Female Lecturers / Subject Specialists (Physics) (BPS-17) — 2023 · Solved Past Paper

Body: Khyber Pakhtunkhwa Public Service Commission (KPPSC) · **Post:** Female Lecturers / Subject Specialists (Physics) (BPS-17) · **Year:** 2023 · **Questions:** 45 in the original paper — **45 solved and verified**, none excluded · **Price:** Free

> **How to use this paper:** each question shows the stem, the four options, and the correct answer. Click “Why each option?” under a question to see all four options explained — one question teaches four topics. General Knowledge answers are as of the 2023 sitting.

Source note: Scanned images of the printed KPPSC question paper, 3 question pages (Q1-Q45, complete), via doc4shares PDF "KPPSC SS Physics Female Past Paper held on 21-02-2023" (https://www.doc4shares.com/view-lecturer-data.php?id=10668; Google Drive file id 1ZwXeid39ehmCiuVfpISYpOKbTiGzyzM_), read visually at 250 dpi with 2x crops for watermark-obscured spots; accessed 11 Nov 2026. Body/date/total corroborated by KPPSC's own Tentative 1st Schedule of 2023 Ability Tests (Female SS Physics E&SE, Advt 01/2021 Sr 08, "45 MCQs Based 21-02-2023") and KPPSC result/interview pages for Female SS Physics Advt 01/2021 Sr 08. No printed key exists; every answer was derived and verified independently from standard textbook physics under the owner's 8 Nov 2026 standard. Printed wording kept as filed (Q10 option A "A/d" vs stem's "b"; Q16/Q20/Q23/Q24/Q31/Q32/Q37 stems; Q25 option B "bottom of the place"; Q33 option A "The light has absorbed"); delegation decisions recorded in the source file (Q2, Q10, Q13, Q22, Q29, Q33), all decided by the assistant under the owner's 8 Nov 2026 delegation.

1 Physics

When an electron is moving then a wave associated with this electron is known as:

- A. UV waves
- B. Plasma waves
- C. Gamma waves
- D. Matter waves ✓ **Correct answer**

A. Wrong: ultraviolet waves are electromagnetic radiation, not the wave associated with a moving electron.

B. Wrong: plasma waves are oscillations in an ionised gas, not the wave of a single moving electron.

C. Wrong: gamma rays are high-energy electromagnetic radiation, not the wave associated with a moving electron.

D. Correct: a moving electron has a de Broglie wavelength, so the wave associated with it is a matter wave.

Question 2 Physics

The diffraction obtained from slow-moving electrons is used to estimate:

- A. Arrangement of atoms in metals ✓ **Correct answer**
- B. Nature of atoms
- C. Number of atoms in metals
- D. Position of atoms in metalloids

A. Correct: electron diffraction patterns reveal the crystal structure — how atoms are arranged — in a metal (the Davisson–Germer result).

B. Wrong: diffraction gives structural information, not the "nature" of the atoms.

C. Wrong: diffraction does not count atoms.

e technique applies to metals (crystals generally), and "metalloids" is the wrong material class.

Question 3 Physics

Consider a charged particle that is accelerated through a potential difference V, then the kinetic energy of the particle

- A. Decreases
- B. Remains the same
- C. Increases ✓ **Correct answer**
- D. Varies depending on the resistance of a wire

A. Wrong: the field does positive work on the charge, so its energy grows, not shrinks.

B. Wrong: the particle gains energy qV from the potential difference.

C. Correct: the work done by the field, qV, appears as kinetic energy, so the kinetic energy increases.

D. Wrong: no wire or resistance is involved in the statement.

Question 4 Physics

As we know that electrons are in the state of motion in atoms, then the energy of each electron in an atom is:

- A. Quantized ✓ **Correct answer**
- B. Continuous
- C. Radial
- D. Randomized

A. Correct: bound electrons occupy discrete energy levels; their energies take only certain allowed values.

B. Wrong: continuous energies belong to free particles, not bound electrons.

dial describes a direction, not the character of the energy.

D. Wrong: the levels are fixed and definite, not random.

Question 5 Physics

Electromagnetic radiation consists of small quantum particles that are known as:

- A. Phonons
- B. Photons ✓ **Correct answer**
- C. Electrons
- D. Quarks

A. Wrong: phonons are quanta of lattice vibration (sound/heat in solids), not of electromagnetic radiation.

B. Correct: electromagnetic radiation is made of photons, each carrying energy hf.

C. Wrong: electrons are charged matter particles, not radiation quanta.

D. Wrong: quarks are constituents of protons and neutrons, not of light.

Question 6 Physics

Considering two quantities are inversely proportional to each other, then the graph between these quantities will be:

- A. Straight line cutting the axis
- B. A straight line through the origin
- C. A parabolic curve
- D. A hyperbolic curve ✓ **Correct answer**

A. Wrong: that is the graph of a linear relation with an intercept, not an inverse relation.

B. Wrong: that is direct proportion (y = kx), the opposite of inverse proportion.

C. Wrong: a parabola is a squared relation ($y = kx^2$), not an inverse one.

nverse proportion means xy = constant, whose graph is a rectangular hyperbola.

Question 7 Physics

When current is parallel to magnetic fields, force on conductor is:

- A. Zero ✓ **Correct answer**
- B. Infinite
- C. 2 times
- D. Same

A. Correct: the magnetic force on a current is F = ILB sin θ, and when the current is parallel to the field θ = 0, so sin θ = 0 and the force is zero.

B. Wrong: no quantity here is infinite; the force is zero, not infinite.

C. Wrong: the force is zero, not doubled.

D. Wrong: "same" has no meaning here, and the force is zero.

Question 8 Physics

Let us have five coulombs of charges placed on a thin-walled conducting shell. Once the charge has come to rest, the electric potential inside the hollow conducting shell is found to be:

- A. Zero
- B. Uniform inside the sphere and equal to the electric potential on the surface of the sphere ✓ **Correct answer**
- C. Smaller than the electric potential outside the sphere
- D. Varying as one over r squared

A. Wrong: the electric FIELD inside is zero, but the potential is not — it equals the surface potential.

conductor is an equipotential, with no field inside, the potential is the same everywhere inside and equals the surface value.

C. Wrong: just outside the surface the potential equals the surface value too; inside it is not smaller.

D. Wrong: the field outside a point charge varies as $1/r^2$; the potential inside a hollow shell does not vary at all.

Question 9 Physics

If we have two capacitors connected in series whose magnitudes are 2F and 4F. What single capacitance is "equivalent" to this combination?

- A. 5/6F
- B. 7/5F
- C. 4/3F ✓ **Correct answer**
- D. 2/5F

A. Wrong: that is not the series result; 1/C = 1/2 + 1/4 = 3/4, not 6/5.

B. Wrong: no combination of 2 F and 4 F in series gives 7/5 F.

C. Correct: in series 1/C = 1/2 + 1/4 = 3/4, so C = 4/3 F.

D. Wrong: 2/5 F is smaller than either capacitor and does not follow from the series rule.

Question 10 Physics

For a parallel-plate capacitor with plate area "A" and plate separation "b", the capacitance is proportional to which of the following?

- A. A/d
- B. A/b^2
- C. A/b^3
- D. A/b ✓ **Correct answer**

" is not a symbol used in this question; the separation is called "b".

B. Wrong: capacitance varies as 1/b, not $1/b^2$.

C. Wrong: capacitance varies as 1/b, not $1/b^3$.

D. Correct: $C = \varepsilon_0 A/b$, so the capacitance is proportional to A/b.

Question 11 Physics

When a constant potential difference is applied across the plates of a parallel-plate capacitor. Neglecting any edge effects, then the electric field inside the capacitor is:

- A. Constant ✓ **Correct answer**
- B. Varying as one over r squared
- C. Decreasing as one moves from the positive to the negative plate
- D. Zero

A. Correct: between parallel plates the field is uniform, E = V/d, the same at every point (edge effects neglected).

B. Wrong: that is the field of a point charge, not of parallel plates.

C. Wrong: the field does not weaken along the way; it is uniform.

D. Wrong: a field exists between the plates whenever a potential difference is applied.

Question 12 Physics

Consider we have a copper rod whose diameter is 1 cm and carries a current of 5 amps. The current is distributed uniformly throughout the rod. The magnetic field halfway between the axis of the rod and its outside edge is:

- A. Zero
- B. Pointing radially outward
- C. Pointing radially inward

les the axis of the rod ✓ **Correct answer**

A. Wrong: the field is zero only on the axis itself, not halfway out.

B. Wrong: the magnetic field of a current never points radially; it curls around the current.

C. Wrong: again, the field lines are circles around the axis, not radial lines.

D. Correct: by Ampère's law the field lines form circles centred on the rod's axis; at half the radius the field is half its surface value and points tangentially.

Question 13 Physics

In an experiment, Davisson and Germer scattered electrons from a crystal of nickel. The scattered electrons formed a strong diffraction pattern. The important conclusion drawn from the experiment is:

- A. Electrons acted like a wave ✓ **Correct answer**
- B. Electrons acted like a particle
- C. Electrons acted like a quantum particle
- D. Electrons have dual nature

A. Correct: the diffraction pattern proved that electrons behave as waves — the experiment's own conclusion (de Broglie waves confirmed).

B. Wrong: particle behaviour was already known; this experiment showed the opposite, wave, behaviour.

C. Wrong: the experiment demonstrated wave behaviour specifically, not a generic "quantum particle" label.

D. Wrong as the answer to this question: dual nature is the broader truth (wave plus particle from several experiments), but the conclusion drawn from THIS experiment alone is the wave nature.

14 Physics

When a physical property such as charge exists in discrete "packets" rather than in continuous amounts, the property is said to be:

- A. Discontinuous
- B. Abrupt
- C. Quantized ✓ **Correct answer**
- D. Non-continuous

A. Wrong: "discontinuous" is a loose description, not the physics term for discrete packets.

B. Wrong: abrupt means sudden, not discrete.

C. Correct: a property that exists only in discrete packets (like charge in units of e) is quantized.

D. Wrong: again a loose description, not the standard term.

Question 15 Physics

If the distance between the earth and moon were halved, the force of the attraction between them would be:

- A. One fourth as great
- B. One half as great
- C. Twice as great
- D. Four times as great ✓ **Correct answer**

A. Wrong: halving the distance strengthens gravity, it does not weaken it.

B. Wrong: the force grows, it does not halve.

C. Wrong: gravity follows an inverse-square law, so halving the distance gives a factor of $(1/2)^{-2} = 4$, not 2.

D. Correct: $F \propto 1/r^2$, so $r \to r/2$ gives $F \to 4F$.

16 Physics

If we have a Galvanometer and want to convert it into a Voltmeter, what process I have to adopted?

- A. High resistance in series ✓ **Correct answer**
- B. High resistance in parallel
- C. Low resistance in series
- D. Low resistance in parallel

A. Correct: a voltmeter is made by connecting a high resistance (multiplier) in series with the galvanometer, so most of the voltage drops across the multiplier and only a small current passes the coil.

B. Wrong: a parallel high resistance does not turn the meter into a voltmeter; a parallel resistance makes an ammeter (and a low one at that).

C. Wrong: a low series resistance would let a large current through the coil and would not extend the voltage range.

D. Wrong: a low resistance in parallel is a shunt — that converts the galvanometer into an ammeter, not a voltmeter.

Question 17 Physics

The greatest induced EMF will occur in a straight wire moving at constant speed through a uniform magnetic field when the angle between the direction of the wire's motion and the direction of the magnetic field is:

- A. 0 degree
- B. 30 degrees
- C. 60 degrees
- D. 90 degrees ✓ **Correct answer**

A. Wrong: at 0° the wire moves along the field, cuts no flux, and the induced EMF is zero —

not the greatest.

B. Wrong: the EMF is Bvl sin 30° = 0.5 Bvl, only half the maximum.

C. Wrong: sin 60° ≈ 0.87, so the EMF is large but not the greatest.

D. Correct: the motional EMF is Bvl sin θ, and sin θ is largest (1) at 90°, when the wire moves perpendicular to the field.

Question 18 Physics

If two light sources will interfere constructively with maximum amplitude then the path difference between them is:

- A. One wavelength ✓ **Correct answer**
- B. One-half wavelength
- C. One-quarter wavelength
- D. One-eighth wavelength

A. Correct: constructive interference needs a path difference of a whole number of wavelengths (λ, 2λ, …); one wavelength gives the two waves in phase with maximum amplitude.

B. Wrong: a half-wavelength path difference puts the waves in opposite phase — destructive interference.

C. Wrong: a quarter-wavelength difference gives partial interference, not maximum constructive amplitude.

D. Wrong: an eighth-wavelength difference also gives only partial constructive interference, not the maximum.

Question 19 Physics

When a satellite is observed to move in a circle about the earth at a constant speed. This

the force acting upon it is.

- A. Zero
- B. Parallel to the direction of the satellite's instantaneous velocity
- C. Perpendicular to the direction of the satellite's instantaneous velocity ✓ **Correct answer**
- D. None of these

A. Wrong: a net force (gravity) must act to keep the satellite turning in a circle; without it the satellite would fly off in a straight line.

B. Wrong: a force along the velocity would change the speed; the speed here is constant.

C. Correct: the gravitational force is centripetal — perpendicular to the velocity — and only changes the direction of motion, not the speed.

D. Wrong: option C correctly describes the force.

Question 20 Physics

When a pendulum bob is vibrating then we have kinetic energy as well as the potential energy. then the relationship between kinetic energy and the potential energy of the pendulum bob is:

- A. Kinetic energy is greater than potential energy
- B. Kinetic energy is less than potential energy
- C. Kinetic energy is equal to potential energy
- D. Kinetic energy plus potential energy equals a constant ✓ **Correct answer**

A. Wrong: the two keep swapping — at the top the kinetic energy is zero and the potential energy is greatest, so neither is always greater.

B. Wrong: at the bottom the kinetic energy is greatest and the potential energy is least.

C. Wrong: they are equal only at one particular point of the swing, not in general.

with no friction, total mechanical energy is conserved — as one grows the other shrinks by the same amount.

Question 21 Physics

When an atomic nucleus emits a beta particle, one of its neutrons disintegrates into one of the following set of particles. Does it disintegrate into:

- A. A positron & an electron
- B. A proton, an electron, and an antineutrino ✓ **Correct answer**
- C. A proton, an electron, and a positron
- D. A neutrino and an antineutrino

A. Wrong: a positron is emitted in β^+ decay (a proton changing), not when a neutron disintegrates.

B. Correct: in β^- decay a neutron becomes a proton plus an electron (the beta particle) plus an electron antineutrino, $n \rightarrow p + e^- + \bar{\nu}e$.

C. Wrong: a positron never appears in neutron β^- decay.

D. Wrong: the decay products are a proton, an electron and an antineutrino — not a neutrino–antineutrino pair.

Question 22 Physics

If you start with 24 grams of a radioactive element with a half-life of one month, how many grams of the radioactive element will be left after 2 months?

- A. 1.5 grams
- B. 3 grams
- C. 6 grams ✓ **Correct answer**
- D. 12 grams

A. Wrong: that would be the amount after four half-lives (24 → 12 → 6 → 3 → 1.5), not two.

at would be the amount after three half-lives, not two.

C. Correct: after one half-life (one month) 12 g remain; after a second half-life (two months) 6 g remain.

D. Wrong: 12 g is the amount after one month only, not after two.

Question 23 Physics

As we know the fundamental particles like quarks that can exist in protons and neutron, please tell me how many colors of quarks are believed to exist?

- A. 1
- B. 2
- C. 5
- D. 3 ✓ **Correct answer**

A. Wrong: a single colour could not give colour-neutral protons and neutrons.

B. Wrong: two colours cannot make the colourless combinations observed.

C. Wrong: there are three quark colours in quantum chromodynamics, not five.

D. Correct: quarks carry one of three colour charges — red, green or blue — and hadrons combine them into colour-neutral states.

Question 24 Physics

Consider we have two types of water such as seawater and fresh water. Now when a boat is floating on the surface of both types of water. A boat will float:

- A. Higher in fresh water than in seawater
- B. Lower in fresh water than in seawater ✓ **Correct answer**
- C. At the same level in both
- D. Any of the above, depending upon its shape

esh water is less dense, so the boat must sink deeper to displace enough water to support its weight.

B. Correct: seawater is denser, so the boat floats higher in seawater and sits lower in fresh water.

C. Wrong: the different densities mean different immersion depths for the same weight.

D. Wrong: the shape does not change the density argument; for any boat the fresh-water draught is greater.

Question 25 Physics

A block of wood initially at rest slides down an inclined plane. Neglecting friction, the kinetic energy of the block at the bottom of the plane is:

- A. All converted into heat
- B. Equal to its potential energy (with respect to the bottom of the place) when it was at the top of the plane ✓ **Correct answer**
- C. Less than its kinetic energy at the top of the plane
- D. Dependant on the materials of which the block is made

A. Wrong: with no friction there is no heating; the energy becomes kinetic energy.

B. Correct: energy is conserved — the potential energy lost in descending appears entirely as kinetic energy at the bottom.

C. Wrong: the block starts at rest, so its kinetic energy at the top is zero; the bottom value is greater, not less.

D. Wrong: with no friction the result depends only on the height descended, not on the material.

26 Physics

There are four fundamental forces in nature. A particle has been associated with each of these four forces. Therefore, Gluons associated with:

- A. Gravitational force
- B. Electromagnetic force
- C. Strong force ✓ **Correct answer**
- D. Weak force

A. Wrong: the graviton (hypothetical) is associated with gravity, not the gluon.

B. Wrong: the photon carries the electromagnetic force, not the gluon.

C. Correct: gluons are the exchange particles of the strong nuclear force, binding quarks together.

D. Wrong: the W and Z bosons carry the weak force, not gluons.

Question 27 Physics

Consider a pendulum that is suspended from the ceiling of a railroad car and is observed to hang at an angle of 10 degrees to the left of the vertical. Which of the following answers could explain this phenomenon?

- A. The railroad car is at rest
- B. The railroad car is accelerating to the left
- C. The railroad car is moving with constant velocity to the right
- D. The railroad car is accelerating to the right ✓ **Correct answer**

A. Wrong: at rest the pendulum would hang straight down.

B. Wrong: acceleration to the left would swing the bob to the right, not the left.

C. Wrong: at constant velocity there is no pseudo-force, so the pendulum hangs vertically.

D. Correct: in the accelerating frame the bob is pushed to the left by the pseudo-force, so

ne left of vertical — the opposite of the acceleration.

Question 28 Physics

If we placed 10 coulombs of charge on a solid copper sphere. If the charge has come to rest, the electric potential inside the sphere is:

- A. Zero
- B. Uniform inside the sphere and equal to the electric potential on the surface of the sphere ✓ **Correct answer**
- C. Smaller than the electric potential outside the sphere
- D. Varying as one over r squared

A. Wrong: the electric field inside a conductor is zero, but the potential is not zero — it is the surface potential throughout.

B. Correct: a conductor in electrostatic equilibrium is an equipotential; charge sits on the surface and the potential inside equals the surface potential.

C. Wrong: just outside the surface the potential equals the surface value; inside it is the same, not smaller.

D. Wrong: that is how the field of a point charge varies; the potential inside a conductor does not vary at all.

Question 29 Physics

If we consider two negative point charges having separation 2 meters apart and repel each other with a force of 2 newtons. When the distance between the charges is doubled, the force between them is:

- A. One-fourth as great ✓ **Correct answer**
- B. One half as great
- C. Twice as great
- D. Four times as great

Coulomb's law gives $F \propto 1/r^2$, so doubling the distance cuts the force to a quarter (2 N becomes 0.5 N).

B. Wrong: the force falls as the square of the distance, not linearly.

C. Wrong: increasing the distance weakens the repulsion, it does not strengthen it.

D. Wrong: that is what would happen if the distance were halved, not doubled.

Question 30 Physics

We have two hockey pucks of unequal mass and connected by a spring of negligible mass, rest on a horizontal frictionless surface. If the spring is released, then the pucks move apart. The center of mass of the two pucks

- A. Move in a circle
- B. Move in the direction of the greater mass
- C. Remain stationary ✓ **Correct answer**
- D. Move in the direction of the smaller mass

A. Wrong: no torque or sideways force acts, so the centre of mass cannot move in a circle.

B. Wrong: the spring force is internal; the centre of mass cannot drift toward either puck.

C. Correct: no external horizontal force acts, so the centre of mass stays where it was (the pucks move apart symmetrically about it).

D. Wrong: the lighter puck moves faster, but the centre of mass itself does not move.

Question 31 Physics

If water is warmed from 0 degrees Celsius to 6 degrees Celsius, which of the following things happens? Will the water

- A. Expand steadily
- B. Contract steadily

and at first and then contract

- D. Contract first then expand ✓ **Correct answer**

A. Wrong: water does not expand steadily from 0 °C — it contracts first.

B. Wrong: water contracts only up to 4 °C; above that it expands.

C. Wrong: the order is reversed — water contracts first, then expands.

D. Correct: water shows anomalous expansion — it contracts as it warms from 0 °C to 4 °C (its maximum density) and then expands from 4 °C to 6 °C.

Question 32 Physics

When the energy is stored in a body as thermal or internal energy. The stored energy must be in:

- A. Heat form of radiant energy
- B. Molecular kinetic energy only
- C. Molecular potential energy only
- D. Both kinetic and potential energy ✓ **Correct answer**

A. Wrong: radiant energy is energy in transit as radiation, not the stored internal energy of a body.

B. Wrong: internal energy includes the kinetic energy of the molecules, but that is only half of it.

C. Wrong: the potential energy of intermolecular forces is only half of the internal energy.

D. Correct: a body's internal (thermal) energy is the sum of the kinetic energy of its molecules (their motion) and the potential energy of their mutual interactions.

Question 33 Physics

When white light passes through a red plate of glass and then through a green plate of

one of the following things occurs?

- A. The light has absorbed ✓ **Correct answer**
- B. The light that emerges as a combination of red and green
- C. The light that emerges lacks only its red and green components
- D. The light that emerges is green

A. Correct: the red plate transmits only red light; the green plate transmits only green and absorbs the red, so no light gets through — it is all absorbed.

B. Wrong: no combination emerges, because the second filter removes what the first one passed.

C. Wrong: nothing emerges at all, so there is no emerging light to describe.

D. Wrong: the green plate cannot create green light from the red light that reaches it; it absorbs it.

Question 34 Physics

A metal ball on an insulated stand is touched by a positively charged glass rod. What happens to the metal ball? Does it:

- A. Gain protons and lose electrons
- B. Gain protons
- C. Gain more protons than electrons
- D. Lose electrons ✓ **Correct answer**

A. Wrong: protons do not move between solids; only electrons transfer.

B. Wrong: protons are bound in the nuclei and are not transferred by touch.

C. Wrong: no protons are gained at all; the ball becomes positive only by losing electrons.

D. Correct: electrons flow from the metal ball onto the positively charged rod, leaving the ball positively charged.

35 Physics

An electron and a proton are moving at the same speed in circular paths in the same uniform magnetic field. The radius of the path of the proton is:

- A. The same as that of the electron
- B. About 2000 times larger than that of the electron ✓ **Correct answer**
- C. A little larger than that of the electron
- D. Smaller than that of the electron

A. Wrong: the radii differ because the masses differ.

B. Correct: the radius is r = mv/qB, so for the same speed and charge magnitude r scales with mass; the proton is about 1836 times heavier than the electron, so its radius is about 2000 times larger.

C. Wrong: the mass ratio is ~1836, not a small factor.

D. Wrong: the proton is heavier, so its radius is larger, not smaller.

Question 36 Physics

To develop the correct mathematical description of the distribution of radiated energy of a blackbody concerning wavelength for a given temperature, Planck found it necessary to assume that the molecular oscillators of the blackbody emitted and absorbed

- A. No radiant energy
- B. Radiant energy in discrete units or quanta ✓ **Correct answer**
- C. Radiant energy in a continuous form
- D. None of these

A. Wrong: the oscillators do emit and absorb energy; the question is in what form.

B. Correct: Planck's breakthrough was that oscillators exchange energy only in discrete quanta, E = nhf — this gave the correct blackbody spectrum.

e classical continuous assumption gave the ultraviolet catastrophe; Planck had to abandon it.

D. Wrong: option B is exactly Planck's assumption.

Question 37 Physics

When someone performs skating on the surface of the ice. Ice skating is possible and practical because of the unique property of water because:

- A. The coefficient of kinetic friction of steel on frozen water decreases with decreasing temperature
- B. Ice readily sublimes
- C. The melting point decreases with increasing pressure ✓ **Correct answer**
- D. Ice is a good thermal insulator

A. Wrong: friction does not fall with falling temperature in the way described, and this is not the mechanism that makes skating possible.

B. Wrong: sublimation of ice is very slow and plays no part in skating.

C. Correct: the skate's narrow blade concentrates the skater's weight into a high pressure, which lowers ice's melting point and creates a thin water film that lubricates the blade.

D. Wrong: ice's insulating quality has nothing to do with skating.

Question 38 Physics

There are many fundamental particles like electrons & Neutrinos. Here, Neutrinos are a subset of:

- A. Photons
- B. Leptons ✓ **Correct answer**
- C. Mesons
- D. Baryons

hotons are gauge bosons, not a family that contains neutrinos.

B. Correct: neutrinos are leptons, alongside electrons, muons and taus — particles that do not feel the strong force.

C. Wrong: mesons are quark–antiquark pairs (hadrons); neutrinos contain no quarks.

D. Wrong: baryons are three-quark particles like protons and neutrons; neutrinos are not baryons.

Question 39 Physics

Consider a perfectly spherical bubble of air is suspended in a tank of water. A beam of light consisting of parallel rays passes through the bubble. As the light emerges from the opposite side of the bubble the light rays:

- A. Diverge ✓ **Correct answer**
- B. Converge
- C. are unaffected
- D. None of these

A. Correct: an air bubble in water acts as a diverging lens — light bends away from the normal entering the rarer medium and again leaving it, so parallel rays spread apart.

B. Wrong: a bubble behaves like a concave lens, not a convex one; it spreads rays, it does not focus them.

C. Wrong: refraction at the two spherical surfaces bends every ray.

D. Wrong: option A correctly describes the rays.

Question 40 Physics

As we know the Gauss' Law of electricity, Gauss' Law of magnetism, Faraday's Law of induction, and Amperes' Law form the basic equations of electromagnetism which is

- A. Coulomb's equations
- B. Volta's equations
- C. Fermi's equations
- D. Maxwell's equations ✓ **Correct answer**

A. Wrong: Coulomb's law describes the force between charges; it is not the set of four field equations.

B. Wrong: Volta is associated with the battery and the volt, not with the four electromagnetic laws.

C. Wrong: Fermi is associated with Fermi–Dirac statistics and the weak interaction, not with these four laws.

D. Correct: the four laws — Gauss's law for electricity, Gauss's law for magnetism, Faraday's law and Ampère's law (with Maxwell's correction) — together are Maxwell's equations.

Question 41 Physics

When a man is sitting in a frictionless rotational chair. When someone decides to have some fun with man and rotate the chair. When the man is spinning and wants to slow down, then he extends his arms and legs, the reason is:

- A. Decreased his angular momentum
- B. Increased his angular momentum
- C. Increased his moment of inertia ✓ **Correct answer**
- D. Changed the direction of the momentum vector

A. Wrong: with no external torque, angular momentum is conserved — it does not decrease.

B. Wrong: again, angular momentum stays constant; only the moment of inertia and the

ed change.

C. Correct: stretching out the arms and legs increases I, and since L = Iω is conserved, the angular speed ω must fall — he slows down.

D. Wrong: the direction of spin does not change; only the speed of rotation falls.

Question 42 Physics

Considering v is the speed of a particle c is the speed of light then the Galilean transformation is valid only when:

- A. v < c
- B. v << c ✓ **Correct answer**
- C. v ≤ c
- D. v = c

A. Wrong: merely being slower than light is not enough — at speeds approaching c, Galilean relativity already fails.

B. Correct: the Galilean transformation is the low-speed limit of the Lorentz transformation and is valid only when the speed is much smaller than the speed of light.

C. Wrong: at speeds close to c the Galilean transformation gives wrong results (no time dilation or length contraction).

D. Wrong: at the speed of light the Galilean transformation is completely invalid.

Question 43 Physics

The Lorentz transformation is applicable when the velocity v of a particle is:

- A. v < c
- B. v is comparable to the speed of light c ✓ **Correct answer**
- C. v > c
- D. None of these

e Lorentz transformation applies at any speed below c, but it is needed (rather than the Galilean one) when v is comparable to c; "v < c" alone does not say when it matters.

B. Correct: relativistic effects become significant when the speed is a substantial fraction of c, and that is when the Lorentz transformation must be used.

C. Wrong: no massive particle can exceed c; the Lorentz transformation does not apply above c.

D. Wrong: option B states the correct condition.

Question 44 Physics

According to Einstein's special theory of relativity time, and length are:

- A. Absolute quantities
- B. Variable quantities ✓ **Correct answer**
- C. Real quantities
- D. None of these

A. Wrong: relativity abolished absolute time and absolute length; they are not the same for all observers.

B. Correct: time dilates and length contracts depending on the observer's relative motion — they vary from frame to frame.

C. Wrong: "real" does not describe their frame-dependence; they are real but relative, and the point of the question is that they vary.

D. Wrong: option B is the correct description.

Question 45 Physics

The general theory of relativity is valid for:

non-inertial frame of reference

- B. The inertial frame of reference
- C. The inertial and non-inertial frame of references ✓ **Correct answer**
- D. None of these

A. Wrong: general relativity covers non-inertial frames, but not ONLY them.

B. Wrong: special relativity covers inertial frames only; general relativity goes beyond them.

C. Correct: general relativity applies in all frames of reference, inertial and non-inertial alike.

D. Wrong: option C is the correct scope.

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