

1. The peak value of an Alternating current is 6 amp, then *r.m.s.* value of current will be  
 (A) 3 A (B)  $3\sqrt{3}$  A  
 (C)  $3\sqrt{2}$  A (D)  $2\sqrt{3}$  A
2. The root mean square value of the alternating current is equal to  
 (A) Twice the peak value  
 (B) Half the peak value  
 (C)  $\frac{1}{\sqrt{2}}$  times the peak value  
 (D) Equal to the peak value
3. An alternating current is given by the equation  $i = i_1 \cos \omega t + i_2 \sin \omega t$ . The *r.m.s.* current is given by  
 (A)  $\frac{1}{\sqrt{2}}(i_1 + i_2)$  (B)  $\frac{1}{\sqrt{2}}(i_1 + i_2)^2$   
 (C)  $\frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$  (D)  $\frac{1}{2}(i_1^2 + i_2^2)^{1/2}$
4. The frequency of ac mains in India is  
 (A) 30 c/s or Hz (B) 50 c/s or Hz  
 (C) 60 c/s or Hz (D) 120 c/s or Hz
5. The potential difference  $V$  and the current  $i$  flowing through an instrument in an ac circuit of frequency  $f$  are given by  $V = 5 \cos \omega t$  volts and  $I = 2 \sin \omega t$  amperes (where  $\omega = 2\pi f$ ). The power dissipated in the instrument is  
 (A) Zero (B) 10 W  
 (C) 5 W (D) 2.5 W
6. The peak value of 220 volts of ac mains is  
 (A) 155.6 volts (B) 220.0 volts  
 (C) 311.0 volts (D) 440 volts
7. An alternating voltage is represented as  $E = 20 \sin 300t$ . The average value of voltage over one cycle will be  
 (A) Zero (B) 10 volt  
 (C)  $20\sqrt{2}$  volt (D)  $\frac{20}{\sqrt{2}}$  volt
8. In an ac circuit,  $V$  and  $I$  are given by  $V = 100 \sin (100t)$  volts,  $I = 100 \sin \left(100t + \frac{\pi}{3}\right)$  mA.  
 The power dissipated in circuit is  
 (A)  $10^4$  watt (B) 10 watt  
 (C) 2.5 watt (D) 5 watt
9. For an ac circuit  $V = 15 \sin \omega t$  and  $I = 20 \cos \omega t$  the average power consumed in this circuit is  
 (A) 300 Watt (B) 150 Watt  
 (C) 75 Watt (D) zero
10. Alternating current can not be measured by dc ammeter because  
 (A) ac cannot pass through dc ammeter  
 (B) Average value of complete cycle is zero  
 (C) ac is virtual  
 (D) ac changes its direction
11. The voltage of domestic ac is 220 volt. What does this represent  
 (A) Mean voltage  
 (B) Peak voltage  
 (C) Root mean voltage  
 (D) Root mean square voltage
12. The resistance of a coil for dc is in ohms. In ac, the resistance  
 (A) Will remain same (B) Will increase  
 (C) Will decrease (D) Will be zero
13. An electric lamp is connected to 220 V, 50 Hz supply. Then the peak value of voltage is  
 (A) 210 V (B) 211 V  
 (C) 311 V (D) 320 V
14. If instantaneous current is given by  $i = 4 \cos (\omega t + \phi)$  amperes, then the *r.m.s.* value of current is  
 (A) 4 amperes (B)  $2\sqrt{2}$  amperes  
 (C)  $4\sqrt{2}$  amperes (D) Zero amperes
15. The peak value of an alternating e.m.f.  $E$  is given by  $E = E_0 \cos \omega t$  is 10 volts and its frequency is 50 Hz. At time  $t = \frac{1}{600}$  sec, the instantaneous e.m.f. is  
 (A) 10 V (B)  $5\sqrt{3}$  V  
 (C) 5 V (D) 1 V
16. In an ac circuit, peak value of voltage is 423 volts. Its effective voltage is  
 (A) 400 volts (B) 323 volts  
 (C) 300 volts (D) 340 volts
17. A choke coil is preferred to a rheostat in ac circuit as  
 (A) It consumes almost zero power  
 (B) It increases current  
 (C) It increases power  
 (D) It increases voltage
18. Current in the circuit is wattless, if  
 (A) Inductance in the circuit is zero  
 (B) Resistance in the circuit is zero  
 (C) Current is alternating  
 (D) Resistance and inductance both are zero

19. Choke coil works on the principle of  
 (A) Transient current (B) Self induction  
 (C) Mutual induction (D) Wattless current
20. An alternating e.m.f. is applied to purely capacitive circuit. The phase relation between e.m.f. and current flowing in the circuit is  
**or**  
 In a circuit containing capacitance only  
 (A) e.m.f. is ahead of current by  $\pi/2$   
 (B) Current is ahead of e.m.f. by  $\pi/2$   
 (C) Current lags behind e.m.f. by  $\pi$   
 (D) Current is ahead of e.m.f. by  $\pi$
21. A choke coil has  
 (A) High inductance and low resistance  
 (B) Low inductance and high resistance  
 (C) High inductance and high resistance  
 (D) Low inductance and low resistance
22. Choke coil is used to control  
 (A) ac (B) dc  
 (C) Both ac and dc (D) Neither ac nor dc
23. A transformer is employed to  
 (A) Obtain a suitable dc voltage  
 (B) Convert dc into ac  
 (C) Obtain a suitable ac voltage  
 (D) Convert ac into dc
24. Which of the following is constructed on the principle of electromagnetic induction  
 (A) Galvanometer (B) Electric motor  
 (C) Generator (D) Voltmeter
25. What is increased in step-down transformer  
 (A) Voltage (B) Current  
 (C) Power (D) Current density
26. A transformer is based on the principle of  
 (A) Mutual inductance (B) Self inductance  
 (C) Ampere's law (D) Lenz's law
27. Dynamo is a device for converting  
 (A) Electrical energy into mechanical energy  
 (B) Mechanical energy into electrical energy  
 (C) Chemical energy into mechanical energy  
 (D) Mechanical energy into chemical energy
28. Fan is based on  
 (A) Electric Motor (B) Electric dynamo  
 (C) Both (D) None of these
29. The working of dynamo is based on principle of  
 (A) Electromagnetic induction  
 (B) Conversion of energy into electricity  
 (C) Magnetic effects of current  
 (D) Heating effects of current
30. Dynamo core is laminated because  
 (A) Magnetic field increases  
 (B) Magnetic saturation level in core increases  
 (C) Residual magnetism in core decreases  
 (D) Loss of energy in core due to eddy currents decreases

PHYSICS

प्रत्यावर्ती धारा  
**Alternating Current**

DPP-1

**ANSWER KEY**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	C	C	B	A	C	A	C	D	B	D	B	C	B	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	A	B	B	B	A	A	C	C	B	A	B	A	A	D

1. Current of 4.8 amperes is flowing through a conductor. The number of electrons per second will be  
 (A)  $3 \times 10^{19}$  (B)  $7.68 \times 10^{21}$   
 (C)  $7.68 \times 10^{20}$  (D)  $3 \times 10^{20}$
2. The conductivity of a superconductor is  
 (A) Infinite (B) Very large  
 (C) Very small (D) Zero
3. When current flows through a conductor, then the order of drift velocity of electrons will be  
 (A)  $10^{10} \text{ m / sec}$  (B)  $10^{-2} \text{ cm / sec}$   
 (C)  $10^4 \text{ cm / sec}$  (D)  $10^{-1} \text{ cm / sec}$
4. The resistivity of a wire depends on its  
 (A) Length  
 (B) Area of cross-section  
 (C) Shape  
 (D) Material
5. Every atom makes one free electron in copper. If 1.1 ampere current is flowing in the wire of copper having 1 mm diameter, then the drift velocity (approx.) will be (Density of copper =  $9 \times 10^3 \text{ kg m}^{-3}$  and atomic weight = 63)  
 (A)  $0.3 \text{ mm / sec}$  (B)  $0.1 \text{ mm / sec}$   
 (C)  $0.2 \text{ mm / sec}$  (D)  $0.2 \text{ cm / sec}$
6. The reciprocal of resistance is  
 (A) Conductance (B) Resistivity  
 (C) Voltage (D) None of the above
7. Which one is not the correct statement  
 (A)  $1 \text{ volt} \times 1 \text{ coulomb} = 1 \text{ joule}$   
 (B)  $1 \text{ volt} \times 1 \text{ ampere} = 1 \text{ joule / second}$   
 (C)  $1 \text{ volt} \times 1 \text{ watt} = 1 \text{ H.P.}$   
 (D) Watt-hour can be expressed in eV
8. Which of the following has a negative temperature coefficient  
 (A) C (B) Fe  
 (C) Mn (D) Ag
9. If a 0.1 % increase in length due to stretching, the percentage increase in its resistance will be  
 (A) 0.2 % (B) 2 %  
 (C) 1 % (D) 0.1 %
10. Resistance of tungsten wire at  $150^\circ\text{C}$  is  $133 \Omega$ . Its resistance temperature coefficient is  $0.0045 / ^\circ\text{C}$ . The resistance of this wire at  $500^\circ\text{C}$  will be  
 (A)  $180 \Omega$  (B)  $225 \Omega$   
 (C)  $258 \Omega$  (D)  $317 \Omega$
11. The specific resistance of manganin is  $50 \times 10^{-8} \text{ ohm} \times \text{m}$ . The resistance of a cube of length 50 cm will be  
 (A)  $10^{-6} \text{ ohm}$  (B)  $2.5 \times 10^{-5} \text{ ohm}$   
 (C)  $10^{-8} \text{ ohm}$  (D)  $5 \times 10^{-4} \text{ ohm}$
12. When the length and area of cross-section both are doubled, then its resistance  
 (A) Will become half  
 (B) Will be doubled  
 (C) Will remain the same  
 (D) Will become four times
13. The resistivity of a wire  
 (A) Increases with the length of the wire  
 (B) Decreases with the area of cross-section  
 (C) Decreases with the length and increases with the cross-section of wire  
 (D) None of the above statement is correct
14. The specific resistance of all metals is most affected by  
 (A) Temperature  
 (B) Pressure  
 (C) Degree of illumination  
 (D) Applied magnetic field
15. An electric wire is connected across a cell of e.m.f.  $E$ . The current  $I$  is measured by an ammeter of resistance  $R$ . According to ohm's law  
 (A)  $E = I^2 R$  (B)  $E = IR$   
 (C)  $E = R/I$  (D)  $E = I/R$
16. A certain wire has a resistance  $R$ . The resistance of another wire identical with the first except having twice its diameter is  
 (A)  $2R$  (B)  $0.25R$   
 (C)  $4R$  (D)  $0.5R$
17. Ohm's law is true  
 (A) For metallic conductors at low temperature  
 (B) For metallic conductors at high temperature  
 (C) For electrolytes when current passes through them  
 (D) For diode when current flows
18. The electric intensity  $E$ , current density  $j$  and specific resistance  $k$  are related to each other by the relation  
 (A)  $E = j/k$  (B)  $E = jk$   
 (C)  $E = k/j$  (D)  $k = jE$
19. Drift velocity  $v_d$  varies with the intensity of electric field as per the relation  
 (A)  $v_d \propto E$  (B)  $v_d \propto \frac{1}{E}$   
 (C)  $v_d = \text{constant}$  (D)  $v_d \propto E^2$
20. There is a current of 1.344 amp in a copper wire whose area of cross-section normal to the length of the wire is  $1 \text{ mm}^2$ . If the number of free electrons per  $\text{cm}^3$  is  $8.4 \times 10^{22}$ , then the drift velocity would be  
 (A)  $1.0 \text{ mm / sec}$  (B)  $1.0 \text{ m / sec}$   
 (C)  $0.1 \text{ mm / sec}$  (D)  $0.01 \text{ mm / sec}$
21. In a conductor 4 coulombs of charge flows for 2 seconds. The value of electric current will be  
 (A) 4 volts (B) 4 amperes  
 (C) 2 amperes (D) 2 volts

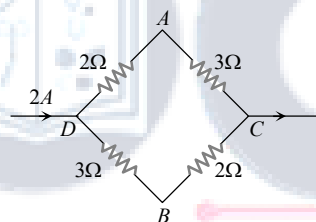
22. Through a semiconductor, an electric current is due to drift of  
 (A) Free electrons  
 (B) Free electrons and holes  
 (C) Positive and negative ions  
 (D) Protons

23. Current of 3.2 amperes is flowing through a conductor. The number of electrons per second will be  
 (A)  $3 \times 10^{-9}$  (B)  $3 \times 10^{-7}$   
 (C)  $3 \times 10^{-5}$  (D)  $2 \times 10^{19}$

24.  $62.5 \times 10^{18}$  electrons per second are flowing through a wire of area of cross-section  $0.1 \text{ m}^2$ , the value of current flowing will be  
 (A) 1 A (B) 0.1 A  
 (C) 10 A (D) 0.11 A

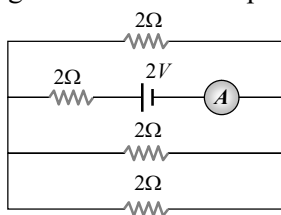
25. A wire 100 cm long and 2.0 mm diameter has a resistance of 0.7 ohm, the electrical resistivity of the material is  
 (A)  $4.4 \times 10^{-6} \text{ ohm} \times \text{m}$   
 (B)  $2.2 \times 10^{-6} \text{ ohm} \times \text{m}$   
 (C)  $1.1 \times 10^{-6} \text{ ohm} \times \text{m}$   
 (D)  $0.22 \times 10^{-6} \text{ ohm} \times \text{m}$

26. A current of 2 A flows in a system of conductors as shown. The potential difference ( $V_A - V_B$ ) will be



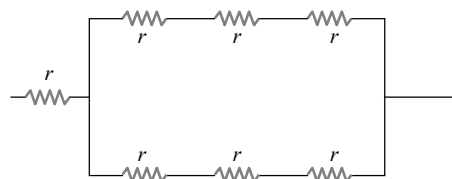
- (A) +2 V (B) +1 V  
 (C) -1 V (D) -2 V

27. The reading of the ammeter as per figure shown is



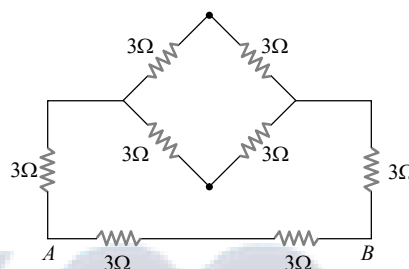
- (A)  $\frac{1}{8} A$  (B)  $\frac{3}{4} A$   
 (C)  $\frac{1}{2} A$  (D) 2 A

28. Referring to the figure below, the effective resistance of the network is



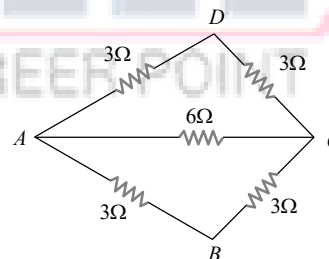
- (A) 2 r (B) 4 r  
 (C) 10 r (D) 5 r / 2

29. Equivalent resistance between A and B will be



- (A) 2 ohm (B) 18 ohm  
 (C) 6 ohm (D) 3.6 ohm

30. The effective resistance between the points A and B in the figure is



- (A) 5 Ω (B) 2 Ω  
 (C) 3 Ω (D) 4 Ω

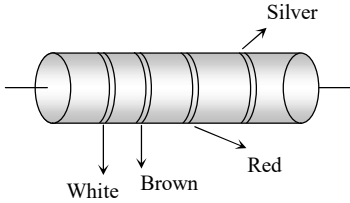
PHYSICS

## विद्युत धारा Current Electricity

DPP-1

### ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	A	B	D	B	A	C	A	A	C	A	C	D	A	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B	A	B	A	C	C	B	D	C	B	B	B	D	D	B

1. Current of 4.8 amperes is flowing through a conductor. The number of electrons per second will be  
 (A)  $3 \times 10^{19}$  (B)  $7.68 \times 10^{21}$   
 (C)  $7.68 \times 10^{20}$  (D)  $3 \times 10^{20}$
2. What is the resistance of a carbon resistance which has bands of colours brown, black and brown  
 (A)  $100 \Omega$  (B)  $1000 \Omega$   
 (C)  $10 \Omega$  (D)  $1 \Omega$
3. When the length and area of cross-section both are doubled, then its resistance  
 (A) Will become half  
 (B) Will be doubled  
 (C) Will remain the same  
 (D) Will become four times
4. A resistance  $R$  is stretched to four times its length. Its new resistance will be  
 (A)  $4R$  (B)  $64R$   
 (C)  $R/4$  (D)  $16R$
5. The example for non-ohmic resistance is  
 (A) Copper wire (B) Carbon resistance  
 (C) Diode (D) Tungsten wire
6. In a conductor 4 coulombs of charge flows for 2 seconds. The value of electric current will be  
 (A) 4 volts (B) 4 amperes  
 (C) 2 amperes (D) 2 volts
7. Through a semiconductor, an electric current is due to drift of  
 (A) Free electrons  
 (B) Free electrons and holes  
 (C) Positive and negative ions  
 (D) Protons
8. A wire of radius  $r$  has resistance  $R$ . If it is stretched to a radius of  $\frac{3r}{4}$ , its resistance becomes  
 (A)  $\frac{9R}{16}$  (B)  $\frac{16R}{9}$   
 (C)  $\frac{81R}{256}$  (D)  $\frac{256R}{81}$
9. 5 amperes of current is passed through a metallic conductor. The charge flowing in one minute in coulombs will be  
 (A) 5 (B) 12  
 (C)  $1/12$  (D) 300
10. An electric wire is connected across a cell of e.m.f.  $E$ . The current  $I$  is measured by an ammeter of resistance  $R$ . According to ohm's law  
 (A)  $E = I^2 R$  (B)  $E = IR$   
 (C)  $E = R/I$  (D)  $E = I/R$
11. For which of the following the resistance decreases on increasing the temperature  
 (A) Copper (B) Tungsten  
 (C) Germanium (D) Aluminium
12. A metal wire of specific resistance  $64 \times 10^{-6} \text{ ohm-cm}$  and length 198 cm has a resistance of 7 ohm, the radius of the wire will be  
 (A) 2.4 cm (B) 0.24 cm  
 (C) 0.024 cm (D) 24 cm
13. The reciprocal of resistance is  
 (A) Conductance (B) Resistivity  
 (C) Voltage (D) None of the above
14. 1.6 mA current is flowing in conducting wire then the number of electrons flowing per second is  
 (A)  $10^{11}$  (B)  $10^{16}$   
 (C)  $10^{19}$  (D)  $10^{15}$
15. If an electric current is passed through a nerve of a man, then man  
 (A) Begins to laugh  
 (B) Begins to weep  
 (C) Is excited  
 (D) Becomes insensitive to pain
16. Conductivity increases in the order of  
 (A) Al, Ag, Cu (B) Al, Cu, Ag  
 (C) Cu, Al, Ag (D) Ag, Cu, Al
17. An electron (charge =  $1.6 \times 10^{-19}$  coulomb) is moving in a circle of radius  $5.1 \times 10^{-11} \text{ m}$  at a frequency of  $6.8 \times 10^{15}$  revolutions/sec. The equivalent current is approximately  
 (A)  $5.1 \times 10^{-3} \text{ amp}$  (B)  $6.8 \times 10^{-3} \text{ amp}$   
 (C)  $1.1 \times 10^{-3} \text{ amp}$  (D)  $2.2 \times 10^{-3} \text{ amp}$
18. The drift velocity of free electrons in a conductor is ' $v$ ' when a current ' $i$ ' is flowing in it. If both the radius and current are doubled, then drift velocity will be  
 (A)  $v$  (B)  $\frac{v}{2}$   
 (C)  $\frac{v}{4}$  (D)  $\frac{v}{8}$
19. An electron revolves  $6 \times 10^{15}$  times/sec in circular loop. The current in the loop is  
 (A) 0.96 mA (B) 0.96  $\mu\text{A}$   
 (C) 28.8 A (D) None of these
20. In the figure a carbon resistor has bands of different colours on its body as mentioned in the figure. The value of the resistance is  


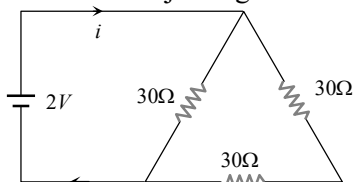
Silver  
Red  
Brown  
White

 (A) 2.2 k $\Omega$  (B) 3.3 k $\Omega$   
 (C) 5.6 k $\Omega$  (D) 9.1 k $\Omega$

21. A wire of resistance  $R$  is divided in 10 equal parts. These parts are connected in parallel, the equivalent resistance of such connection will be  
 (A)  $0.01 R$  (B)  $0.1 R$   
 (C)  $10 R$  (D)  $100 R$

22. A wire has resistance  $12 \Omega$ . It is bent in the form of a circle. The effective resistance between the two points on any diameter is equal to  
 (A)  $12 \Omega$  (B)  $6 \Omega$   
 (C)  $3 \Omega$  (D)  $24 \Omega$

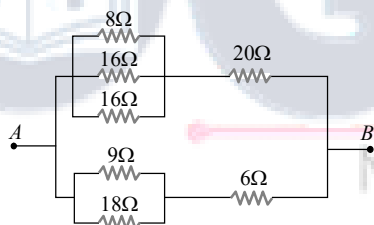
23. The current in the adjoining circuit will be



- (A)  $\frac{1}{45}$  ampere (B)  $\frac{1}{15}$  ampere  
 (C)  $\frac{1}{10}$  ampere (D)  $\frac{1}{5}$  ampere

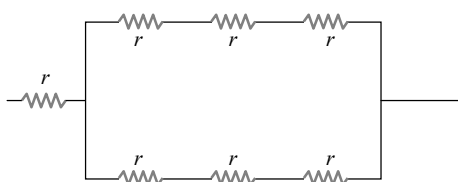
24. There are 8 equal resistances  $R$ . Two are connected in parallel, such four groups are connected in series, the total resistance of the system will be  
 (A)  $R/2$  (B)  $2R$   
 (C)  $4R$  (D)  $8R$

25. The equivalent resistance of the arrangement of resistances shown in adjoining figure between the points  $A$  and  $B$  is



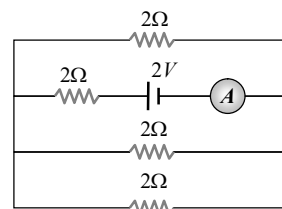
- (A)  $6 \text{ ohm}$  (B)  $8 \text{ ohm}$   
 (C)  $16 \text{ ohm}$  (D)  $24 \text{ ohm}$

26. Referring to the figure below, the effective resistance of the network is



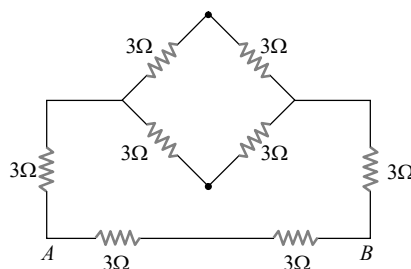
- (A)  $2r$  (B)  $4r$   
 (C)  $10r$  (D)  $5r/2$

27. The reading of the ammeter as per figure shown is



- (A)  $\frac{1}{8} A$  (B)  $\frac{3}{4} A$   
 (C)  $\frac{1}{2} A$  (D)  $2 A$

28. Equivalent resistance between  $A$  and  $B$  will be

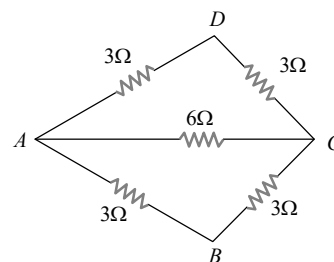


- (A)  $2 \text{ ohm}$  (B)  $18 \text{ ohm}$   
 (C)  $6 \text{ ohm}$  (D)  $3.6 \text{ ohm}$

29. Lamps used for household lighting are connected in

- (A) Series  
 (B) Parallel  
 (C) Mixed circuit  
 (D) None of the above

30. The effective resistance between the points  $A$  and  $B$  in the figure is



- (A)  $5 \Omega$  (B)  $2 \Omega$   
 (C)  $3 \Omega$  (D)  $4 \Omega$

ANSWER KEY

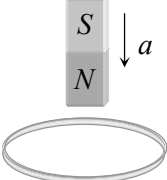
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	A	C	D	C	C	B	D	D	B	C	C	A	B	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B	C	B	A	D	A	C	C	B	B	D	B	D	B	B

1. A point charge  $+q$  is placed at the centre of a cube of side  $L$ . The electric flux emerging from the cube is
  - (A)  $\frac{q}{\epsilon_0}$
  - (B) Zero
  - (C)  $\frac{6qL^2}{\epsilon_0}$
  - (D)  $\frac{q}{6L^2\epsilon_0}$
2. Electric field at a point varies as  $r^0$  for
  - (A) An electric dipole
  - (B) A point charge
  - (C) A plane infinite sheet of charge
  - (D) A line charge of infinite length
3. A sphere of radius  $R$  has a uniform distribution of electric charge in its volume. At a distance  $x$  from its centre, for  $x < R$ , the electric field is directly proportional to
  - (A)  $\frac{1}{x^2}$
  - (B)  $\frac{1}{x}$
  - (C)  $x$
  - (D)  $x^2$
4. Total electric flux coming out of a unit positive charge put in air is
  - (A)  $\epsilon_0$
  - (B)  $\epsilon_0^{-1}$
  - (C)  $(4\pi\epsilon_0)^{-1}$
  - (D)  $4\pi\epsilon_0$
5. Gauss's law is true only if force due to a charge varies as
  - (A)  $r^{-1}$
  - (B)  $r^{-2}$
  - (C)  $r^{-3}$
  - (D)  $r^{-4}$
6. For a given surface the Gauss's law is stated as  $\oint \mathbf{E} \cdot d\mathbf{s} = 0$ . From this we can conclude that
  - (A)  $E$  is necessarily zero on the surface
  - (B)  $E$  is perpendicular to the surface at every point
  - (C) The total flux through the surface is zero
  - (D) The flux is only going out of the surface
7. If a spherical conductor comes out from the closed surface of the sphere then total flux emitted from the surface will be
  - (A)  $\frac{1}{\epsilon_0} \times$  (the charge enclosed by surface)
  - (B)  $\epsilon_0 \times$  (charge enclosed by surface)
  - (C)  $\frac{1}{4\pi\epsilon_0} \times$  (charge enclosed by surface)
  - (D) 0
8. A cube of side  $l$  is placed in a uniform field  $E$ , where  $E = E\hat{i}$ . The net electric flux through the cube is
  - (A) Zero
  - (B)  $l^2 E$
  - (C)  $4l^2 E$
  - (D)  $6l^2 E$
9. According to Gauss' Theorem, electric field of an infinitely long straight wire is proportional to
  - (A)  $r$
  - (B)  $\frac{1}{r^2}$
  - (C)  $\frac{1}{r^3}$
  - (D)  $\frac{1}{r}$
10. Eight dipoles of charges of magnitude  $e$  are placed inside a cube. The total electric flux coming out of the cube will be
  - (A)  $\frac{8e}{\epsilon_0}$
  - (B)  $\frac{16e}{\epsilon_0}$
  - (C)  $\frac{e}{\epsilon_0}$
  - (D) Zero
11. The capacity of a condenser is  $4 \times 10^{-6}$  farad and its potential is 100 volts. The energy released on discharging it fully will be
  - (A) 0.02 Joule
  - (B) 0.04 Joule
  - (C) 0.025 Joule
  - (D) 0.05 Joule
12. A parallel plate air capacitor is charged to a potential difference of  $V$ . After disconnecting the battery, distance between the plates of the capacitor is increased using an insulating handle. As a result, the potential difference between the plates
  - (A) Decreases
  - (B) Increases
  - (C) Becomes zero
  - (D) Does not change
13. A condenser of capacity  $50 \mu F$  is charged to 10 volts. Its energy is equal to
  - (A)  $2.5 \times 10^{-3}$  joule
  - (B)  $2.5 \times 10^{-4}$  joule
  - (C)  $5 \times 10^{-2}$  joule
  - (D)  $1.2 \times 10^{-8}$  joule
14. If the capacity of a spherical conductor is 1 picofarad, then its diameter, would be
  - (A)  $1.8 \times 10^{-3}$  m
  - (B)  $18 \times 10^{-3}$  m
  - (C)  $1.8 \times 10^{-5}$  m
  - (D)  $18 \times 10^{-7}$  m
15. The potential gradient at which the dielectric of a condenser just gets punctured is called
  - (A) Dielectric constant
  - (B) Dielectric strength
  - (C) Dielectric resistance
  - (D) Dielectric number
16. The ratio of charge to potential of a body is known as
  - (A) Capacitance
  - (B) Conductance
  - (C) Inductance
  - (D) Resistance

17. A parallel plate condenser has a capacitance  $50\mu F$  in air and  $110\mu F$  when immersed in an oil. The dielectric constant ' $k$ ' of the oil is  
 (A) 0.45 (B) 0.55  
 (C) 1.10 (D) 2.20
18. The radius of a metallic sphere if its capacitance is  $1/9 F$ , is  
 (A)  $10^6 m$  (B)  $10^7 m$   
 (C)  $10^9 m$  (D)  $10^8 m$
19. The capacity of parallel plate condenser depends on  
 (A) The type of metal used  
 (B) The thickness of plates  
 (C) The potential applied across the plates  
 (D) The separation between the plates
20. The energy of a charged capacitor resides in  
 (A) The electric field only  
 (B) The magnetic field only  
 (C) Both the electric and magnetic field  
 (D) Neither in electric nor magnetic field
21. The capacity of a parallel plate capacitor increases with the  
 (A) Decrease of its area  
 (B) Increase of its distance  
 (C) Increase of its area  
 (D) None of the above
22. The capacity of a spherical conductor in MKS system is  
 (A)  $\frac{R}{4\pi\epsilon_0}$  (B)  $\frac{4\pi\epsilon_0}{R}$   
 (C)  $4\pi\epsilon_0 R$  (D)  $4\pi\epsilon_0 R^2$
23. The energy stored in the condenser is  
 (A)  $QV$  (B)  $\frac{1}{2}QV$   
 (C)  $\frac{1}{2}C$  (D)  $\frac{1}{2}\frac{Q}{C}$
24. Can a metal be used as a medium for dielectric  
 (A) Yes  
 (B) No  
 (C) Depends on its shape  
 (D) Depends on dielectric
25. A  $6\mu F$  capacitor is charged from 10 volts to 20 volts. Increase in energy will be  
 (A)  $18 \times 10^{-4} J$  (B)  $9 \times 10^{-4} J$   
 (C)  $4.5 \times 10^{-4} J$  (D)  $9 \times 10^{-6} J$
26. A  $2\mu F$  capacitor is charged to 100 volt and then its plates are connected by a conducting wire. The heat produced is  
 (A) 1 J (B) 0.1 J  
 (C) 0.01 J (D) 0.001 J
27. The distance between the circular plates of a parallel plate condenser 40mm in diameter, in order to have same capacity as a sphere of radius 1 metre is  
 (A) 0.01mm (B) 0.1 mm  
 (C) 1.0 mm (D) 10 mm
28. 125 identical drops each charged to the same potential of 50 volts are combined to form a single drop. The potential of the new drop will be  
 (A) 50 V (B) 250 V  
 (C) 500 V (D) 1250 V
29. When a slab of dielectric material is introduced between the parallel plates of a capacitor which remains connected to a battery, then charge on plates relative to earlier charge  
 (A) Is less  
 (B) Is same  
 (C) Is more  
 (D) May be less or more depending on the nature of the material introduced
30. A charge of  $10^{-9} C$  is placed on each of the 64 identical drops of radius 2cm. They are then combined to form a bigger drop. Find its potential  
 (A)  $7.2 \times 10^3 V$  (B)  $7.2 \times 10^2 V$   
 (C)  $1.44 \times 10^2 V$  (D)  $1.44 \times 10^3 V$

## ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	C	C	B	B	C	A	A	D	D	A	B	A	B	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	D	C	D	A	C	C	B	B	B	C	B	B	C	A

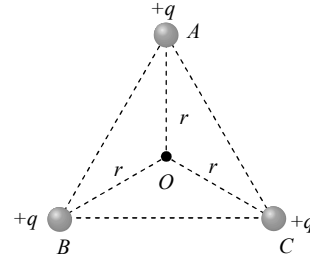
- The unit of magnetic flux is  
(A) *Weber / m<sup>2</sup>* (B) *Weber*  
(C) *Henry* (D) *Ampere/m*
- The dimensions of magnetic flux are  
(A)  $MLT^{-2}A^{-2}$  (B)  $ML^2T^{-2}A^{-2}$   
(C)  $ML^2T^{-1}A^{-2}$  (D)  $ML^2T^{-2}A^{-1}$
- In electromagnetic induction, the induced e.m.f. in a coil is independent of  
(A) Change in the flux  
(B) Time  
(C) Resistance of the circuit  
(D) None of the above
- When a bar magnet falls through a long hollow metal cylinder fixed with its axis vertical, the final acceleration of the magnet is  
(A) Equal to zero  
(B) Less than  $g$   
(C) Equal to  $g$   
(D) Equal to  $g$  in to beginning and then more than  $g$
- The magnetic field in a coil of 100 turns and 40 square cm area is increased from 1 Tesla to 6 Tesla in 2 second. The magnetic field is perpendicular to the coil. The e.m.f. generated in it is  
(A)  $10^4 V$  (B)  $1.2 V$   
(C)  $1.0 V$  (D)  $10^{-2} V$
- Lenz's law is consequence of the law of conservation of  
(A) Charge (B) Momentum  
(C) Mass (D) Energy
- The north pole of a long horizontal bar magnet is being brought closer to a vertical conducting plane along the perpendicular direction. The direction of the induced current in the conducting plane will be  
(A) Horizontal (B) Vertical  
(C) Clockwise (D) Anticlockwise
- The magnetic flux linked with a coil at any instant 't' is given by  $\phi = 5t^3 - 100t + 300$ , the e.m.f. induced in the coil at  $t = 2$  second is  
(A)  $-40 V$  (B)  $40 V$   
(C)  $140 V$  (D)  $300 V$
- In electromagnetic induction, the induced charge in a coil is independent of  
(A) Change in the flux  
(B) Time  
(C) Resistance in the circuit  
(D) None of the above
- Lenz's law is expressed by the following formula (here  $e =$  induced e.m.f.,  $\phi =$  magnetic flux in one turn and  $N =$  number of turns)  
(A)  $e = -\phi \frac{dN}{dt}$  (B)  $e = -N \frac{d\phi}{dt}$   
(C)  $e = -\frac{d}{dt} \left( \frac{\phi}{N} \right)$  (D)  $e = N \frac{d\phi}{dt}$
- A moving conductor coil in a magnetic field produces an induced e.m.f. This is in accordance with  
(A) Amperes law (B) Coulomb law  
(C) Lenz's law (D) Faraday's law
- A metallic ring is attached with the wall of a room. When the north pole of a magnet is brought near to it, the induced current in the ring will be  
  
(A) First clockwise then anticlockwise  
(B) In clockwise direction  
(C) In anticlockwise direction  
(D) First anticlockwise then clockwise
- The north pole of a magnet is brought near a metallic ring. The direction of the induced current in the ring will be  
(A) Clockwise (B) Anticlockwise  
(C) Towards north (D) Towards south
- The magnetic flux linked with a coil is given by an equation  $\phi$  (in webers)  $= 8t^2 + 3t + 5$ . The induced e.m.f. in the coil at the fourth second will be  
(A) 16 units (B) 39 units  
(C) 67 units (D) 145 units
- The formula for induced e.m.f. in a coil due to change in magnetic flux through the coil is (here  $A =$  area of the coil,  $B =$  magnetic field)  
(A)  $e = -A \frac{dB}{dt}$  (B)  $e = -B \frac{dA}{dt}$   
(C)  $e = -\frac{d}{dt}(A \cdot B)$  (D)  $e = -\frac{d}{dt}(A \times B)$
- The current flowing in two coaxial coils in the same direction. On increasing the distance between the two, the electric current will  
(A) Increase  
(B) Decrease  
(C) Remain unchanged  
(D) The information is incomplete
- Faraday's laws are consequence of conservation of  
(A) Energy  
(B) Energy and magnetic field  
(C) Charge  
(D) Magnetic field
- A copper ring is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet while it is passing through the ring is  
(A) Equal to that due to gravity  
(B) Less than that due to gravity  
(C) More than that due to gravity  
(D) Depends on the diameter of the ring and the length of the magnet

19. To induce an e.m.f. in a coil, the linking magnetic flux  
 (A) Must decrease  
 (B) Can either increase or decrease  
 (C) Must remain constant  
 (D) Must increase
20. A square coil  $10^{-2} m^2$  area is placed perpendicular to a uniform magnetic field of intensity  $10^3 Wb/m^2$ . The magnetic flux through the coil is  
 (A) 10 weber (B)  $10^{-5}$  weber  
 (C)  $10^5$  weber (D) 100 weber
21. The direction of induced current is such that it opposes the very cause that has produced it. This is the law of  
 (A) Lenz (B) Faraday  
 (C) Kirchhoff (D) Fleming
22. The direction of induced e.m.f. during electromagnetic induction is given by  
 (A) Faraday's law (B) Lenz's law  
 (C) Maxwell's law (D) Ampere's law
23. The north pole of a bar magnet is moved swiftly downward towards a closed coil and then second time it is raised upwards slowly. The magnitude and direction of the induced currents in the two cases will be of  

<b>First case</b>		<b>Second case</b>
(A) Low value Clockwise	–	Higher value anticlockwise
(B) Low value clockwise	–	Equal value anticlockwise
(C) Higher value clockwise	–	Low value clockwise
(D) Higher value anticlockwise	–	Low value clockwise
24. In a coil of area  $10 cm^2$  and 10 turns with a magnetic field directed perpendicular to the plane and is changing at the rate of  $10^8 gauss/second$ . The resistance of the coil is 20 ohm. The current in the coil will be  
 (A) 5 amp (B) 0.5 amp  
 (C) 0.05 amp (D)  $5 \times 10^8 amp$
25. Lenz's law gives  
 (A) The magnitude of the induced e.m.f.  
 (B) The direction of the induced current  
 (C) Both the magnitude and direction of the induced current  
 (D) The magnitude of the induced current
26. A coil having an area  $2m^2$  is placed in a magnetic field which changes from  $1Wb/m^2$  to  $4Wb/m^2$  in a interval of 2 second. The e.m.f. induced in the coil will be  
 (A) 4 V (B) 3 V  
 (C) 1.5 V (D) 2 V
27. Two different loops are concentric and lie in the same plane. The current in the outer loop is clockwise and increasing with time. The induced current in the inner loop then, is  
 (A) Clockwise  
 (B) Zero  
 (C) Counter clockwise  
 (D) In a direction that depends on the ratio of the loop radii
28. According to Faraday's law of electromagnetic induction  
 (A) The direction of induced current is such that it opposes the cause producing it  
 (B) The magnitude of induced e.m.f. produced in a coil is directly proportional to the rate of change of magnetic flux  
 (C) The direction of induced e.m.f. is such that it opposes the cause producing it  
 (D) None of the above
29. The total charge induced in a conducting loop when it is moved in magnetic field depends on  
 (A) The rate of change of magnetic flux  
 (B) Initial magnetic flux only  
 (C) The total change in magnetic flux  
 (D) Final magnetic flux only
30. Lenz's law applies to  
 (A) Electrostatics  
 (B) Lenses  
 (C) Electro-magnetic induction  
 (D) Cinema slides

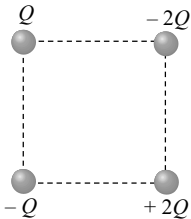
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	D	C	A	C	D	D	B	B	B	D	C	B	C	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	A	B	B	A	A	B	D	A	B	B	C	B	C	C

1. A charge  $q$  is placed at the centre of the line joining two equal charges  $Q$ . The system of the three charges will be in equilibrium, if  $q$  is equal to
- (A)  $-\frac{Q}{2}$  (B)  $-\frac{Q}{4}$   
 (C)  $+\frac{Q}{4}$  (D)  $+\frac{Q}{2}$
2. Two charges  $+5\mu C$  and  $+10\mu C$  are placed  $20\text{ cm}$  apart. The net electric field at the mid-Point between the two charges is
- (A)  $4.5 \times 10^6\text{ N/C}$  directed towards  $+5\mu C$   
 (B)  $4.5 \times 10^6\text{ N/C}$  directed towards  $+10\mu C$   
 (C)  $13.5 \times 10^6\text{ N/C}$  directed towards  $+5\mu C$   
 (D)  $13.5 \times 10^6\text{ N/C}$  directed towards  $+10\mu C$
3. Inside a hollow charged spherical conductor, the potential
- (A) Is constant  
 (B) Varies directly as the distance from the centre  
 (C) Varies inversely as the distance from the centre  
 (D) Varies inversely as the square of the distance from the centre
4. The potential at a point, due to a positive charge of  $100\mu C$  at a distance of  $9\text{ m}$ , is
- (A)  $10^4\text{ V}$  (B)  $10^5\text{ V}$   
 (C)  $10^6\text{ V}$  (D)  $10^7\text{ V}$
5. The electric charge in uniform motion produces
- (A) An electric field only  
 (B) A magnetic field only  
 (C) Both electric and magnetic field  
 (D) Neither electric nor magnetic field
6. Electric field strength due to a point charge of  $5\mu C$  at a distance of  $80\text{ cm}$  from the charge is
- (A)  $8 \times 10^4\text{ N/C}$  (B)  $7 \times 10^4\text{ N/C}$   
 (C)  $5 \times 10^4\text{ N/C}$  (D)  $4 \times 10^4\text{ N/C}$
7. Two charged spheres of radii  $10\text{ cm}$  and  $15\text{ cm}$  are connected by a thin wire. No current will flow, if they have
- (A) The same charge on each  
 (B) The same potential  
 (C) The same energy  
 (D) The same field on their surfaces
8. The electric field inside a spherical shell of uniform surface charge density is
- (A) Zero  
 (B) Constant, less than zero  
 (C) Directly proportional to the distance from the centre  
 (D) None of the above
9. If a unit positive charge is taken from one point to another over an equipotential surface, then
- (A) Work is done on the charge  
 (B) Work is done by the charge  
 (C) Work done is constant  
 (D) No work is done
10. Electric lines of force about negative point charge are
- (A) Circular, anticlockwise  
 (B) Circular, clockwise  
 (C) Radial, inward (D) Radial, outward
11. ABC is an equilateral triangle. Charges  $+q$  are placed at each corner. The electric intensity at  $O$  will



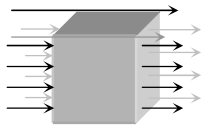
- (A)  $\frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$  (B)  $\frac{1}{4\pi\epsilon_0} \frac{q}{r}$   
 (C) Zero (D)  $\frac{1}{4\pi\epsilon_0} \frac{3q}{r^2}$

12. The magnitude of electric field intensity  $E$  is such that, an electron placed in it would experience an electrical force equal to its weight is given by
- (A)  $mge$  (B)  $\frac{mg}{e}$  (C)  $\frac{e}{mg}$  (D)  $\frac{e^2}{m^2}g$
13. A conductor with a positive charge
- (A) Is always at  $+ve$  potential  
 (B) Is always at zero potential  
 (C) Is always at negative potential  
 (D) May be at  $+ve$ , zero or  $-ve$  potential
14. An electron enters between two horizontal plates separated by  $2\text{ mm}$  and having a potential difference of  $1000\text{ V}$ . The force on electron is
- (A)  $8 \times 10^{-12}\text{ N}$  (B)  $8 \times 10^{-14}\text{ N}$   
 (C)  $8 \times 10^9\text{ N}$  (D)  $8 \times 10^{14}\text{ N}$
15. An electron and a proton are in a uniform electric field, the ratio of their accelerations will be
- (A) Zero  
 (B) Unity  
 (C) The ratio of the masses of proton and electron  
 (D) The ratio of the masses of electron and proton
16. Conduction electrons are almost uniformly distributed within a conducting plate. When placed in an electrostatic field  $\vec{E}$ , the electric field within the plate
- (A) Is zero (B) Depends upon  $E$   
 (C) Depends upon  $\vec{E}$   
 (D) Depends upon the atomic number of the conducting element

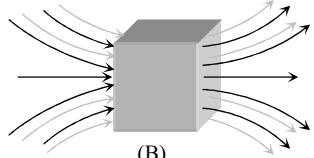
17. How much kinetic energy will be gained by an  $\alpha$ -particle in going from a point at  $70\text{ V}$  to another point at  $50\text{ V}$
- (A)  $40\text{ eV}$  (B)  $40\text{ keV}$   
(C)  $40\text{ MeV}$  (D)  $0\text{ eV}$
18. Three particles, each having a charge of  $10\text{ }\mu\text{C}$  are placed at the corners of an equilateral triangle of side  $10\text{ cm}$ . The electrostatic potential energy of the system is (Given  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9\text{ N-m}^2/\text{C}^2$ )
- (A) Zero (B) Infinite  
(C)  $27\text{ J}$  (D)  $100\text{ J}$
19. Deuteron and  $\alpha$ -particle are put  $1\text{ \AA}$  apart in air. Magnitude of intensity of electric field due to deuteron at  $\alpha$ -particle is
- (A) Zero  
(B)  $2.88 \times 10^{11}\text{ newton / coulomb}$   
(C)  $1.44 \times 10^{11}\text{ newton / coulomb}$   
(D)  $5.76 \times 10^{11}\text{ newton / coulomb}$
20. Two point charges of  $20\text{ }\mu\text{C}$  and  $80\text{ }\mu\text{C}$  are  $10\text{ cm}$  apart. Where will the electric field strength be zero on the line joining the charges from  $20\text{ }\mu\text{C}$  charge
- (A)  $0.1\text{ m}$  (B)  $0.04\text{ m}$   
(C)  $0.033\text{ m}$  (D)  $0.33\text{ m}$
21. Angle between equipotential surface and lines of force is
- (A) Zero (B)  $180^\circ$  (C)  $90^\circ$  (D)  $45^\circ$
22. A charge of  $5\text{ C}$  is given a displacement of  $0.5\text{ m}$ . The work done in the process is  $10\text{ J}$ . The potential difference between the two points will be
- (A)  $2\text{ V}$  (B)  $0.25\text{ V}$  (C)  $1\text{ V}$  (D)  $25\text{ V}$
23. Four charges are placed on corners of a square as shown in figure having side of  $5\text{ cm}$ . If  $Q$  is one microcoulomb, then electric field intensity at centre will be
- 
- (A)  $1.02 \times 10^7\text{ N/C}$  upwards  
(B)  $2.04 \times 10^7\text{ N/C}$  downwards  
(C)  $2.04 \times 10^7\text{ N/C}$  upwards  
(D)  $1.02 \times 10^7\text{ N/C}$  downwards
24. The unit of electric field is not equivalent to
- (A)  $\text{N/C}$  (B)  $\text{J/C}$   
(C)  $\text{V/m}$  (D)  $\text{J/C-m}$
25. The electric potential  $V$  is given as a function of distance  $x$  (metre) by  $V = (5x^2 + 10x - 9)\text{ volt}$ . Value of electric field at  $x = 1$  is
- (A)  $20\text{ V/m}$  (B)  $6\text{ V/m}$   
(C)  $11\text{ V/m}$  (D)  $-23\text{ V/m}$
26. At a certain distance from a point charge the electric field is  $500\text{ V/m}$  and the potential is  $3000\text{ V}$ . What is this distance
- (A)  $6\text{ m}$  (B)  $12\text{ m}$   
(C)  $36\text{ m}$  (D)  $144\text{ m}$
27. The electric field due to a dipole at a distance  $r$  on its axis is
- (A) Directly proportional to  $r^3$   
(B) Inversely proportional to  $r^3$   
(C) Directly proportional to  $r^2$   
(D) Inversely proportional to  $r^2$
28. An electric dipole of moment  $\vec{p}$  is placed normal to the lines of force of electric intensity  $\vec{E}$ , then the work done in deflecting it through an angle of  $180^\circ$  is
- (A)  $pE$  (B)  $+2pE$   
(C)  $-2pE$  (D) Zero
29. The torque acting on a dipole of moment  $\vec{P}$  in an electric field  $\vec{E}$  is
- (A)  $\vec{P} \cdot \vec{E}$  (B)  $\vec{P} \times \vec{E}$   
(C) Zero (D)  $\vec{E} \times \vec{P}$
30. An electron and a proton are at a distance of  $1\text{ \AA}$ . The moment of this dipole will be ( $\text{C} \times \text{m}$ )
- (A)  $1.6 \times 10^{19}$  (B)  $1.6 \times 10^{-29}$   
(C)  $3.2 \times 10^{19}$  (D)  $3.2 \times 10^{-29}$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	A	A	B	C	B	B	A	D	C	C	B	D	B	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	A	C	C	C	C	A	A	B	A	A	B	D	B	B

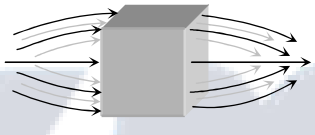
- Unit of magnetic flux density (or magnetic induction) is
  - Tesla
  - Weber/metre<sup>2</sup>
  - Newton/ampere-metre
  - All of the above
- A magnet is placed in iron powder and then taken out, then maximum iron powder is at
  - Some away from north pole
  - Some away from south pole
  - The middle of the magnet
  - The end of the magnet
- Points *A* and *B* are situated along the extended axis of 2 cm long bar magnet at a distance *x* and 2*x* cm respectively. From the pole nearer to the points, the ratio of the magnetic field at *A* and *B* will be
  - 4 : 1 exactly
  - 4 : 1 approx.
  - 8 : 1 exactly
  - 8 : 1 approx.
- Magnetic intensity for an axial point due to a short bar magnet of magnetic moment *M* is given by
  - $\frac{\mu_0}{4\pi} \times \frac{M}{d^3}$
  - $\frac{\mu_0}{4\pi} \times \frac{M}{d^2}$
  - $\frac{\mu_0}{2\pi} \times \frac{M}{d^3}$
  - $\frac{\mu_0}{2\pi} \times \frac{M}{d^2}$
- A magnet of magnetic moment *M* and pole strength *m* is divided in two equal parts, then magnetic moment of each part will be
  - M*
  - M* / 2
  - M* / 4
  - 2*M*
- The distance of two points on the axis of a magnet from its centre is 10 cm and 20 cm respectively. The ratio of magnetic intensity at these points is 12.5 : 1. The length of the magnet will be
  - 5 cm
  - 25 cm
  - 10 cm
  - 20 cm
- If a magnet of pole strength *m* is divided into four parts such that the length and width of each part is half that of initial one, then the pole strength of each part will be
  - m* / 4
  - m* / 2
  - m* / 8
  - 4*m*
- The magnetism of magnet is due to
  - The spin motion of electron
  - Earth
  - Pressure of big magnet inside the earth
  - Cosmic rays
- A bar magnet having centre *O* has a length of 4 cm. Point *P*<sub>1</sub> is in the broad side-on and *P*<sub>2</sub> is in the end side-on position with *OP*<sub>1</sub> = *OP*<sub>2</sub> = 10 metres. The ratio of magnetic intensities *H* at *P*<sub>1</sub> and *P*<sub>2</sub> is
  - H*<sub>1</sub> : *H*<sub>2</sub> = 16 : 100
  - H*<sub>1</sub> : *H*<sub>2</sub> = 1 : 2
  - H*<sub>1</sub> : *H*<sub>2</sub> = 2 : 1
  - H*<sub>1</sub> : *H*<sub>2</sub> = 100 : 16
- The magnetic field at a point *x* on the axis of a small bar magnet is equal to the field at a point *y* on the equator of the same magnet. The ratio of the distances of *x* and *y* from the centre of the magnet is
  - 2<sup>-3</sup>
  - 2<sup>-1/3</sup>
  - 2<sup>3</sup>
  - 2<sup>1/3</sup>
- In the case of bar magnet, lines of magnetic induction
  - Start from the north pole and end at the south pole
  - Run continuously through the bar and outside
  - Emerge in circular paths from the middle of the bar
  - Are produced only at the north pole like rays of light from a bulb
- A uniform magnetic field, parallel to the plane of the paper existed in space initially directed from left to right. When a bar of soft iron is placed in the field parallel to it, the lines of force passing through it will be represented by
 



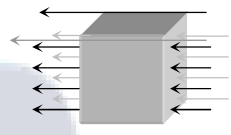
(A)



(B)

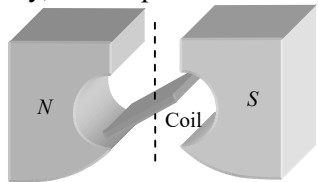


(C)



(D)

  - Figure (A)
  - Figure (B)
  - Figure (C)
  - Figure (D)
- Which of the following, the most suitable material for making permanent magnet is
  - Steel
  - Soft iron
  - Copper
  - Nickel
- The figure below shows the north and south poles of a permanent magnet in which *n* turn coil of area of cross-section *A* is resting, such that for a current *i* passed through the coil, the plane of the coil makes an angle  $\theta$  with respect to the direction of magnetic field *B*. If the plane of the magnetic field and the coil are horizontal and vertical respectively, the torque on the coil will be
 



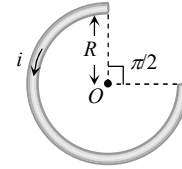
  - $\tau = niAB \cos \theta$
  - $\tau = niAB \sin \theta$
  - $\tau = niAB$
  - None of the above, since the magnetic field is radial
- A long magnet is cut in two parts in such a way that the ratio of their lengths is 2 : 1. The ratio of pole strengths of both the section is
  - Equal
  - In the ratio of 2 : 1
  - In the ratio of 1 : 2
  - In the ratio of 4 : 1

16. Two small bar magnets are placed in a line with like poles facing each other at a certain distance  $d$  apart. If the length of each magnet is negligible as compared to  $d$ , the force between them will be inversely proportional to  
(A)  $d$  (B)  $d^2$  (C)  $\frac{1}{d^2}$  (D)  $d^4$
17. Magnetic field intensity is defined as  
(A) Magnetic moment per unit volume  
(B) Magnetic induction force acting on a unit magnetic pole  
(C) Number of lines of force crossing per unit area  
(D) Number of lines of force crossing per unit volume
18. A bar magnet of length  $10\text{ cm}$  and having the pole strength equal to  $10^{-3}\text{ weber}$  is kept in a magnetic field having magnetic induction (B) equal to  $4\pi \times 10^{-3}\text{ Tesla}$ . It makes an angle of  $30^\circ$  with the direction of magnetic induction. The value of the torque acting on the magnet is  
(A)  $2\pi \times 10^{-7}\text{ N}\times\text{m}$  (B)  $2\pi \times 10^{-5}\text{ N}\times\text{m}$   
(C)  $0.5\text{ N}\times\text{m}$  (D)  $0.5 \times 10^2\text{ N}\times\text{m}$   
( $\mu_0 = 4\pi \times 10^{-7}\text{ weber / amp}\times\text{m}$ )  
( $\mu_0 = 4\pi \times 10^{-7}\text{ wb/A}\times\text{m}$ )
19. If the magnetic flux is expressed in *weber*, then magnetic induction can be expressed in  
(A) *Weber/m<sup>2</sup>* (B) *Weber/m*  
(C) *Weber-m* (D) *Weber-m<sup>2</sup>*
20. A magnetic needle is kept in a non-uniform magnetic field. It experiences  
(A) A force and a torque  
(B) A force but not a torque  
(C) A torque but not a force  
(D) Neither a torque nor a force
21. What happens to the force between magnetic poles when their pole strength and the distance between them are both doubled  
(A) Force increases to two times the previous value  
(B) No change  
(C) Force decreases to half the previous value  
(D) Force increases to four times the previous value
22. Magnetic induction is a  
(A) Scalar quantity (B) Vector quantity  
(C) Both (A) and (B) (D) None of the above
23. If a hole is made at the centre of a bar magnet, then its magnetic moment will  
(A) Increase (B) Decrease  
(C) Not change (D) None of these
24. The small magnets each of magnetic moment  $10\text{ A-m}^2$  are placed end-on position  $0.1\text{ m}$  apart from their centres. The force acting between them is  
(A)  $0.6 \times 10^7\text{ N}$  (B)  $0.06 \times 10^7\text{ N}$   
(C)  $0.6\text{ N}$  (D)  $0.06\text{ N}$
25. The incorrect statement regarding the lines of force of the magnetic field  $B$  is  
(A) Magnetic intensity is a measure of lines of force passing through unit area held normal to it  
(B) Magnetic lines of force form a close curve  
(C) Inside a magnet, its magnetic lines of force move from north pole of a magnet towards its south pole  
(D) Due to a magnet magnetic lines of force never cut each Other
26. Rate of change of torque  $\tau$  with deflection  $\theta$  is maximum for a magnet suspended freely in a uniform magnetic field of induction  $B$ , when  
(A)  $\theta = 0^\circ$  (B)  $\theta = 45^\circ$   
(C)  $\theta = 60^\circ$  (D)  $\theta = 90^\circ$
27. Force between two unit pole strength placed at a distance of one metre is  
(A)  $1\text{ N}$  (B)  $\frac{10^{-7}}{4\pi}\text{ N}$   
(C)  $10^{-7}\text{ N}$  (D)  $4\pi \times 10^{-7}\text{ N}$
28. A magnet of magnetic moment  $M$  is rotated through  $360^\circ$  in a magnetic field  $H$ , the work done will be  
(A)  $MH$  (B)  $2MH$   
(C)  $2\pi MH$  (D) Zero
29. The unit of magnetic moment is  
(A)  $\text{Wb/m}$  (B)  $\text{Wb.m}^2$   
(C)  $\text{A.m}$  (D)  $\text{A.m}^2$
30. The direction of line of magnetic field of bar magnet is  
(A) From south pole to north pole  
(B) From north pole to south pole  
(C) Across the bar magnet  
(D) From south pole to north pole inside the magnet and from north pole to south pole outside the magnet

## ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	D	D	C	B	C	B	A	B	D	B	B	A	A	A
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	B	A	A	A	B	B	C	C	C	A	C	D	D	D

1. Two straight horizontal parallel wires are carrying the same current in the same direction,  $d$  is the distance between the wires. You are provided with a small freely suspended magnetic needle. At which of the following positions will the orientation of the needle be independent of the magnitude of the current in the wires
- (A) At a distance  $d/2$  from any of the wires  
 (B) At a distance  $d/2$  from any of the wires in the horizontal plane  
 (C) Anywhere on the circumference of a vertical circle of radius  $d$  and centre halfway between the wires  
 (D) At points halfway between the wires in the horizontal plane
2. A length  $L$  of wire carries a steady current  $I$ . It is bent first to form a circular plane coil of one turn. The same length is now bent more sharply to give a double loop of smaller radius. The magnetic field at the centre caused by the same current is
- (A) A quarter of its first value  
 (B) Unaltered  
 (C) Four times of its first value  
 (D) A half of its first value
3. Magnetic field due to a ring having  $n$  turns at a distance  $x$  on its axis is proportional to (if  $r =$  radius of ring)
- (A)  $\frac{r}{(x^2 + r^2)}$  (B)  $\frac{r^2}{(x^2 + r^2)^{3/2}}$   
 (C)  $\frac{nr^2}{(x^2 + r^2)^{3/2}}$  (D)  $\frac{n^2 r^2}{(x^2 + r^2)^{3/2}}$
4. The magnetic field  $d\vec{B}$  due to a small current element  $d\vec{l}$  at a distance  $\vec{r}$  and element carrying current  $i$  is,
- or
- Vector form of Biot-savart's law is
- (A)  $d\vec{B} = \frac{\mu_0}{4\pi} i \left( \frac{d\vec{l} \times \vec{r}}{r} \right)$  (B)  $d\vec{B} = \frac{\mu_0}{4\pi} i^2 \left( \frac{d\vec{l} \times \vec{r}}{r} \right)$   
 (C)  $d\vec{B} = \frac{\mu_0}{4\pi} i^2 \left( \frac{d\vec{l} \times \vec{r}}{r^2} \right)$  (D)  $d\vec{B} = \frac{\mu_0}{4\pi} i \left( \frac{d\vec{l} \times \vec{r}}{r^3} \right)$
5. The magnetic field at the centre of coil of  $n$  turns, bent in the form of a square of side  $2l$ , carrying current  $i$ , is
- (A)  $\frac{\sqrt{2}\mu_0 ni}{\pi}$  (B)  $\frac{\sqrt{2}\mu_0 ni}{2\pi}$   
 (C)  $\frac{\sqrt{2}\mu_0 ni}{4\pi}$  (D)  $\frac{2\mu_0 ni}{\pi}$
6. A current  $i$  ampere flows in a circular arc of wire whose radius is  $R$ , which subtend an angle  $3\pi/2$  radian at its centre. The magnetic induction  $B$  at the centre is



- (A)  $\frac{\mu_0 i}{R}$  (B)  $\frac{\mu_0 i}{2R}$   
 (C)  $\frac{2\mu_0 i}{R}$  (D)  $\frac{3\mu_0 i}{8R}$
7. The magnetic induction in air at a point  $1\text{ cm}$  away from a long wire that carries a current of  $1\text{ A}$ , will be
- (A)  $1 \times 10^{-5} \text{ T}$  (B)  $2 \times 10^{-5} \text{ T}$   
 (C)  $3 \times 10^{-5} \text{ T}$  (D)  $4 \times 10^{-5} \text{ T}$
8. The magnetic field at the centre of current carrying coil is
- (A)  $\frac{\mu_0 ni}{2r}$  (B)  $\frac{\mu_0 ni}{2\pi r}$   
 (C)  $\frac{\mu_0 ni}{4r}$  (D)  $\mu_0 ni$
9. Magnetic field intensity at the centre of coil of 50 turns, radius  $0.5\text{ m}$  and carrying a current of  $2\text{ A}$  is
- (A)  $0.5 \times 10^{-5} \text{ T}$  (B)  $1.25 \times 10^{-4} \text{ T}$   
 (C)  $3 \times 10^{-5} \text{ T}$  (D)  $4 \times 10^{-5} \text{ T}$
10. At a distance of  $10\text{ cm}$  from a long straight wire carrying current, the magnetic field is  $0.04\text{ T}$ . At the distance of  $40\text{ cm}$ , the magnetic field will be
- (A)  $0.01\text{ T}$  (B)  $0.02\text{ T}$   
 (C)  $0.08\text{ T}$  (D)  $0.16\text{ T}$
11. Tesla is the unit of
- (A) Electric flux (B) Magnetic flux  
 (C) Electric field (D) Magnetic field
12. A helium nucleus makes a full rotation in a circle of radius  $0.8\text{ metre}$  in two seconds. The value of the magnetic field  $B$  at the centre of the circle will be
- (A)  $\frac{10^{-19}}{\mu_0}$  (B)  $10^{-19} \mu_0$   
 (C)  $2 \times 10^{-10} \mu_0$  (D)  $\frac{2 \times 10^{-10}}{\mu_0}$
13. A solenoid is  $1.0\text{ metre}$  long and it has 4250 turns. If a current of  $5.0\text{ ampere}$  is flowing through it, what is the magnetic field at its centre [ $\mu_0 = 4\pi \times 10^{-7} \text{ weber / amp - m}$ ]
- (A)  $5.4 \times 10^{-2} \text{ weber / m}^2$  (B)  $2.7 \times 10^{-2} \text{ weber / m}^2$   
 (C)  $1.35 \times 10^{-2} \text{ weber / m}^2$  (D)  $0.675 \times 10^{-2} \text{ weber / m}^2$
14. Due to  $10\text{ ampere}$  of current flowing in a circular coil of  $10\text{ cm}$  radius, the magnetic field produced at its centre is  $3.14 \times 10^{-3} \text{ Weber / m}^2$ . The number of turns in the coil will be
- (A) 5000 (B) 100  
 (C) 50 (D) 25

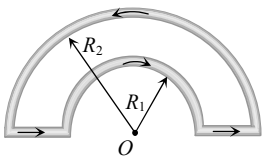
15. The expression for magnetic induction inside a solenoid of length  $L$  carrying a current  $I$  and having  $N$  number of turns is

- (A)  $\frac{\mu_0 N}{4\pi LI}$  (B)  $\mu_0 NI$   
 (C)  $\frac{\mu_0 NLI}{4\pi}$  (D)  $\mu_0 \frac{N}{L} I$

16. Field at the centre of a circular coil of radius  $r$ , through which a current  $I$  flows is

- (A) Directly proportional to  $r$   
 (B) Inversely proportional to  $I$   
 (C) Directly proportional to  $I$   
 (D) Directly proportional to  $I^2$

17. The magnetic induction at the centre  $O$  in the figure shown is



- (A)  $\frac{\mu_0 i}{4} \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$  (B)  $\frac{\mu_0 i}{4} \left( \frac{1}{R_1} + \frac{1}{R_2} \right)$   
 (C)  $\frac{\mu_0 i}{4} (R_1 - R_2)$  (D)  $\frac{\mu_0 i}{4} (R_1 + R_2)$

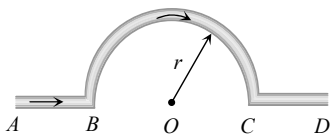
18. Field inside a solenoid is

- (A) Directly proportional to its length  
 (B) Directly proportional to current  
 (C) Inversely proportional to total number of turns  
 (D) Inversely proportional to current

19. The direction of magnetic lines of forces close to a straight conductor carrying current will be

- (A) Along the length of the conductor  
 (B) Radially outward  
 (C) Circular in a plane perpendicular to the conductor  
 (D) Helical

20. In the figure, shown the magnetic induction at the centre of there arc due to the current in portion AB will be



- (A)  $\frac{\mu_0 i}{r}$  (B)  $\frac{\mu_0 i}{2r}$  (C)  $\frac{\mu_0 i}{4r}$  (D) Zero

21. A long solenoid is formed by winding 20 turns/cm. The current necessary to produce a magnetic field of 20 millitesla inside the solenoid will be approximately

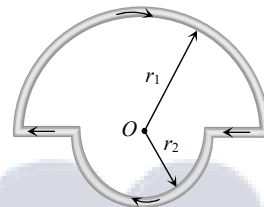
$$\left( \frac{\mu_0}{4\pi} = 10^{-7} \text{ tesla-metre / ampere} \right)$$

- (A) 8.0 A (B) 4.0 A (C) 2.0 A (D) 1.0 A

22. Two concentric circular coils of ten turns each are situated in the same plane. Their radii are 20 and 40 cm and they carry respectively 0.2 and 0.3 ampere current in opposite direction. The magnetic field in weber / m<sup>2</sup> at the centre is

- (A)  $\frac{35}{4} \mu_0$  (B)  $\frac{\mu_0}{80}$   
 (C)  $\frac{7}{80} \mu_0$  (D)  $\frac{5}{4} \mu_0$

23. In the figure shown there are two semicircles of radii  $r_1$  and  $r_2$  in which a current  $i$  is flowing. The magnetic induction at the centre  $O$  will be



- (A)  $\frac{\mu_0 i}{r} (r_1 + r_2)$  (B)  $\frac{\mu_0 i}{4} (r_1 - r_2)$   
 (C)  $\frac{\mu_0 i}{4} \left( \frac{r_1 + r_2}{r_1 r_2} \right)$  (D)  $\frac{\mu_0 i}{4} \left( \frac{r_2 - r_1}{r_1 r_2} \right)$

24. A helium nucleus makes a full rotation in a circle of radius 0.8 metre in two seconds. The value of the magnetic field  $B$  at the centre of the circle will be

- (A)  $\frac{10^{-19}}{\mu_0}$  (B)  $10^{-19} \mu_0$   
 (C)  $2 \times 10^{-10} \mu_0$  (D)  $\frac{2 \times 10^{-10}}{\mu_0}$

25. Field at the centre of a circular coil of radius  $r$ , through which a current  $I$  flows is

- (A) Directly proportional to  $r$   
 (B) Inversely proportional to  $I$   
 (C) Directly proportional to  $I$   
 (D) Directly proportional to  $I^2$

PHYSICS

## गतिमान आवेश और चुंबकत्व Moving Charge and Magnetism

DPP-1

### ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	C	C	D	A	D	B	A	B	A	D	B	B	C	D
16	17	18	19	20	21	22	23	24	25					
C	A	B	C	D	A	D	C	B	C					

1. The transformation ratio in the step-up transformer is
  - (A) 1
  - (B) Greater than one
  - (C) Less than one
  - (D) The ratio greater or less than one depends on the other factors
2. Which of the following is constructed on the principle of electromagnetic induction
  - (A) Galvanometer
  - (B) Electric motor
  - (C) Generator
  - (D) Voltmeter
3. What is increased in step-down transformer
  - (A) Voltage
  - (B) Current
  - (C) Power
  - (D) Current density
4. Quantity that remains unchanged in a transformer is
  - (A) Voltage
  - (B) Current
  - (C) Frequency
  - (D) None of the above
5. A transformer is based on the principle of
  - (A) Mutual inductance
  - (B) Self inductance
  - (C) Ampere's law
  - (D) Lenz's law
6. A transformer is used to
  - (A) Change the alternating potential
  - (B) Change the alternating current
  - (C) To prevent the power loss in alternating current flow
  - (D) To increase the power of current source
7. Dynamo is a device for converting
  - (A) Electrical energy into mechanical energy
  - (B) Mechanical energy into electrical energy
  - (C) Chemical energy into mechanical energy
  - (D) Mechanical energy into chemical energy
8. The efficiency of transformer is very high because
  - (A) There is no moving part in a transformer
  - (B) It produces very high voltage
  - (C) It produces very low voltage
  - (D) None of the above
9. A transformer is employed to
  - (A) Obtain a suitable dc voltage
  - (B) Convert dc into ac
  - (C) Obtain a suitable ac voltage
  - (D) Convert ac into dc
10. The working of dynamo is based on principle of
  - (A) Electromagnetic induction
  - (B) Conversion of energy into electricity
  - (C) Magnetic effects of current
  - (D) Heating effects of current
11. Dynamo core is laminated because
  - (A) Magnetic field increases
  - (B) Magnetic saturation level in core increases
  - (C) Residual magnetism in core decreases
  - (D) Loss of energy in core due to eddy currents decreases
12. Fan is based on
  - (A) Electric Motor
  - (B) Electric dynamo
  - (C) Both
  - (D) None of these
13. The potential difference  $V$  and the current  $i$  flowing through an instrument in an ac circuit of frequency  $f$  are given by  $V = 5 \cos \omega t$  volts and  $I = 2 \sin \omega t$  amperes (where  $\omega = 2\pi f$ ). The power dissipated in the instrument is
  - (A) Zero
  - (B) 10 W
  - (C) 5 W
  - (D) 2.5 W
14. An alternating voltage is represented as  $E = 20 \sin 300t$ . The average value of voltage over one cycle will be
  - (A) Zero
  - (B) 10 volt
  - (C)  $20\sqrt{2}$  volt
  - (D)  $\frac{20}{\sqrt{2}}$  volt
15. In an ac circuit,  $V$  and  $I$  are given by  $V = 100 \sin (100 t)$  volts,  $I = 100 \sin \left( 100t + \frac{\pi}{3} \right)$  mA. The power dissipated in circuit is
  - (A)  $10^4$  watt
  - (B) 10 watt
  - (C) 2.5 watt
  - (D) 5 watt
16. For an ac circuit  $V = 15 \sin \omega t$  and  $I = 20 \cos \omega t$  the average power consumed in this circuit is
  - (A) 300 Watt
  - (B) 150 Watt
  - (C) 75 Watt
  - (D) zero
17. Alternating current can not be measured by dc ammeter because
  - (A) ac cannot pass through dc ammeter
  - (B) Average value of complete cycle is zero
  - (C) ac is virtual
  - (D) ac changes its direction
18. The resistance of a coil for dc is in ohms. In ac, the resistance
  - (A) Will remain same
  - (B) Will increase
  - (C) Will decrease
  - (D) Will be zero
19. If instantaneous current is given by  $i = 4 \cos (\omega t + \phi)$  amperes, then the r.m.s. value of current is
  - (A) 4 amperes
  - (B)  $2\sqrt{2}$  amperes
  - (C)  $4\sqrt{2}$  amperes
  - (D) Zero amperes

20. In an ac circuit, peak value of voltage is 423 volts. Its effective voltage is  
 (A) 400 volts (B) 323 volts  
 (C) 300 volts (D) 340 volts
21. The peak value of an Alternating current is 6 amp, then r.m.s. value of current will be  
 (A) 3 A (B)  $3\sqrt{3}$  A  
 (C)  $3\sqrt{2}$  A (D)  $2\sqrt{3}$  A
22. The peak value of 220 volts of ac mains is  
 (A) 155.6 volts (B) 220.0 volts  
 (C) 311.0 volts (D) 440 volts
23. The voltage of domestic ac is 220 volt. What does this represent  
 (A) Mean voltage  
 (B) Peak voltage  
 (C) Root mean voltage  
 (D) Root mean square voltage
24. The frequency of ac mains in India is  
 (A) 30 c/s or Hz (B) 50 c/s or Hz  
 (C) 60 c/s or Hz (D) 120 c/s or Hz
25. An electric lamp is connected to 220 V, 50 Hz supply. Then the peak value of voltage is  
 (A) 210 V (B) 211 V  
 (C) 311 V (D) 320 V
26. The root mean square value of the alternating current is equal to  
 (A) Twice the peak value  
 (B) Half the peak value  
 (C)  $\frac{1}{\sqrt{2}}$  times the peak value  
 (D) Equal to the peak value
27. An alternating current is given by the equation  $i = i_1 \cos \omega t + i_2 \sin \omega t$ . The r.m.s. current is given by  
 (A)  $\frac{1}{\sqrt{2}}(i_1 + i_2)$  (B)  $\frac{1}{\sqrt{2}}(i_1 + i_2)^2$   
 (C)  $\frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$  (D)  $\frac{1}{2}(i_1^2 + i_2^2)^{1/2}$
28. The peak value of an alternating e.m.f.  $E$  is given by  $E = E_0 \cos \omega t$  is 10 volts and its frequency is 50 Hz. At time  $t = \frac{1}{600}$  sec, the instantaneous e.m.f. is  
 (A) 10 V (B)  $5\sqrt{3}$  V  
 (C) 5 V (D) 1 V
29. A choke coil has  
 (A) High inductance and low resistance  
 (B) Low inductance and high resistance  
 (C) High inductance and high resistance  
 (D) Low inductance and low resistance
30. Choke coil works on the principle of  
 (A) Transient current (B) Self induction  
 (C) Mutual induction (D) Wattless current

PHYSICS

विद्युतचुंबकीय तरंगे  
 Electromagnetic Wave

DPP-1

ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	C	B	C	A	A	B	A	C	A	D	A	A	A	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	B	B	B	C	C	C	D	B	C	C	C	B	A	B

- If in nature there may not be an element for which the principal quantum number  $n > 4$ , then the total possible number of elements will be  
(A) 60 (B) 32  
(C) 4 (D) 64
- The wavelength of the first line of Balmer series is  $6563 \text{ \AA}$ . The Rydberg constant for hydrogen is about  
(A)  $1.09 \times 10^7 \text{ per m}$  (B)  $1.09 \times 10^8 \text{ per m}$   
(C)  $1.09 \times 10^9 \text{ per m}$  (D)  $1.09 \times 10^5 \text{ per m}$
- In the Bohr's hydrogen atom model, the radius of the stationary orbit is directly proportional to ( $n =$  principle quantum number)  
(A)  $n^{-1}$  (B)  $n$   
(C)  $n^{-2}$  (D)  $n^2$
- The Rydberg constant  $R$  for hydrogen is  
(A)  $R = -\left(\frac{1}{4\pi\epsilon_0}\right) \cdot \frac{2\pi^2me^2}{ch^2}$  (B)  $R = \left(\frac{1}{4\pi\epsilon_0}\right) \cdot \frac{2\pi^2me^4}{ch^2}$   
(C)  $R = \left(\frac{1}{4\pi\epsilon_0}\right)^2 \cdot \frac{2\pi^2me^4}{c^2h^2}$  (D)  $R = \left(\frac{1}{4\pi\epsilon_0}\right)^2 \cdot \frac{2\pi^2me^4}{ch^3}$
- In the  $n^{\text{th}}$  orbit, the energy of an electron  $E_n = -\frac{13.6}{n^2} eV$  for hydrogen atom. The energy required to take the electron from first orbit to second orbit will be  
(A)  $10.2 eV$  (B)  $12.1 eV$   
(C)  $13.6 eV$  (D)  $3.4 eV$
- Ratio of the wavelengths of first line of Lyman series and first line of Balmer series is  
(A) 1:3 (B) 27:5  
(C) 5:27 (D) 4:9
- In the following atoms and molecules for the transition from  $n = 2$  to  $n = 1$ , the spectral line of minimum wavelength will be produced by  
(A) Hydrogen atom (B) Deuterium atom  
(C) Uni-ionized helium (D) di-ionized lithium
- The minimum energy required to excite a hydrogen atom from its ground state is  
(A)  $13.6 eV$  (B)  $-13.6 eV$   
(C)  $3.4 eV$  (D)  $10.2 eV$
- The Lyman series of hydrogen spectrum lies in the region  
(A) Infrared (B) Visible  
(C) Ultraviolet (D) Of X-rays
- Which of the transitions in hydrogen atom emits a photon of lowest frequency ( $n =$  quantum number)  
(A)  $n = 2$  to  $n = 1$  (B)  $n = 4$  to  $n = 3$   
(C)  $n = 3$  to  $n = 1$  (D)  $n = 4$  to  $n = 2$
- The size of an atom is of the order of  
(A)  $10^{-8} m$  (B)  $10^{-10} m$   
(C)  $10^{-12} m$  (D)  $10^{-14} m$
- An electron in the  $n = 1$  orbit of hydrogen atom is bound by  $13.6 eV$ . If a hydrogen atom is in the  $n = 3$  state, how much energy is required to ionize it  
(A)  $13.6 eV$  (B)  $4.53 eV$   
(C)  $3.4 eV$  (D)  $1.51 eV$
- Which one of the series of hydrogen spectrum is in the visible region  
(A) Lyman series (B) Balmer series  
(C) Paschen series (D) Bracket series
- Which of the following transitions in a hydrogen atom emits photon of the highest frequency  
(A)  $n = 1$  to  $n = 2$  (B)  $n = 2$  to  $n = 1$   
(C)  $n = 2$  to  $n = 6$  (D)  $n = 6$  to  $n = 2$
- In the above figure  $D$  and  $E$  respectively represent  
(A) Absorption line of Balmer series and the ionization potential of hydrogen  
(B) Absorption line of Balmer series and the wavelength lesser than lowest of the Lyman series  
(C) Spectral line of Balmer series and the maximum wavelength of Lyman series  
(D) Spectral line of Lyman series and the absorption of greater wavelength of limiting value of Paschen series
- In Bohr model of the hydrogen atom, the lowest orbit corresponds to  
(A) Infinite energy  
(B) The maximum energy  
(C) The minimum energy  
(D) Zero energy
- The Rutherford  $\alpha$ -particle experiment shows that most of the  $\alpha$ -particles pass through almost unscattered while some are scattered through large angles. What information does it give about the structure of the atom  
(A) Atom is hollow  
(B) The whole mass of the atom is concentrated in a small centre called nucleus  
(C) Nucleus is positively charged  
(D) All the above
- A hydrogen atom (ionisation potential  $13.6 eV$ ) makes a transition from third excited state to first excited state. The energy of the photon emitted in the process is  
(A)  $1.89 eV$  (B)  $2.55 eV$   
(C)  $12.09 eV$  (D)  $12.75 eV$

19. Which of the following is true  
 (A) Lyman series is a continuous spectrum  
 (B) Paschen series is a line spectrum in the infrared  
 (C) Balmer series is a line spectrum in the ultraviolet  
 (D) The spectral series formula can be derived from the Rutherford model of the hydrogen atom
20. The spectral series of the hydrogen spectrum that lies in the ultraviolet region is the  
 (A) Balmer series (B) Pfund series  
 (C) Paschen series (D) Lyman series
21. The energy required to knock out the electron in the third orbit of a hydrogen atom is equal to  
 (A)  $13.6 \text{ eV}$  (B)  $+\frac{13.6}{9} \text{ eV}$   
 (C)  $-\frac{13.6}{3} \text{ eV}$  (D)  $-\frac{3}{13.6} \text{ eV}$
22. If  $m$  is mass of electron,  $v$  its velocity,  $r$  the radius of stationary circular orbit around a nucleus with charge  $Ze$ , then from Bohr's first postulate, the kinetic energy  $K = \frac{1}{2}mv^2$  of the electron in C.G.S. system is equal to  
 (A)  $\frac{1}{2} \frac{Ze^2}{r}$  (B)  $\frac{1}{2} \frac{Ze^2}{r^2}$   
 (C)  $\frac{Ze^2}{r}$  (D)  $\frac{Ze}{r^2}$
23. An electron has a mass of  $9.1 \times 10^{-31} \text{ kg}$ . It revolves round the nucleus in a circular orbit of radius  $0.529 \times 10^{-10} \text{ metre}$  at a speed of  $2.2 \times 10^6 \text{ m/s}$ . The magnitude of its linear momentum in this motion is  
 (A)  $1.1 \times 10^{-34} \text{ kg-m/s}$  (B)  $2.0 \times 10^{-24} \text{ kg-m/s}$   
 (C)  $4.0 \times 10^{-24} \text{ kg-m/s}$  (D)  $4.0 \times 10^{-31} \text{ kg-m/s}$
24. The radius of electron's second stationary orbit in Bohr's atom is  $R$ . The radius of the third orbit will be  
 (A)  $3R$  (B)  $2.25R$   
 (C)  $9R$  (D)  $\frac{R}{3}$
25. In a beryllium atom, if  $a_0$  be the radius of the first orbit, then the radius of the second orbit will be in general  
 (A)  $na_0$  (B)  $a_0$   
 (C)  $n^2a_0$  (D)  $\frac{a_0}{n^2}$
26. The angular momentum of electron in  $n^{\text{th}}$  orbit is given by  
 (A)  $nh$  (B)  $\frac{h}{2\pi}$   
 (C)  $n\frac{h}{2\pi}$  (D)  $n^2\frac{h}{2\pi}$
27. The ionization potential for second He electron is  
 (A)  $13.6 \text{ eV}$  (B)  $27.2 \text{ eV}$   
 (C)  $54.4 \text{ eV}$  (D)  $100 \text{ eV}$
28. The energy required to remove an electron in a hydrogen atom from  $n = 10$  state is  
 (A)  $13.6 \text{ eV}$  (B)  $1.36 \text{ eV}$   
 (C)  $0.136 \text{ eV}$  (D)  $0.0136 \text{ eV}$
29. The ionisation energy of 10 times ionised sodium atom is  
 (A)  $13.6 \text{ eV}$  (B)  $13.6 \times 11 \text{ eV}$   
 (C)  $\frac{13.6}{11} \text{ eV}$  (D)  $13.6 \times (11)^2 \text{ eV}$
30. Every series of hydrogen spectrum has an upper and lower limit in wavelength. The spectral series which has an upper limit of wavelength equal to  $18752 \text{ \AA}$  is  
 (A) Balmer series (B) Lyman series  
 (C) Paschen series (D) Pfund series  
 (Rydberg constant  $R = 1.097 \times 10^7 \text{ per metre}$ )

## ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	A	D	D	A	C	D	D	C	B	B	D	B	A	A
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	D	B	B	D	B	A	B	B	C	C	C	C	D	C

1. Radius of  ${}^4_2\text{He}$  nucleus is 3 Fermi. The radius of  ${}^{206}_{82}\text{Pb}$  nucleus will be  
 (A) 5 Fermi (B) 6 Fermi  
 (C) 11.16 Fermi (D) 8 Fermi
2. Nuclear forces are  
 (A) Short ranged attractive and charge independent  
 (B) Short ranged attractive and charge dependent  
 (C) Long ranged repulsive and charge independent  
 (D) Long ranged repulsive and charge dependent
3. Which of the following particles are constituents of the nucleus  
 (A) Protons and electrons  
 (B) Protons and neutrons  
 (C) Neutrons and electrons  
 (D) Neutrons and positrons
4. The mass defect per nucleon is called  
 (A) Binding energy (B) Packing fraction  
 (C) Ionisation energy (D) Excitation energy
5. Order of magnitude of density of uranium nucleus is ( $m_p = 1.67 \times 10^{-27} \text{ kg}$ )  
 (A)  $10^{20} \text{ kg/m}^3$  (B)  $10^{17} \text{ kg/m}^3$   
 (C)  $10^{14} \text{ kg/m}^3$  (D)  $10^{11} \text{ kg/m}^3$
6. The mechanism of the hydrogen bomb is based on  
 (A) Fission of isotopes of hydrogen  
 (B) Fusion of protons  
 (C) Fusion of deuterium and tritium  
 (D) Fusion of neutrons
7. In nuclear reactions, we have the conservation of  
 (A) Mass only  
 (B) Energy only  
 (C) Momentum only  
 (D) Mass, energy and momentum
8. Outside a nucleus  
 (A) Neutron is stable  
 (B) Proton and neutron both are stable  
 (C) Neutron is unstable  
 (D) Neither neutron nor proton is stable
9. The particles which can be added to the nucleus of an atom without changing its chemical properties are called  
 (A) Electrons (B) Protons  
 (C) Neutrons (D) None of the above
10. Which of the following isotopes is normally fissionable?  
 (A)  ${}_{92}\text{U}^{238}$  (B)  ${}_{93}\text{Np}^{239}$   
 (C)  ${}_{92}\text{U}^{235}$  (D)  ${}_{2}\text{He}^4$
11. The control rod in a nuclear reactor is made of  
 (A) Uranium (B) Cadmium  
 (C) Graphite (D) Plutonium
12. The neutron was discovered by  
 (A) Marie Curie (B) Pierre Curie  
 (C) James Chadwick (D) Rutherford
13. The force acting between proton and proton inside the nucleus is  
 (A) Coulombic (B) Nuclear  
 (C) Both (D) None of these
14. The energy equivalent of 1 kilogram of matter is about  
 (A)  $10^{-15} \text{ J}$  (B) 1 J  
 (C)  $10^{-12} \text{ J}$  (D)  $10^{17} \text{ J}$
15. The  $\alpha$ -particle is the nucleus of an atom of  
 (A) Neon (B) Hydrogen  
 (C) Helium (D) Deuterium
16. Nuclear binding energy is equivalent to  
 (A) Mass of proton  
 (B) Mass of neutron  
 (C) Mass of nucleus  
 (D) Mass defect of nucleus
17. Atomic number of a nucleus is  $Z$  and atomic mass is  $M$ . The number of neutron is  
 (A)  $M - Z$  (B)  $M$   
 (C)  $Z$  (D)  $M + Z$
18. If the binding energy of the deuterium is 2.23 MeV. The mass defect given in a.m.u. is  
 (A) -0.0024 (B) -0.0012  
 (C) 0.0012 (D) 0.0024

19. Which of the following has the mass closest in value to that of the positron  
(A) Proton (B) Electron  
(C) Photon (D) Neutrino  
(1 a.m.u = 931 MeV)
20. Size of nucleus is of the order of  
(A)  $10^{-10} m$  (B)  $10^{-15} m$   
(C)  $10^{-12} m$  (D)  $10^{-19} m$
21. For effective nuclear forces, the distance should be  
(A)  $10^{-10} m$  (B)  $10^{-13} m$   
(C)  $10^{-15} m$  (D)  $10^{-20} m$
22. The mass defect for the nucleus of helium is 0.0303 a.m.u. What is the binding energy per nucleon for helium in MeV  
(A) 28 (B) 7  
(C) 4 (D) 1
23. Isotopes are atoms having  
(A) Same number of protons but different number of neutrons  
(B) Same number of neutrons but different number of protons  
(C) Same number of protons and neutrons  
(D) None of the above
24. Nucleus of an atom whose atomic mass is 24 consists of  
(A) 11 electrons, 11 protons and 13 neutrons  
(B) 11 electrons, 13 protons and 11 neutrons  
(C) 11 protons and 13 neutrons  
(D) 11 protons and 13 electrons
25. Binding energy of a nucleus is  
(A) Energy given to its nucleus during its formation  
(B) Total mass of nucleus converted to energy units  
(C) Loss of energy from the nucleus during its formation  
(D) Total K.E. and P.E. of the nucleons in the nucleus
26. The mass number of a nucleus is equal to the number of  
(A) Electrons it contains  
(B) Protons it contains  
(C) Neutrons it contains  
(D) Nucleons it contains
27. The binding energy per nucleon is maximum in the case of  
(A)  ${}^2_4\text{He}$  (B)  ${}^{56}_{26}\text{Fe}$   
(C)  ${}^{141}_{56}\text{Ba}$  (D)  ${}^{235}_{92}\text{U}$
28. The rest energy of an electron is  
(A) 510 KeV (B) 931 KeV  
(C) 510 MeV (D) 931 MeV
29. The mass of a neutron is the same as that of  
(A) A proton (B) A meson  
(C) An epsilon (D) An electron
30. In  ${}_{88}\text{Ra}^{226}$  nucleus, there are  
(A) 138 protons and 88 neutrons  
(B) 138 neutrons and 88 protons  
(C) 226 protons and 88 electrons  
(D) 226 neutrons and 138 electrons

PHYSICS

नाभिक  
Nucleus

DPP-1

### ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	A	B	B	B	C	D	C	C	C	B	C	C	D	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	A	D	B	B	C	B	A	C	C	D	B	A	A	B

- The de-Broglie wavelength  $\lambda$  associated with an electron having kinetic energy  $E$  is given by the expression  
 (A)  $\frac{h}{\sqrt{2mE}}$  (B)  $\frac{2h}{mE}$   
 (C)  $2mhE$  (D)  $\frac{2\sqrt{2mE}}{h}$
- The speed of an electron having a wavelength of  $10^{-10}m$  is  
 (A)  $7.25 \times 10^6 m/s$  (B)  $6.26 \times 10^6 m/s$   
 (C)  $5.25 \times 10^6 m/s$  (D)  $4.24 \times 10^6 m/s$
- The idea of matter waves was given by  
 (A) Davisson and Germer  
 (B) de-Broglie  
 (C) Einstein (D) Planck
- The de-Broglie wavelength of an electron having  $80eV$  of energy is nearly  
 ( $1eV = 1.6 \times 10^{-19} J$ , Mass of electron =  $9 \times 10^{-31} kg$   
 Planck's constant =  $6.6 \times 10^{-34} J\text{-sec}$ )  
 (A)  $140 \text{ \AA}$  (B)  $0.14 \text{ \AA}$   
 (C)  $14 \text{ \AA}$  (D)  $1.4 \text{ \AA}$
- Wave is associated with matter  
 (A) When it is stationary  
 (B) When it is in motion with the velocity of light only  
 (C) When it is in motion with any velocity  
 (D) None of the above
- What is the de-Broglie wavelength of the  $\alpha$ -particle accelerated through a potential difference  $V$   
 (A)  $\frac{0.287}{\sqrt{V}} \text{ \AA}$  (B)  $\frac{12.27}{\sqrt{V}} \text{ \AA}$   
 (C)  $\frac{0.101}{\sqrt{V}} \text{ \AA}$  (D)  $\frac{0.202}{\sqrt{V}} \text{ \AA}$
- The de-Broglie wavelength associated with the particle of mass  $m$  moving with velocity  $v$  is  
 (A)  $h/mv$  (B)  $mv/h$   
 (C)  $mh/v$  (D)  $m/hv$
- If the de-Broglie wavelengths for a proton and for a  $\alpha$ -particle are equal, then the ratio of their velocities will be  
 (A) 4 : 1 (B) 2 : 1  
 (C) 1 : 2 (D) 1 : 4
- If the work function of a metal is ' $\phi$ ' and the frequency of the incident light is ' $\nu$ ', there is no emission of photoelectron if  
 (A)  $\nu < \frac{\phi}{h}$  (B)  $\nu = \frac{\phi}{h}$   
 (C)  $\nu > \frac{\phi}{h}$  (D)  $\nu > = < \frac{\phi}{h}$
- The momentum of a photon is  $3.3 \times 10^{-29} kg - m/sec$ . Its frequency will be  
 (A)  $3 \times 10^3 Hz$  (B)  $6 \times 10^3 Hz$   
 (C)  $7.5 \times 10^{12} Hz$  (D)  $1.5 \times 10^{13} Hz$
- Ultraviolet radiations of  $6.2eV$  falls on an aluminium surface (work function  $4.2 eV$ ). The kinetic energy in joules of the fastest electron emitted is approximately  
 (A)  $3.2 \times 10^{-21}$  (B)  $3.2 \times 10^{-19}$   
 (C)  $3.2 \times 10^{-17}$  (D)  $3.2 \times 10^{-15}$
- The rest mass of the photon is  
 (A) 0  
 (B)  $\infty$   
 (C) Between 0 and  $\infty$   
 (D) Equal to that of an electron
- The work function of a metal is  $4.2 eV$ , its threshold wavelength will be  
 (A)  $4000 \text{ \AA}$  (B)  $3500 \text{ \AA}$   
 (C)  $2955 \text{ \AA}$  (D)  $2500 \text{ \AA}$
- If the momentum of a photon is  $p$ , then its frequency is  
 (A)  $\frac{ph}{c}$  (B)  $\frac{pc}{h}$   
 (C)  $\frac{mh}{c}$  (D)  $\frac{mc}{h}$
- When light falls on a metal surface, the maximum kinetic energy of the emitted photo-electrons depends upon  
 (A) The time for which light falls on the metal  
 (B) Frequency of the incident light  
 (C) Intensity of the incident light  
 (D) Velocity of the incident light
- An important spectral emission line has a wavelength of  $21 cm$ . The corresponding photon energy is  
 (A)  $5.9 \times 10^{-4} eV$  (B)  $5.9 \times 10^{-6} eV$   
 (C)  $5.9 \times 10^{-8} eV$  (D)  $11.8 \times 10^{-6} eV$   
 ( $h = 6.62 \times 10^{-34} Js$ ;  $c = 3 \times 10^8 m/s$ )
- Threshold frequency for a metal is  $10^{15} Hz$ . Light of  $\lambda = 4000 \text{ \AA}$  falls on its surface. Which of the following statements is correct  
 (A) No photoelectric emission takes place  
 (B) Photo-electrons come out with zero speed  
 (C) Photo-electrons come out with  $10^3 m/sec$  speed  
 (D) Photo-electrons come out with  $10^5 m/sec$  speed

18. Wavelength of a  $1\text{ keV}$  photon is  $1.24 \times 10^{-9}\text{ m}$ . What is the frequency of  $1\text{ MeV}$  photon  
 (A)  $1.24 \times 10^{15}\text{ Hz}$  (B)  $2.4 \times 10^{20}\text{ Hz}$   
 (C)  $1.24 \times 10^{18}\text{ Hz}$  (D)  $2.4 \times 10^{23}\text{ Hz}$
19. Kinetic energy with which the electrons are emitted from the metal surface due to photoelectric effect is  
 (A) Independent of the intensity of illumination  
 (B) Independent of the frequency of light  
 (C) Inversely proportional to the intensity of illumination  
 (D) Directly proportional to the intensity of illumination
20. Which of the following statement is not correct  
 (A) Photographic plates are sensitive to infrared rays  
 (B) Photographic plates are sensitive to ultraviolet rays  
 (C) Infra-red rays are invisible but can cast shadows like visible light  
 (D) Infrared photons have more energy than photons of visible light
21. Einstein's photoelectric equation states that  $E_k = h\nu - \phi$ . In this equation  $E_k$  refers to  
 (A) Kinetic energy of all the emitted electrons  
 (B) Mean kinetic energy of the emitted electrons  
 (C) Maximum kinetic energy of the emitted electrons  
 (D) Minimum kinetic energy of the emitted electrons
22. Which of the following is incorrect statement regarding photon  
 (A) Photon exerts no pressure  
 (B) Photon energy is  $h\nu$   
 (C) Photon rest mass is zero  
 (D) None of these
23. Electron volt is a unit of  
 (A) Potential (B) Charge  
 (C) Power (D) Energy
24. When the speed of electrons increases, then the value of its specific charge  
 (A) Increases (B) Decreases  
 (C) Remains unchanged  
 (D) Increases upto some velocity and then begins to decrease
25. Cathode rays are similar to visible light rays in that  
 (A) They both can be deflected by electric and magnetic fields  
 (B) They both have a definite magnitude of wavelength  
 (C) They both can ionise a gas through which they pass  
 (D) They both can expose a photographic plate
26. The ratio of momenta of an electron and an  $\alpha$ -particle which are accelerated from rest by a potential difference of  $100\text{ V}$  is  
 (A) 1 (B)  $\sqrt{\frac{2m_e}{m_\alpha}}$   
 (C)  $\sqrt{\frac{m_e}{m_\alpha}}$  (D)  $\sqrt{\frac{m_e}{2m_\alpha}}$
26. The specific charge of an electron is  
 (A)  $1.6 \times 10^{-19}\text{ coulomb}$   
 (B)  $4.8 \times 10^{-10}\text{ stat coulomb}$   
 (C)  $1.76 \times 10^{11}\text{ coulomb / kg}$   
 (D)  $1.76 \times 10^{-11}\text{ coulomb / kg}$
27. When subjected to a transverse electric field, cathode rays move  
 (A) Down the potential gradient  
 (B) Up the potential gradient  
 (C) Along a hyperbolic path  
 (D) Along a circular path
29. Cathode rays enter into a uniform magnetic field perpendicular to the direction of the field. In the magnetic field their path will be  
 (A) Straight line (B) Circle  
 (C) Parabolic (D) Ellipse
30. The fact that electric charges are integral multiples of the fundamental electronic charge was proved experimentally by  
 (A) Planck (B) J.J. Thomson  
 (C) Einstein (D) Millikan

## ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	A	B	D	C	C	A	A	A	D	B	A	C	B	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B	A	B	A	D	C	A	D	B	D	D	C	B	B	D

1. Sound travels in rocks in the form of
  - (A) Longitudinal elastic waves only
  - (B) Transverse elastic waves only
  - (C) Both longitudinal and transverse elastic waves
  - (D) Non-elastic waves
2. The nature of sound waves in gases is
  - (A) Transverse
  - (B) Longitudinal
  - (C) Stationary
  - (D) Electromagnetic
3. The distance between two consecutive crests in a wave train produced in a string is 5 cm. If 2 complete waves pass through any point per second, the velocity of the wave is
  - (A) 10 cm/sec
  - (B) 2.5 cm/sec
  - (C) 5 cm/sec
  - (D) 15 cm/sec
4. Which of the following is the longitudinal wave
  - (A) Sound waves
  - (B) Waves on plucked string
  - (C) Water waves
  - (D) Light waves
5. Mechanical waves on the surface of a liquid are
  - (A) Transverse
  - (B) Longitudinal
  - (C) Torsional
  - (D) Both transverse and longitudinal
6. A man sets his watch by a whistle that is 2 km away. How much will his watch be in error. (speed of sound in air 330 m/sec)
  - (A) 3 seconds fast
  - (B) 3 seconds slow
  - (C) 6 seconds fast
  - (D) 6 seconds slow
7. Which of the following do not require medium for transmission
  - (A) Cathode ray
  - (B) Electromagnetic wave
  - (C) Sound wave
  - (D) None of the above
8. A medium can carry a longitudinal wave because it has the property of
  - (A) Mass
  - (B) Density
  - (C) Compressibility
  - (D) Elasticity
9. Sound waves have the following frequencies that are audible to human beings
  - (A) 5 c/s
  - (B) 27000 c/s
  - (C) 5000 c/s
  - (D) 50,000 c/s
10. 'SONAR' emits which of the following waves
  - (A) Radio waves
  - (B) Ultrasonic waves
  - (C) Light waves
  - (D) Magnetic waves
11. The following phenomenon cannot be observed for sound waves
  - (A) Refraction
  - (B) Interference
  - (C) Diffraction
  - (D) Polarisation
12. The wavelength of ultrasonic waves in air is of the order of
  - (A)  $5 \times 10^{-5}$  cm
  - (B)  $5 \times 10^{-8}$  cm
  - (C)  $5 \times 10^5$  cm
  - (D)  $5 \times 10^8$  cm
13. What is the phase difference between two successive crests in the wave
  - (A)  $\pi$
  - (B)  $\pi/2$
  - (C)  $2\pi$
  - (D)  $4\pi$
14. The minimum audible wavelength at room temperature is about
  - (A) 0.2 Å
  - (B) 5 Å
  - (C) 5 cm to 2 metre
  - (D) 20 mm
15. The number of waves contained in unit length of the medium is called
  - (A) Elastic wave
  - (B) Wave number
  - (C) Wave pulse
  - (D) Electromagnetic wave
16. Which of the following is not the transverse wave
  - (A) X-rays
  - (B)  $\gamma$ -rays
  - (C) Visible light wave
  - (D) Sound wave in a gas
17. Frequency range of the audible sounds is
  - (A) 0 Hz – 30 Hz
  - (B) 20 Hz – 20 kHz
  - (C) 20 kHz – 20,000 kHz
  - (D) 20 kHz – 20 MHz
18. The wave length of light in visible part ( $\lambda_V$ ) and for sound ( $\lambda_S$ ) are related as
  - (A)  $\lambda_V > \lambda_S$
  - (B)  $\lambda_S > \lambda_V$
  - (C)  $\lambda_S = \lambda_V$
  - (D) None of these
19. Which of the following is different from others
  - (A) Velocity
  - (B) Wavelength
  - (C) Frequency
  - (D) Amplitude

20. Sound waves in air are  
 (A) Transverse (B) Longitudinal  
 (C) De-Broglie waves (D) All the above
21. Velocity of sound in air is  
 (A) Faster in dry air than in moist air  
 (B) Directly proportional to pressure  
 (C) Directly proportional to temperature  
 (D) Independent of pressure of air
22. Speed of sound at constant temperature depends on  
 (A) Pressure (B) Density of gas  
 (C) Above both (D) None of the above
23. Sound velocity is maximum in  
 (A)  $H_2$  (B)  $N_2$   
 (C)  $He$  (D)  $O_2$
24. The minimum distance of reflector surface from the source for listening the echo of sound is  
 (A) 28 m (B) 18 m  
 (C) 19 m (D) 16.5 m
25. The type of waves that can be propagated through solid is  
 (A) Transverse (B) Longitudinal  
 (C) Both (A) and (B) (D) None of these
26. Velocity of sound in air  
 I. Increases with temperature  
 II. Decreases with temperature  
 III. Increase with pressure  
 IV. Is independent of pressure  
 V. Is independent of temperature  
 Choose the correct answer.  
 (A) Only I and II are true  
 (B) Only I and III are true  
 (C) Only II and III are true  
 (D) Only I and IV are true
27. If wavelength of a wave is  $\lambda = 6000 \text{ \AA}$ . Then wave number will be  
 (A)  $166 \times 10^3 \text{ m}^{-1}$  (B)  $16.6 \times 10^{-1} \text{ m}^{-1}$   
 (C)  $1.66 \times 10^6 \text{ m}^{-1}$  (D)  $1.66 \times 10^7 \text{ m}^{-1}$
28. Water waves are  
 (A) Longitudinal  
 (B) Transverse  
 (C) Both longitudinal and transverse  
 (D) Neither longitudinal nor transverse
29. A plane wave is represented by  
 $x = 1.2 \sin(314 t + 12.56y)$   
 Where  $x$  and  $y$  are distances measured along in  $x$  and  $y$  direction in meters and  $t$  is time in seconds.  
 This wave has  
 (A) A wavelength of 0.25 m and travels in +ve  $x$  direction  
 (B) A wavelength of 0.25 m and travels in +ve  $y$  direction  
 (C) A wavelength of 0.5 m and travels in -ve  $y$  direction  
 (D) A wavelength of 0.5 m and travels in -ve  $x$  direction
30. The relation between time and displacement for two particles is given by  
 $y_1 = 0.06 \sin 2\pi(0.04t + \phi_1)$ ,  $y_2 = 0.03 \sin 2\pi(1.04t + \phi_2)$   
 The ratio of the intensity of the waves produced by the vibrations of the two particles will be  
 (A) 2 : 1 (B) 1 : 2  
 (C) 4 : 1 (D) 1 : 4

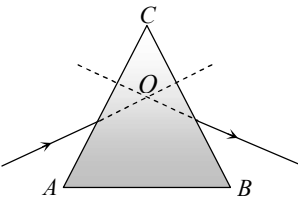
PHYSICS

तरंग प्रकाशिकी  
 Wave optic

DPP-1

ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	B	A	A	D	D	B	D	C	B	D	A	C	D	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	B	B	D	B	D	D	A	D	C	D	C	C	C	C

1. A diminished virtual image can be formed only in  
(A) Plane mirror (B) A concave mirror  
(C) A convex mirror (D) Concave-parabolic mirror
2. An object of length  $6\text{ cm}$  is placed on the principal axis of a concave mirror of focal length  $f$  at a distance of  $4f$ . The length of the image will be  
(A)  $2\text{ cm}$  (B)  $12\text{ cm}$   
(C)  $4\text{ cm}$  (D)  $1.2\text{ cm}$
3. The minimum distance between the object and its real image for concave mirror is  
(A)  $f$  (B)  $2f$   
(C)  $4f$  (D) Zero
4. The focal length of a convex mirror is  $20\text{ cm}$  its radius of curvature will be  
(A)  $10\text{ cm}$  (B)  $20\text{ cm}$   
(C)  $30\text{ cm}$  (D)  $40\text{ cm}$
5. An object  $2.5\text{ cm}$  high is placed at a distance of  $10\text{ cm}$  from a concave mirror of radius of curvature  $30\text{ cm}$ . The size of the image is  
(A)  $9.2\text{ cm}$  (B)  $10.5\text{ cm}$   
(C)  $5.6\text{ cm}$  (D)  $7.5\text{ cm}$
6. Which of the following form (s) a virtual and erect image for all positions of the object  
(A) Convex lens (B) Concave lens  
(C) Convex mirror (D) Concave mirror
7. When light travels from glass to air, the incident angle is  $\theta_1$  and the refracted angle is  $\theta_2$ . The true relation is  
(A)  $\theta_1 = \theta_2$  (B)  $\theta_1 < \theta_2$   
(C)  $\theta_1 \geq \theta_2$  (D) Not predictable
8. The angle of a prism is  $30^\circ$ . The rays incident at  $60^\circ$  at one refracting face suffer a deviation of  $30^\circ$ . The angle of emergence is  
(A)  $0^\circ$  (B)  $30^\circ$   
(C)  $60^\circ$  (D)  $90^\circ$
9. A plane glass slab is kept over various coloured letters, the letter which appears least raised is  
(A) Blue (B) Violet  
(C) Green (D) Red
10. In the given figure, what is the angle of prism  

- (A)  $A$  (B)  $B$   
(C)  $C$  (D)  $D$
11. When light travels from one medium to the other of which the refractive index is different, then which of the following will change  
(A) Frequency, wavelength and velocity  
(B) Frequency and wavelength  
(C) Frequency and velocity  
(D) Wavelength and velocity
12. Which of the following statement is true  
(A) Velocity of light is constant in all media  
(B) Velocity of light in vacuum is maximum  
(C) Velocity of light is same in all reference frames  
(D) Laws of nature have identical form in all reference frames
13. Rainbow is formed due to  
(A) Refraction  
(B) Dispersion and total internal reflection  
(C) Total internal reflection  
(D) Scattering
14. When a light wave goes from air into water, the quantity that remains unchanged is its  
(A) Speed (B) Amplitude  
(C) Frequency (D) Wavelength
15. The bottom of a container filled with liquid appear slightly raised because of  
(A) Refraction  
(B) Interference  
(C) Diffraction  
(D) Reflection
16. Light takes  $8\text{ minutes } 20\text{ seconds}$  to reach from sun on the earth. If the whole atmosphere is filled with water, the light will take the time ( ${}_a\mu_w = 4/3$ )  
(A)  $8\text{ minutes } 20\text{ seconds}$   
(B)  $8\text{ minutes}$   
(C)  $6\text{ minutes } 11\text{ seconds}$   
(D)  $11\text{ minutes } 6\text{ seconds}$
17. The critical angle for diamond (refractive index = 2) is  
(A) About  $20^\circ$  (B)  $60^\circ$   
(C)  $45^\circ$  (D)  $30^\circ$
18. Optical fibres are related with  
(A) Communication (B) Light  
(C) Computer (D) None of these

19. For which of the following pairs the critical angle is smallest  
 (A) Water to air (B) Glass to water  
 (C) Glass to air (D) Glass to glass
20. The critical angle for a medium is  $60^\circ$ . The refractive index of the medium  
 (A)  $2/\sqrt{3}$  (B)  $\sqrt{2}/3$   
 (C)  $\sqrt{3}$  (D)  $\sqrt{3}/2$
21. A monochromatic light is passed through a prism,..... colour shows minimum deviation  
 (A) Red (B) Violet  
 (C) Yellow (D) Green
22. At what distance from a convex lens of focal length 30 cm, an object should be placed so that the size of the image be 1/2th of the object  
 (A) 30 cm (B) 60 cm  
 (C) 15 cm (D) 90 cm
23. Magnification produced by a concave lens is always  
 (A) Less than one  
 (B) More than one  
 (C) One  
 (D) Less or more than one
24. When light rays from the sun fall on a convex lens along a direction parallel to its axis  
 (A) Focal length for all colours is the same  
 (B) Focal length for violet colour is the shortest  
 (C) Focal length for yellow colour is the longest  
 (D) Focal length for red colour is the shortest
25. When the convergent nature of a convex lens will be less as compared with air  
 (A) In water (B) In oil  
 (C) In both (D) None of these
26. An object is placed 9 cm from a magnifying lens of focal length 24 cm. What is the magnitude of magnification  
 (A) 1.2 (B) 1.6  
 (C) 2.0 (D) 2.4
27. An object of height 1.5 cm is placed on the axis of a convex lens of focal length 25 cm. A real image is formed at a distance of 75 cm from the lens. The size of the image will be  
 (A) 4.5 cm (B) 3.0 cm  
 (C) 0.75 cm (D) 0.5 cm
28. A symmetric double convex lens is cut in two equal parts by a plane perpendicular to the principal axis. If the power of the original lens was 4D, the power of a cut lens will be  
 (A) 2 D (B) 3 D  
 (C) 4 D (D) 5 D
29. The focal length of convex lens 30 cm and the size of image is quarter of the object, then the object distance is  
 (A) 90 cm (B) 60 cm  
 (C) 30 cm (D) 40 cm
30. A double convex lens of glass of  $\mu = 1.5$  has radius of curvature of each of its surface is 0.2 m. The power of the lens is  
 (A) + 10 D (B) - 10 D  
 (C) - 5 D (D) +5 D

ANSWER KEY

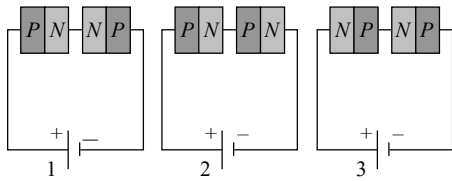
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	A	D	D	D	B,C	B	A	D	C	D	B	B	C	A
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
D	D	A	C	A	A	D	A	B	C	B	B	A	A	D

1. The majority charge carriers in  $P$ -type semiconductor are
  - (A) Electrons
  - (B) Protons
  - (C) Holes
  - (D) Neutrons
2. A semiconductor is cooled from  $T_1K$  to  $T_2K$ . Its resistance
  - (A) Will decrease
  - (B) Will increase
  - (C) Will first decrease and then increase
  - (D) Will not change
3. A  $P$ -type semiconductor can be obtained by adding
  - (A) Arsenic to pure silicon
  - (B) Gallium to pure silicon
  - (C) Antimony to pure germanium
  - (D) Phosphorous to pure germanium
4. The valence of an impurity added to germanium crystal in order to convert it into a  $P$ -type semiconductor is
  - (A) 6
  - (B) 5
  - (C) 4
  - (D) 3
5. At zero Kelvin a piece of germanium
  - (A) Becomes semiconductor
  - (B) Becomes good conductor
  - (C) Becomes bad conductor
  - (D) Has maximum conductivity
6. In a semiconductor, the concentration of electrons is  $8 \times 10^{14} / \text{cm}^3$  and that of the holes is  $5 \times 10^{12} \text{cm}^3$ . The semiconductor is
  - (A)  $P$ -type
  - (B)  $N$ -type
  - (C) Intrinsic
  - (D)  $PNP$ -type
7. A hole in a  $P$ -type semiconductor is
  - (A) An excess electron
  - (B) A missing electron
  - (C) A missing atom
  - (D) A donor level
8. When the electrical conductivity of a semiconductor is due to the breaking of its covalent bonds, then the semiconductor is said to be
  - (A) Donor
  - (B) Acceptor
  - (C) Intrinsic
  - (D) Extrinsic
9. The energy band gap of  $Si$  is
  - (A)  $0.70 \text{ eV}$
  - (B)  $1.1 \text{ eV}$
  - (C) Between  $0.70 \text{ eV}$  to  $1.1 \text{ eV}$
  - (D)  $5 \text{ eV}$
10. Let  $n_p$  and  $n_e$  be the number of holes and conduction electrons respectively in a semiconductor. Then
  - (A)  $n_p > n_e$  in an intrinsic semiconductor
  - (B)  $n_p = n_e$  in an extrinsic semiconductor
  - (C)  $n_p = n_e$  in an intrinsic semiconductor
  - (D)  $n_e > n_p$  in an intrinsic semiconductor
11. Which statement is correct
  - (A)  $N$ -type germanium is negatively charged and  $P$ -type germanium is positively charged
  - (B) Both  $N$ -type and  $P$ -type germanium are neutral
  - (C)  $N$ -type germanium is positively charged and  $P$ -type germanium is negatively charged
  - (D) Both  $N$ -type and  $P$ -type germanium are negatively charged
12. In the forward bias arrangement of a  $PN$ -junction diode
  - (A) The  $N$ -end is connected to the positive terminal of the battery
  - (B) The  $P$ -end is connected to the positive terminal of the battery
  - (C) The direction of current is from  $N$ -end to  $P$ -end in the diode
  - (D) The  $P$ -end is connected to the negative terminal of battery
13. The depletion layer in the  $P$ - $N$  junction region is caused by
  - (A) Drift of holes
  - (B) Diffusion of charge carriers
  - (C) Migration of impurity ions
  - (D) Drift of electrons
14. A semiconductor device is connected in a series circuit with a battery and a resistance. A current is found to pass through the circuit. If the polarity of the battery is reversed, the current drops almost to zero. The device may be
  - (A) A  $P$ -type semiconductor
  - (B) An  $N$ -type semiconductor
  - (C) A  $PN$ -junction
  - (D) An intrinsic semiconductor
15. What is the current in the circuit shown below
 

$-4V$  —  $PN$  —  $300\Omega$  —  $-1V$

  - (A)  $0 \text{ amp}$
  - (B)  $10^{-2} \text{ amp}$
  - (C)  $1 \text{ amp}$
  - (D)  $0.10 \text{ amp}$
16. In a  $PN$ -junction diode not connected to any circuit
  - (A) The potential is the same everywhere
  - (B) The  $P$ -type is a higher potential than the  $N$ -type side
  - (C) There is an electric field at the junction directed from the  $N$ -type side to the  $P$ -type side
  - (D) There is an electric field at the junction directed from the  $P$ -type side to the  $N$ -type side
17. The  $PN$  junction diode is used as
  - (A) An amplifier
  - (B) A rectifier
  - (C) An oscillator
  - (D) A modulator

18. Two PN-junctions can be connected in series by three different methods as shown in the figure. If the potential difference in the junctions is the same, then the correct connections will be



- (A) In the circuit (1) and (2)
- (B) In the circuit (2) and (3)
- (C) In the circuit (1) and (3)
- (D) Only in the circuit (1)

19. In forward bias, the width of potential barrier in a P-N junction diode

- (A) Increases
- (B) Decreases
- (C) Remains constant
- (D) First increases then decreases

20. A PN-junction has a thickness of the order of

- (A) 1 cm
- (B) 1 mm
- (C)  $10^{-6} m$
- (D)  $10^{-12} cm$

21. The following truth table corresponds to the logic gate

A	0	0	1	1
B	0	1	0	1
X	0	1	1	1

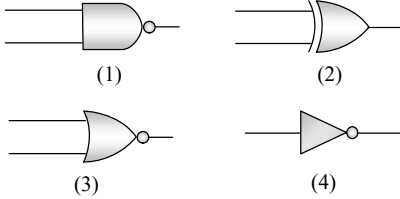
- (A) NAND
- (B) OR
- (C) AND
- (D) XOR

22. A truth table is given below. Which of the following has this type of truth table

A	0	1	0	1
B	0	0	1	1
y	1	0	0	0

- (A) XOR gate
- (B) NOR gate
- (C) AND gate
- (D) OR gate

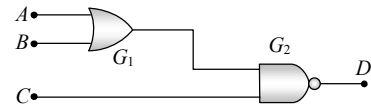
23. Given below are symbols for some logic gates



The XOR gate and NOR gate respectively are

- (A) 1 and 2
- (B) 2 and 3
- (C) 3 and 4
- (D) 1 and 4

24. For the given combination of gates, if the logic states of inputs  $A, B, C$  are as follows  $A = B = C = 0$  and  $A = B = 1, C = 0$  then the logic states of output  $D$  are

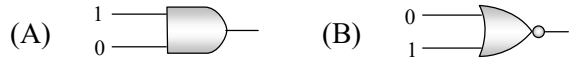


- (A) 0, 0
- (B) 0, 1
- (C) 1, 0
- (D) 1, 1

25. How many NAND gates are used to form an AND gate

- (A) 1
- (B) 2
- (C) 3
- (D) 4

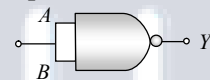
26. Which of the following gates will have an output of 1



27. What will be the input of  $A$  and  $B$  for the Boolean expression  $\overline{(A+B)} \cdot \overline{(A \cdot B)} = 1$

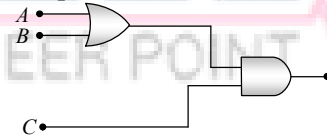
- (A) 0, 0
- (B) 0, 1
- (C) 1, 0
- (D) 1, 1

28. This symbol represents



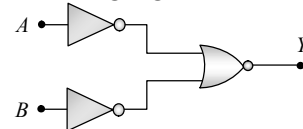
- (A) NOT gate
- (B) OR gate
- (C) AND gate
- (D) NOR gate

29. To get an output 1 from the circuit shown in the figure, the input must be



- (A)  $A = 0, B = 1, C = 0$
- (B)  $A = 1, B = 0, C = 0$
- (C)  $A = 1, B = 0, C = 1$
- (D)  $A = 1, B = 1, C = 0$

30. Which logic gate is represented by the following combination of logic gates



- (A) OR
- (B) NAND
- (C) AND
- (D) NOR

ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	B	B	D	C	B	B	C	B	C	B	B	B	C	A
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	B	B	B	C	B	B	B	D	B	C	A	A	C	C