PHY101 Physics Final Term Solved MCQs Mega File (All in One)

1. A total charge of 6.3×10^{-8} C is distributed uniformly throughout a 2.7-cm radius sphere. The volume charge density is:
A. 3.7×10^{-7} C/m3
B. 6.9×10^{-6} C/m3
C. 6.9×10^{-6} C/m2
D. 2.5×10^{-4} C/m3
E. 7.6×10^{-4} C/m3
ans: E

2. Charge is placed on the surface of a 2.7-cm radius isolated conducting sphere. The surface charge density is uniform and has the value 6.9×10^{-6} C/m2. The total charge on the sphere is:
A. 5.6×10^{-10} C
B. 2.1×10^{-8} C
C. 4.7×10^{-8} C
D. 6.3×10^{-8} C
E. 9.5×10^{-3} C
ans: D

3. A spherical shell has an inner radius of 3.7 cm and an outer radius of 4.5 cm. If charge is distributed uniformly throughout the shell with a volume density of 6.1×10^{-4} C/m3 the total charge is:
A. 1.0×10^{-7} C
B. 1.3×10^{-7} C
C. 2.0×10^{-7} C
D. 2.3×10^{-7} C
E. 4.0×10^{-7} C
ans: A

4. A cylinder has a radius of 2.1 cm and a length of 8.8 cm. Total Charge.1×10^{-7} C is distributed uniformly throughout. The volume charge density is:
A. 5.3×10^{-5} C/m3
B. 5.3×10^{-5} C/m2
C. 8.5×10^{-4} C/m3
D. 5.0×10^{-3} C/m3
E. 6.3×10^{-2} C/m3
ans: D

5. When a piece of paper is held with one face perpendicular to a uniform electric field the flux through it is 25N · m2 /C. When the paper is turned 25◦ with respect to the field the flux through it is:
A. 0
B. 12N · m2/C
C. 21N · m2/C
D. 23N · m2/C
E. 25N · m2/C
ans: D

6. The flux of the electric field (24N/C)ˆi + (30N/C)ˆj + (16N/C)ˆk through a 2.0m2 portion of the yz plane is:

A. 32N · m2 /C
B. 34N · m2 /C
C. 42N · m2 /C
D. 48N · m2 /C
E. 60N · m2 /C
ans: D

7. Consider Gauss's law: □ □ E · d□ A = q/□0. Which of the following is true?
A. □ E must be the electric field due to the enclosed charge
B. If q = 0, then □ E = 0 everywhere on the Gaussian surface
C. If the three particles inside have charges of +q, +q, and −2q, then the integral is zero
D. on the surface □ E is everywhere parallel to d□ A
E. If a charge is placed outside the surface, then it cannot affect □ E at any point on the surface
ans: C

8. A charged point particle is placed at the center of a spherical Gaussian surface. The electric flux ΦE is changed if:
A. the sphere is replaced by a cube of the same volume
B. the sphere is replaced by a cube of one-tenth the volume
C. the point charge is moved off center (but still inside the original sphere)
D. the point charge is moved to just outside the sphere
E. a second point charge is placed just outside the sphere
ans: D

9. Choose the INCORRECT statement:
A. Gauss' law can be derived from Coulomb's law
B. Gauss' law states that the net number of lines crossing any closed surface in an outward direction is proportional to the net charge enclosed within the surface
C. Coulomb's law can be derived from Gauss' law and symmetry
D. Gauss' law applies to a closed surface of any shape
E. According to Gauss' law, if a closed surface encloses no charge, then the electric field must vanish everywhere on the surface
ans: E

10. The outer surface of the cardboard center of a paper towel roll:
A. is a possible Gaussian surface
B. cannot be a Gaussian surface because it encloses no charge
C. cannot be a Gaussian surface since it is an insulator
D. cannot be a Gaussian surface because it is not a closed surface
E. none of the above
ans: D

11. A physics instructor in an anteroom charges an electrostatic generator to 25 μC, then carries it into the lecture hall. The net electric flux in N · m2/C through the lecture hall walls is:
A. 0
B. 25 × 10−6
C. 2.2 × 105
D. 2.8 × 106
E. can not tell unless the lecture hall dimensions are given
ans: D

12. A point particle with charge q is placed inside the cube but not at its center. The electric flux through any one side of the cube:
A. is zero
B. is q/□0
C. is q/4□0
D. is q/6□0
E. cannot be computed using Gauss' law
ans: E

13. A particle with charge 5.0-μC is placed at the corner of a cube. The total electric flux in N · m2 /C through all sides of the cube is:
A. 0
B. 7.1 × 104
C. 9.4 × 104

D. 1.4 × 105
E. 5.6 × 105
ans: E

14. A point particle with charge q is at the center of a Gaussian surface in the form of a cube. The electric flux through any one face of the cube is:
A. q/□0
B. q/4π□0
C. q/3□0
D. q/6□0
E. q/12□0
ans: D

15. The table below gives the electric flux in N·m2/C through the ends and round surfaces of four Gaussian surfaces in the form of cylinders. Rank the cylinders according to the charge inside, from the most negative to the most positive. left end right end rounded surface
cylinder 1: +2 × 10−9 +4 × 10−9 −6 × 10−9
cylinder 2: +3 × 10−9 −2 × 10−9 +6 × 10−9
cylinder 3: −2 × 10−9 −5 × 10−9 +3 × 10−9
cylinder 4: +2 × 10−9 −5 × 10−9 −3 × 10−9

A. 1, 2, 3, 4
B. 4, 3, 2, 1
C. 3, 4, 2, 1
D. 3, 1, 4, 2
E. 4, 3, 1, 2
ans: E

16. A conducting sphere of radius 0.01m has a charge of 1.0 × 10−9 C deposited on it. The magnitude of the electric field in N/C just outside the surface of the sphere is:
A. 0
B. 450
C. 900
D. 4500
E. 90, 000
ans: C

17. A round wastepaper basket with a 0.15-m radius opening is in a uniform electric field of 300N/C, perpendicular to the opening. The total flux through the sides and bottom, in N · m2 C, is:
A. 0
B. 4.2
C. 21
D. 280
E. can not tell without knowing the areas of the sides and bottom
ans: C

18. 10C of charge are placed on a spherical conducting shell. A particle with a charge of −3C is placed at the center of the cavity. The net charge on the inner surface of the shell is:
A. −7C
B. −3C
C. 0C
D. +3C
E. +7C
ans: D

19. 10C of charge are placed on a spherical conducting shell. A particle with a charge of −3C is placed at the center of the cavity. The net charge on the outer surface of the shell is:
A. −7C
B. −3C
C. 0C
D. +3C
E. +7C
ans: E

20. A 30-N/C uniform electric field points perpendicularly toward the left face of a large neutral conducting sheet. The surface charge density in C/m2 on the left and right faces, respectively, are:
A. −2.7 × 10−9 C/m2; +2.7 × 10−9 C/m2
B. +2.7 × 10−9 C/m2; −2.7 × 10−9 C/m2
C. −5.3 × 10−9 C/m2; +5.3 × 10−9 C/m2
D. +5.3 × 10−9 C/m2; −5.3 × 10−9 C/m2
E. 0; 0
ans: A

23. Charge Q is distributed uniformly throughout an insulating sphere of radius R. The magnitude of the electric field at a point R/2 from the center is:
A. Q/4π□0R2
B. Q/π□0R2
C. 3Q/4π□0R2
D. Q/8π□0R2
E. none of these
ans: D

24. Positive charge Q is distributed uniformly throughout an insulating sphere of radius R, centered at the origin. A particle with positive charge Q is placed at x = 2R on the x axis. The magnitude of the electric field at x = R/2 on the x axis is:
A. Q/4π□0R2
B. Q/8π□0R2
C. Q/72π□0R2
D. 17Q/72π□0R2
E. none of these
ans: C

25. Charge Q is distributed uniformly throughout a spherical insulating shell. The net electric flux in N · m2 /C through the inner surface of the shell is:
A. 0
B. Q/□0
C. 2Q/□0
D. Q/4π□0
E. Q/2π□0
ans: A

26. Charge Q is distributed uniformly throughout a spherical insulating shell. The net electric flux in N · m2 /C through the outer surface of the shell is:
A. 0
B. Q/□0
C. 2Q/□0
D. Q/4□0
E. Q/2π□0
ans: B

27. A 3.5-cm radius hemisphere contains a total charge of 6.6 × 10−7 C. The flux through the rounded portion of the surface is 9.8 × 104 N · m2 /C. The flux through the flat base is:
A. 0
B. +2.3 × 104 N · m2 /C
C. −2.3 × 104 N · m2 /C
D. −9.8 × 104 N · m2 /C
E. +9.8 × 104 N · m2 /C
ans: C

28. Charge is distributed uniformly along a long straight wire. The electric field 2 cm from the wire is 20N/C. The electric field 4 cm from the wire is:
A. 120N/C
B. 80N/C
C. 40N/C
D. 10N/C
E. 5N/C
ans: D

29. Positive charge Q is placed on a conducting spherical shell with inner radius R1 and outer radius R2. A point charge q is placed at the center of the cavity. The magnitude of the electric field at a point outside the shell, a distance r from the center, is:
A. zero
B. Q/4π□0r2
C. q/4π□0r2
D. (q + Q)/4π□0r2
E. (q + Q)/4π□0(R2
1 − r2)
ans: D

30. Positive charge Q is placed on a conducting spherical shell with inner radius R1 and outer radius R2. A point charge q is placed at the center of the cavity. The magnitude of the electric field produced by the charge on the inner surface at a point in the interior of the conductor, a distance r from the center, is:
A. 0
B. Q/4vπ□0R2 1
C. Q/4π□0R2 2
D. q/4π□0r2
E. Q/4π□0r2
ans: D

31. A long line of charge with λ□ charge per unit length runs along the cylindrical axis of a cylindrical shell which carries a charge per unit length of λc. The charge per unit length on the inner and outer surfaces of the shell, respectively are:
A. λ□ and λc
B. −λ□ and λc + λ□
C. −λ□ and λc − λc
D. λ□ + λc and λc − λ□
E. λ□ − λc and λc + λ□
ans: B

32. Charge is distributed uniformly on the surface of a large flat plate. The electric field 2 cm from the plate is 30N/C. The electric field 4 cm from the plate is:
A. 120N/C
B. 80N/C
C. 30N/C
D. 15N/C
E. 7.5N/C
ans: C

33. A particle with charge Q is placed outside a large neutral conducting sheet. At any point in the interior of the sheet the electric field produced by charges on the surface is directed:
A. toward the surface
B. away from the surface
C. toward Q
D. away from Q
E. none of the above
ans: C

34. A hollow conductor is positively charged. A small uncharged metal ball is lowered by a silk thread through a small opening in the top of the conductor and allowed to touch its inner surface. After the ball is removed, it will have:
A. a positive charge
B. a negative charge
C. no appreciable charge
D. a charge whose sign depends on what part of the inner surface it touched
E. a charge whose sign depends on where the small hole is located in the conductor
ans: C

35. A spherical conducting shell has charge Q. A particle with charge q is placed at the center of the cavity. The charge on the inner surface of the shell and the charge on the outer surface of the shell, respectively, are:
A. 0, Q
B. q, Q − q
C. Q, 0

D. −q, Q + q
E. −q, 0
ans: D

36. A particle with a charge of 5.5×10^{-8}C is 3.5 cm from a particle with a charge of -2.3×10^{-8} C. The potential energy of this two-particle system, relative to the potential energy at infinite separation, is:
A. 3.2×10^{-4} J
B. -3.2×10^{-4} J
C. 9.3×10^{-3} J
D. -9.3×10^{-3} J
E. zero
ans: B

37. A particle with a charge of 5.5×10^{-8}C is fixed at the origin. A particle with a charge of -2.3×10^{-8} C is moved from x = 3.5 cm on the x axis to y = 4.3 cm on the y axis. The change in potential energy of the two-particle system is:
A. 3.1×10^{-3} J
B. -3.1×10^{-3} J
C. 6.0×10^{-5} J
D. -6.0×10^{-5} J
E. 0
ans: C

38. A particle with a charge of 5.5×10^{-8} C charge is fixed at the origin. A particle with a charge of -2.3×10^{-8} C charge is moved from x = 3.5 cm on the x axis to y = 3.5 cm on the y axis. The change in the potential energy of the two-particle system is:
A. 3.2×10^{-4} J
B. -3.2×10^{-4} J
C. 9.3×10^{-3} J
D. -9.3×10^{-3} J
E. 0
ans: E

39. Three particles lie on the x axis: particle 1, with a charge of 1×10^{-8} C is at x = 1 cm, particle 2, with a charge of 2×10^{-8} C, is at x = 2 cm, and particle 3, with a charge of -3×10^{-8} C, is at x = 3 cm. The potential energy of this arrangement, relative to the potential energy for infinite separation, is:
A. $+4.9 \times 10^{-4}$ J
B. -4.9×10^{-4} J
C. $+8.5 \times 10^{-4}$ J
D. -8.5×10^{-4} J
E. zero
ans: B

40. Two identical particles, each with charge q, are placed on the x axis, one at the origin and the other at x = 5 cm. A third particle, with charge −q, is placed on the x axis so the potential energy of the three-particle system is the same as the potential energy at infinite separation. Its x coordinate is:
A. 13 cm
B. 2.5 cm
C. 7.5 cm
D. 10 cm
E. −5 cm
ans: A

41. Choose the correct statement:
A. A proton tends to go from a region of low potential to a region of high potential
B. The potential of a negatively charged conductor must be negative
C. If □ E = 0 at a point P then V must be zero at P
D. If V = 0 at a point P then □ E must be zero at P
E. None of the above are correct
ans: E

42. If 500 J of work are required to carry a charged particle between two points with a potential difference of 20V, the magnitude of the charge on the particle is:
A. 0.040C

B. 12.5C
C. 20C
D. cannot be computed unless the path is given
E. none of these
ans: B

43. The potential difference between two points is 100V. If a particle with a charge of 2C is transported from one of these points to the other, the magnitude of the work done is:
A. 200 J
B. 100 J
C. 50 J
D. 100 J
E. 2 J
ans: A

44. During a lightning discharge, 30C of charge move through a potential difference of 1.0×108 V in 2.0 × 10−2 s. The energy released by this lightning bolt is:
A. 1.5 × 1011 J
B. 3.0 × 109 J
C. 6.0 × 107 J
D. 3.3 × 106 J
E. 1500 J
ans: B

45. An electron is accelerated from rest through a potential difference V . Its final speed is proportional to:
A. V
B. V 2
C. √V
D. 1/V
E. 1/√V
ans: C

46. Two large parallel conducting plates are separated by a distance d, placed in a vacuum, and connected to a source of potential difference V . An oxygen ion, with charge 2e, starts from rest on the surface of one plate and accelerates to the other. If e denotes the magnitude of the electron charge, the final kinetic energy of this ion is:
A. eV/2
B. eV/d
C. eV d
D. V d/e
E. 2eV
ans: E

47. An electron volt is :
A. the force acting on an electron in a field of 1N/C
B. the force required to move an electron 1 meter
C. the energy gained by an electron in moving through a potential difference of 1 volt
D. the energy needed to move an electron through 1 meter in any electric field
E. the work done when 1 coulomb of charge is moved through a potential difference of 1 volt.
ans: C

48. An electron has charge −e and mass me. A proton has charge e and mass 1840me. A "proton volt" is equal to:
A. 1 eV
B. 1840 eV
C. (1/1840) eV
D. √1840 eV
E. (1/√1840) eV
ans: A

49. Two conducting spheres are far apart. The smaller sphere carries a total charge Q. The larger sphere has a radius that is twice that of the smaller and is neutral. After the two spheres are connected by a conducting wire, the charges on the smaller and larger spheres, respectively, are:
A. Q/2 and Q/2
B. Q/3 and 2Q/3

C. 2Q/3 and Q/3
D. zero and Q
E. 2Q and −Q
ans: B

50. A conducting sphere with radius R is charged until the magnitude of the electric field just outside its surface is E. The electric potential of the sphere, relative to the potential far away, is:
A. zero
B. E/R
C. E/R2
D. ER
E. ER2
ans: D

51. A 5-cm radius conducting sphere has a surface charge density of 2 ×10−6 C/m2 on its surface. Its electric potential, relative to the potential far away, is:
A. 1.1 × 104 V
B. 2.2 × 104 V
C. 2.3 × 105 V
D. 3.6 × 105 V
E. 7.2 × 106 V
ans: A

52. A hollow metal sphere is charged to a potential V . The potential at its center is:
A. V
B. 0
C. −V
D. 2V
E. πV
ans: A

53. Positive charge is distributed uniformly throughout a non-conducting sphere. The highest electric potential occurs:
A. at the center
B. at the surface
C. halfway between the center and surface
D. just outside the surface
E. far from the sphere
ans: A

54. A total charge of 7×10−8 C is uniformly distributed throughout a non-conducting sphere with a radius of 5 cm. The electric potential at the surface, relative to the potential far away, is about:
A. −1.3 × 104 V
B. 1.3 × 104 V
C. 7.0 × 105 V
D. −6.3 × 104 V
E. 0
ans: B

55. Eight identical spherical raindrops are each at a potential V , relative to the potential far away. They coalesce to make one spherical raindrop whose potential is:
A. V/8
B. V/2
C. 2V
D. 4V
E. 8V
ans: D

56. A metal sphere carries a charge of 5 × 10−9 C and is at a potential of 400V, relative to the potential far away. The potential at the center of the sphere is:
A. 400V
B. −400V
C. 2 × 10−6 V
D. 0
E. none of these
ans: A

57. A 5-cm radius isolated conducting sphere is charged so its potential is +100V, relative to the potential far away. The charge density on its surface is:
A. +2.2 × 10−7 C/m2
B. −2.2 × 10−7 C/m2
C. +3.5 × 10−7 C/m2
D. −3.5 × 10−7 C/m2
E. +1.8 × 10−8 C/m2
ans: E

57. A conducting sphere has charge Q and its electric potential is V , relative to the potential far away. If the charge is doubled to 2Q, the potential is:
A. V
B. 2V
C. 4V
D. V/2
E. V/4
ans: B

58. The potential difference between the ends of a 2-meter stick that is parallel to a uniform electric field is 400V. The magnitude of the electric field is:
A. zero
B. 100V/m
C. 200V/m
D. 400V/m
E. 800V/m
ans: E

59. In a certain region of space the electric potential increases uniformly from east to west and does not vary in any other direction. The electric field:
A. points east and varies with position
B. points east and does not vary with position
C. points west and varies with position
D. points west and does not vary with position
E. points north and does not vary with position
ans: B

60. If the electric field is in the positive x direction and has a magnitude given by E = Cx2, where C is a constant, then the electric potential is given by V =:
A. 2Cx
B. −2Cx
C. Cx3/3
D. −Cx3/3
E. −3Cx3
ans: D

61. The work required to carry a particle with a charge of 6.0C from a 5.0-V equipotential surface to a 6.0-V equipotential surface and back again to the 5.0-V surface is:
A. 0
B. 1.2 × 10−5 J
C. 3.0 × 10−5 J
D. 6.0 × 10−5 J
E. 6.0 × 10−6 J
ans: A

62. The equipotential surfaces associated with a charged point particles are:
A. radially outward from the particle
B. vertical planes
C. horizontal planes
D. concentric spheres centered at the particle
E. concentric cylinders with the particle on the axis.
ans: D

63. The electric field in a region around the origin is given by $E = C(x\hat{i} + y\hat{j})$, where C is a constant. The equipotential surfaces in that region are:
A. concentric cylinders with axes along the z axis
B. concentric cylinders with axes along the x axis
C. concentric spheres centered at the origin
D. planes parallel to the xy plane
E. planes parallel to the yz plane
ans: A

64.Room temperature is about 20 degrees on the:
Select correct option:

Kelvin scale
Celsius scale
Fahrenheit scale
Absolute scale

65.A particle with zero mass and energy E carries momentum:
Select correct option:

Ec
Ec^2
vEc
E/c

66.The quantum number ms is most closely associated with what property of the electron in an atom?
Select correct option:

Magnitude of the orbital angular momentum
Energy
z component of the spin angular momentum
z component of the orbital angular momentum

67.J.J.Thompson's measurement of e/m for electrons provides evidence of the:
Select correct option:

Wave nature of matter
Particle nature of matter
Wave nature of radiation
Particle nature of radiation

68.During a slow adiabatic expansion of a gas:
Select correct option:

The pressure remains constant
Energy is added as heat
Work is done on the gas
No energy enters or leaves as heat

69. The electric potential in a certain region of space is given by $V = -7.5x^2 + 3x$, where V is in volts and x is in meters. In this region the equipotential surfaces are:
A. planes parallel to the x axis
B. planes parallel to the yz plane
C. concentric spheres centered at the origin
D. concentric cylinders with the x axis as the cylinder axis
E. unknown unless the charge is given
ans: B

70. A particle with charge q is to be brought from far away to a point near an electric dipole. No work is done if the final position of the particle is on:
A. the line through the charges of the dipole
B. a line that is perpendicular to the dipole moment

C. a line that makes an angle of 45◦ with the dipole moment
D. a line that makes an angle of 30◦ with the dipole moment
E. none of the above
ans: B

71. Equipotential surfaces associated with an electric dipole are:
A. spheres centered on the dipole
B. cylinders with axes along the dipole moment
C. planes perpendicular to the dipole moment
D. planes parallel to the dipole moment
E. none of the above
ans: E

72. The units of capacitance are equivalent to:
A. J/C
B. V/C
C. J2/C
D. C/J
E. C2/J
ans: E

73. A farad is the same as a:
A. J/V
B. V/J
C. C/V
D. V/C
E. N/C
ans: C

74. A capacitor C "has a charge Q". The actual charges on its plates are:
A. Q, Q
B. Q/2, Q/2
C. Q, −Q
D. Q/2, −Q/2
E. Q, 0
ans: C

75. Each plate of a capacitor stores a charge of magnitude 1mC when a 100-V potential difference is applied. The capacitance is:
A. 5 μF
B. 10 μF
C. 50 μF
D. 100 μF
E. none of these
ans: B

76. To charge a 1-F capacitor with 2C requires a potential difference of:
A. 2V
B. 0.2V
C. 5V
D. 0.5V
E. none of these
ans: A

77. The capacitance of a parallel-plate capacitor with plate area A and plate separation d is given by:
A. □0d/A
B. □0d/2A
C. □0A/d
D. □0A/2d
E. Ad/□0
ans: C

78. The capacitance of a parallel-plate capacitor is:
A. proportional to the plate area
B. proportional to the charge stored
C. independent of any material inserted between the plates
D. proportional to the potential difference of the plates

E. proportional to the plate separation
ans: A

79. The plate areas and plate separations of five parallel plate capacitors are
capacitor 1: area A0, separation d0
capacitor 2: area 2A0, separation 2d0
capacitor 3: area 2A0, separation d0/2
capacitor 4: area A0/2, separation 2d0
capacitor 5: area A0, separation d0/2
Rank these according to their capacitances, least to greatest.
A. 1, 2, 3, 4, 5
B. 5, 4, 3, 2, 1
C. 5, 3 and 4 tie, then 1, 2
D. 4, 1 and 2 tie, then 5, 3
E. 3, 5, 1 and 2 tie, 1, 4
ans: D

80. The capacitance of a parallel-plate capacitor can be increased by:
A. increasing the charge
B. decreasing the charge
C. increasing the plate separation
D. decreasing the plate separation
E. decreasing the plate area
ans: D

81. If both the plate area and the plate separation of a parallel-plate capacitor are doubled, the capacitance is:
A. doubled
B. halved
C. unchanged
D. tripled
E. quadrupled
ans: C

82. If the plate area of an isolated charged parallel-plate capacitor is doubled:
A. the electric field is doubled
B. the potential difference is halved
C. the charge on each plate is halved
D. the surface charge density on each plate is doubled
E. none of the above
ans: B

83. If the plate separation of an isolated charged parallel-plate capacitor is doubled:
A. the electric field is doubled
B. the potential difference is halved
C. the charge on each plate is halved
D. the surface charge density on each plate is doubled
E. none of the above
ans: E

84. Pulling the plates of an isolated charged capacitor apart:
A. increases the capacitance
B. increases the potential difference
C. does not affect the potential difference
D. decreases the potential difference
E. does not affect the capacitance
ans: B

85. If the charge on a parallel-plate capacitor is doubled:
A. the capacitance is halved
B. the capacitance is doubled
C. the electric field is halved
D. the electric field is doubled
E. the surface charge density is not changed on either plate
ans: D

86. A parallel-plate capacitor has a plate area of 0.2m2 and a plate separation of 0.1mm. To obtain an electric field of 2.0 × 106 V/m between the plates, the magnitude of the charge on each plate should be:
A. 8.9 × 10−7 C
B. 1.8 × 10−6 C
C. 3.5 × 10−6 C
D. 7.1 × 10−6 C
E. 1.4 × 10−5 C
ans: D

87. A parallel-plate capacitor has a plate area of 0.2m2 and a plate separation of 0.1 mm. If the charge on each plate has a magnitude of 4 × 10−6 C the potential difference across the plates is approximately:

A. 0
B. 4 × 10−2 V
C. 1 × 102 V
D. 2 × 102 V
E. 4 × 108 V
ans: D

88. The capacitance of a spherical capacitor with inner radius a and outer radius b is proportional to:
A. a/b
B. b − a
C. b2 − a2
D. ab/(b − a)
E. ab/(b2 − a2)
ans: D

89. The capacitance of a single isolated spherical conductor with radius R is proportional to:
A. R
B. R2
C. 1/R
D. 1/R2
E. none of these
ans: A

90. The capacitance of a cylindrical capacitor can be increased by:
A. decreasing both the radius of the inner cylinder and the length
B. increasing both the radius of the inner cylinder and the length
C. increasing the radius of the outer cylindrical shell and decreasing the length
D. decreasing the radius of the inner cylinder and increasing the radius of the outer cylindrical shell
E. only by decreasing the length
ans: B

91. A battery is used to charge a series combination of two identical capacitors If the potential difference across the battery terminals is V and total charge Q flows through the battery during the charging process then the charge on the positive plate of each capacitor and the potential difference across each capacitor are:
A. Q/2 and V/2, respectively
B. Q and V , respectively
C. Q/2 and V , respectively
D. Q and V/2, respectively
E. Q and 2V , respectively
ans: D

92. A battery is used to charge a parallel combination of two identical capacitors. If the potential difference across the battery terminals is V and total charge Q flows through the battery during the charging process then the charge on the positive plate of each capacitor and the potential difference across each capacitor are:
A. Q/2 and V/2, respectively
B. Q and V , respectively
C. Q/2 and V , respectively
D. Q and V/2, respectively
E. Q and 2V , respectively
ans: C

93. A 2-μF and a 1-μF capacitor are connected in series and a potential difference is applied across the combination. The 2-μF capacitor has:
A. twice the charge of the 1-μF capacitor
B. half the charge of the 1-μF capacitor
C. twice the potential difference of the 1-μF capacitor
D. half the potential difference of the 1-μF capacitor
E. none of the above
ans: D

94. A 2-μF and a 1-μF capacitor are connected in parallel and a potential difference is applied across the combination. The 2-μF capacitor has:
A. twice the charge of the 1-μF capacitor
B. half the charge of the 1-μF capacitor
C. twice the potential difference of the 1-μF capacitor
D. half the potential difference of the 1-μF capacitor
E. none of the above
ans: A

95. Let Q denote charge, V denote potential difference, and U denote stored energy. Of these quantities, capacitors in series must have the same:
A. Q only
B. V only
C. U only
D. Q and U only
E. V and U only
ans: A

96. Let Q denote charge, V denote potential difference, and U denote stored energy. Of these quantities, capacitors in parallel must have the same:
A. Q only
B. V only
C. U only
D. Q and U only
E. V and U only
ans: B

97. Capacitors C1 and C2 are connected in parallel. The equivalent capacitance is given by:
A. C1C2/(C1 + C2)
B. (C1 + C2)/C1C2
C. 1/(C1 + C2)
D. C1/C2
E. C1 + C2
ans: E

98. Capacitors C1 and C2 are connected in series. The equivalent capacitance is given by:
A. C1C2/(C1 + C2)
B. (C1 + C2)/C1C2
C. 1/(C1 + C2)
D. C1/C2
E. C1 + C2
ans: A

99. Capacitors C1 and C2 are connected in series and a potential difference is applied to the combination. If the capacitor that is equivalent to the combination has the same potential difference, then the charge on the equivalent capacitor is the same as:
A. the charge on C1
B. the sum of the charges on C1 and C2
C. the difference of the charges on C1 and C2
D. the product of the charges on C1 and C2
E. none of the above
ans: A

100. Capacitors C1 and C2 are connected in parallel and a potential difference is applied to the combination. If the capacitor that is equivalent to the combination has the same potential difference, then the charge on the equivalent capacitor is the same as:
A. the charge on C1
B. the sum of the charges on C1 and C2
C. the difference of the charges on C1 and C2
D. the product of the charges on C1 and C2
E. none of the above
ans: B

101. Two identical capacitors are connected in series and two, each identical to the first, are connected in parallel. The equivalent capacitance of the series connection is the equivalent capacitance of parallel connection.

A. twice
B. four times
C. half
D. one-fourth
E. the same as
ans: D

102. Two identical capacitors, each with capacitance C, are connected in parallel and the combination is connected in series to a third identical capacitor. The equivalent capacitance of this arrangement is:
A. 2C/3
B. C
C. 3C/2
D. 2C
E. 3C
ans: A

103. A 2-μF and a 1-μF capacitor are connected in series and charged from a battery. They store charges P and Q, respectively. When disconnected and charged separately using the same battery, they have charges R and S, respectively. Then:
A. R > S > Q = P
B. P > Q > R = S
C. R > P = Q > S
D. R =P >S = Q
E. R > P > S = Q
ans: A

104. A 20-F capacitor is charged to 200V. Its stored energy is:
A. 4000 J
B. 4 J
C. 0.4J
D. 2000 J
E. 0.1J
ans: C

105. A charged capacitor stores 10C at 40V. Its stored energy is:
A. 400 J
B. 4 J
C. 0.2J
D. 2.5J
E. 200 J
ans: E

106. A 2-μF and a 1-μF capacitor are connected in series and charged by a battery. They store energies P and Q, respectively. When disconnected and charged separately using the same battery, they store energies R and S, respectively. Then:
A. R > P > S > Q
B. P > Q > R > S
C. R > P > Q > S
D. P >R>S >Q
E. R > S > Q > P
ans: E

107. The quantity (1/2)□0E2 has the significance of:
A. energy/farad
B. energy/coulomb
C. energy
D. energy/volume
E. energy/volt
ans: D

108. Capacitors A and B are identical. Capacitor A is charged so it stores 4 J of energy and capacitor B is uncharged. The capacitors are then connected in parallel. The total stored energy in the capacitors is now:
A. 16 J
B. 8 J
C. 4 J
D. 2 J
E. 1 J
ans: D

109. To store a total of 0.040 J of energy in the two identical capacitors shown, each should have a capacitance of: 200V
A. 0.10 μF
B. 0.50 μF0.10 μF
C. 1.0 μJ
D. 1.5 μF
E. 2.0 μF
ans: C

110. A battery is used to charge a parallel-plate capacitor, after which it is disconnected. Then the plates are pulled apart to twice their original separation. This process will double the:
A. capacitance
B. surface charge density on each plate
C. stored energy
D. electric field between the two places
E. charge on each plate
ans: C

111. A parallel-plate capacitor has a plate area of 0.3m2 and a plate separation of 0.1 mm. If the charge on each plate has a magnitude of 5×10−6 C then the force exerted by one plate on the other has a magnitude of about:
A. 0
B. 5N
C. 9N
D. 1 × 104 N
E. 9 × 105 N
ans: B

112. A certain capacitor has a capacitance of 5.0 μF. After it is charged to 5.0 μC and isolated, the plates are brought closer together so its capacitance becomes 10 μF. The work done by the agent is about:
A. zero
B. 1.25 × 10−6 J
C. −1.25 × 10−6 J
D. 8.3 × 10−7 J
E. −8.3 × 10−7 J
ans: C

113. A dielectric slab is slowly inserted between the plates of a parallel plate capacitor, while the potential difference between the plates is held constant by a battery. As it is being inserted:
A. the capacitance, the potential difference between the plates, and the charge on the positive plate all increase
B. the capacitance, the potential difference between the plates, and the charge on the positive plate all decrease
C. the potential difference between the plates increases, the charge on the positive plate decreases, and the capacitance remains the same
D. the capacitance and the charge on the positive plate decrease but the potential difference between the plates remains the same

E. the capacitance and the charge on the positive plate increase but the potential difference between the plates remains the same
ans: E

114. An air-filled parallel-plate capacitor has a capacitance of 1 pF. The plate separation is then doubled and a wax dielectric is inserted, completely filling the space between the plates. As a result, the capacitance becomes 2 pF. The dielectric constant of the wax is:
A. 0.25
B. 0.5
C. 2.0
D. 4.0
E. 8.0
ans: D

115. One of materials listed below is to be placed between two identical metal sheets, with no, air gap, to form a parallel-plate capacitor. Which produces the greatest capacitance?

A. material of thickness 0.1mm and dielectric constant 2
B. material of thickness 0.2mm and dielectric constant 3
C. material of thickness 0.3mm and dielectric constant 2
D. material of thickness 0.4mm and dielectric constant 8
E. material of thickness 0.5mm and dielectric constant 11
ans: E

116. Two capacitors are identical except that one is filled with air and the other with oil. Both capacitors carry the same charge. The ratio of the electric fields Eair/Eoil is:
A. between 0 and 1
B. 0
C. 1
D. between 1 and infinity
E. infinite
ans: D

117. A parallel-plate capacitor, with air dielectric, is charged by a battery, after which the battery is disconnected. A slab of glass dielectric is then slowly inserted between the plates. As it is being inserted:
A. a force repels the glass out of the capacitor
B. a force attracts the glass into the capacitor
C. no force acts on the glass
D. a net charge appears on the glass
E. the glass makes the plates repel each other
ans: B

118. Two parallel-plate capacitors with the same plate separation but different capacitance are connected in parallel to a battery. Both capacitors are filled with air. The quantity that is NOT the same for both capacitors when they are fully charged is:
A. potential difference
B. energy density
C. electric field between the plates
D. charge on the positive plate
E. dielectric constant
ans: D

119. Two parallel-plate capacitors with the same plate area but different capacitance are connected in parallel to a battery. Both capacitors are filled with air. The quantity that is the same for both capacitors when they are fully charged is:
A. potential difference
B. energy density
C. electric field between the plates
D. charge on the positive plate
E. plate separation
ans: A

120. Two parallel-plate capacitors with different plate separation but the same capacitance are connected in series to a battery. Both capacitors are filled with air. The quantity that is NOT the same for both capacitors when they are fully charged is:

A. potential difference
B. stored energy
C. electric field between the plates
D. charge on the positive plate
E. dielectric constant
ans: C

121. Two parallel-plate capacitors with different capacitance but the same plate separation are connected in series to a battery. Both capacitors are filled with air. The quantity that is the same for both capacitors when they are fully charged is:
A. potential difference
B. stored energy
C. energy density
D. electric field between the plates
E. charge on the positive plate
ans: E

122. A car battery is rated at 80A · h. An ampere-hour is a unit of:
A. power
B. energy
C. current
D. charge
E. force
ans: D

123. Current has units:
A. kilowatt·hour
B. coulomb/second
C. coulomb
D. volt
E. ohm
ans: B

124. Current has units:
A. kilowatt·hour
B. ampere
C. coulomb
D. volt
E. ohm
ans: B

125. The units of resistivity are:
A. ohm
B. ohm·meter
C. ohm/meter
D. ohm/meter2
E. none of these
ans: B

126. The rate at which electrical energy is used may be measured in:
A. watt/second
B. watt·second
C. watt
D. joule·second
E. kilowatt·hour
ans: C

127. Energy may be measured in:
A. kilowatt
B. joule·second
C. watt
D. watt·second
E. volt/ohm
ans: D

128. Which one of the following quantities is correctly matched to its unit?

A. Power – kW·h
B. Energy – kW
C. Potential difference – J/C
D. Current – A/s
E. Resistance – V/C
ans: C

129. Current is a measure of:
A. force that moves a charge past a point
B. resistance to the movement of a charge past a point
C. energy used to move a charge past a point
D. amount of charge that moves past a point per unit time
E. speed with which a charge moves past a point
ans: D

130. A 60-watt light bulb carries a current of 0.5A. The total charge passing through it in one hour is:
A. 120C
B. 3600C
C. 3000C
D. 2400C
E. 1800C
ans: E

The number of significant figures in 0.00150 is:

► 5
► 4
► 3
► 2

One revolution is the same as:

► 1 rad
► 57 rad
► π/2 rad
► π rad
► 2π rad

A body to be in equilibrium under the combined action of several forces:

► All the forces must be applied at the same point
all the forces must be applied at the same point
► all of the forces form pairs of equal and opposite forces
► any two of these forces must be balanced by a third force
► the sum of the torques about any point must equal zero

A bucket of water is pushed from left to right with increasing speed across a horizontal surface. Consider the pressure at two points at the same level in the water.

► It is the same
► It is higher at the point on the left
► It is higher at the point on the right
► At first it is higher at the point on the left but as the bucket speeds up it is lower there

An organ pipe with both ends open is 0.85m long. Assuming that the speed of sound is 340m/s, the frequency of the third harmonic of this pipe is:

► A. 200 Hz
► B. 300 Hz
► C. 400 Hz
► D. 600 Hz

Capacitors C1 and C2 are connected in series. The equivalent capacitance is given by

► C1C2/(C1 + C2)
► (C1 + C2)/C1C2

► 1/(C1 + C2)
► C1/C2

If the potential difference across a resistor is doubled:

► only the current is doubled
► only the current is halved
► only the resistance is doubled
► only the resistance is halved

By using only two resistors, R1 and R2, a student is able to obtain resistances of 3 Ω, 4Ω, 12Ω, and 16 Ω. The values of R1 and R2 (in ohms) are:

► 3, 4
► 2, 12
► 3, 16
► 4, 12

Faraday's law states that an induced emf is proportional to:

► the rate of change of the electric field
► the rate of change of the magnetic flux
► the rate of change of the electric flux
► the rate of change of the magnetic field

A generator supplies 100V to the primary coil of a transformer. The primary has 50 turns and the secondary has 500 turns. The secondary voltage is:

► 1000V
► 500V
► 250V
► 100V

The wavelength of red light is 700 nm. Its frequency is _____________.

► 4.30 * 104 Hertz
► 4.30 * 103 Hertz
► 4.30 * 105 Hertz
► 4.30 * 102 Hertz

A laser in a compact disc player generates light that has a wavelength of 780 nm in air. The light then enters into the plastic of a CD. If the index of refraction of plastic is 1.55, the speed of this light once enter the plastic is ________.

► 3.00 * 108 m/s
► 1.94 * 108 m/s
► 4.29 * 108 km/h
► 3.00 * 108 km/h

Which of the following electromagnetic radiations has photons with the greatest energy?

► blue light
► yellow light
► x rays
► radio waves

A virtual image is one:

► toward which light rays converge but do not pass through
► from which light rays diverge as they pass through
► toward which light rays converge and pass through
► from which light rays diverge but do not pass through

What is the unit of magnification factor?

► meter.Kelvin

► radian.Kelvin
► degree.Kelvin
► **no units**

During an adiabatic process an object does 100 J of work and its temperature decreases by 5K. During another process it does 25 J of work and its temperature decreases by 5 K. Its heat capacity for the second process is.

► 20 J/K
► 100 J/K
► **15 J/K**
► 5 J/K

An ideal gas expands into a vacuum in a rigid vessel. As a result there is:

► **a change in entropy**
► a decrease of internal energy
► an increase of pressure
► a change in temperature

The Stern-Gerlach experiment makes use of:

► a strong uniform magnetic field
► **a strong non-uniform magnetic field**
► a strong uniform electric field
► a strong non-uniform electric field

A large collection of nuclei are undergoing alpha decay. The rate of decay at any instant is proportional to:

► **the number of undecayed nuclei present at that instant**
► the time since the decays started
► the time remaining before all have decayed
► the half-life of the decay

As a 2.0-kg block travels around a 0.50-m radius circle it has an angular speed of 12 rad/s. The circle is parallel to the xy plane and is centered on the z axis, a distance of 0.75m from the origin. The z component of the angular momentum around the origin is:

► **6.0kg · m2/s**
► 9.0kg · m2/s
► 11 kg · m2/s
► 14 kg · m2/s

A net torque applied to a rigid object always tends to produce:

► linear acceleration
► rotational equilibrium
► **angular acceleration**
► rotational inertia

An object attached to one end of a spring makes 20 vibrations in 10 s. Its angular frequency is:

► 1.57 rad/s
► 2.0 rad/s
► 6.3 rad/s
► **12.6 rad/s**

In simple harmonic motion, the restoring force must be proportional to the:

► amplitude
► frequency
► velocity
► **displacement**

Mercury is a convenient liquid to use in a barometer because:

► it is a metal
► it has a high boiling point
► it expands little with temperature
► it has a high density

The units of the electric field are:

► J/m
► J/(C·m)
► N/C
► J·C

A farad is the same as a

► J/V
► V/J
► C/V
► V/C

We desire to make an LC circuit that oscillates at 100 Hz using an inductance of 2.5H. We also need a capacitance of:

► 1 F
► 1mF
► 1 μF
► 100 μF

Which of the following statements is NOT TRUE about electromagnetic waves?

► Electromagnetic waves satisfy the Maswell's Equation.
► Electromagnetic waves can not travel through space.
► The receptions of electromagnetic waves require an antenna.
► The electromagnetic radiation from a burning candle is unpolarized.

Radio waves and light waves are ___________________________.

► Longitudinal waves
► Transverse waves
► Electromagnetic and transverse both
► Electromagnetic and longitudinal both

Wen's Law states that, *lmax* = ________ K.

► 2.90 * 10-3 Hertz
► 2.90 * 10-3 s
► 2.90 * 10-3 kg
► 2.90 * 10-3 m

Interference of light is evidence that:

► the speed of light is very large
► light is a transverse wave
► light is a wave phenomenon
► light is electromagnetic in character

Fahrenheit and Kelvin scales agree numerically at a reading of:

► -40
► 0
► 273
► 574

According to the theory of relativity:

► moving clocks run fast
► energy is not conserved in high speed collisions
► the speed of light must be measured relative to the ether
► **none of the above are true**

Light from a stationary spaceship is observed, and then the spaceship moves directly away from the observer at high speed while still emitting the light. As a result, the light seen by the observer has:

► higher frequency and a longer wavelength than before
► **lower frequency and a shorter wavelength than before** **(Not Sure)**
► higher frequency and a shorter wavelength than before
► lower frequency and a longer wavelength than before

How fast should you move away from a 6.0 × 1014 Hz light source to observe waves with a frequency of 4.0 × 1014 Hz?

► 0.20c
► **0.38c**
► 0.45c
► 0.51c

The quantum number n is most closely associated with what property of the electron in a hydrogen atom?

► **Energy**
► Orbital angular momentum
► Spin angular momentum
► Magnetic moment

The quantum number ms is most closely associated with what property of the electron in an atom?

► Magnitude of the orbital angular momentum
► Energy
► **z component of the spin angular momentum**
► z component of the orbital angular momentum

As the wavelength of a wave in a uniform medium increases, its speed will _____.

► Decrease
► Increase
► **Remain the same**
► None of these

X

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