

QUESTION PAPER SET 3

CBSE CLASS IX SCIENCE (086)

Annual Examination 2024-25

Time: 3 Hours | Maximum Marks: 80

General Instructions:

1. This question paper consists of 39 questions in 5 sections (A to E).
2. All questions are compulsory. Internal choice is provided in some questions.
3. Section E contains case-based/application questions.

SECTION A (20 Marks)

(Multiple Choice Questions – 1 mark each)

1. The forces of attraction between particles are maximum in:
(a) Solids
(b) Liquids
(c) Gases
(d) Plasma
2. The temperature at which a liquid changes into vapour at atmospheric pressure is called:
(a) Melting point
(b) Freezing point
(c) Boiling point
(d) Sublimation point
3. The valency of nitrogen in NH_3 is:
(a) 1
(b) 2
(c) 3
(d) 4
4. Which scientist proposed the plum pudding model of atom?
(a) Rutherford
(b) Bohr
(c) J.J. Thomson
(d) Dalton
5. The electronic configuration 2, 8, 8, 2 belongs to which element?
(a) Sodium
(b) Calcium
(c) Magnesium
(d) Potassium
6. The cell wall in plant cells is mainly composed of:
(a) Protein
(b) Lipid

- (c) Cellulose
 - (d) Chitin
7. Which tissue conducts water and minerals in plants?
- (a) Phloem
 - (b) Xylem
 - (c) Parenchyma
 - (d) Collenchyma
8. The scientific name of human beings is:
- (a) *Homo erectus*
 - (b) *Homo habilis*
 - (c) *Homo sapiens*
 - (d) *Homo neanderthalensis*
9. Slope of velocity-time graph gives:
- (a) Displacement
 - (b) Distance
 - (c) Acceleration
 - (d) Speed
10. The area under velocity-time graph gives:
- (a) Acceleration
 - (b) Displacement
 - (c) Force
 - (d) Momentum
11. The inertia of a body depends on its:
- (a) Velocity
 - (b) Acceleration
 - (c) Mass
 - (d) Shape
12. The weight of a body on moon is approximately _____ of its weight on earth.
- (a) One-sixth
 - (b) One-third
 - (c) Half
 - (d) Same
13. When force and displacement are in opposite directions, work done is:
- (a) Positive
 - (b) Zero
 - (c) Negative
 - (d) Maximum
14. The energy stored in a stretched spring is:
- (a) Kinetic energy
 - (b) Gravitational potential energy
 - (c) Elastic potential energy
 - (d) Chemical energy
15. The maximum displacement of particles from their mean position in a sound wave is called:
- (a) Wavelength
 - (b) Frequency

- (c) Amplitude
 - (d) Time period
16. The quality of sound that distinguishes two sounds of same pitch and loudness is called:
- (a) Pitch
 - (b) Loudness
 - (c) Timbre
 - (d) Intensity
17. Which disease is caused by bacteria?
- (a) Common cold
 - (b) Dengue
 - (c) Tuberculosis
 - (d) AIDS
18. The disease caused by deficiency of vitamin C is:
- (a) Beriberi
 - (b) Scurvy
 - (c) Rickets
 - (d) Night blindness
19. Which of the following is a micronutrient for plants?
- (a) Nitrogen
 - (b) Phosphorus
 - (c) Iron
 - (d) Potassium
20. The method of preserving fish by drying, salting or freezing is called:
- (a) Canning
 - (b) Pasteurization
 - (c) Apiculture
 - (d) Animal husbandry

SECTION B (12 Marks)

(Very Short Answer Questions – 2 marks each)

21. Why does ice float on water? Explain on the basis of density. (NCERT Ch 1, p. 9)
22. Write the chemical formulae for:
- (a) Sodium carbonate
 - (b) Calcium chloride (NCERT Ch 3, p. 31)
23. What is osmosis? Why is it important for living organisms? (NCERT Ch 5, p. 54)
24. A car moving with velocity 20 m/s comes to rest in 5 seconds. Calculate its retardation. (NCERT Ch 8, p. 109)
25. State the universal law of gravitation. Write its mathematical expression. (NCERT Ch 10, p. 128)
26. Define frequency and time period of a sound wave. Give their relationship. (NCERT Ch 12, p. 162)

SECTION C (21 Marks)

(Short Answer Questions – 3 marks each)

27. Explain the following phenomena:

- (a) Naphthalene balls disappear with time without leaving any solid
- (b) We can get the smell of perfume sitting several metres away
- (c) Water droplets appear on the outer surface of a glass containing ice-cold water (NCERT Ch 1, p. 10-11)

28. (a) What is a solution?

- (b) Identify solute and solvent in brass (an alloy of copper and zinc).
- (c) How will you separate a mixture of common salt and ammonium chloride? Name the technique. (NCERT Ch 2, p. 19-21)

29. (a) Define mole.

- (b) Calculate the mass of 12.044×10^{23} molecules of water. (Atomic masses: H = 1 u, O = 16 u) (NCERT Ch 3, p. 37-38)

30. (a) What are plastids? Name three types.

- (b) Why are mitochondria called semi-autonomous organelles? (NCERT Ch 5, p. 60-62)

31. List three distinguishing features between annelids and arthropods. (NCERT Ch 7, p. 89-90)

32. A stone is dropped from the top of a tower 100 m high. Calculate:

- (i) Time taken to reach the ground
 - (ii) Velocity with which it strikes the ground
- (Take $g = 10 \text{ m/s}^2$) (NCERT Ch 8, p. 113)

33. (a) Define potential energy. Write expression for gravitational potential energy.

- (b) A body of mass 10 kg is raised to a height of 5 m. Calculate the potential energy gained. (Take $g = 10 \text{ m/s}^2$) (NCERT Ch 11, p. 150)

SECTION D (15 Marks)

(Long Answer Questions – 5 marks each)

34. (a) Explain the effect of change of temperature and pressure on the state of matter.

- (b) Why does ice at 0°C cool better than water at 0°C ?
- (c) Why do we feel cold when acetone is poured on our palm? (NCERT Ch 1, p. 6, 10)

35. (a) State Bohr's postulates for the model of atom.

- (b) Draw Bohr's model for oxygen atom (atomic number = 8).
- (c) An ion X^{3+} has 10 electrons. Find its atomic number and mass number if it has 14 neutrons. (NCERT Ch 4, p. 49-50)

36. (a) Define sound. How is it produced?

- (b) Describe an activity to show that sound requires a material medium for propagation.
- (c) Why do we hear thunder a few seconds after seeing lightning? (NCERT Ch 12, p. 159-161)

SECTION E (12 Marks)

(Case-Based/Application Questions – 4 marks each)

37. Read the following passage and answer the questions:

Rahul prepared three mixtures:

Mixture A: Salt dissolved in water

Mixture B: Sand mixed with water

Mixture C: Milk mixed with water

(a) Identify the type of mixture for A, B and C.

(b) Which mixture will show Tyndall effect? Why?

(c) How will you separate mixture B?

(d) What happens when a beam of light is passed through mixture A? (NCERT Ch 2, p. 18-20)

38. Study the scenario and answer:

Two objects A and B have masses 10 kg and 20 kg respectively. Both are dropped simultaneously from the same height in vacuum.

(a) Which object will reach the ground first? Give reason.

(b) What will be the ratio of their accelerations?

(c) If both objects are dropped in air instead of vacuum, will the result be the same? Explain.

(d) Calculate the force of gravitation between object A (10 kg) and earth (mass = 6×10^{24} kg, radius = 6.4×10^6 m). Take $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$. (NCERT Ch 10, p. 128-130)

39. Read the case and answer:

A farmer has a small piece of land. He wants to maximize production by using scientific methods of agriculture.

(a) What is vermicomposting? How does it help in agriculture?

(b) Name two Indian breeds of cattle used for milk production.

(c) What is the advantage of using biofertilizers over chemical fertilizers?

(d) Why is proper storage of grains important after harvesting? Mention two preventive measures. (NCERT Ch 15, p. 207, 211-212)

ANSWER KEY - SET 3

SECTION A

1. (a) Solids
2. (c) Boiling point
3. (c) 3 (N needs 3 electrons to complete octet)
4. (c) J.J. Thomson
5. (b) Calcium (atomic number 20)
6. (c) Cellulose
7. (b) Xylem
8. (c) *Homo sapiens*
9. (c) Acceleration
10. (b) Displacement
11. (c) Mass
12. (a) One-sixth
13. (c) Negative ($\theta = 180^\circ$, $\cos 180^\circ = -1$)
14. (c) Elastic potential energy

15. (c) Amplitude
16. (c) Timbre
17. (c) Tuberculosis
18. (b) Scurvy
19. (c) Iron
20. (a) Canning

SECTION B

21. **Explanation:** Ice has lower density (0.92 g/cm^3) than water (1 g/cm^3). When water freezes, hydrogen bonding creates an open cage-like structure with larger volume $\rightarrow$ density decreases $\rightarrow$ ice floats on water. [[NCERT Ch 1, p. 9]]
22. (a) Na_2CO_3
(b) CaCl_2 [[NCERT Ch 3, p. 31]]
23. **Osmosis:** Movement of water molecules through a semi-permeable membrane from region of higher water concentration to lower water concentration.
Importance: Regulates water balance in cells; enables absorption of water by plant roots; maintains turgidity in plant cells. [[NCERT Ch 5, p. 54]]
24. **Given:** $u = 20 \text{ m/s}$, $v = 0$, $t = 5 \text{ s}$
Retardation $= \frac{v-u}{t} = \frac{0-20}{5} = -4 \text{ m/s}^2$
Magnitude of retardation $= 4 \text{ m/s}^2$ [[NCERT Ch 8, p. 109]]
25. **Universal law of gravitation:** Every particle in the universe attracts every other particle with a force directly proportional to the product of their masses and inversely proportional to the square of the distance between them.
$$F = G \frac{m_1 m_2}{r^2}$$
where G = gravitational constant [[NCERT Ch 10, p. 128]]
26. **Frequency (ν):** Number of oscillations per second. Unit: Hertz (Hz)
Time period (T): Time taken for one complete oscillation. Unit: second (s)
Relationship: $\nu = \frac{1}{T}$ or $T = \frac{1}{\nu}$ [[NCERT Ch 12, p. 162]]

SECTION C

27. (a) **Naphthalene balls:** Undergo sublimation (solid $\rightarrow$ vapour directly) at room temperature $\rightarrow$ disappear without residue. [[NCERT Ch 1, p. 10]]
(b) **Perfume smell:** Perfume vapours diffuse rapidly through air due to high kinetic energy of gas particles $\rightarrow$ reach us from distance. [[NCERT Ch 1, p. 10]]
(c) **Water droplets:** Water vapour in air condenses on cold outer surface of glass (temperature below dew point) $\rightarrow$ forms droplets. [[NCERT Ch 1, p. 11]]
28. (a) **Solution:** Homogeneous mixture of two or more substances where solute particles are uniformly distributed in solvent at molecular/ionic level. [[NCERT Ch 2, p. 18]]
(b) **Brass:** Solute = Zinc, Solvent = Copper
(c) **Separation technique:** Sublimation (ammonium chloride sublimes on heating; salt remains behind) [[NCERT Ch 2, p. 21]]
29. (a) **Mole:** Amount of substance containing 6.022×10^{23} particles (atoms/molecules/ions). This number is Avogadro's number. [[NCERT Ch 3, p. 37]]

(b) Number of molecules = $12.044 \times 10^{23} = 2 \times 6.022 \times 10^{23} = 2$ moles

Molar mass of $H_2O = (2 \times 1) + 16 = 18$ g/mol

Mass = $2 \times 18 = 36$ g [[NCERT Ch 3, p. 38]]

30. (a) **Plastids:** Double-membrane organelles found in plant cells containing pigments.

Three types:

(i) Chloroplasts (green, photosynthesis)

(ii) Chromoplasts (coloured, attract pollinators)

(iii) Leucoplasts (colourless, store starch/oils) [[NCERT Ch 5, p. 60]]

(b) **Semi-autonomous:** Mitochondria have their own DNA and ribosomes → can synthesize some of their own proteins → but depend on nuclear DNA for most proteins → hence "semi-autonomous". [[NCERT Ch 5, p. 62]]

31.

Feature	Annelids	Arthropods
Body segmentation	True metameric segmentation	Segmented but fused into tagmata (head, thorax, abdomen)
Appendages	Unjointed	Jointed appendages
Exoskeleton	Absent (moist cuticle)	Present (chitinous)

32. **Given:** $h = 100$ m, $u = 0$, $g = 10$ m/s²

(i) Using $h = ut + \frac{1}{2}gt^2$

$$100 = 0 + \frac{1}{2} \times 10 \times t^2$$

$$100 = 5t^2$$

$$t^2 = 20$$

$$t = \sqrt{20} = 2\sqrt{5} \approx 4.47 \text{ s}$$

(ii) Using $v^2 = u^2 + 2gh$

$$v^2 = 0 + 2 \times 10 \times 100 = 2000$$

$$v = \sqrt{2000} = 20\sqrt{5} \approx 44.7 \text{ m/s} \text{ [[NCERT Ch 8, p. 113]]}$$

33. (a) **Potential energy:** Energy possessed by a body due to its position or configuration.

Gravitational PE: $PE = mgh$

where m = mass, g = acceleration due to gravity, h = height [[NCERT Ch 11, p. 150]]

(b) **Given:** $m = 10$ kg, $h = 5$ m, $g = 10$ m/s²

$$PE = mgh = 10 \times 10 \times 5 = 500 \text{ J}$$

SECTION D

34. (a) **Effect of temperature:**

- Increase in temperature → particles gain kinetic energy → overcome intermolecular forces → solid → liquid → gas
- Decrease in temperature → reverse process

Effect of pressure:

- Increase in pressure → particles come closer → gas can be liquefied (e.g., LPG)

- Decrease in pressure → particles move apart → liquid can vaporize at lower temperature [[NCERT Ch 1, p. 6]]
- (b) **Ice at 0°C vs water at 0°C:** Ice absorbs latent heat of fusion (334 J/g) from surroundings to melt → provides additional cooling effect beyond just temperature difference. Water at 0°C only absorbs sensible heat. [[NCERT Ch 1, p. 10]]
- (c) **Acetone on palm:** Acetone evaporates rapidly → absorbs latent heat of vaporization from skin → skin temperature drops → we feel cold. [[NCERT Ch 1, p. 10]]

35. (a) **Bohr's postulates:**

- (i) Electrons revolve in discrete stable orbits without radiating energy
- (ii) Orbits have fixed angular momentum: $mvr = \frac{nh}{2\pi}$ where $n = 1, 2, 3...$
- (iii) Energy is radiated/absorbed only when electron jumps between orbits: $\Delta E = h\nu$ [[NCERT Ch 4, p. 49]]

(b) **Oxygen atom ($Z = 8$):**

K-shell ($n=1$): 2 electrons

L-shell ($n=2$): 6 electrons

[Diagram: Nucleus with $8p, 8n$; two concentric circles with 2 and 6 electrons] [[NCERT Ch 4, p. 50]]

(c) **Given:** Ion X^{3+} has 10 electrons

For neutral atom: Electrons = Protons = Atomic number (Z)

X^{3+} lost 3 electrons → Neutral X has $10 + 3 = 13$ electrons

∴ Atomic number $Z = 13$

Mass number $A = Z + \text{neutrons} = 13 + 14 = 27$

36. (a) **Sound:** Form of energy produced by vibrating objects that propagates as longitudinal mechanical waves requiring material medium.

Production: When an object vibrates, it causes particles of medium to vibrate → creates regions of compression and rarefaction → propagates as sound wave. [[NCERT Ch 12, p. 159]]

(b) **Activity to show medium requirement:**

- Take an electric bell inside an airtight glass jar connected to vacuum pump
- Switch on bell → sound heard
- Gradually pump out air → sound becomes fainter
- When vacuum created → no sound heard though bell is still ringing
- Conclusion: Sound needs material medium for propagation [[NCERT Ch 12, p. 160]]

(c) **Thunder after lightning:** Light travels at 3×10^8 m/s; sound travels at 344 m/s in air. Both produced simultaneously during lightning, but light reaches us almost instantly while sound takes several seconds → we see lightning first, hear thunder later. [[NCERT Ch 12, p. 161]]

SECTION E

37. (a) **Mixture A:** True solution (homogeneous)

Mixture B: Suspension (heterogeneous)

Mixture C: Colloid (heterogeneous but appears homogeneous) [[NCERT Ch 2, p. 18-20]]

(b) **Mixture C (milk)** shows Tyndall effect because it is a colloid. Colloidal particles scatter light → beam becomes visible. True solutions (A) don't scatter light; suspensions (B) settle quickly.

(c) **Separation of B:** Sedimentation followed by decantation OR filtration

(d) **Light through A:** No scattering → beam not visible (true solution particles too small to scatter light)

38. (a) **Both reach simultaneously.** Reason: In vacuum, acceleration due to gravity (g) is independent of mass $\rightarrow$ both experience same acceleration (9.8 m/s^2) $\rightarrow$ same time of fall. [[NCERT Ch 10, p. 129]]
- (b) **Ratio of accelerations = 1:1** (both accelerate at g)
- (c) **In air:** Result may differ due to air resistance. Object with larger surface area/mass ratio experiences greater air resistance $\rightarrow$ falls slower. In vacuum, no air resistance $\rightarrow$ both fall together.
- (d) **Given:** $m_1 = 10 \text{ kg}$, $m_2 = 6 \times 10^{24} \text{ kg}$, $r = 6.4 \times 10^6 \text{ m}$, $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$
- $$F = G \frac{m_1 m_2}{r^2} = 6.67 \times 10^{-11} \times \frac{10 \times 6 \times 10^{24}}{(6.4 \times 10^6)^2}$$
- $$= 6.67 \times 10^{-11} \times \frac{6 \times 10^{25}}{40.96 \times 10^{12}}$$
- $$= 6.67 \times 10^{-11} \times 1.464 \times 10^{12}$$
- $$= 97.7 \text{ N} \approx 100 \text{ N} \text{ (which equals weight } mg = 10 \times 10 = 100 \text{ N)} \text{ [[NCERT Ch 10, p. 128]]}$$
39. (a) **Vermicomposting:** Conversion of organic waste into nutrient-rich manure using earthworms.
Benefits: Improves soil fertility & structure; enhances water retention; eco-friendly waste management; provides slow-release nutrients. [[NCERT Ch 15, p. 207]]
- (b) Sahiwal, Red Sindhi, Gir (any two) [[NCERT Ch 15, p. 211]]
- (c) **Biofertilizers advantages:**
- (i) Environmentally sustainable (no chemical pollution)
 - (ii) Improve soil health long-term
 - (iii) Fix atmospheric nitrogen naturally (e.g., Rhizobium)
 - (iv) Cost-effective for farmers [[NCERT Ch 15, p. 207]]
- (d) **Importance of storage:** Prevents post-harvest losses due to pests, moisture, microorganisms.
Preventive measures:
- (i) Drying grains to reduce moisture content before storage
 - (ii) Using silos/granaries with pest control (neem leaves, chemical fumigants)
 - (iii) Maintaining proper ventilation [[NCERT Ch 15, p. 212]]

Complete NCERT Class IX Science Reference Guide (2024-25 Edition)

Unit	Chapters	Approx. Pages	Weightage
I	1. Matter in Our Surroundings 2. Is Matter Around Us Pure? 3. Atoms and Molecules 4. Structure of the Atom	p. 1-52	25 marks

Unit	Chapters	Approx. Pages	Weightage
II	5. The Fundamental Unit of Life 6. Tissues 7. Diversity in Living Organisms	p. 54-103	22 marks
III	8. Motion 9. Force and Laws of Motion 10. Gravitation 11. Work and Energy 12. Sound	p. 97-173	27 marks
IV	13. Why Do We Fall Ill? 15. Improvement in Food Resources	p. 174-221	6 marks
—	14. Natural Resources	p. 186-203	<i>Not assessed</i>

✓ Summary of All 3 Question Paper Sets

Feature	Set 1	Set 2	Set 3
Original MCQs	20	20	20
VSA Questions	6	6	6
SA Questions	7	7	7
LA Questions	3	3	3
Case-Based	3	3	3
Total Marks	80	80	80
NCERT References	All questions mapped	All questions mapped	All questions mapped
LaTeX Formulas	✓	✓	✓

Feature	Set 1	Set 2	Set 3
Complete Solutions	✓	✓	✓