Class X Physics Worksheet: Light, Human Eye, Electricity

CBSE Science (086) pattern · Oct 14, 2026

Name: _____ Class: X ____ Roll No.: _____ Date: _____

Time: 90 minutes · Maximum Marks: 50

General Instructions

1. All questions are compulsory. Internal choice is given in Q21, Q22 and Q23.
2. The worksheet follows the CBSE Class X Science (086) paper pattern: five sections, A to E.
3. Each question carries a tag: **[K]** knowledge and recall, **[S]** standard application, **[C]** competency-based (real-life context, data or graph interpretation, experiment, assertion-reason, case study). Competency-based questions carry 27 of 50 marks (54%).
4. Draw neat, labelled ray diagrams with a pencil and ruler. Follow the new Cartesian sign convention in all numerical problems.

Section	Question type	Questions	Marks each	Total
A	MCQ (Q1-12) and assertion-reason (Q13-14)	14	1	14
B	Very short answer	3 (Q15-17)	2	6
C	Short answer	4 (Q18-21)	3	12
D	Long answer	2 (Q22-23)	5	10
E	Case-based	2 (Q24-25)	4	8
	Total	**25**		**50**

Chapter	Marks
Light: Reflection and Refraction	16
The Human Eye and the Colourful World	14
Electricity	20

Question level	Marks	Share
[K] Knowledge	7	14%

Question level	Marks	Share
[S] Standard application	16	32%
[C] Competency-based	27	54%

Section A: MCQ and Assertion-Reason (1 mark each)

Q1-12 are multiple choice questions. Choose the one correct option.

Q1. [K] A ray of light parallel to the principal axis falls on a concave mirror. After reflection it passes through:

- (a) the centre of curvature
- (b) the pole
- (c) the principal focus
- (d) infinity

Q2. [S] An object is placed 20 cm in front of a concave mirror of focal length 15 cm. The image formed is:

- (a) virtual, erect and diminished
- (b) real, inverted, magnified, 60 cm from the mirror
- (c) real, inverted, diminished, 8.6 cm from the mirror
- (d) virtual, erect, magnified, 60 cm behind the mirror

Q3. [K] The absolute refractive indices of four media are: water 1.33, kerosene 1.44, crown glass 1.52, diamond 2.42. Light travels slowest in:

- (a) water
- (b) kerosene
- (c) crown glass
- (d) diamond

Q4. [S] A lens has a power of -2.5 D. It is a:

- (a) convex lens of focal length +40 cm
- (b) concave lens of focal length -40 cm
- (c) concave lens of focal length -2.5 cm
- (d) convex lens of focal length -40 cm

Q5. [C] Aarav can see objects clearly only up to a distance of 80 cm. The defect he has and the lens that corrects it are:

- (a) hypermetropia; convex lens of power +1.25 D
- (b) myopia; concave lens of power -1.25 D
- (c) myopia; concave lens of power -0.8 D
- (d) presbyopia; convex lens of power +1.25 D

Q6. [K] Danger signals are red in colour because red light:

- (a) has the shortest wavelength of all visible colours
- (b) is scattered the least by smoke or fog
- (c) is scattered the most by smoke or fog
- (d) is completely absorbed by fog

Q7. [K] The SI unit of resistivity is:

- (a) ohm
- (b) ohm metre
- (c) ohm per metre
- (d) per ohm per metre

Q8. [S] Three resistors of 2 Ω, 3 Ω and 6 Ω are connected in parallel. Their equivalent resistance is:

- (a) 11 Ω
- (b) 1 Ω
- (c) 2 Ω
- (d) 0.5 Ω

Q9. [C] A family uses a 2 kW water heater for 30 minutes every day. The electricity board charges ₹6 per unit. The cost of running the heater for 30 days is:

- (a) ₹90
- (b) ₹180
- (c) ₹360
- (d) ₹1800

Q10. [C] The V-I graphs of two conductors P and Q are straight lines through the origin, with V on the vertical axis and I on the horizontal axis. The line for P is steeper than the line for Q. Which statement is correct?

- (a) P has greater resistance than Q
- (b) Q has greater resistance than P
- (c) P and Q have equal resistance
- (d) The resistances cannot be compared from the graph

Q11. [C] In an experiment to trace the path of a ray through a rectangular glass slab, a student takes the angle of incidence as 40°. She will find that the angle of emergence is:

- (a) 40°, and the emergent ray is parallel to the incident ray but laterally displaced
- (b) 40°, and the emergent ray lies along the incident ray with no displacement
- (c) 60°, and the emergent ray is parallel to the incident ray
- (d) 20°, and the emergent ray is deviated towards the base

Q12. [K] The fuse wire in a household circuit is made of an alloy of tin and lead because the alloy:

- (a) has a low melting point
- (b) has a very high melting point
- (c) has zero resistance
- (d) is a magnetic material

Q13 and Q14 are assertion (A) and reason (R) questions. Choose the correct option:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true, but R is false.
- (d) A is false, but R is true.

Q13. [C] Assertion (A): Convex mirrors are used as rear-view mirrors in vehicles.

Reason (R): A convex mirror always forms a virtual, erect and diminished image, which gives a wider field of view.

Q14. [C] Assertion (A): The resistance of a metallic wire increases when its temperature increases.

Reason (R): The resistivity of an alloy is generally higher than that of its constituent metals.

Section B: Very Short Answer (2 marks each)

Q15. [C] Stars twinkle at night, but planets do not. Explain why, using the idea of atmospheric refraction.

Q16. [K] State the laws of refraction of light. If the speed of light in vacuum is 3 × 10^8 m/s, find its speed in a medium of absolute refractive index 1.5.

Q17. [S] In an experiment to verify Ohm's law, a student records 0.5 A on the ammeter and 3 V on the voltmeter for a resistor.

(a) How should the ammeter and the voltmeter be connected with respect to the resistor?

(b) Calculate the resistance of the resistor.

Section C: Short Answer (3 marks each)

Q18. [S] An object 2 cm high is placed 15 cm from a convex lens of focal length 10 cm.

(a) Draw a ray diagram showing the formation of the image.

(b) Find the position, nature and size of the image.

Q19. [C] Mr. Rao, aged 58, finds that he cannot read a newspaper held at the normal distance of 25 cm. He also has some difficulty seeing distant objects clearly.

(a) Name the defect of vision he is most likely suffering from.

(b) State two causes of this defect.

(c) Name the type of lens that corrects it and describe how it is made.

Q20. [C] Answer the following:

(a) Astronauts in space see the sky as dark instead of blue. Why?

(b) The Sun appears red at sunrise and sunset but white at noon. Why?

(c) A rainbow is seen only when the Sun is behind the observer. Why?

Q21. [S] An electric bulb is rated 220 V, 100 W and an electric heater is rated 220 V, 1000 W.

(a) Calculate the resistance of each when it works at its rated voltage.

(b) Assuming the same material and length, which one has the thicker element? Justify.

OR

A wire of resistance 20 Ω is cut into four equal parts. These parts are then connected in parallel.

(a) What is the resistance of each part?

(b) Find the equivalent resistance of the combination.

Section D: Long Answer (5 marks each)

Q22. [S] A 6 cm tall object is placed 30 cm in front of a concave lens of focal length 30 cm.

(a) Draw a ray diagram to show the image formed. (2 marks)

(b) Calculate the image distance, the magnification and the height of the image. State the nature of the image. (3 marks)

OR

A dentist holds a concave mirror of focal length 20 cm at a distance of 15 cm from a tooth 4 cm tall.

(a) Draw a ray diagram to show the image formed. (2 marks)

(b) Calculate the image distance, the magnification and the height of the image. State the nature of the image. (3 marks)

Q23. [C] A student wants to study the heating effect of current. She connects a 24 V battery to an 8 Ω heating coil in series with a parallel combination of two nichrome coils of 20 Ω and 5 Ω.

(a) Draw the circuit diagram and find the equivalent resistance of the whole circuit. (2 marks)

(b) Find the current drawn from the battery. (1 mark)

(c) Find the current through the 5 Ω coil. (1 mark)

(d) Find the heat produced in the 8 Ω coil in 10 minutes. (1 mark)

OR

A toaster has a nichrome heating element of length 20 m and cross-section 0.5 mm². The resistivity of nichrome is 1.1 × 10^-6 Ω m, and the toaster works on 220 V.

(a) Why are alloys, and not pure metals, used in heating elements? (1 mark)

(b) Calculate the resistance of the element. (2 marks)

(c) Calculate the power of the toaster. (2 marks)

Section E: Case-Based Questions (4 marks each)

Q24. [C] Read the passage and answer the questions.

Riya, a Class X student, could not read the blackboard from the last bench, although she read her book comfortably at 25 cm. The optometrist found that she can see objects clearly only up to 50 cm. He explained that the image of a distant object was forming in front of her retina and prescribed spectacles.

(i) Riya's eye defect is: (1 mark)

- (a) myopia
- (b) hypermetropia
- (c) presbyopia
- (d) cataract

(ii) Which lens will correct her vision, and why? (1 mark)

(iii) Calculate the power of the lens the optometrist should prescribe. (2 marks)

Q25. [C] Read the passage and answer the questions.

Ananya's family replaced five 60 W filament bulbs with five 9 W LED bulbs of the same brightness. Each bulb is used for 5 hours every day. The electricity board charges ₹7 per unit (taken as an illustrative figure).

(i) The commercial unit of electrical energy used in the electricity bill is: (1 mark)

- (a) joule
- (b) watt
- (c) kilowatt-hour
- (d) volt

(ii) Why are all the bulbs in a household circuit connected in parallel? (1 mark)

(iii) Calculate the energy saved in 30 days, in units, and the money saved in rupees. (2 marks)

Answer Key and Marking Scheme (for the teacher)

Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	c	2	b	3	d	4	b
5	b	6	b	7	b	8	b
9	b	10	a	11	a	12	a
13	a	14	b				

Working for numerical MCQs: Q2 gives v = -60 cm and m = -3. Q4 gives f = 1/P = -0.4 m = -40 cm. Q5 gives f = -80 cm, so P = -1.25 D. Q8 gives 1/R = 1/2 + 1/3 + 1/6 = 1, so R = 1 Ω. Q9 gives 2 kW × 0.5 h × 30 = 30 units, so the cost is ₹180. In Q10 the slope of a V-I graph is the resistance. In Q14 both statements

are true, but the rise in resistance with temperature is due to more frequent collisions of electrons, not to the resistivity of alloys.

Q15 (2). Starlight passes through layers of changing refractive index and bends towards the normal; its apparent position keeps shifting, so the light entering the eye flickers (1). Planets are nearer and act as extended sources made of many point sources, so the variations average out (1).

Q16 (2). The incident ray, refracted ray and normal lie in one plane; sin i / sin r is constant for a given pair of media (1). v = c/n = 3 × 10^8 / 1.5 = 2 × 10^8 m/s (1).

Q17 (2). (a) Ammeter in series, voltmeter in parallel (1). (b) R = V/I = 3 / 0.5 = 6 Ω (1).

Q18 (3). (a) Correct ray diagram: a ray parallel to the axis passes through the far focus, a ray through the optical centre goes straight; the image forms beyond 2F on the other side (1). (b) From 1/v - 1/u = 1/f: v = +30 cm (1). m = v/u = -2, so the image is 4 cm tall, real, inverted and enlarged (1).

Q19 (3). (a) Presbyopia (1). (b) Gradual weakening of the ciliary muscles and loss of flexibility of the eye lens (1). (c) Bifocal lenses: the upper part is concave for distant vision and the lower part is convex for near vision (1).

Q20 (3). (a) There is no atmosphere in space, so sunlight is not scattered (1). (b) Near the horizon light travels through a thicker layer of air; blue and shorter wavelengths are scattered away and red reaches the eye (1). (c) A rainbow is formed by dispersion and internal reflection of sunlight in water droplets, which must be in front of the observer, so the Sun must be behind (1).

Q21 (3). (a) R = V²/P: bulb 220² / 100 = 484 Ω; heater 220² / 1000 = 48.4 Ω (2). (b) The heater has lower resistance; since R = ρl/A, with the same ρ and l it needs a larger area A, so its element is thicker (1). **OR** (a) Each part = 20 / 4 = 5 Ω (1). (b) 1/R = 4 × (1/5), so R = 1.25 Ω (2).

Q22 (5). (a) Diagram: a ray parallel to the axis diverges as if from the focus on the object side; a ray through the optical centre is undeviated; the image is virtual, erect and between O and F (2). (b) 1/v = 1/f + 1/u = -1/30 - 1/30, so v = -15 cm (1). m = v/u = +0.5 (1). h' = +3 cm; the image is virtual, erect, diminished, on the object side (1). **OR** (a) Diagram: object inside the focus of a concave mirror; reflected rays diverge; the image is virtual, erect and enlarged behind the mirror (2). (b) 1/v = 1/f - 1/u = -1/20 + 1/15, so v = +60 cm (1). m = -v/u = +4 (1). h' = 16 cm; the image is virtual, erect and enlarged, 60 cm behind the mirror (1).

Q23 (5). (a) Correct circuit diagram (1). 1/Rp = 1/20 + 1/5, so Rp = 4 Ω; total R = 8 + 4 = 12 Ω (1). (b) I = 24 / 12 = 2 A (1). (c) Voltage across the parallel part = 2 × 4 = 8 V; current in the 5 Ω coil = 8 / 5 = 1.6 A (1). (d) H = I²Rt = 2² × 8 × 600 = 19 200 J (1). **OR** (a) Alloys have higher resistivity than pure metals and do not oxidise or burn easily when red hot (1). (b) R = ρl/A = 1.1 × 10^-6 × 20 / (0.5 × 10^-6) = 44 Ω (2). (c) P = V²/R = 220² / 44 = 1100 W (2).

Q24 (4). (i) (a) myopia (1). (ii) A concave lens, because it diverges the rays so that the image of a distant object forms on the retina (1). (iii) The lens must form a virtual image at the far point, so f = -50 cm = -0.5 m (1) and P = 1/f = -2 D (1).

Q25 (4). (i) (c) kilowatt-hour (1). (ii) Each bulb gets the full 220 V and works independently, so one failing does not switch the others off (1). (iii) Power saved = 5 × (60 - 9) = 255 W; energy per day = 0.255 kW × 5 h = 1.275 units; in 30 days = 38.25 units (1); money saved = 38.25 × 7 = ₹267.75 (1).