

SCO INTERNATIONAL PHYSICS OLYMPIAD

CLASS 10 OFFICIAL QUESTION PAPER

Question Paper Set A

Designed from Class 10 Physics syllabus pathways and aligned with SCO's platform flow for guided preparation, practice, reporting and future-ready science learning.

- grade-fit physics learning across optics, electricity, magnetism and energy systems
- international-style MCQ reasoning using diagrams, numerical thinking and evidence-based explanation
- Ready academic format for schools, teachers, parents and students

Optics	Human Eye	Electricity	Magnetism	Energy
Reflection & Refraction	Vision	Circuits	Safety	Sources

Guidelines for the Candidate

Exam Snapshot

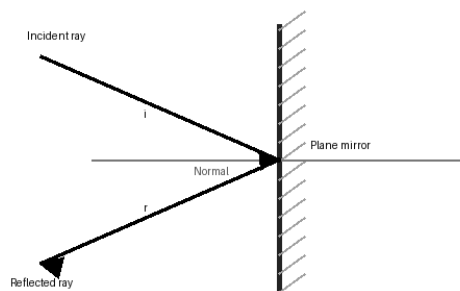
- Total Questions: 50 | Duration: 60 minutes
- Sections: General Understanding, Case Study, Reason & Assertion, Achievers Section
- Each question has one correct option. No calculator is required unless permitted by the invigilator.

Question Paper

Section A: General Understanding

Concept accuracy, formula application and direct reasoning.

Q1. A ray makes an angle of 35° with the surface of a plane mirror. What is the angle between the incident ray and the reflected ray?



- A) 35°
- B) 55°
- C) 70°
- D) 110°

Answer: D) 110°

Explanation: The angle of incidence is measured from the normal. If the ray makes 35° with the mirror surface, it makes 55° with the normal. The reflected ray also makes 55° with the normal, so the angle between the two rays is 110° .

Q2. An object is placed beyond the centre of curvature of a concave mirror. Which image is formed?

- A) Virtual, erect and magnified
- B) Real, inverted and diminished
- C) Real, inverted and same size
- D) Virtual, erect and diminished

Answer: B) Real, inverted and diminished

Explanation: For a concave mirror, an object beyond C forms a real, inverted and diminished image between C and F.

Q3. A concave mirror has focal length 15 cm. What is its radius of curvature?

- A) 7.5 cm
- B) 15 cm
- C) 30 cm
- D) 45 cm

Answer: C) 30 cm

Explanation: For spherical mirrors, radius of curvature $R = 2f$. Therefore $R = 2 \times 15 \text{ cm} = 30 \text{ cm}$.

Q4. A ray of light travels from air into glass at an angle of incidence of 45° . If glass has refractive index 1.5, what happens to the ray?

- A) It bends away from the normal
- B) It bends towards the normal
- C) It travels undeviated
- D) It is completely reflected

Answer: B) It bends towards the normal

Explanation: When light enters an optically denser medium from a rarer medium, its speed decreases and it bends towards the normal.

Q5. A coin appears raised when placed at the bottom of a beaker filled with water. Which phenomenon explains this observation?

- A) Reflection
- B) Refraction
- C) Dispersion
- D) Diffusion

Answer: B) Refraction

Explanation: Light from the coin bends while passing from water to air, so the coin appears at an apparent depth smaller than its real depth.

Q6. The speed of light in a transparent medium is 2.0×10^8 m/s. What is the refractive index of the medium?

- A) 1.0
- B) 1.2
- C) 1.5
- D) 2.0

Answer: C) 1.5

Explanation: Refractive index $n = c/v = (3.0 \times 10^8)/(2.0 \times 10^8) = 1.5$.

Q7. Which part of the human eye is mainly responsible for changing the focal length of the eye lens during accommodation?

- A) Iris
- B) Ciliary muscles
- C) Retina
- D) Cornea

Answer: B) Ciliary muscles

Explanation: Ciliary muscles alter the curvature of the eye lens, allowing the eye to focus on near and distant objects.

Q8. A student cannot see distant objects clearly but can read nearby text. Which corrective lens is required?

- A) Convex lens
- B) Concave lens
- C) Cylindrical lens only
- D) Plane glass

Answer: B) Concave lens

Explanation: This is myopia. A concave lens diverges incoming light so that the image forms correctly on the retina.

Q9. Why does a glass prism split white light into different colours?

- A) All colours reflect equally
- B) Different colours have different speeds in glass
- C) All colours have the same wavelength in glass
- D) The prism absorbs red light

Answer: B) Different colours have different speeds in glass

Explanation: Dispersion occurs because different wavelengths refract by different amounts in glass.

Q10. A convex lens has focal length 25 cm. What is its power?

- A) +2 D
- B) +4 D
- C) -4 D
- D) -2 D

Answer: B) +4 D

Explanation: Power $P = 1/f$ when f is in metres. Here $f = 0.25$ m, so $P = 1/0.25 = +4$ D.

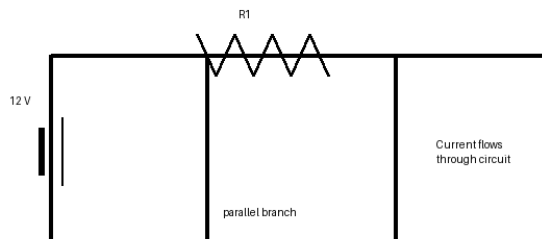
Q11. A $6\ \Omega$ resistor is connected across a 12 V battery. What current flows through the resistor?

- A) 0.5 A
- B) 1 A
- C) 2 A
- D) 6 A

Answer: C) 2 A

Explanation: Using Ohm's law, $I = V/R = 12/6 = 2$ A.

Q12. Three resistors of $3\ \Omega$, $6\ \Omega$ and $6\ \Omega$ are connected in series. What is the equivalent resistance?



- A) $2\ \Omega$
- B) $6\ \Omega$
- C) $9\ \Omega$
- D) $15\ \Omega$

Answer: D) $15\ \Omega$

Explanation: In a series connection, equivalent resistance is the sum: $3 + 6 + 6 = 15\ \Omega$.

Q13. An electric heater draws 5 A from a 220 V supply. What is its power?

- A) 44 W
- B) 225 W
- C) 1100 W
- D) 2200 W

Answer: C) 1100 W

Explanation: Power $P = VI = 220 \times 5 = 1100$ W.

Q14. Which wire is preferred for household electric wiring?

- A) Thin high-resistance wire
- B) Thick low-resistance copper wire
- C) Wet cotton thread
- D) Thin plastic wire

Answer: B) Thick low-resistance copper wire

Explanation: Copper has low resistance and high conductivity. A thicker wire also reduces heating losses.

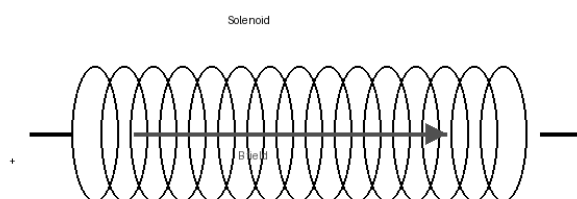
Q15. What is the direction of force on a current-carrying conductor placed in a magnetic field determined by?

- A) Fleming's left-hand rule
- B) Fleming's right-hand rule
- C) Ohm's law
- D) Snell's law

Answer: A) Fleming's left-hand rule

Explanation: Fleming's left-hand rule gives the direction of force on a current-carrying conductor in a magnetic field.

Q16. A solenoid has more turns per unit length while current remains the same. What happens to the magnetic field inside it?



- A) It decreases
- B) It remains zero
- C) It increases
- D) It reverses automatically

Answer: C) It increases

Explanation: The magnetic field inside a solenoid is proportional to the number of turns per unit length and the current.

Q17. Which device converts electrical energy into mechanical energy using the magnetic effect of current?

- A) Electric motor
- B) Electric fuse
- C) Voltmeter
- D) Dry cell

Answer: A) Electric motor

Explanation: An electric motor uses the force on a current-carrying coil in a magnetic field to produce rotation.

Q18. What is the function of an earth wire in a household circuit?

- A) Increase the current
- B) Provide a safe path for leakage current
- C) Reduce the voltage to zero
- D) Store electrical energy

Answer: B) Provide a safe path for leakage current

Explanation: The earth wire carries leakage current safely to the ground and helps prevent electric shock.

Q19. Which source is usually considered renewable?

- A) Coal
- B) Petroleum
- C) Wind energy
- D) Natural gas

Answer: C) Wind energy

Explanation: Wind energy is renewable because it is naturally replenished, unlike fossil fuels.

Q20. A machine takes 1000 J of input energy and gives 650 J of useful output energy. What is its efficiency?

- A) 35%
- B) 50%
- C) 65%
- D) 100%

Answer: C) 65%

Explanation: Efficiency = useful output/input \times 100 = $650/1000 \times 100 = 65\%$.

Section B: Case Study and Real-Life Application

Context-based physics problems for school, home and technology situations.

Q21. Case Study: Optical Safety — A student uses a concave mirror to focus sunlight on a small spot. Which statement best explains why the spot becomes hot?

- A) A concave mirror absorbs all sunlight
- B) Reflected rays converge near the focus, concentrating energy
- C) The mirror creates extra light energy
- D) A concave mirror blocks infrared radiation

Answer: B) Reflected rays converge near the focus, concentrating energy

Explanation: A concave mirror can converge parallel rays of sunlight near its focus. Concentrating light energy on a small area raises temperature.

Q22. Case Study: Corrective Eyewear — A myopic student has a far point of 2 m. Which lens power is closest to the corrective lens needed for distant vision?

- A) +0.5 D
- B) -0.5 D
- C) +2 D
- D) -2 D

Answer: B) -0.5 D

Explanation: For distant objects, the lens forms a virtual image at the far point. $f \approx -2$ m, so $P = 1/f = -0.5$ D.

Q23. Case Study: School Circuit — A laboratory circuit has two $10\ \Omega$ resistors connected in parallel across a 5 V battery. What is the total current?

- A) 0.25 A
- B) 0.5 A
- C) 1.0 A
- D) 2.0 A

Answer: C) 1.0 A

Explanation: Two equal $10\ \Omega$ resistors in parallel give $5\ \Omega$ equivalent resistance. Current $I = V/R = 5/5 = 1$ A.

Q24. Case Study: Prism Experiment — A beam of white light enters a prism and emerges as a spectrum. Which colour deviates the least in a normal glass prism?

- A) Violet
- B) Blue
- C) Green
- D) Red

Answer: D) Red

Explanation: Red light has the longest wavelength among visible colours and is deviated least by a prism.

Q25. Case Study: Energy Audit — A school installs LED lamps instead of incandescent bulbs. Which reason best supports this change?

- A) LEDs convert more electrical energy into light and waste less as heat
- B) LEDs require more current for the same brightness
- C) LEDs work only during daytime
- D) LEDs cannot be used with electricity

Answer: A) LEDs convert more electrical energy into light and waste less as heat

Explanation: LEDs are more efficient than incandescent bulbs because less energy is lost as heat.

Q26. Case Study: Electromagnet — A recycling plant uses an electromagnet to lift iron scrap. Which change will increase the lifting strength?

- A) Decrease current
- B) Remove the soft iron core
- C) Increase current through the coil
- D) Replace iron core with plastic

Answer: C) Increase current through the coil

Explanation: A stronger current produces a stronger magnetic field in an electromagnet.

Q27. Case Study: Refraction Tank — A ray enters water from air and bends towards the normal. Which pair of changes is correct?

- A) Speed decreases and wavelength decreases
- B) Speed increases and wavelength increases
- C) Frequency decreases and speed increases
- D) Frequency increases and wavelength stays same

Answer: A) Speed decreases and wavelength decreases

Explanation: When light enters a denser medium, speed and wavelength decrease, while frequency remains unchanged.

Q28. Case Study: Household Safety — A 5 A fuse is replaced by a 15 A fuse in a device designed for 5 A. Why is this unsafe?

- A) It will melt too early
- B) It may allow excessive current before melting
- C) It reduces the voltage to zero
- D) It makes the device consume no power

Answer: B) It may allow excessive current before melting

Explanation: A high-rated fuse may not melt during dangerous overcurrent, increasing fire risk.

Q29. Case Study: Solar Home — A 2 m^2 solar panel receives 800 W/m^2 sunlight and operates at 20% efficiency. What electrical power is produced?

- A) 160 W
- B) 320 W
- C) 800 W
- D) 1600 W

Answer: B) 320 W

Explanation: Input power = $800 \times 2 = 1600 \text{ W}$. Output = 20% of 1600 = 320 W.

Q30. Case Study: Lens Design — A camera uses a convex lens to form a real image on a sensor. Where must the object generally be placed for a real image to form?

- A) At the optical centre
- B) Between lens and focus
- C) Beyond the focal length
- D) Exactly at the focus only

Answer: C) Beyond the focal length

Explanation: A convex lens forms a real image when the object is placed beyond the focal length.

Section C: Reason and Assertion

Choose the best relationship between Assertion and Reason.

Q31. Assertion (A): A plane mirror forms a virtual image. Reason (R): Reflected rays appear to diverge from a point behind the mirror. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: A) Both A and R are true, and R explains A

Explanation: In a plane mirror, reflected rays do not actually meet behind the mirror; they only appear to do so, forming a virtual image.

Q32. Assertion (A): A concave lens is used to correct myopia. Reason (R): It converges distant rays before they enter the eye. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: C) A is true, R is false

Explanation: A concave lens corrects myopia, but it diverges rays, helping the image form on the retina.

Q33. Assertion (A): The equivalent resistance in a parallel combination is less than the smallest individual resistance. Reason (R): Parallel connection provides multiple paths for current. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: A) Both A and R are true, and R explains A

Explanation: Multiple paths reduce the overall opposition to current, making equivalent resistance smaller.

Q34. Assertion (A): The magnetic field around a straight current-carrying wire is circular. Reason (R): The direction is given by the right-hand thumb rule. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: A) Both A and R are true, and R explains A

Explanation: The right-hand thumb rule shows that field lines encircle the current-carrying wire.

Q35. Assertion (A): A fuse is connected in series with the live wire. Reason (R): It must break the circuit when current exceeds a safe value. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: A) Both A and R are true, and R explains A

Explanation: A fuse must be in series so that melting of the fuse wire opens the circuit.

Q36. Assertion (A): Dispersion occurs because all colours travel at the same speed in glass. Reason (R): Different wavelengths refract by different amounts. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: D) A is false, R is true

Explanation: Different colours travel at different speeds in glass, so they refract by different amounts.

Q37. Assertion (A): Convex mirrors are used as rear-view mirrors. Reason (R): They provide a wider field of view and form erect diminished images. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: A) Both A and R are true, and R explains A

Explanation: Convex mirrors help drivers view a wider area behind the vehicle.

Q38. Assertion (A): Electric power can be written as $P = I^2R$ for a resistor. Reason (R): Using $V = IR$ in $P = VI$ gives $P = I^2R$. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: A) Both A and R are true, and R explains A

Explanation: Substitution of Ohm's law into the power formula gives $P = I^2R$.

Q39. Assertion (A): Fossil fuels are renewable on a human time scale. Reason (R): They take millions of years to form. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

Answer: D) A is false, R is true

Explanation: Fossil fuels are non-renewable because their formation takes millions of years.

Q40. Assertion (A): Red light deviates least in a prism. Reason (R): Red light has a longer wavelength than violet light. Choose the correct option.

- A) Both A and R are true, and R explains A
- B) Both A and R are true, but R does not explain A
- C) A is true, R is false
- D) A is false, R is true

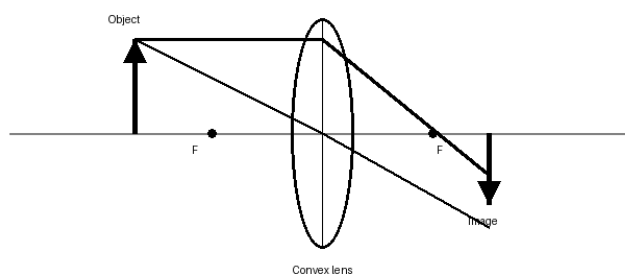
Answer: A) Both A and R are true, and R explains A

Explanation: In glass, longer wavelength red light is refracted less than violet light.

Section D: Achievers Section

Higher-order, multi-step and olympiad-style reasoning questions.

Q41. A convex lens of focal length 20 cm forms an image of an object placed 30 cm in front of it. Using $1/f = 1/v - 1/u$ with Cartesian signs, what is the image distance?



- A) 12 cm
- B) 30 cm
- C) 60 cm
- D) -60 cm

Answer: C) 60 cm

Explanation: Here $f = +20$ cm and $u = -30$ cm. $1/v = 1/f + 1/u = 1/20 - 1/30 = 1/60$, so $v = +60$ cm.

Q42. A circuit has 4 Ω and 6 Ω resistors in parallel, connected in series with a 5 Ω resistor. What is the total resistance?

- A) 2.4 Ω
- B) 5.0 Ω
- C) 7.4 Ω
- D) 15 Ω

Answer: C) 7.4 Ω

Explanation: Parallel of 4 Ω and 6 Ω is $(4 \times 6)/(4+6) = 2.4$ Ω . Total resistance = $2.4 + 5 = 7.4$ Ω .

Q43. A 60 W lamp operates for 5 hours daily. How much electrical energy does it consume in 30 days?

- A) 3 kWh
- B) 6 kWh
- C) 9 kWh
- D) 30 kWh

Answer: C) 9 kWh

Explanation: Energy = power \times time = 0.06 kW \times (5 \times 30 h) = 9 kWh.

Q44. A light ray in glass ($n = 1.5$) strikes a glass-air boundary. The critical angle is about 42° . What happens if the angle of incidence is 50° ?

- A) It refracts normally
- B) It suffers total internal reflection
- C) It bends towards the normal
- D) It stops at the surface

Answer: B) It suffers total internal reflection

Explanation: Total internal reflection occurs when light goes from denser to rarer medium and incidence angle exceeds the critical angle.

Q45. A 2 kW electric geyser runs for 30 minutes. If electricity costs 0.20 dollar per kWh, what is the cost?

- A) 0.10 dollar
- B) 0.20 dollar
- C) 0.40 dollar
- D) 1.00 dollar

Answer: B) 0.20 dollar

Explanation: Energy used = $2 \text{ kW} \times 0.5 \text{ h} = 1 \text{ kWh}$. Cost = $1 \times 0.20 = 0.20$ dollar.

Q46. A wire of length 0.5 m carries 4 A current perpendicular to a 0.2 T magnetic field. What is the force on the wire?

- A) 0.04 N
- B) 0.4 N
- C) 4 N
- D) 40 N

Answer: B) 0.4 N

Explanation: Force $F = BIL \sin 90^\circ = 0.2 \times 4 \times 0.5 = 0.4 \text{ N}$.

Q47. A convex mirror has focal length 25 cm. What is its power in dioptres if treated as a diverging mirror-lens analogy for sign?

- A) +4 D
- B) -4 D
- C) +0.04 D
- D) -0.04 D

Answer: B) -4 D

Explanation: For a diverging optical element, focal length is negative. $f = -0.25 \text{ m}$, so $P = 1/f = -4 \text{ D}$.

Q48. A village uses a wind turbine that receives 5000 W wind power and delivers 1800 W electrical power. What is its efficiency?

- A) 18%
- B) 28%
- C) 36%
- D) 50%

Answer: C) 36%

Explanation: Efficiency = $\text{output}/\text{input} \times 100 = 1800/5000 \times 100 = 36\%$.

Q49. Two lenses of power +2 D and -5 D are placed in contact. What is the combined power and nature of the combination?

- A) +7 D, converging
- B) -3 D, diverging
- C) +3 D, converging
- D) -7 D, diverging

Answer: B) -3 D, diverging

Explanation: $P_{\text{total}} = +2 + (-5) = -3$ D. Negative power indicates a diverging combination.

Q50. A student gets a virtual, erect, magnified image using a convex lens. Where is the object placed?

- A) Beyond 2F
- B) At 2F
- C) Between F and 2F
- D) Between the lens and F

Answer: D) Between the lens and F

Explanation: A convex lens works as a magnifying glass when the object is between the optical centre and focus, producing a virtual, erect and magnified image.

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	D	2	B	3	C	4	B	5	B
6	C	7	B	8	B	9	B	10	B
11	C	12	D	13	C	14	B	15	A
16	C	17	A	18	B	19	C	20	C
21	B	22	B	23	C	24	D	25	A
26	C	27	A	28	B	29	B	30	C
31	A	32	C	33	A	34	A	35	A
36	D	37	A	38	A	39	D	40	A
41	C	42	C	43	C	44	B	45	B
46	B	47	B	48	C	49	B	50	D

Global Standard Alignment

This Class 10 physics document is structured for conceptual clarity, numerical reasoning, practical application and scientific literacy. The learning design is benchmarked against international physics and science-learning expectations including NGSS Physical Science, Cambridge IGCSE Physics, OECD/PISA science literacy and pre-university physics-olympiad progression.

- Conceptual model building: ray diagrams, circuit models, field models and energy-system models.
- Quantitative reasoning: formula selection, unit handling, proportionality and estimation.
- Application in real contexts: household safety, renewable energy, optical devices and medical/technology applications.
- Higher-order extension: multi-step numericals and evidence-based reasoning in the Achievers Section.