current I with a volume current density of $\vec{J} = \alpha\hat{z}$, where $\hat{z}$ is the unit vector along the axis of the cylinder and α is a constant. The magnitude of the magnetic field B at a point distance $2R$ from the axis of the cylinder is

Select one:

a. $\mu_0 R\alpha$

b. $\frac{1}{4}\mu_0 R\alpha$

c. $\frac{1}{2}\mu_0 \alpha$

d. $\frac{1}{4\pi R}\mu_0 \alpha$

Your answer is incorrect.

The correct answer is: $\frac{1}{4}\mu_0 R\alpha$

Question 19

Incorrect

Mark 0.00 out of 1.40

A cylindrical wire of radius R is carrying a current with current density given by $\vec{J}(r) = J_0(1 - \frac{r}{R})\hat{z}$ (here r is the cylindrical polar coordinate) where J_0 is a constant. The magnitude of $\vec{\nabla} \times \vec{B}$ at a point on the axis of the wire would be

Select one:

- a. $\frac{\mu_0 J_0}{\pi R^2}$
- b. $\mu_0 J_0 \pi R^2$
- c. Zero
- d. $\mu_0 J_0$

Your answer is incorrect.

The correct answer is: $\mu_0 J_0$

Question 20

Correct

Mark 1.40 out of 1.40

1000 Amp current is flowing through wire of length 2.5 m. If it feels a 4 N repulsive force from a parallel wire 5 cm away, what are the direction and magnitude of current in the other wire? ($\mu_0 = 4\pi \times 10^{-7} N/A^2$)

Select one:

- a. 400 Amp, in the opposite direction
- b. 1000 Amp, in the same direction
- c. 400 Amp, in the same direction
- d. 1000 Amp, in the opposite direction

Your answer is correct.

The correct answer is: 400 Amp, in the opposite direction

Question 21

Correct

Mark 1.40 out of 1.40

An infinitely long thin straight wire carries a current I along the *z*-direction. The magnetic flux passing through a circular path of radius R and having the wire as the center and lying in the plane (*x*-*y* plane) perpendicular to the wire will be

Select one:

a. $\mu_0 I \pi R^2$

b. $\mu_0 I$

c. $\frac{1}{2}\mu_0 I R$

d. Zero ✓

Your answer is correct.

The correct answer is: Zero

Question 22

Correct

Mark 1.40 out of 1.40

A cylindrical conductor of inner and outer radius a and b respectively carries a current I, distributed uniformly across its cross section. The current density J will be

Select one:

a. $\frac{I}{\pi b^2}$

b. $\frac{I}{\pi(b^2+a^2)}$

c. $\frac{I}{\pi(b^2-a^2)}$ ✓

d. $\frac{I}{\pi a^2}$

Your answer is correct.

The correct answer is: $\frac{I}{\pi(b^2-a^2)}$

Question 23

Correct

Mark 1.40 out of 1.40

An infinitely long cylindrical wire of radius R lying parallel to the z-axis carries a uniform current I distributed uniformly across its cross section. The magnetic field inside the cylinder at a distance r from the axis will be

Select one:

a. $\frac{\mu_0 IR}{2\pi r^2}\hat{\phi}$

b. $\frac{\mu_0 Ir}{2\pi R^2}\hat{\phi}$ ✓

c. $\frac{\mu_0 I}{2\pi r}\hat{\phi}$

d. $\frac{\mu_0 I}{2\pi R}\hat{\phi}$

Your answer is correct.

The correct answer is: $\frac{\mu_0 Ir}{2\pi R^2}\hat{\phi}$

Question 24

Incorrect

Mark 0.00 out of 1.40

A square loop of wire having a length of 10 cm is kept in a time varying magnetic field $B = 2t$. The magnetic field is perpendicular to the loop. The magnitude of the induced emf will be

Select one:

a. 1.25 mV

b. 2.5 mV

c. 20 mV ✗

d. 12.5 V

Your answer is incorrect.

The correct answer is: 1.25 mV

Question 25

Correct

Mark 1.40 out of 1.40

A long cylindrical rod of radius R has uniform magnetization $M_0\hat{k}$ parallel to its axis. There are no free currents. The magnetic field inside and outside the rod are respectively

Select one:

a. $\mu_0 M_0\hat{k}, 0$

b. $0, \mu_0 M_0\hat{k}$

c. $\mu_0 M_0\hat{\phi}, 0$

d. $0, \mu_0 M_0\hat{\phi}$

Your answer is correct.

The correct answer is: $\mu_0 M_0\hat{k}, 0$