



Class 12 Physics | Electric Charges And Fields

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Two point charges have force F in vacuum. If both charges double at fixed distance, force becomes:

- A. $F/2$ B. $2F$ C. $F/4$ D. $4F$

2. A $2\ \mu\text{C}$ charge in a uniform field of $300\ \text{N/C}$ experiences force:

- A. $6 \times 10^{-6}\ \text{N}$ B. $600\ \text{N}$ C. $6 \times 10^{-4}\ \text{N}$ D. $150\ \text{N}$

3. Electric field due to an isolated positive point charge points:

- A. Tangentially B. Radially inward
C. Along a closed circle D. Radially outward

4. At the midpoint between two equal positive charges, net field is:

- A. Directed toward one charge
B. Twice one charge's field
C. Zero
D. Infinite

5. At the midpoint between equal and opposite charges, field points:

- A. From positive toward negative charge
B. From negative toward positive charge
C. Perpendicular to their line
D. Nowhere because it is zero

6. Electric dipole moment is directed from:

- A. Negative to positive charge
B. Perpendicular to dipole axis
C. Centre to either end
D. Positive to negative charge

7. A dipole with moment p in field E has maximum torque:

- A. pE B. E/p C. 0 D. p/E

8. A dipole parallel to a uniform electric field has torque:

- A. $pE/2$ B. pE C. $2pE$ D. Zero

9. Electric flux through area A with normal parallel to uniform field E is:

- A. A/E B. EA C. 0 D. E/A

10. A closed surface encloses charge q . Net electric flux is:

- A. 0 always B. q/ϵ_0 C. $q\epsilon_0$ D. $q/(4\pi\epsilon_0)$

11. A charge lies outside a closed surface. Its net flux through that surface is:

- A. q/ϵ_0 B. Zero C. $-q/\epsilon_0$ D. $q/(2\epsilon_0)$

12. Inside a charged conducting sphere in electrostatic equilibrium, field is:

- A. Zero
B. Proportional to radius
C. Infinite
D. Constant nonzero

13. Field just outside an infinite nonconducting sheet of charge density σ is:

- A. $2\sigma/\epsilon_0$ B. σ/ϵ_0 C. $\sigma r/\epsilon_0$ D. $\sigma/(2\epsilon_0)$

14. At large distance r , a short dipole's axial field varies as:

- A. $1/r^3$ B. $1/r$ C. r D. $1/r^2$

15. A positive charge is moved along an electric field line. The electric force on it acts:

- A. Only if it accelerates
B. Along the field
C. Against the field
D. Perpendicular to the field

ANSWER KEY — check after completing all 15 questions

1.D 2.C 3.D 4.C 5.A 6.A 7.A 8.D 9.B 10.B 11.B 12.A 13.D 14.A 15.B

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Class 12 Physics | Electrostatic Potential And Capacitance

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Potential due to point charge Q at distance r in vacuum is:

- A. $Q/(kr)$ B. kQ/r C. kQ/r^2 D. kQr

2. The SI unit of electric potential is:

- A. J C B. J/C C. N/C D. C/J

3. A +2 C charge moves through a potential rise of 3 V. Its potential-energy change is:

- A. +1.5 J B. +6 J C. -1.5 J D. -6 J

4. On an equipotential surface, electrostatic work for displacement of a charge is:

- A. Dependent on path length
B. Always positive
C. Always negative
D. Zero

5. Electric field is directed toward:

- A. Increasing charge magnitude
B. Decreasing potential
C. Increasing potential
D. Constant potential necessarily

6. At the midpoint of equal and opposite point charges, potential is:

- A. Negative B. Infinite C. Positive D. Zero

7. Capacitance is defined by:

- A. QV B. Q/V^2 C. V/Q D. Q/V

8. A 4 μF capacitor is charged to 12 V. Charge is:

- A. 0.33 μC B. 48 μC C. 16 μC D. 3 μC

9. Parallel-plate capacitance in vacuum is:

- A. $\epsilon_0 Ad$ B. $\epsilon_0 d/A$ C. $\epsilon_0 A/d$ D. Ad/ϵ_0

10. Plate separation doubles at fixed area. Capacitance becomes:

- A. Four times B. Unchanged C. Half D. Twice

11. Two 6 μF capacitors in series have equivalent capacitance:

- A. 3 μF B. 36 μF C. 12 μF D. 6 μF

12. Capacitors 2 μF and 3 μF in parallel give:

- A. 1.2 μF B. 1 μF C. 5 μF D. 6 μF

13. Energy stored in a 2 μF capacitor at 10 V is:

- A. 10 μJ B. 20 μJ C. 100 μJ D. 200 μJ

14. A dielectric of $K=4$ completely fills an isolated charged capacitor. Voltage becomes:

- A. Four times B. Unchanged
C. Twice D. One-fourth

15. The same dielectric fills a capacitor connected to an ideal fixed-voltage battery. Charge becomes:

- A. Half B. Unchanged
C. Four times D. One-fourth

ANSWER KEY — check after completing all 15 questions

1.B 2.B 3.B 4.D 5.B 6.D 7.D 8.B 9.C 10.C 11.A 12.C 13.C 14.D 15.C

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Class 12 Physics | Current Electricity

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. A wire carries 12 C in 4 s. Current is:

A. 0.33 A B. 8 A C. 3 A D. 48 A

2. A 6 Ω resistor carries 2 A. Potential difference is:

A. 24 V B. 3 V C. 12 V D. 8 V

3. Ohm's law applies when physical conditions such as temperature are:

A. Always increasing B. Irrelevant
C. Always decreasing D. Constant

4. For a uniform wire, resistance is:

A. ρLA B. $\rho L/A$ C. LA/ρ D. $\rho A/L$

5. A wire is stretched to twice its length with unchanged volume and resistivity. Resistance becomes:

A. Twice B. Half C. Four times D. Unchanged

6. The SI unit of resistivity is:

A. $\Omega \text{ m}^2$ B. S/m C. Ω/m D. $\Omega \text{ m}$

7. Two resistors 3 Ω and 6 Ω in parallel have equivalent resistance:

A. 4.5 Ω B. 9 Ω C. 2 Ω D. 3 Ω

8. Resistors 2 Ω and 4 Ω in series across 12 V carry:

A. 6 A B. 2 A C. 3 A D. 0.5 A

9. A 5 Ω resistor carries 2 A. Heat produced in 3 s is:

A. 120 J B. 60 J C. 30 J D. 15 J

10. A cell has emf 2 V and internal resistance 0.5 Ω . Supplying 1 A, terminal voltage is:

A. 0.5 V B. 2.5 V C. 2 V D. 1.5 V

11. A 3 V cell with internal resistance 1 Ω connects to 2 Ω load. Current is:

A. 1.5 A B. 0.5 A C. 1 A D. 3 A

12. Kirchhoff's junction rule expresses conservation of:

A. Energy B. Mass of wire
C. Charge D. Magnetic flux

13. Kirchhoff's loop rule expresses conservation of:

A. Momentum
B. Energy
C. Charge only
D. Current magnitude in every branch

14. A balanced Wheatstone bridge has $P=2 \Omega$, $Q=4 \Omega$ and $R=3 \Omega$. S is:

A. 6 Ω B. 3 Ω C. 1.5 Ω D. 8 Ω

15. At fixed current and carrier density, doubling wire area makes drift-speed magnitude:

A. Half B. Twice C. Four times D. Unchanged

ANSWER KEY — check after completing all 15 questions

1.C 2.C 3.D 4.B 5.C 6.D 7.C 8.B 9.B 10.D 11.C 12.C 13.B 14.A 15.A

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Class 12 Physics | Moving Charges And Magnetism

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Magnetic force on a positive charge q moving at speed v perpendicular to B has magnitude:

- A. qB/v B. 0 C. qvB D. qv/B

2. A charge moving parallel to a magnetic field experiences magnetic force:

- A. $2qvB$ B. Zero C. qvB D. qB/v

3. A magnetic force on a moving point charge does work equal to:

- A. mv^2 B. Zero C. qB D. qvB

4. A charged particle enters uniform B perpendicularly. Its path is:

- A. Elliptical necessarily B. Parabolic
C. Straight D. Circular

5. Radius of this circular path is:

- A. $\frac{abs(q)B}{(mv)}$ B. $\frac{m}{(abs(q)Bv)}$
C. $\frac{mvB}{abs(q)}$ D. $\frac{mv}{(abs(q)B)}$

6. For fixed charge, mass and B , doubling particle speed makes radius:

- A. Unchanged B. Twice C. Four times D. Half

7. Field at distance r from a long straight current I is:

- A. $\frac{\mu_0 I}{(2\pi r)}$ B. $\frac{\mu_0 I r}{(2\pi)}$ C. $\frac{\mu_0 I}{(4\pi r^2)}$ D. $\frac{\mu_0 I}{(2r^2)}$

8. Doubling distance from a long straight wire makes field:

- A. One-fourth B. Twice C. Half D. Unchanged

9. Two parallel wires carrying currents in the same direction:

- A. Repel B. Rotate necessarily
C. Exert zero force D. Attract

10. A straight wire 0.2 m long carries 5 A perpendicular to 0.4 T field. Force is:

- A. 4 N B. 2.5 N C. 0.04 N D. 0.4 N

11. Field at the centre of one circular loop of radius R carrying I is:

- A. $\frac{\mu_0 I R}{2}$ B. $\frac{\mu_0 I}{(2\pi R)}$ C. $\frac{\mu_0 I}{R^2}$ D. $\frac{\mu_0 I}{(2R)}$

12. Magnetic dipole moment of an N -turn coil of area A carrying I is:

- A. NI/A B. IA/N C. NA/I D. NIA

13. Torque on a coil of moment m in B is greatest when its normal is:

- A. Antiparallel to B B. Perpendicular to B
C. Parallel to B D. At 0° to B

14. A moving-coil galvanometer is converted to an ammeter using:

- A. A capacitor in series
B. High resistance in series
C. High resistance in parallel only
D. Low resistance in parallel

15. A galvanometer is converted to a voltmeter using:

- A. High resistance in series
B. An inductor in parallel
C. Low resistance in parallel
D. A short circuit

ANSWER KEY — check after completing all 15 questions

1.C 2.B 3.B 4.D 5.D 6.B 7.A 8.C 9.D 10.D 11.D 12.D 13.B 14.D 15.A

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Class 12 Physics | Magnetism And Matter

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Magnetic field lines of a bar magnet:

- A. Never enter the magnet
- B. Intersect outside the magnet
- C. Start and end at isolated magnetic charges
- D. Form closed loops

2. An isolated magnetic north pole is:

- A. Always present at Earth's centre
- B. Obtained by cutting exactly at the centre
- C. Not obtained by cutting a bar magnet
- D. Obtained by heating any magnet

3. SI unit of magnetic dipole moment is:

- A. N/C B. $A\ m^2$ C. T/m D. A/m

4. A bar magnet in a uniform magnetic field has net force:

- A. Zero B. mB C. 2mB D. m/B

5. A magnetic dipole is in stable equilibrium when its moment is:

- A. Antiparallel to B B. Perpendicular to B
- C. Parallel to B D. At 45° to B

6. Its potential energy when antiparallel to B is:

- A. 0 B. +mB C. -mB D. -2mB

7. Torque on a magnetic dipole of $2\ A\ m^2$ perpendicular to $0.5\ T$ field is:

- A. $0.25\ N\ m$ B. 0 C. $4\ N\ m$ D. $1\ N\ m$

8. Far from a short bar magnet, axial field magnitude compared with equatorial field at equal r is:

- A. Four times B. Equal C. Half D. Twice

9. Diamagnetic materials are:

- A. Strongly attracted always
- B. Unaffected by all fields
- C. Weakly repelled by magnetic fields
- D. Permanent magnets always

10. Paramagnetic materials are:

- A. Weakly repelled
- B. Perfect magnetic shields
- C. Always permanent magnets
- D. Weakly attracted by magnetic fields

11. Ferromagnetic materials show:

- A. Only negative susceptibility
- B. No magnetic response
- C. No interaction among atomic moments
- D. Strong magnetisation due to domains

12. Which is diamagnetic?

- A. Bismuth B. Platinum C. Iron D. Aluminium

13. Which is ferromagnetic at room temperature?

- A. Bismuth B. Copper C. Water D. Iron

14. When a ferromagnet is heated above its Curie temperature, it becomes:

- A. Nonexistent
- B. Paramagnetic
- C. A magnetic monopole
- D. Perfect diamagnetic

15. Diamagnetic susceptibility is:

- A. Exactly one B. Small and negative
- C. Infinite D. Large and positive

ANSWER KEY — check after completing all 15 questions

1.D 2.C 3.B 4.A 5.C 6.B 7.D 8.D 9.C 10.D 11.D 12.A 13.D 14.B 15.B

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Class 12 Physics | Electromagnetic Induction

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. For θ between B and the area normal, magnetic flux through a planar loop is:

- A. B/A B. A/B C. $BA \sin\theta$ always D. $BA \cos\theta$

2. A 0.02 m^2 loop is normal to a 0.5 T field. Flux is:

- A. 10 Wb B. 0.25 Wb C. 0.04 Wb D. 0.01 Wb

3. Faraday's law relates induced emf to rate of change of:

- A. Electric charge
B. Resistance
C. Magnetic flux linkage
D. Mass

4. Flux through each of 100 turns changes by 0.02 Wb in 0.1 s . Average emf magnitude is:

- A. 2 V B. 200 V C. 0.2 V D. 20 V

5. The negative sign in Faraday's law expresses:

- A. Ohm's law B. Gauss's law
C. Lenz's law D. Coulomb's law

6. Lenz's law is consistent with conservation of:

- A. Energy B. Charge only
C. Angular speed D. Mass only

7. A rod of length 0.5 m moves at 4 m/s perpendicular to $B=0.2 \text{ T}$, with rod perpendicular to both. Emf is:

- A. 0.04 V B. 0.4 V C. 2.5 V D. 4 V

8. A stationary loop in a uniform time-independent B has induced emf:

- A. B/A B. BA C. Zero D. Infinite

9. A bar magnet approaching a closed coil induces current that:

- A. Has no magnetic effect
B. Opposes its approach magnetically
C. Continues unchanged after all motion stops
D. Always attracts the magnet

10. SI unit of inductance is:

- A. Weber B. Tesla C. Henry D. Farad

11. A 2 H inductor has current changing at 3 A/s . Self-induced emf magnitude is:

- A. 0.67 V B. 5 V C. 6 V D. 1.5 V

12. An inductor opposes changes in:

- A. Resistance only
B. Temperature only
C. Constant magnetic flux only
D. Current

13. Energy in a 0.5 H inductor carrying 4 A is:

- A. 4 J B. 8 J C. 1 J D. 2 J

14. If inductor current doubles, stored magnetic energy becomes:

- A. Unchanged B. Four times C. Half D. Twice

15. In mutual induction, emf in a secondary coil arises from:

- A. Earth's electric field
B. Constant primary current always
C. Secondary resistance alone
D. Changing current in the primary coil

ANSWER KEY — check after completing all 15 questions

1.D 2.D 3.C 4.D 5.C 6.A 7.B 8.C 9.B 10.C 11.C 12.D 13.A 14.B 15.D



Class 12 Physics | Alternating Current

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. An AC current has peak $10\sqrt{2}$ A. Its rms value is:

- A. 5 A B. $10\sqrt{2}$ A C. 10 A D. 20 A

2. A sinusoidal voltage has rms value 220 V. Peak voltage is:

- A. $220\sqrt{2}$ V B. 440 V C. $220/\sqrt{2}$ V D. 110 V

3. Mean sinusoidal current over a complete cycle is:

- A. $I_0/\sqrt{2}$ B. Zero C. I_0 D. $2I_0$

4. In a pure resistor AC circuit, current and voltage are:

- A. In phase
B. 90° out of phase
C. 45° out of phase always
D. 180° out of phase

5. In a pure inductor, current:

- A. Is in phase
B. Lags voltage by 90°
C. Lags by 180°
D. Leads voltage by 90°

6. In a pure capacitor, current:

- A. Lags by 180°
B. Leads voltage by 90°
C. Is in phase
D. Lags voltage by 90°

7. Inductive reactance is:

- A. ω/L B. $1/(\omega L)$ C. L/ω D. ωL

8. Capacitive reactance is:

- A. $1/(\omega C)$ B. C/ω C. ω/C D. ωC

9. If frequency doubles, capacitive reactance becomes:

- A. Unchanged B. Four times C. Twice D. Half

10. A series RLC circuit resonates when:

- A. $X_L=0$ only B. $X_C=0$ only
C. $X_L=X_C$ D. $R=X_L+X_C$

11. At series resonance, impedance equals:

- A. $2R$ B. X_L+X_C C. Zero for every circuit D. R

12. A series circuit has $R=3\ \Omega$ and net reactance $4\ \Omega$. Impedance magnitude is:

- A. $5\ \Omega$ B. $7\ \Omega$ C. $12\ \Omega$ D. $1\ \Omega$

13. An AC circuit has $V_{rms}=100$ V, $I_{rms}=2$ A and power factor 0.8. Mean power is:

- A. 200 W B. 160 W C. 80 W D. 250 W

14. An ideal transformer has $N_s/N_p=5$ and $V_p=20$ V. V_s is:

- A. 100 V B. 25 V C. 4 V D. 400 V

15. An ideal transformer steps voltage up by factor 4. Secondary current relative to primary is:

- A. Equal B. Twice C. Four times D. One-fourth

ANSWER KEY — check after completing all 15 questions

1.C 2.A 3.B 4.A 5.B 6.B 7.D 8.A 9.D 10.C 11.D 12.A 13.B 14.A 15.D

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Class 12 Physics | Electromagnetic Waves

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Electromagnetic waves in vacuum are:

- A. Transverse
- B. Longitudinal
- C. Stationary only
- D. Mechanical

2. In a plane electromagnetic wave, E and B are:

- A. Perpendicular and in phase
- B. Parallel and 90° out of phase
- C. Perpendicular and opposite in phase
- D. Parallel and in phase

3. The relation between field amplitudes in vacuum is:

- A. $E_0 = B_0$
- B. $E_0 = c^2 B_0$
- C. $B_0 = c E_0$
- D. $E_0 = c B_0$

4. An EM wave has $B_0 = 10^{-8}$ T. With $c = 3 \times 10^8$ m/s, E_0 is:

- A. 3 V/m
- B. 30 V/m
- C. 3×10^{-16} V/m
- D. 0.3 V/m

5. An EM wave of frequency 10^8 Hz in vacuum has wavelength:

- A. 0.3 m
- B. 3 m
- C. 300 m
- D. 30 m

6. Which needs no material medium to travel?

- A. Sound in air
- B. Visible light
- C. A stretched-string wave
- D. A water-surface wave

7. Which has the highest frequency?

- A. Radio waves
- B. Microwaves
- C. Gamma rays
- D. Infrared

8. Which has the longest wavelength?

- A. Visible light
- B. Ultraviolet
- C. X-rays
- D. Radio waves

9. Correct order of increasing frequency is:

- A. Microwave, radio, visible, infrared
- B. Radio, infrared, microwave, visible
- C. Visible, infrared, microwave, radio
- D. Radio, microwave, infrared, visible

10. Infrared radiation is commonly used in:

- A. Nuclear gamma spectroscopy only
- B. TV remote controls
- C. Radio broadcasting at metre wavelengths
- D. Imaging bones through the body

11. X-rays are used in medical imaging mainly because they:

- A. Are audible
- B. Cannot travel in vacuum
- C. Have the longest wavelengths
- D. Penetrate tissues with differing absorption

12. Ultraviolet radiation is commonly used for:

- A. Heating only by conduction
- B. Germicidal disinfection
- C. AM radio transmission
- D. Underwater sound detection

13. Microwaves are commonly used in:

- A. Mechanical balances
- B. Ordinary optical microscopes as visible light
- C. Radar systems
- D. Stethoscopes

14. Displacement current is associated with:

- A. Constant magnetic flux
- B. A stationary charge with constant field
- C. Only moving positive ions
- D. Changing electric flux

15. For a charging capacitor, displacement current between plates equals:

- A. Conduction current in the leads
- B. Half the lead current
- C. Twice the lead current
- D. Zero always

ANSWER KEY — check after completing all 15 questions

1.A 2.A 3.D 4.A 5.B 6.B 7.C 8.D 9.D 10.B 11.D 12.B 13.C 14.D 15.A



Class 12 Physics | Ray Optics And Optical Instruments

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. A concave mirror has focal length -15 cm. Its radius of curvature is:

- A. -30 cm B. +30 cm C. +15 cm D. -7.5 cm

2. An object is at the centre of curvature of a concave mirror. Its image is:

- A. Real and half-size
B. Real, inverted and same size
C. At infinity
D. Virtual and enlarged

3. An object between a concave mirror's pole and focus gives an image that is:

- A. Virtual, erect and enlarged
B. Virtual and diminished
C. Real and inverted
D. At the focus

4. A convex mirror produces for a real object:

- A. Real, enlarged image
B. Virtual, erect, diminished image
C. Virtual, inverted image
D. Real, inverted image

5. For light entering glass from air, which stays unchanged?

- A. Direction always B. Frequency
C. Speed D. Wavelength

6. A medium has refractive index 1.5. Light speed in it is ($c=3\times 10^8$):

- A. 4.5×10^8 m/s B. 1.5×10^8 m/s
C. 2×10^8 m/s D. 3×10^8 m/s

7. Total internal reflection requires travel:

- A. Along the normal
B. From denser to rarer medium above critical angle
C. From rarer to denser at any angle
D. From denser to rarer below critical angle

8. For glass-to-air critical angle C with $n=\sqrt{2}$, C is:

- A. 45° B. 90° C. 60° D. 30°

9. A convex lens has focal length 20 cm. Power is:

- A. +20 D B. +5 D C. -5 D D. +0.05 D

10. Two thin lenses of powers +4 D and -1 D in contact have power:

- A. -3 D B. -4 D C. +3 D D. +5 D

11. An object is 30 cm in front of a convex lens of focal length 15 cm. Image distance is:

- A. -30 cm B. +30 cm C. -10 cm D. +10 cm

12. A concave lens forms an image of a real object that is:

- A. Virtual, enlarged
B. Real and enlarged
C. Real, inverted and diminished
D. Virtual, erect and diminished

13. At minimum deviation in a prism:

- A. Emergent ray is always normal
B. Angle of incidence equals angle of emergence
C. Refraction angles sum to zero
D. Deviation is zero

14. An astronomical telescope in normal adjustment has angular magnification magnitude:

- A. f_o+f_e B. $f_o f_e$ C. f_o/f_e D. f_e/f_o

15. A simple microscope with relaxed eye uses an object at:

- A. Twice the focal length
B. The convex lens's focal plane
C. Infinity
D. The lens's optical centre

ANSWER KEY — check after completing all 15 questions

1.A 2.B 3.A 4.B 5.B 6.C 7.B 8.A 9.B 10.C 11.B 12.D 13.B 14.C 15.B

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Class 12 Physics | Wave Optics

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Huygens' principle treats each point on a wavefront as a source of:

- A. Only reflected rays B. Secondary wavelets
C. Material particles D. Static electric fields

2. A plane wavefront corresponds to:

- A. Diverging spherical rays only
B. Converging rays only
C. Parallel rays
D. No propagation

3. For sustained interference, sources must have:

- A. Same frequency and constant phase difference
B. Different frequencies always
C. Equal wavelengths but random phase
D. Equal intensities only

4. In Young's experiment, fringe width is:

- A. $\lambda D/d$ B. $D/(\lambda d)$ C. dD/λ D. $\lambda d/D$

5. If slit separation doubles in Young's experiment, fringe width becomes:

- A. Half B. Four times C. Unchanged D. Twice

6. If screen distance doubles, fringe width becomes:

- A. Unchanged B. Four times C. Half D. Twice

7. For $\lambda=600$ nm, $D=2$ m and $d=0.6$ mm, fringe width is:

- A. 2 mm B. 1 mm C. 0.2 mm D. 20 mm

8. Constructive interference occurs for path difference:

- A. Any path difference B. $(n+1/2)\lambda$
C. $n\lambda$ D. $\lambda/4$ only

9. Destructive interference occurs for path difference:

- A. $n\lambda$ B. $(n+1/2)\lambda$ C. $2n\lambda$ D. 0

10. Two equal coherent waves each of intensity I interfere in phase. Maximum intensity is:

- A. 0 B. I C. $4I$ D. $2I$

11. At the central bright fringe of ideal Young's experiment, path difference is:

- A. Zero B. $\lambda/4$ C. $3\lambda/2$ D. $\lambda/2$

12. If the whole Young apparatus is immersed in water of index n , fringe width becomes:

- A. $n^2\beta$ B. β/n C. $n\beta$ D. Unchanged

13. Single-slit diffraction is significant when slit width is:

- A. Comparable to wavelength
B. Infinite
C. Zero only
D. Always much greater than wavelength

14. The central diffraction maximum becomes wider when slit width:

- A. Tends to infinity B. Decreases
C. Doubles D. Increases

15. The central bright band in single-slit diffraction is approximately:

- A. Twice as wide as the adjacent bright band
B. Four times as wide
C. Half as wide
D. Equal in width

ANSWER KEY — check after completing all 15 questions

1.B 2.C 3.A 4.A 5.A 6.D 7.A 8.C 9.B 10.C 11.A 12.B 13.A 14.B 15.A

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Class 12 Physics | Dual Nature Of Radiation And Matter

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Energy of a photon of frequency ν is:

- A. ν/h B. $h\nu^2$ C. h/ν D. $h\nu$

2. Photoelectric emission occurs only if light frequency is:

- A. Below threshold always
B. At least the threshold frequency
C. Independent of the metal
D. Zero

3. Work function equals:

- A. $h\nu_0$ B. $e\nu_0$ C. h/ν_0 D. ν_0/h

4. Einstein's photoelectric equation is:

- A. $K_{\max} = h\nu - \phi$ B. $K_{\max} = h\nu + \phi$
C. $K_{\max} = h\nu\phi$ D. $K_{\max} = \phi - h\nu$

5. Light of photon energy 5 eV falls on a metal of work function 2 eV. $K_{\max}$ is:

- A. 3 eV B. 2.5 eV C. 7 eV D. 10 eV

6. For $K_{\max} = 3$ eV, stopping potential magnitude is:

- A. 3 V B. 1.5 V C. 9 V D. 6 V

7. At fixed frequency above threshold, increasing intensity increases primarily:

- A. Saturation photocurrent
B. Work function
C. Maximum kinetic energy
D. Stopping potential

8. At fixed intensity, increasing frequency above threshold increases:

- A. Planck's constant
B. Maximum electron kinetic energy
C. Electron charge
D. Work function

9. Slope of stopping potential versus frequency is:

- A. e/h B. e C. h D. h/e

10. Increasing intensity below threshold frequency produces:

- A. No photoemission in the usual single-photon regime
B. A lower work function
C. Immediate emission regardless of frequency
D. Increased stopping potential

11. A photon has momentum magnitude:

- A. h/λ B. 0 C. $h\lambda$ D. λ/h

12. De Broglie wavelength of a particle is:

- A. h/p^2 B. h/p C. p/h D. hp

13. If a nonrelativistic particle's momentum doubles, its wavelength becomes:

- A. Twice B. Unchanged C. Four times D. Half

14. An electron accelerated from rest through V has wavelength proportional to:

- A. V B. $\sqrt{V}$ C. $1/V$ D. $1/\sqrt{V}$

15. An electron and proton have equal momenta. Their de Broglie wavelengths are:

- A. Larger for proton B. Larger for electron
C. Equal D. Both zero

ANSWER KEY — check after completing all 15 questions

1.D 2.B 3.A 4.A 5.A 6.A 7.A 8.B 9.D 10.A 11.A 12.B 13.D 14.D 15.C

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Class 12 Physics | Atoms

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. In Rutherford scattering, most α particles pass through thin foil because atoms are mostly:

- A. Stationary electrons
- B. Dense nuclear matter
- C. Empty space
- D. Uniform positive charge

2. Large-angle scattering indicates that positive charge is concentrated in a:

- A. Uniform sphere
- B. Diffuse electron cloud
- C. Large hollow shell
- D. Small massive nucleus

3. Bohr's angular-momentum condition is:

- A. $mvr = nh$
- B. $mvr = nh/(2\pi)$
- C. $mvr = 2\pi nh$
- D. $mvr = h/n$

4. Radius of the n th hydrogen orbit varies as:

- A. $1/n$
- B. n
- C. $1/n^2$
- D. n^2

5. Energy of hydrogen in level n is:

- A. $-13.6/n^2$ eV
- B. $-13.6/n$ eV
- C. $-13.6n^2$ eV
- D. $+13.6/n^2$ eV

6. Hydrogen energy in $n=2$ is:

- A. $+3.4$ eV
- B. -6.8 eV
- C. -13.6 eV
- D. -3.4 eV

7. Energy needed to ionise ground-state hydrogen is:

- A. 3.4 eV
- B. 1.51 eV
- C. 10.2 eV
- D. 13.6 eV

8. Energy needed to excite hydrogen from $n=1$ to $n=2$ is:

- A. 3.4 eV
- B. 17 eV
- C. 10.2 eV
- D. 13.6 eV

9. A transition from $n=3$ to $n=2$ in hydrogen belongs to:

- A. Balmer series
- B. Brackett series
- C. Lyman series
- D. Paschen series

10. Lyman-series transitions end at:

- A. $n=1$
- B. $n=2$
- C. $n=3$
- D. $n=4$

11. Lyman-series radiation is mainly in the:

- A. Infrared
- B. Radio
- C. Microwave
- D. Ultraviolet

12. When an electron falls to a lower allowed level, the atom:

- A. Emits a photon
- B. Absorbs a photon necessarily
- C. Always ionises
- D. Gains internal energy

13. A hydrogen atom in $n=3$ needs how much energy to ionise?

- A. 10.2 eV
- B. 13.6 eV
- C. 3.4 eV
- D. About 1.51 eV

14. The ratio of hydrogen orbit radii r_3/r_1 is:

- A. $1/3$
- B. 9
- C. $1/9$
- D. 3

15. For hydrogen, electron speed in n th Bohr orbit is proportional to:

- A. $1/n$
- B. n
- C. $1/n^2$
- D. n^2

ANSWER KEY — check after completing all 15 questions

1.C 2.D 3.B 4.D 5.A 6.D 7.D 8.C 9.A 10.A 11.D 12.A 13.D 14.B 15.A

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Class 12 Physics | Nuclei

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. A nucleus with atomic number Z and mass number A contains neutrons numbering:

- A. $A+Z$ B. A C. $A-Z$ D. Z

2. Isotopes have the same:

- A. Neutron number always
B. Atomic number but different mass numbers
C. Mass number but different atomic numbers
D. Nuclear mass exactly

3. Isobars have the same:

- A. Charge necessarily B. Neutron number
C. Mass number D. Atomic number

4. Nuclear radius approximately follows:

- A. $R=R_0A^{1/3}$ B. $R=R_0/A$ C. $R=R_0A$ D. $R=R_0A^2$

5. For mass numbers 8 and 64, nuclear-radius ratio R_{64}/R_8 is:

- A. 8 B. 2 C. 4 D. $1/2$

6. Nuclear density is approximately:

- A. Proportional to A
B. Inversely proportional to A^2
C. Independent of mass number
D. Proportional to A^2

7. Mass defect is the difference between:

- A. Sum of free nucleon masses and nuclear mass
B. Radius and diameter
C. Atomic number and mass number
D. Proton and electron counts

8. Binding energy equals:

- A. $\Delta m/c^2$ B. Δmc^2 C. Δmc D. $c^2/\Delta m$

9. If mass defect is 0.01 u, binding energy is ($1 \text{ u } c^2=931.5 \text{ MeV}$):

- A. 0.9315 MeV B. 93.15 MeV
C. 9315 MeV D. 9.315 MeV

10. A nucleus has binding energy 80 MeV and $A=10$. Binding energy per nucleon is:

- A. 0.125 MeV B. 70 MeV C. 800 MeV D. 8 MeV

11. Greater binding energy per nucleon generally indicates:

- A. Greater stability against separation into free nucleons
B. Larger mass defect per nucleus always
C. Larger atomic number always
D. Lower nuclear density always

12. Binding energy per nucleon is near its maximum for nuclei around:

- A. Uranium B. Iron and nickel
C. Hydrogen D. Helium only

13. Nuclear fission refers to:

- A. Splitting a heavy nucleus into lighter nuclei
B. Removing orbital electrons
C. Chemical combustion
D. Combining light nuclei

14. Nuclear fusion refers to:

- A. Combining light nuclei into a heavier nucleus
B. Splitting uranium only
C. Emission of visible light only
D. Ionising a gas

15. Fusion requires very high temperature primarily to:

- A. Make protons neutral
B. Help nuclei overcome electrostatic repulsion
C. Eliminate nuclear forces
D. Remove gravitational attraction

ANSWER KEY — check after completing all 15 questions

1.C 2.B 3.C 4.A 5.B 6.C 7.A 8.B 9.D 10.D 11.A 12.B 13.A 14.A 15.B

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Class 12 Physics | Semiconductor Electronics

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. A semiconductor has an energy gap typically:

- A. Exactly zero always
- B. Infinite
- C. Smaller than that of an insulator
- D. Larger than that of every insulator

2. In an intrinsic semiconductor, electron and hole concentrations are:

- A. Always zero
- B. Unequal by a factor of two
- C. Independent of temperature
- D. Equal

3. When temperature rises, intrinsic semiconductor conductivity generally:

- A. Becomes zero
- B. Increases
- C. Decreases like a metal
- D. Remains exactly constant

4. Doping silicon with a pentavalent impurity produces:

- A. An insulator necessarily
- B. p-type material
- C. A pure metal
- D. n-type material

5. Doping silicon with a trivalent impurity produces:

- A. An intrinsic semiconductor
- B. A superconductor
- C. n-type material
- D. p-type material

6. Majority carriers in n-type semiconductor are:

- A. Protons
- B. Electrons
- C. Neutrons
- D. Holes

7. Majority carriers in p-type semiconductor are:

- A. Holes
- B. Electrons
- C. Neutrons
- D. Positive impurity ions moving freely

8. An n-type semiconductor is electrically:

- A. Negatively charged overall always
- B. Positively charged overall always
- C. Neutral overall
- D. Unable to conduct

9. Near a p-n junction, the depletion region has:

- A. No fixed ions
- B. Very few mobile charge carriers
- C. Only freely moving electrons
- D. Only freely moving holes

10. The built-in electric field in a depletion region points from:

- A. n-side to p-side
- B. Nowhere; it is always zero
- C. Parallel to the junction
- D. p-side to n-side

11. A junction is forward biased when:

- A. No battery is present
- B. Both sides connect to positive terminal
- C. p-side connects to negative and n-side to positive terminal
- D. p-side connects to positive and n-side to negative terminal

12. Forward bias makes depletion width:

- A. Unchanged always
- B. Smaller
- C. Larger
- D. Infinite

13. Reverse bias makes depletion width:

- A. Negative
- B. Larger
- C. Zero
- D. Smaller

14. A diode used as a rectifier chiefly:

- A. Stores magnetic energy
- B. Allows current mainly in one direction
- C. Increases AC frequency necessarily
- D. Provides resistance independent of voltage

15. An ideal half-wave rectifier driven at 50 Hz produces output pulses at:

- A. 100 Hz
- B. 25 Hz
- C. 0 Hz
- D. 50 Hz

ANSWER KEY — check after completing all 15 questions

1.C 2.D 3.B 4.D 5.D 6.B 7.A 8.C 9.B 10.A 11.D 12.B 13.B 14.B 15.D

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