PH110MIDSEMMOODLE

Question 1
Incorrect
Mark 0.00 out of 1.00
Flag question

which of the following options is incorrect:-

a) $E_{above}^{perpendicular} - E_{below}^{perpendicular} = \frac{\sigma}{\varepsilon_0}$

b) $E_{above}^{\parallel} = E_{below}^{\parallel}$

c) $E_{above}^{perpendicular} = E_{below}^{perpendicular}$

d) $E_{above} - E_{below} = \frac{\sigma}{\varepsilon_0}\hat{n}$

- i. d
- ii. c
- iii. a
- iv. b ✗

The correct answer is:
c

Question 2
Correct
Mark 1.00 out of 1.00
Flag question

If E is the electric field intensity of an electrostatic field then the electrostatic energy density is proportional to

a) E
b) 1/E
c) $1/E^2$
d) E^2

- i. c
- ii. b
- iii. d ✓
- iv. a

The correct answer is:
d

Question 3
Incorrect
Mark 0.00 out of 1.00
Flag question

Three concentric thin spherical shell of radii a, b and c (a<b<c) carry uniform surface electric charge of densities σ, $-\sigma$ and σ, respectively. The electric potential at the surface of the outermost shell is

a) $\frac{\sigma}{\varepsilon_0}(c - b + a)$

b) $\frac{\sigma}{\varepsilon_0}(c^2/a - b^2/a + a)$

c) $\frac{\sigma}{\varepsilon_0}(c - b + a)$

d) $\frac{\sigma}{\varepsilon_0}(c - b^2/c + a^2/c)$

- i. d
- ii. c
- iii. a ✗
- iv. b

The correct answer is:
d

Question 4
Correct
Mark 1.00 out of 1.00
Flag question

Evaluate the following integral $\int_2^5 (3x^2 - 2x - 1)\delta(x - 3)dx$ where δ is the dirac delta function.

a) 10
b) 30
c) 20
d) 50

- i. b
- ii. d
- iii. a
- iv. c ✓

The correct answer is:
c

Question 5
Correct
Mark 1.00 out of 1.00
Flag question

Which of the following relations hold for a non-zero vector $\vec{a}$.

a) $\nabla . \vec{a} = 0$
b) $\nabla \times \vec{a} = 0$
c) $\nabla . (\nabla \times \vec{a}) = 0$
d) $\nabla(\nabla \times \vec{a}) = 0$

- i. d
- ii. c ✓
- iii. b
- iv. a

The correct answer is:
c

Question 6
Correct
Mark 1.00 out of 1.00
Flag question

Two large metal plates are held at a small distance d apart. Suppose we put a charge Q on each plate. What is the electrostatic pressure on each plate?

a) $Q^2/2\varepsilon_0 A^2$ b) 0 c) $Q^2/4\varepsilon_0 A^2$ d) $2Q^2/\varepsilon_0 A^2$

- i. d
- ii. a ✓
- iii. b
- iv. c

The correct answer is:
a

Question 7
Incorrect
Mark 0.00 out of 1.00
Flag question

A charge Q is uniformly distributed over the surface of a spherical shell of radius R. The electrostatic energy is directly proportional to:
a) $Q^2, 1/R$
b) Q^2, R^2
c) $Q, 1/R$
d) Q, R

i. b
ii. a
iii. d
iv. c ×

The correct answer is:
a

Question 8
Incorrect
Mark 0.00 out of 1.00
Flag question

The potential due to the dipole on the midpoint of the two charges will be
a) 0
b) Unity
c) ∞
d) -∞

i. a ×
ii. c
iii. d
iv. b

The correct answer is:
c

Question 9
Incorrect
Mark 0.00 out of 1.00
Flag question

The flux density depends only on the charge and is independent of the permittivity of the medium
a) True b) False c) Not enough information given

i. b ×
ii. a
iii. c

The correct answer is:
a

Question 10
Incorrect
Mark 0.00 out of 1.00
Flag question

Which of the following is a scalar field?
a) The distribution of velocity in liquid
b) The distribution of velocity in gas
c) The distribution of temperature
d) The distribution of magnetic or electrostatics field intensity

i. c
ii. b
iii. a ×
iv. d

The correct answer is:
c

Question 11
Incorrect
Mark 0.00 out of 1.00
Flag question

Which of the following option is not possible (V is vector field and T is a scalar field): -

a) Gradient of divergence $\nabla(\nabla . V)$
b) Curl of divergence $\nabla \times (\nabla . V)$
c) curl of gradient $\nabla \times (\nabla T)$
d) Curl of curl $\nabla \times (\nabla \times V)$

i. b
ii. a
iii. d
iv. c ×

The correct answer is:
b

Question 12
Incorrect
Mark 0.00 out of 1.00
Flag question

If the space is entirely filled with a homogeneous linear dielectric, then curl of electric displacement is

a. 0
b. Can't say
c. Curl of dipole moment ×
d. Curl of Polarization
e. Curl of electric field

The correct answer is:
Curl of Polarization

Question 13
Correct
Mark 1.00 out of 1.00
Flag question

Which component of the electric field intensity is always continuous at the boundary?
a) Tangential
b) Normal
c) Horizontal
d) Vertical

i. a
ii. b
iii. c
iv. d

The correct answer is:
a

Question 14
Incorrect
Mark 0.00 out of 1.00
Flag question

An electric field in a region is given by E(x,y,z) = ax $\hat{i}$ + cz $\hat{j}$ + 6by $\hat{k}$ for which values of
a,b,c does this represents an electrostatic field ?

a) 13,1,12 b) 17,6,1 c) 13,1,16 d) 45,6,1

i. b
ii. None
iii. a
iv. c or d

The correct answer is:
None

Question 15
Incorrect
Mark 0.00 out of 1.00
Flag question

An electrostatic field $\vec{E}$ exists in a given region R. Choose the wrong statement

a) Circulation of $\vec{E}$ is zero
b) $\vec{E}$ can always be expressed as a gradient of scalar field
c) The work done in a closed path lying entirely in R is zero
d) The potential difference between any two arbitrary points in the region R is zero

i. d
ii. a
iii. c
iv. b

The correct answer is:
d

Question 16
Correct
Mark 1.00 out of 1.00
Flag question

Find the value of $\iint \nabla(x^2 + y^2 + z^2).dS$, where S is any closed surface enclosing volume V.
a) 6V
b) 4V
c) V
d) 5V

i. b
ii. c
iii. d
iv. a

The correct answer is:
a

Question 17
Incorrect
Mark 0.00 out of 1.00
Flag question

Four point charges $\pm q_1$ and $\pm q_2$ are placed at the corners of a rectangle of side a and b as shown in the figure:

What is the magnitude of the dipole moment of the system?

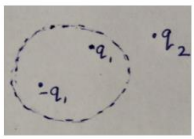
a) $(q_1 + q_2)\sqrt{a^2 + b^2}$
b) $(q_1 - q_2)(a - b)$
c) $\sqrt{(q_1 + q_2)^2 a^2 + (q_1 - q_2)^2 b^2}$
d) The dipole moment will depend on the choice of origin

i. c
ii. d
iii. b
iv. a

The correct answer is:
c

Question 18
Incorrect
Mark 0.00 out of 1.00
Flag question

A Gaussian surface in the figure is shown by dotted line. The electric field on the surface will be



a) due to q1 and q2 only

b) due to q only

c) Zero

d) due to all

i. b
ii. a
iii. c
iv. d

The correct answer is:
d

Question 19
Incorrect
Mark 0.00 out of 1.00
Flag question

A loop of radius r carries a uniform distribution charge. Assuming the potential at infinity to be zero , the ratio of potential at a height 2r on the axis to that at height 3r is

a) ½ b) 2 c) $1/\sqrt{2}$ d) $\sqrt{2}$

i. c
ii. d
iii. b
iv. a

The correct answer is:
d

Question 20
Incorrect
Mark 0.00 out of 1.00
Flag question

Divergence of a three-dimensional radial vector field $\vec{r}$ is:
a) $\hat{i}+\hat{j}+\hat{k}$
b) $\frac{1}{r}$
c) $3(\hat{i}+\hat{j}+\hat{k})$
d) 3

i. b
ii. c
iii. d
iv. a

The correct answer is:
d

Question 21
Incorrect
Mark 0.00 out of 1.00
Flag question

Which of the following rule is incorrect
a) $\nabla.(fA) = f(\nabla.A) + A.(\nabla f)$
b) $\nabla.(A \times B) = B.(\nabla \times A) + A.(\nabla \times B)$.
c) $\nabla \times (fA) = f(\nabla \times A) - A \times (\nabla f)$
d) $\nabla(fg) = f\nabla g + g\nabla f$

i. a
ii. b
iii. c
iv. d

The correct answer is:
b

Question 22
Partially correct
Mark 0.50 out of 1.00
Flag question

An electric dipole is placed at the center of a sphere. Mark the correct options: -

a) The flux of the electric field through a sphere is a zero.

b) Electric field is zero at every point on the sphere.

c) Electric field is not zero anywhere on the sphere.

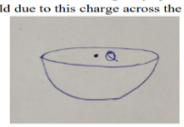
d) Electric field is zero on the circle on the sphere.

i. b
ii. c
iii. d
iv. a

The correct answers are:
a,
c

Question **23**
Incorrect
Mark 0.00 out of 1.00
Flag question

A charge Q is placed at a centre of imaginary spherical surface using the gauss's law find the flux of electric field due to this charge across the surface of hemisphere



a) Q/ε b) 0 c) $Q/2\varepsilon$ d) $24Q/16\varepsilon$

- i. b
- ii. d
- iii. c
- iv. a

The correct answer is:
c

Question **24**
Incorrect
Mark 0.00 out of 1.00
Flag question

Curl of $v = s(2 + sin^2\phi)\hat{s} + s\,sin\phi\,cos\phi\,\hat{\phi} + 3z\,\hat{z}$

a) 0 b) ¼
c) ¼ d) ¼

- i. d
- ii. a
- iii. c
- iv. b

The correct answer is:
a

Question **25**
Incorrect
Mark 0.00 out of 1.00
Flag question

Which of the following is a vector field?
a) distribution of temperature
b) magnetic and electrostatics potential
c) density of any non-directed quantity in a given region of space
d) the distribution of electric or magnetic field intensity

- i. a
- ii. d
- iii. c
- iv. b

The correct answer is:
d

Question **26**
Correct
Mark 1.00 out of 1.00
Flag question

Curl of $f(x, y, z) = 2xy\hat{\imath} + (x^2 + z^2)\hat{\jmath} + 2yz\hat{k}$ is:
a) $xy^2\hat{\imath} - 2xyz\hat{k}$ and irrotational
b) 0 and irrotational
c) $xy^2\hat{\imath} - 2xyz\hat{k}$ and rotational
d) 0 and rotational

- i. a
- ii. c
- iii. b
- iv. d

The correct answer is:
b

Question **27**
Correct
Mark 1.00 out of 1.00
Flag question

Divergence of $\vec{f}(x, y, z) = \frac{(x\hat{\imath}+y\hat{\jmath}+z\hat{k})}{r^2}$, $where\ r^2 = x^2 + y^2 + z^2, (x, y, z) \neq 0$ is:
a) 0
b) 1
c) 2
d) 3

- i. c
- ii. a
- iii. b
- iv. d

The correct answer is:
a

Question **28**
Incorrect
Mark 0.00 out of 1.00
Flag question

The fundamental theorem for gradients says that
(a) the line integral of the gradient is given by the value of the function at the boundaries.
(b) the integral of the gradient over a volume is equal to the value of the function at the surface.
(c) Both.
(d) None of the above.

- i. c
- ii. d
- iii. b
- iv. a

The correct answer is:
a

Question **29**
Correct
Mark 1.00 out of 1.00
Flag question

Suppose the potential function is a step function. The equation that gets satisfied is
a) Laplace equation
b) Poisson equation
c) Maxwell equation
d) Ampere equation

i. d
ii. a ✓
iii. b
iv. c

The correct answer is:
a

Question **30**
Correct
Mark 1.00 out of 1.00
Flag question

Evaluate the surface integral $\iint (3xi + 2yj).dS$, where S is sphere given by $x^2 + y^2 + z^2 = 9$.
a) 120π
b) 180π
c) 240π
d) 360π

i. d
ii. c
iii. b ✓
iv. a

The correct answer is:
b

Question **31**
Incorrect
Mark 0.00 out of 1.00
Flag question

Uniform line charge λ is placed on an infinite straight wire, distance d above the ground conducting plane (wire runs parallel to the x axis and conducting plane is in xy plane). The charge density induced on the nearby surface of conducting plane is
a) 0 b) $-\lambda$ c) $\lambda/2$ d) 2λ

i. b
ii. d
iii. c ✗
iv. a

The correct answer is:
b

Question **32**
Correct
Mark 1.00 out of 1.00
Flag question

What will be the polarity of charge on outer sphere of radius *a* if a sphere of radius *r* carrying charge *q* is present inside that outer sphere ?

a. 2q
b. Insufficient information to answer
c. None ✓
d. q

The correct answer is:
None

Question **33**
Correct
Mark 1.00 out of 1.00
Flag question

Coulomb law is valid for moving charge?

a. True
b. Can't say
c. False ✓

The correct answer is:
False

Question **34**
Correct
Mark 1.00 out of 1.00
Flag question

Evaluate the following integral:

$$\int_{-\infty}^{a} \delta(x - b)\, dx$$

a) 1 if (a > b)
b) 0 if (a > b)
c) 0 if (a < b)
d) 4π (In both the cases)

i. c ✓
ii. b
iii. a
iv. d

The correct answer is:
c

Question **35**
Incorrect
Mark 0.00 out of 1.00
Flag question

Find the charge enclosed by a sphere of charge density 'ρ' and radius 'a'.
a) $\rho(4\pi a^2)$
b) $\rho(2\pi a^2)$
c) $\rho(2\pi a^3/3)$
d) $\rho(4\pi a^3/3)$

- i. b
- ii. a ✖
- iii. d
- iv. c

The correct answer is:
d

Question **36**
Incorrect
Mark 0.00 out of 1.00
Flag question

The electric field due to an unknown charge distribution is given by

$$\vec{E} = \frac{q}{r^2}\, exp\,(-4r)\,\hat{r}$$

The total charge over all space is equal to
a) 0
b) q
c) q/4
d) q/π

- i. d
- ii. a
- iii. b
- iv. c ✖

The correct answer is:
a

Question **37**
Incorrect
Mark 0.00 out of 1.00
Flag question

Equipotential surfaces corresponding to a particular charge distribution is given by $4x^2 + (y-2)^2 + z^2 = V$, where V is constant . The electric field $\vec{E}$ at origin is given by
a) $\vec{E} = 0$
b) $\vec{E} = 2\hat{x}$
c) $\vec{E} = 4\hat{y}$
d) $\vec{E} = -4\hat{y}$

- i. d
- ii. c
- iii. a
- iv. b ✖

The correct answer is:
c

Question **38**
Incorrect
Mark 0.00 out of 1.00
Flag question

An ion with charge +*q* is in a region of uniform electric field of magnitude *E*. The charge is moved a distance *d* in the direction of field. Which of the following is true?
a) The electric potential energy of the ion decreases by amount *qEd*
b) The electric potential energy of the ion increases by amount *qEd*
c) The electric potential energy of the ion decreases by amount *Ed*
d) The electric potential energy of the ion increases by amount *Ed*

- i. a
- ii. c
- iii. b
- iv. d ✖

The correct answer is:
a

Question **39**
Incorrect
Mark 0.00 out of 1.00
Flag question

Find the value of $\oint F.dr$ by Stoke's theorem where $\vec{F} = y^2\hat{\imath} + x^2\hat{\jmath} - (x+z)\hat{k}$ and C is the boundary of the triangle with vertices at (0,0,0), (1,0,0) and (1,1,0) is
a) 1/2
b) 1/3
c) 1/4
d) 1/5

- i. a
- ii. b
- iii. c ✖
- iv. d

The correct answer is:
b

Question **40**
Incorrect
Mark 0.00 out of 1.00
Flag question

When the electric field becomes zero which of the following relations hold.
a) B = P
b) E = P
c) D = P
d) H = P

- i. c
- ii. d
- iii. b
- iv. a ✖

The correct answer is:
c

Question 41
Incorrect
Mark 0.00 out of 1.00
Flag question

A point charge +q is kept at a distance d from the centre of a conducting sphere of radius R. If d > R, the potential on the sphere is

a) $\frac{q}{4\pi\varepsilon_0 d}$ b) $\frac{q}{4\pi\varepsilon_0 R}$ c) $\frac{q}{4\pi\varepsilon_0(d-R)}$ d) $\frac{q}{4\pi\varepsilon_0}\left(\frac{1}{d}-\frac{1}{R}\right)$

i. d
ii. c
iii. b
iv. a

The correct answer is:
a

Question 42
Correct
Mark 1.00 out of 1.00
Flag question

Positive and negative charges of equal magnitude are kept at (0, 0, a/2) and (0, 0, -a/2). Work done by electric field when another positive charge is moved from (-a, 0, 0) to (a, 0, 0)

a) 0 b) 4 J c) 8J d) 2/3 J

i. b
ii. d
iii. c
iv. a

The correct answer is:
a

Question 43
Incorrect
Mark 0.00 out of 1.00
Flag question

Two spheres, each of radius R and carrying uniform volume charges densities +ρ and – ρ, respectively, are placed so that they partially overlap. The electric field in the region of overlap is

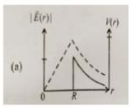
a) varies as distance r from the centre of sphere with charge density +ρ
b) zero
c) constant
d) not enough information given

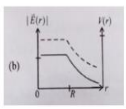
i. a
ii. c
iii. b
iv. d

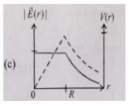
The correct answer is:
c

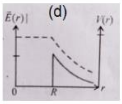
Question 44
Incorrect
Mark 0.00 out of 1.00
Flag question

Consider a thin spherical shell of radius R with its centre at origin, carrying uniform positive surface charge density. The variation of the magnitude of the Electric field |E(r)| and the potential V(r) with the distance r from the centre, is best represented by which graph?









i. b
ii. a
iii. c
iv. d

The correct answer is:
d

Question **45**
Correct
Mark 1.00 out of 1.00
Flag question

Electric field inside a perfectly conducting media is
a) 0 b) infinity c) 120 π d) depends on the value of charge

i. d
ii. a ✔
iii. b
iv. c

The correct answer is:
a

Question **46**
Incorrect
Mark 0.00 out of 1.00
Flag question

Electrostatic energy follows superposition principle.

a. False
b. Can't answer
c. True ✖

The correct answer is:
False

Question **47**
Incorrect
Mark 0.00 out of 1.00
Flag question

Which of the following option is incorrect about gradient:

a) The gradient $|\nabla T|$ points in the direction of maximum increase of the function T

b) The magnitude $|\nabla T|$ gives the slope along the mininum direction.

c) The magnitude $|\nabla T|$ gives the slope along the maximal direction.

d) Line integral of gradient is path independent.

i. c
ii. b
iii. d
iv. a ✖

The correct answer is:
b

Question **48**
Incorrect
Mark 0.00 out of 1.00
Flag question

In any scalar field, we can draw surfaces corresponding to equal values of the scalar. they are known as
a) Vector line
b) Flux line
c) Equipotential surfaces
d) None of the above

i. b ✖
ii. a
iii. c
iv. d

The correct answer is:
c

Question **49**
Incorrect
Mark 0.00 out of 1.00
Flag question

let ϕ_1, ϕ_2, ϕ_3 be the fluxes through the 3 closed surfaces

a) $|\phi_1| > |\phi_2| > |\phi_3|$
b) $|\phi_1| > |\phi_3| > |\phi_2|$
c) $|\phi_3| > |\phi_2| > |\phi_1|$
d) $|\phi_3| > |\phi_1| > |\phi_2|$

i. d
ii. a ✖
iii. c
iv. b

The correct answer is:
b

Question **50**
Partially correct
Mark 0.50 out of 1.00
Flag question

which of the following is/are valid:-

a) The gauss's law can be used to calculate the field distribution around an electric dipole

b) If the electric field between two point charges is zero somewhere then the sign of two charges is the same

c) The work done by the external forces in moving a unit positive charge from point A at potential V_A to point B at potential V_B is $(V_B - V_A)$.

d) If electric field due to a point charge varies as $r^{-2.5}$ instead of r^{-2} then the gauss's law will still be valid

i. a
ii. c ✔
iii. d
iv. b

The correct answers are:
b,
c