1. Match **List - I** with **List - II**.

List - I	List - II
A. Resistive circuit	I. No power dissipation
B. Purely capacitive or inductive circuit	II. Maximum power dissipation as $X_L = X_C$
C. Series L – C – R circuit	III. Power dissipated only in the resistor
D. Series L – C – R circuit at resonance	IV. Maximum power dissipation

   Choose the correct answer from the options given below:
   (a) A-IV, B-I, C-III, D-II
   (b) A-I, B-II, C-IV, D-III
   (c) A-IV, B-II, C-I, D-III
   (d) A-I, B-IV, C-III, D-II

2. The resolving power of a refracting type telescope can be increased by:
   (a) Choosing a large diameter objective lens
   (b) Choosing a small diameter objective lens
   (c) Increasing wavelength of light
   (d) Using an objective lens of large focal length

3. A plane electromagnetic wave of frequency 75 Hz travels in free space along the X-direction. At a particular point in space and time $\vec{E} = 9.6\hat{j}$. What is $\vec{B}$ at that point? (E = Electric field, B = Magnetic field)
   (a) $3.2 \times 10^{-8}\hat{k}$ T
   (b) $3.2 \times 10^{-8}\hat{j}$ T
   (c) $3.2 \times 10^{-8}\hat{i}$ T
   (d) $9.6\hat{j}$ T

4. Electromagnetic wave travels with speed of 2.0×10^8 m/s in any medium of relative permeability (μ_r) 1.5. Find the relative permittivity of the medium (ε_r)
   (a) 1.25
   (b) 1.50
   (c) 2.25
   (d) 2.50

5. Match **List - I** with **List - II**.

List - I (Devices)	List - II (Application)
A. Electrolytic Cell	I. Store charges
B. Parallel Plate Capacitor	II. Maintains steady current
C. Meter Bridge	III. accelerate charges
D. Van de Graff Generator	IV. find unknown resistance

   Choose the **correct** answer from the options given below:
   (a) A-I, B-II, C-III, D-IV
   (b) A-IV, B-III, C-II, D-I
   (c) A-II, B-I, C-IV, D-III
   (d) A-II, B-III, C-IV, D-I

6. Match **List - I** with **List - II**.

List - I (Physicist)	List - II (Contribution to EM Theory)
A. James Max well	I. Production of shorter EM waves
B. G. Marconi	II. Displacement current
C. J.C. Bose	III. Demonstrated the existence of EM waves
D. Hienrich Hertz	IV. Transmission of EM waves

   Choose the **correct** answer from the options given below:
   (a) A-II, B-IV, C-I, D-III
   (b) A-I, B-II, C-III, D-IV
   (c) A-IV, B-II, C-III, D-I
   (d) A-II, B-I, C-IV, D-III

7. Three identical polaroid sheets P_1, P_2, P_3 are oriented so that pass axis of P_2 and P_3 are inclined to P_1 at 60° and 90° respectively. A monochromatic source of intensity I_0 is used to pass through P_1, P_2, P_3. Intensities after passing through P_1, P_2, P_3 will be respectively:

   A. $I_0, \dfrac{I_0}{2}, \dfrac{I_0}{8}$
   B. $\dfrac{I_0}{2}, \dfrac{I_0}{8}, \dfrac{I_0}{32}$
   C. $\dfrac{I_0}{2}, \dfrac{I_0}{8}, \dfrac{3I_0}{32}$
   D. $I_0, \dfrac{I_0}{2}$, zero

   Choose the correct answer from the options given below:
   (a) C
   (b) B
   (c) D
   (d) A

8. An electron in a hydrogen atom is in the third excited state. It returns to the ground state by emitting photons.
   How many different photon wavelengths are possible?
   (a) 9
   (b) 6
   (c) 3
   (d) 2

9. A message signal of frequency ω_m is superposed on a carrier wave of frequency ω_c to get an amplitude modulated wave (AM). The frequency of the AM wave will be:
   (a) ω_m
   (b) ω_c
   (c) $\dfrac{\omega_c + \omega_m}{2}$
   (d) $\dfrac{\omega_c - \omega_m}{2}$

10. A concave mirror has radius of curvature 2 m. Light from a distance star is incident on the mirror. The distance of the image of the star from the mirror is:

(a) Infinite   (b) 1 m

(c) 2 m   (d) 0.5 m

11. Two nuclei have their mass numbers in the ratio of 1 : 3. The ratio of their nuclear densities would be :

(a) 1 : 3   (b) 3 : 1

(c) $\sqrt{3}$: 1   (d) 1 : 1

12. Two pitch balls each weighing 19.6×10^{-4} kg are suspended from the same point 'O' by two silk threads each 1 m long. Balls hold identical charge and repel each other making angle 90° at point 'O' between threads. The magnitude of charge is:
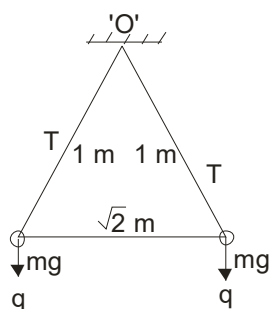
(a) 6.94×10^{-7} C   (b) 2.06×10^{-6} C

(c) 3.12×10^{-6} C   (d) 4.84×10^{-6} C

13. In a transistor :

A. one of the outer layers is heavily doped and is called collector

B. one of the outer layers is heavily doped and is called emitter

C. the middle layers is very lightly doped and is called base

D. one of the outer layer is moderately doped and is called emitter

E. one of the outer layer is moderately doped and is called collector

Choose the correct answer from the options given below:

(a) A, C and D only   (b) B, C and E only

(c) C, D and E only   (d) A, C and E only

14. The linear charge density of an infinite line charge producing a uniform electric field of 9×10^6 N/C at a distance of 2 cm is :

(a) 1 μ C/m   (b) 0.1 μ C/m

(c) 10 μ C/m   (d) 100 μ C/m

(Take permittivity of vacuum $\varepsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2})

15. What is the effect on the focal length of a convex lens when it is immersed in a liquid whose refractive index is equal to refractive index of the lens?

(a) Focal length will become infinity

(b) Focal length will become zero

(c) Focal length will reduce but not become zero

(d) Focal length remains unchanged

16. The generalised communication system will have following essential components in sequence in a block diagram.

A. Transmitter   B. Channel

C. Receiver   D. Information source

E. User of information

Choose the correct answer from the options given below:

(a) B, C, E, A, D   (b) C, E, A, B, D

(c) D, A, B, C, E   (d) A, B, D, E, C

17. A square coil of side 10 cm, 500 turns and resistance 3 Ω is placed with its plane perpendicular to the horizontal component of the Earth's magnetic field. It is rotated about vertical axis passing through centre by 180° in 0.25 second. Estimate the magnitude of the emf and current induced in the coil. Horizontal component of the Earth's magnetic field at the place is 3.0×10^{-5} T.

(a) 9×10^{-6} V, 3×10^{-6} A

(b) 21×10^{-6} V, 7×10^{-6} A

(c) 12×10^{-6} V, 4×10^{-6} A

(d) 12×10^{-4} V, 4×10^{-4} A

18. Match **List - I** with **List - II**.

List - I	List - II
A. Mobility	I. Ω m
B. Current density	II. A m^{-2}
C. Conductivity	III. Ω^{-1} m^{-1}
D. Resistivity	IV. m^2 V^{-1} s^{-1}

Choose the **correct** answer from the options given below:

(a) A-IV, B-II, C-III, D-I   (b) A-I, B-III, C-II, D-IV

(c) A-III, B-I, C-IV, D-II   (d) A-II, B-III, C-IV, D-I

19. A glass prism of angle 60° has an angle of minimum deviation of 30° for a given colour of light. The refractive index of glass for that colour of light is:

(a) 1.414   (b) 1.892

(c) 2.313   (d) 2.568

20. In the graph, Binding energy per nucleon $\left(\dfrac{NE}{N}\right)$ against nuclear mass (M) is plotted. A, B, C, D, E, F correspond to different nuclei. Consider following four reactions where Q is the energy released. In which reaction Q is positive?
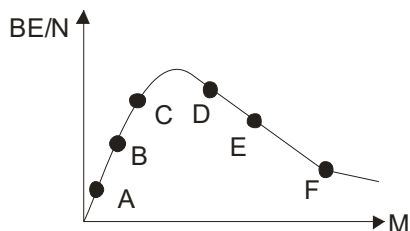
A. $C \rightarrow A + B + Q$

B. $F \rightarrow D + E + Q$

C. $C + A \rightarrow C + Q$

D. $D + E \rightarrow F + Q$

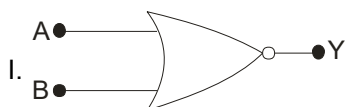Choose the correct answer from the options given below:

(a) C and D only   (b) A and B only

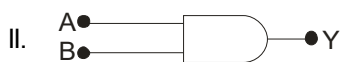(c) B and D only   (d) B and C only

21. Match **List - I** with **List - II**.

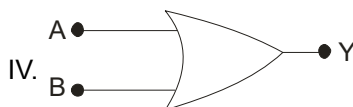| List - I		List - II
A. NAND Gate	I.	
B. OR Gate	II.	
C. NOR Gate	III.	
D. AND Gate	IV.	

Choose the **correct** answer from the options given below:

(a) A-I, B-IV, C-III, D-II   (b) A-IV, B-III, C-II, D-I

(c) A-III, B-IV, C-I, D-II   (d) A-I, B-II, C-IV, D-III

22. Which of the following phenomena proved that the photon has particle nture?

(a) Interference   (b) Diffraction

(c) Polarization   (d) Photoelectric effect

23. The electric field of an electric dipole at a large distance is proportional to :

(a) $\dfrac{1}{r}$ (b) $\dfrac{1}{r^2}$

(c) $\dfrac{1}{r^3}$ (d) $\dfrac{1}{r^4}$

24. Match **List - I** with **List - II**.

List - I	List - II
A. $\oint \vec{B} \cdot \overline{dl} = \mu_0 i_c + \mu_0 \in_0 \dfrac{d\phi_E}{dt}$	I. Faraday's Law
B. $\oint \vec{E} \cdot \overline{dl} = \dfrac{-d\phi_B}{dt}$	II. Gauss's law for magnetism
C. $\oint \vec{B} \cdot \overline{dA} = 0$	III. Ampere-Maxwell Law
D. $\oint \vec{E} \cdot \overline{dA} = \dfrac{Q}{\in_0}$	IV. Gauss's Law for electricity

Choose the **correct** answer from the options given below:

(a) A-III, B-I, C-IV, D-II   (b) A-III, B-I, C-II, D-IV

(c) A-I, B-III, C-II, D-IV   (d) A-III, B-II, C-I, D-IV

25. In a half wave rectifier, the frequency of the output is:

(a) half the frequency of input

(b) same as that of input

(c) twice the frequency of input

(d) Zero

26. At a certain place, the horizontal component is B_o and the vertical component is V_o. If $B_o = V_o$ then the total magnetic field at that place will be:

(a) B_o (b) $2B_o$

(c) $3B_o$ (d) $\sqrt{2}B_o$

27. The wavelength of the first spectral line of an element is 5893 Å. The first excitation energy is:

(a) 2.1 eV   (b) 4.2 eV

(c) 6.3. eV   (d) 8.4 eV

28. A cylindrical bar magnet is kept along the axis of circular coil. If the magnet is rotated about its axis, then:

(a) a current will be induced in the coil

(b) no current will be induced in the coil

(c) an emf will be induced in the coil

(d) no magnetic flux would be linked with coil

29. A charge particle having charge q is moving is a circle of radius R with a uniform speed υ. The associated magnetic moment μ is given by :

(a) $\dfrac{q\upsilon R}{2}$ (b) $\dfrac{q\upsilon^2 R}{2}$

(c) $\dfrac{q\upsilon R^2}{2}$ (d) $q\upsilon R$

30. Dimension of Permittivity is:
   (a) $[ML^{-2}T^2A^3]$ (b) $[M^{-1}L^{-3}T^4A^{-2}]$
   (c) $[M°L°T°A°]$ (d) $[M^{-1}L^{-3}T^4A^2]$

31. In a hydrogen atom the effect on potential energy of the electron with increase in radius of orbits will be:
   (a) potential energy remains the same
   (b) potential energy increases
   (c) potential energy decreases
   (d) potential energy initially decreases then increases

32. An electric field in x – y plane is given by the equation $\vec{E} = E_0\hat{i}$ N/C. A positively charged particle is given a velocity of $5\ \hat{j}$ m/s at point x = 3, y = 0 in x – y plane. The particle will experience force:
   (a) along x-axis (b) along y-axis
   (c) along z-axis (d) along negative z-axis

33. Find the total current drawn from the battery as shown in the circuit diagram:
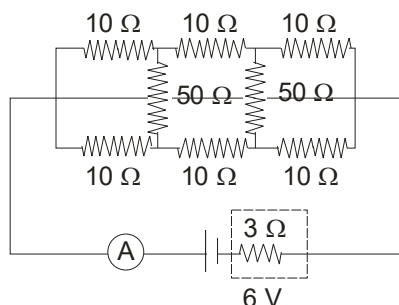
   (a) 0.33 A (b) 0.66 A
   (c) 3.3 A (d) 13.3 A

34. Choose the correct statements from the following:
   A. For a point charge, concentric spheres centred at the location of the charge are equipotential surfaces
   B. For practical purpose the earth is used as a reference at zero potential in electrical circuit
   C. In a cavity within a conductor without charges, the electric field is zero
   D. During charging by rubbing, the insulating material with higher work function becomes positively charged
   E. Dielectric polarisation means formation of electric dipole inside the dielectric
   Choose the correct answer from the options given below:
   (a) B and D only (b) A, D and E only
   (c) C, D and E only (d) A, B, C and E

35. In a potentiometer, a cell is balanced at 240 cm. On shunting the cell with 2 Ω resistance, the balancing comes at 120 cm. What is the internal resistance of the cell?
   (a) 4 Ω (b) 2 Ω
   (c) 1 Ω (d) 0.5 Ω

36. The work function for Tungsten and Sodium are 4.2 eV and 2.3 eV, respectively. If the threshold wavelength for Sodium is 5460 Å, then that for tungsten is:
   (a) 2990 Å (b) 5893 Å
   (c) 9970 Å (d) 2791 Å

37. A cell of emf 3 V and internal resistance 0.1 Ω is connected to a 3.9 Ω external resistance. What will be the potential difference across the terminals of the cell?
   (a) 1.925 V (b) 2.925 V
   (c) 2.529 V (d) 2.295 V

38. A proton is moving in a circular path of radius R in a uniform magnetic field B. It carries a kinetic energy of 2 MeV. What should be the energy of an α-particle to move in a circle of same radius in the same field?
   (a) 1 MeV (b) 2 MeV
   (c) 4 MeV (d) 3 MeV

39. If in a plano-convex lens, the radius of the convex surface is 10 cm and the focal length is 30 cm. Then the refractive index of the material will be:
   (a) 1.33 (b) 1.50
   (c) 1.66 (d) 3.0

40. Energy and momentum of a photon is given by the expressions, energy E = hv, and momentum $p = \dfrac{h}{\lambda}$, respectively, where v is the frequency of photon, h is Plank's constant and λ is the wavelength of the photon. On the basis of the above statement, choose the option which is equal to the velocity of light?
   (a) Ep^{-1} (b) Ep
   (c) $E^{-1}p$ (d) E^2P^{-2}

41. Which of the following statements are true for diamagnetic substances?
   A. They are feebly repelled by magnet
   B. They are feebly attracted by magnet
   C. Susceptibility is small and positive
   D. Susceptibility is small and negative
   Choose the **correct** answer from the options given below:
   (a) A and C only (b) B and C only
   (c) A and D only (d) B and D only

42. A moving coil galvanometer has N number of turns in the coil with area A. It carries a current I and the magnetic field is B. The torque acting on the coil is:

(a) NIB^2A^2

(b) NI^2BA

(c) N^2IBA

(d) $NIBA$

43. Self Inductance of coil causes:

(a) decays of current through it only

(b) the growth of current through it only

(c) both the growth and decay of current through it

(d) neither the growth nor the decay of current through it

44. In the depletion layer of a reverse biased p-n junction, the :

(a) potential is zero

(b) potential is maximum

(c) drift current is zero

(d) electric field is zero

45. Two slits are kept 1 mm apart and the screen 1.0 m away. What is the fringe separation when blue-green light of wavelength 500 nm is used?

(a) 0.05 mm

(b) 0.5 mm

(c) 5.0 mm

(d) 50.0 mm

46. If k be the kinetic energy and m the mass of a moving particle then the de-Broglie wavelength of the particle is:

(a) $\lambda = \dfrac{h}{\sqrt{mk}}$

(b) $\lambda = \dfrac{2h}{\sqrt{mk}}$

(c) $\lambda = \dfrac{h}{2\sqrt{mk}}$

(d) $\lambda = \dfrac{h}{\sqrt{2mk}}$

47. A coil when given supply of 20 V D.C. draws a current of 4 A. When the same coil is given supply of 20 V A.C. with 80 Hz, draw a current of 2A. The self Inductance of the coil is:

(a) 0.8×10^{-2} H

(b) 1.2×10^{-2} H

(c) 1.7×10^{-2} H

(d) 3.2×10^{-2} H

48. Two identical capacitors are joined in parallel, charged to a potential V and then separated and connected in series, i.e., negative plate of first is connected to positive plate of second:

(a) the charges on the plates connected together are destroyed

(b) the charges on the free plates are decreased

(c) the potential difference between the free plates become 2 V

(d) the potential differences between the free plates becomes 4 V

49. A moving charge produces:

(a) magnetic field only

(b) electric field only

(c) magnetic field and electric field both

(d) neither electric field nor magnetic field

50. The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5 Ω and at steam point, it is 5.23 Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire becomes 5.795 Ω. Find the temperature of the bath.

(a) 27°C

(b) 172.8°C

(c) 345.65°C

(d) 691.24°C