

# SCO INTERNATIONAL PHYSICS OLYMPIAD

## CLASS 10 SAMPLE QUESTION PAPER

Practice Paper Set S

Includes answer key, explanations and ready academic formatting

**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

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

## Question Paper

### Section A: General Understanding

Concept accuracy, formula application and direct reasoning.

**Q1.** A ray of light strikes a plane mirror at an angle of incidence of  $40^\circ$ . What is the angle of reflection?

- A)  $20^\circ$
- B)  $40^\circ$
- C)  $50^\circ$
- D)  $80^\circ$

**Answer:** B)  $40^\circ$

**Explanation:** According to the law of reflection, the angle of incidence equals the angle of reflection.

**Q2.** Which mirror is used by dentists to view enlarged images of teeth?

- A) Plane mirror
- B) Concave mirror
- C) Convex mirror
- D) Rough mirror

**Answer:** B) Concave mirror

**Explanation:** A concave mirror can form a virtual, erect and enlarged image when the object is close to the mirror.

**Q3.** A convex mirror always forms which type of image?

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

**Answer:** B) Virtual, erect and diminished

**Explanation:** A convex mirror diverges reflected rays and forms a small, erect virtual image behind the mirror.

**Q4.** The refractive index of a medium is 1.33. What does this mean?

- A) Light travels faster in the medium than in vacuum
- B) Light travels 1.33 times slower in the medium than in vacuum
- C) The medium reflects all light
- D) Light has no speed in the medium

**Answer:** B) Light travels 1.33 times slower in the medium than in vacuum

**Explanation:** Refractive index  $n = c/v$ , so a value greater than one means light is slower in that medium than in vacuum.

**Q5.** A pencil partly dipped in water appears bent due to:

- A) Reflection
- B) Refraction
- C) Scattering
- D) Absorption

**Answer:** B) Refraction

**Explanation:** Light bends at the air-water interface, making the submerged part appear displaced.

**Q6.** Which defect of vision is corrected using a convex lens?

- A) Myopia
- B) Hypermetropia
- C) Colour blindness
- D) Night blindness

**Answer:** B) Hypermetropia

**Explanation:** A convex lens converges rays and helps focus nearby objects on the retina in hypermetropia.

**Q7.** The splitting of white light into its component colours is called:

- A) Dispersion
- B) Interference
- C) Diffraction
- D) Magnetisation

**Answer:** A) Dispersion

**Explanation:** Dispersion is the separation of white light into colours due to different refraction of wavelengths.

**Q8.** Which colour deviates most in a glass prism?

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

**Answer:** D) Violet

**Explanation:** Violet light has shorter wavelength and is refracted more than red light.

**Q9.** A  $10\ \Omega$  resistor carries a current of 2 A. What is the potential difference across it?

- A) 5 V
- B) 10 V
- C) 20 V
- D) 40 V

**Answer:** C) 20 V

**Explanation:** Using  $V = IR$ ,  $V = 2 \times 10 = 20\text{ V}$ .

**Q10.** Two resistors of  $4\ \Omega$  and  $8\ \Omega$  are connected in series. What is their equivalent resistance?

- A)  $2.7\ \Omega$
- B)  $4\ \Omega$
- C)  $8\ \Omega$
- D)  $12\ \Omega$

**Answer:** D)  $12\ \Omega$

**Explanation:** Resistances add in series:  $4 + 8 = 12\ \Omega$ .

**Q11.** A 100 W bulb is used for 10 hours. How much energy is consumed?

- A) 0.1 kWh
- B) 1 kWh
- C) 10 kWh
- D) 100 kWh

**Answer:** B) 1 kWh

**Explanation:** Energy =  $0.1 \text{ kW} \times 10 \text{ h} = 1 \text{ kWh}$ .

**Q12.** Which appliance works mainly on the heating effect of electric current?

- A) Electric iron
- B) Electric fan
- C) Loudspeaker
- D) Solar cell

**Answer:** A) Electric iron

**Explanation:** An electric iron uses Joule heating in a high-resistance element.

**Q13.** What happens to the magnetic field around a wire if the current is reversed?

- A) It disappears permanently
- B) Its direction reverses
- C) Its strength becomes infinite
- D) It becomes electric field only

**Answer:** B) Its direction reverses

**Explanation:** The right-hand thumb rule shows that reversing current reverses magnetic field direction.

**Q14.** A current-carrying coil placed in a magnetic field experiences torque. This is the working principle of a:

- A) Electric motor
- B) Electric fuse
- C) Electric heater
- D) Lens

**Answer:** A) Electric motor

**Explanation:** A motor rotates because a current-carrying coil experiences torque in a magnetic field.

**Q15.** Which of the following is a disadvantage of fossil fuels?

- A) They are inexhaustible
- B) They cause air pollution and are limited
- C) They produce no carbon dioxide
- D) They cannot produce heat

**Answer:** B) They cause air pollution and are limited

**Explanation:** Fossil fuels are non-renewable and release pollutants and greenhouse gases on burning.

**Q16.** Which of the following is a clean energy source during operation?

- A) Coal power
- B) Diesel generator
- C) Solar power
- D) Kerosene stove

**Answer:** C) Solar power

**Explanation:** Solar panels produce electricity without direct combustion or exhaust emissions during operation.

**Q17.** The SI unit of electric power is:

- A) volt
- B) ampere
- C) watt
- D) ohm

**Answer:** C) watt

**Explanation:** Power is measured in watts (W).

**Q18.** The resistance of a wire generally increases when:

- A) Its length increases
- B) Its thickness increases
- C) Its temperature becomes absolute zero
- D) It is replaced by a superconductor

**Answer:** A) Its length increases

**Explanation:** Resistance is directly proportional to length for a uniform wire.

**Q19.** Which lens is thicker at the centre and thinner at the edges?

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

**Answer:** B) Convex lens

**Explanation:** A convex lens is thicker at the centre and converges light rays.

**Q20.** In an electric circuit, an ammeter is connected:

- A) In parallel
- B) In series
- C) Without terminals
- D) Only across the switch

**Answer:** B) In series

**Explanation:** An ammeter measures current, so it must be connected in series with the component.

## Section B: Case Study and Real-Life Application

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

**Q21. Case Study: Mirror in a Shop** — A shopkeeper uses a mirror that shows a wide area of the shop in a small image. Which mirror is being used?

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

**Answer:** B) Convex mirror

**Explanation:** Convex mirrors provide a wide field of view with diminished erect images.

**Q22. Case Study: Aquarium** — A fish in water appears closer to the surface than it really is. This is because light rays from the fish:

- A) Bend away from the normal on moving from water to air
- B) Bend towards the normal on moving from water to air
- C) Reflect completely at all angles
- D) Do not enter air

**Answer:** A) Bend away from the normal on moving from water to air

**Explanation:** As light moves from water to air, it bends away from the normal, causing apparent depth to be less than real depth.

**Q23. Case Study: Overloaded Socket** — A household socket becomes hot when many devices are connected. What is the most likely reason?

- A) Current is too low
- B) Excess current causes heating in wires
- C) Voltage becomes zero
- D) Magnetic field cools the wire

**Answer:** B) Excess current causes heating in wires

**Explanation:** High current through resistance produces heat according to Joule's law.

**Q24. Case Study: Electric Motor** — In a simple DC motor, what reverses current in the coil every half turn?

- A) Split-ring commutator
- B) Fuse
- C) Ammeter
- D) Lens

**Answer:** A) Split-ring commutator

**Explanation:** The split-ring commutator reverses current direction to maintain continuous rotation.

**Q25. Case Study: Rainbow** — A rainbow forms because sunlight undergoes which combination in water droplets?

- A) Reflection only
- B) Refraction, internal reflection and dispersion
- C) Magnetism and heating
- D) Absorption only

**Answer:** B) Refraction, internal reflection and dispersion

**Explanation:** A rainbow forms due to dispersion and reflection/refraction of sunlight inside water droplets.

**Q26. Case Study: Village Energy** — A village wants energy that is renewable and suitable for a sunny region. Which option is most appropriate?

- A) Diesel generator
- B) Solar photovoltaic panels
- C) Coal boiler
- D) Petrol engine

**Answer:** B) Solar photovoltaic panels

**Explanation:** Solar panels are renewable and well suited to regions with high sunlight.

**Q27. Case Study: Fuse Selection** — A device normally draws 3 A. Which fuse rating is most suitable among the options?

- A) 1 A
- B) 3 A
- C) 5 A
- D) 20 A

**Answer:** C) 5 A

**Explanation:** A fuse should be just above the normal operating current, so 5 A is safer than a much larger rating.

**Q28. Case Study: Magnifier** — A student uses a convex lens as a magnifying glass. Where should the object be placed?

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

**Answer:** C) Between F and the lens

**Explanation:** For magnification with a convex lens, the object is placed between the focus and the lens.

**Q29. Case Study: Electric Bill** — A 500 W appliance runs for 4 hours. What is the energy consumed?

- A) 0.5 kWh
- B) 1 kWh
- C) 2 kWh
- D) 4 kWh

**Answer:** C) 2 kWh

**Explanation:** Energy = 0.5 kW × 4 h = 2 kWh.

**Q30. Case Study: Magnetic Compass** — A compass needle deflects when placed near a current-carrying wire. What does this show?

- A) Current produces a magnetic field
- B) Current produces gravity
- C) A compass detects heat only
- D) A wire blocks magnetic fields

**Answer:** A) Current produces a magnetic field

**Explanation:** The deflection demonstrates the magnetic effect of electric current.

## Section C: Reason and Assertion

Choose the best relationship between Assertion and Reason.

**Q31.** Assertion (A): In a series circuit, current is the same through every component. Reason (R): There is only one path 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:** A series circuit has a single path, so the same current passes through all components.

**Q32.** Assertion (A): A rainbow is an example of dispersion. Reason (R): Sunlight contains different colours that bend differently in water droplets. 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:** Different colours refract differently, producing the rainbow spectrum.

**Q33.** Assertion (A): A voltmeter is connected in parallel. Reason (R): It measures potential difference across a component. 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:** Potential difference is measured between two points, so the voltmeter is connected in parallel.

**Q34.** Assertion (A): A convex lens always forms real images. Reason (R): Convex lenses converge parallel rays. 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:** A convex lens can form a virtual image when the object is between the lens and focus.

**Q35.** Assertion (A): Greater current in an electromagnet usually increases its strength. Reason (R): Magnetic field due to current increases with 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:** More current in the coil makes the electromagnet stronger.

**Q36.** Assertion (A): Non-renewable energy resources can be used endlessly. Reason (R): Fossil fuels form over millions of years. 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 limited because they take geological time to form.

**Q37.** Assertion (A): Power rating tells how quickly a device uses electrical energy. Reason (R): Power is energy transferred per unit time. 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 definition of power directly explains device power rating.

**Q38.** Assertion (A): A concave mirror can form a real image. Reason (R): It can converge reflected rays. 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:** When the object is beyond the focus, a concave mirror can form a real image by converging reflected rays.

**Q39.** Assertion (A): White light has only one colour. Reason (R): A prism can split white light into a spectrum. 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:** White light is a mixture of colours, and a prism can separate them.

**Q40.** Assertion (A): Earthing helps protect users from electric shock. Reason (R): It gives leakage current a low-resistance path to ground. 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:** Earthing diverts unsafe leakage current away from the human body.

## Section D: Achievers Section

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

**Q41.** A 12 V battery is connected to a  $3\ \Omega$  resistor in series with a parallel combination of  $6\ \Omega$  and  $6\ \Omega$ . What is the circuit current?

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

**Answer:** B) 2 A

**Explanation:** The parallel pair gives  $3\ \Omega$ . Total resistance =  $3 + 3 = 6\ \Omega$ . Current =  $12/6 = 2\ \text{A}$ .

**Q42.** A ray travels from water ( $n = 1.33$ ) to air. If the critical angle is about  $49^\circ$ , what happens for incidence angle  $60^\circ$ ?

- A) Ordinary refraction
- B) Total internal reflection
- C) No reflection
- D) It becomes red

**Answer:** B) Total internal reflection

**Explanation:** Since  $60^\circ$  is greater than the critical angle and light is going from denser to rarer medium, total internal reflection occurs.

**Q43.** A wire has resistance  $8\ \Omega$ . If the current is 3 A, how much heat is produced in 10 seconds?

- A) 24 J
- B) 80 J
- C) 240 J
- D) 720 J

**Answer:** D) 720 J

**Explanation:** Heat  $H = I^2Rt = 3^2 \times 8 \times 10 = 720\ \text{J}$ .

**Q44.** Two lenses of focal lengths  $+20\ \text{cm}$  and  $-50\ \text{cm}$  are in contact. What is the combined power?

- A) +3 D
- B) +5 D
- C) -2 D
- D) -7 D

**Answer:** A) +3 D

**Explanation:**  $P_1 = +5\ \text{D}$  and  $P_2 = -2\ \text{D}$ . Combined power = +3 D.

**Q45.** A 1 m wire carrying 2 A current experiences a force of 0.6 N in a uniform magnetic field perpendicular to it. What is the magnetic field strength?

- A) 0.1 T
- B) 0.2 T
- C) 0.3 T
- D) 1.2 T

**Answer:** C) 0.3 T

**Explanation:**  $F = BIL$ , so  $B = F/(IL) = 0.6/(2 \times 1) = 0.3$  T.

**Q46.** A lamp rated 220 V, 100 W is operated at 110 V assuming resistance stays constant. What is the approximate power consumed?

- A) 25 W
- B) 50 W
- C) 100 W
- D) 200 W

**Answer:** A) 25 W

**Explanation:** For constant resistance, P is proportional to  $V^2$ . Halving voltage makes power one-fourth:  $100/4 = 25$  W.

**Q47.** A concave mirror forms an image twice the size of the object and inverted. What can be concluded?

- A) The image is virtual
- B) The image is real
- C) The mirror is plane
- D) The object is at infinity

**Answer:** B) The image is real

**Explanation:** An inverted image produced by a concave mirror is real.

**Q48.** A solar cell receives 1200 W of sunlight and outputs 180 W electrical power. What is its efficiency?

- A) 10%
- B) 15%
- C) 18%
- D) 25%

**Answer:** B) 15%

**Explanation:** Efficiency =  $180/1200 \times 100 = 15\%$ .

**Q49.** A prism causes violet to bend more than red. Which statement is correct?

- A) Violet has shorter wavelength than red
- B) Red has no frequency
- C) Violet travels faster than red in glass
- D) Red is not part of visible light

**Answer:** A) Violet has shorter wavelength than red

**Explanation:** Violet has a shorter wavelength and generally refracts more in glass.

**Q50.** An electric motor does not rotate when the split-ring commutator is replaced by a continuous ring arrangement without proper current reversal. Why?

- A) Torque direction may reverse each half turn, preventing continuous rotation
- B) Resistance becomes zero
- C) The coil becomes invisible
- D) The magnet stops producing a field

**Answer:** A) Torque direction may reverse each half turn, preventing continuous rotation

**Explanation:** For continuous rotation, current in the coil must reverse every half turn so torque remains in the same rotational direction.

## Answer Key

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

## 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.