Future Topper

Annual Examination Practice Paper 2

Class IX Science (086)

Time allowed: 3 hours Maximum marks: 80

Syllabus covered: the full Class IX Science syllabus (Exploration, NCERT). Unit weightage follows CBSE: World of Living 27, Matter: Its Nature and Behaviour 25, Motion, Force, Work and Sound 23, Earth as a System 5.

General instructions

1. This paper has 39 questions in three sections. All questions are compulsory.
2. Section A (Biology and Earth Science): questions 1 to 16, 32 marks.
3. Section B (Chemistry): questions 17 to 27, 25 marks.
4. Section C (Physics): questions 28 to 39, 23 marks.
5. Each section has multiple-choice and assertion-reason questions of 1 mark, followed by questions of 2 to 5 marks. Marks are shown against each question.
6. Internal choice is given in some questions. Attempt only one of the choices.
7. Draw neat, labelled diagrams wherever needed.

Section A: Biology and Earth Science

32 marks

1. Apart from the nucleus, which of these organelles has its own DNA? **1**

(a) Golgi apparatus (b) Endoplasmic reticulum
(c) Mitochondrion (d) Lysosome

2. Cells of meristematic tissue have **1**

(a) dense cytoplasm and a large nucleus (b) large vacuoles
(c) thick walls hardened by lignin (d) large spaces filled with air

3. In humans, the female gamete (egg) is produced in the **1**

(a) uterus (b) ovary
(c) oviduct (d) vagina

4. Organisms that have a cell wall made of chitin and feed on dead and decaying matter belong to the kingdom **1**

(a) Monera (b) Protista
(c) Plantae (d) Fungi

5. Animals that have a backbone, scales, fins and gills are placed in the class **1**

(a) Amphibia (b) Pisces
(c) Aves (d) Mammalia

6. The part of sunlight that we feel as heat on our skin is mainly **1**

(a) ultraviolet rays (b) X-rays
(c) infrared rays (d) radio waves

7. Plants return water vapour to the air through the process of **1**

(a) transpiration (b) condensation
(c) infiltration (d) precipitation

8. **Assertion (A):** Many flowers pollinated by insects are brightly coloured and scented. **1**
Reason (R): Bright colours and scent attract insects to the flowers.

(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.

9. **Assertion (A):** Ciliated epithelium lines the inside of the windpipe. **1**
Reason (R): Ciliated epithelium is made of dead cells.

(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.

10. What is menstruation? Why does it happen? **2**

11. Give two differences between gymnosperms and angiosperms, with one example of each. **2**

OR

Write two features of the class Mammalia, with two examples.

12. Draw a labelled diagram of an animal cell showing any six parts. **3**

13. What is cell division? Name its two types and say where each takes place in the body. How can uncontrolled cell division harm the body? **3**

14. Read the passage and answer the questions. **4**

The Sun's heat turns water from seas, lakes and soil into vapour. The vapour rises, cools and forms clouds, and the water comes back to the ground. Some of it flows into rivers, and some soaks into the soil to refill the water stored underground. In many cities, open ground has been covered with concrete, and wells that once had water have dried up.

(a) Name the process by which water vapour forms clouds. (1)

(b) Name two forms in which water returns to the ground. (1)

(c) Explain why covering open ground with concrete and cutting trees lowers the water stored underground. (2)
OR

(d) Why do we say the water cycle is driven by the Sun? (2)

15. Read the passage and answer the questions. **4**

Adolescence brings many changes in the body, including changes in the reproductive organs. Knowing how the body works, keeping clean, and being able to talk openly with parents, teachers or doctors all help young people stay healthy. Good reproductive health also includes access to correct information and to medical care when needed.

(a) Name the male reproductive organ that produces sperm. (1)

(b) Why is personal hygiene especially important during menstruation? (1)

(c) Give two reasons why correct information about reproductive health is important for adolescents. (2)
OR

(d) Why are methods of birth control important for the health of a family? Give two reasons. (2)

16. Describe the process of sexual reproduction in a flowering plant, from pollination to the formation of seed and fruit. **5**

OR

Write one main feature and one example of each of these vertebrate classes: Pisces, Amphibia, Reptilia, Aves and Mammalia.

Section B: Chemistry

25 marks

17. An atom has 11 protons and 12 neutrons. Its mass number is **1**

(a) 11 (b) 23
(c) 12 (d) 34

18. Which pair of atoms are isobars? **1**

(a) $^{12}_{6}C$ and $^{14}_{6}C$ (b) $^{35}_{17}Cl$ and $^{37}_{17}Cl$
(c) $^{1}_{1}H$ and $^{2}_{1}H$ (d) $^{40}_{18}Ar$ and $^{40}_{20}Ca$

19. In fog, the dispersed phase and the dispersion medium are **1**

(a) liquid in gas (b) gas in liquid
(c) solid in gas (d) liquid in liquid

20. **Assertion (A):** The valency of chlorine is 1. **1**
Reason (R): A chlorine atom needs one more electron to complete its octet.

(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.

21. Describe Thomson's model of the atom. Why was it given up? **2**

22. How much salt and how much water are present in 250 g of a 12% (mass by mass) salt solution? **2**

23. Write three main points of Bohr's model of the atom. **3**

24. What is an ion? Distinguish between a cation and an anion with one example of each. Give one example of a polyatomic ion. **3**

25. 5.3 g of sodium carbonate reacts with 6.0 g of ethanoic acid. The products are 2.2 g of carbon dioxide, 0.9 g of water and 8.2 g of sodium ethanoate. Show that these figures agree with the law of conservation of mass. **3**

OR

Write the chemical formulae of calcium phosphate, aluminium sulphate and ammonium chloride. Show how you worked out any one of them.

26. Read the passage and answer the questions. **4**

At a town's water treatment plant, river water is first left to stand in large tanks. Alum is added, and the fine mud particles clump together and sink. The water is then passed through beds of sand and gravel, and finally a small amount of chlorine is added before it is supplied to homes.

(a) Why is alum added to the water? (1)

(b) Which process removes the remaining fine particles? (1)

(c) Why is chlorine added? Is the water supplied to homes a pure substance? Give a reason. (2)
OR

(d) How is centrifugation different from filtration? Give one use of centrifugation. (2)

27. (i) What is atomicity? Write the atomicity of ozone (O_3) and phosphorus (P_4). (1) **4**
(ii) Find the molecular mass of glucose, $C_6H_{12}O_6$. (C = 12 u, H = 1 u, O = 16 u) (2)
(iii) How many atoms are there in one molecule of glucose? (1)

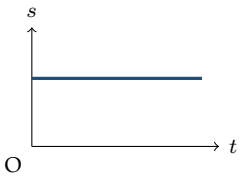
OR

Elements P, Q and R have the electron distributions 2, 8, 1; 2, 8, 7; and 2, 8, 8.
(i) Which of them is chemically inactive, and why?
(ii) P and Q combine. Write the formula of the compound, the type of bond, and how it forms.

Section C: Physics

23 marks

28. The displacement-time graph of an object is shown. The object is **1**



(a) moving with uniform velocity (b) accelerating
(c) at rest (d) slowing down

29. The kinetic energy of a 4 kg object moving at 3 m/s is **1**
(a) 18 J (b) 12 J
(c) 36 J (d) 6 J

30. The pitch of a sound depends on its **1**
(a) amplitude (b) speed
(c) loudness (d) frequency

31. The force of friction always **1**
(a) helps motion (b) opposes relative motion between surfaces
(c) acts upward (d) is zero on rough surfaces

32. A pair of scissors is an example of a **1**
(a) pulley (b) inclined plane
(c) lever (d) screw

33. One kilowatt hour is equal to **1**
(a) 1000 J (b) 3600 J
(c) 3.6×10^3 J (d) 3.6×10^6 J

34. **Assertion (A):** Sound travels faster in steel than in air. **1**
Reason (R): Sound is a longitudinal wave.
(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.

35. An athlete runs once round a circular track of radius 70 m in 44 s at constant speed. Find her speed. Why is her motion called accelerated even though her speed does not change? **2**

36. What is inertia? Which has more inertia, a cricket ball or a rubber ball of the same size? Give a reason, and one example of inertia from daily life. **3**

OR

A cricket ball of mass 0.15 kg moving at 20 m/s is stopped by a fielder in 0.1 s. Find the force applied by the fielder. Why does the fielder pull his hands back while catching?

37. A sound wave has a frequency of 440 Hz and travels at 330 m/s in air. Find its wavelength. How is the loudness of a sound different from its pitch? **3**

38. A stone is dropped from the top of a cliff and hits the ground 3 s later. Take $g = 10\ \text{m/s}^2$ and ignore air resistance. **4**

(a) With what speed does it hit the ground? (1)

(b) How high is the cliff? (1)

(c) Sketch the velocity-time graph of the stone, and say what the area under the graph gives. (2)

OR

(d) If the stone were instead thrown straight up at 20 m/s, how high would it rise and how long would it take to reach the top? (2)

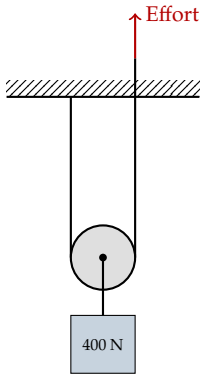
39. A motor lifts 200 kg of water into a tank 15 m above the ground in 1 minute. Take $g = 10\ \text{m/s}^2$. **4**

(i) Find the work done by the motor. (ii) Find its power. (iii) What energy change takes place in lifting the water?

OR

(i) Why do we use a single fixed pulley, even though its mechanical advantage is only 1?

(ii) What least effort is needed to lift the 400 N load with the single movable pulley shown, if friction and the weight of the pulley are ignored? What is its mechanical advantage?



***** End of question paper *****

Solutions

Answers give the points an examiner looks for. Any correct answer in the student's own words should get full credit.

Section A

1. Mitochondria (and plastids) have their own DNA and ribosomes. **Answer: (c)**

2. **Answer: (a)**

3. **Answer: (b) ovary**

4. **Answer: (d) Fungi**

5. **Answer: (b) Pisces**

6. **Answer: (c) infrared rays**

7. **Answer: (a) transpiration**

8. R gives the reason the features in A are useful to the plant. **Answer: (a)**

9. A is true. R is false: ciliated epithelium is made of living cells whose cilia beat to push mucus and dust out of the windpipe. **Answer: (c)**

10. Menstruation is the monthly flow of blood and tissue from the uterus through the vagina. Each month the lining of the uterus thickens to receive a fertilised egg. If the egg is not fertilised, this lining breaks down and comes out as the menstrual flow, roughly every 28 days.

11. Gymnosperms have naked seeds, not enclosed in a fruit; angiosperms have seeds enclosed inside a fruit. Gymnosperms usually have no flowers, while angiosperms have flowers. Examples: pine or cycas (gymnosperm); mango or pea (angiosperm).
OR: Mammals have hair on their bodies, and females have mammary glands that make milk for the young. Most give birth to live young. Examples: human, cow, cat, whale, bat (any two).

12. Any six correctly labelled: cell membrane, cytoplasm, nucleus, nuclear membrane, nucleolus, mitochondria, endoplasmic reticulum, Golgi apparatus, lysosome, ribosomes, small vacuole. There should be no cell wall and no large central vacuole.

13. Cell division is the process by which a cell divides to form new cells. Mitosis takes place in body cells for growth and repair. Meiosis takes place in the reproductive organs to form gametes, which have half the number of chromosomes. When cells divide without control, they form a lump of cells called a tumour, which can damage nearby tissues and spread (cancer).

14. (a) Condensation.
(b) Rain and snow (hail or sleet also correct).
(c) Concrete does not let rainwater soak into the ground, so it runs off into drains. Trees and their roots slow the water down and help it sink in; without them, more water runs off and less refills the groundwater.
OR (d): The Sun's heat causes evaporation, which lifts water into the air. Unequal heating by the Sun also produces winds that carry the clouds. Without the Sun's energy, the cycle would stop.

15. (a) Testis (testes).
(b) It prevents infections and keeps the body comfortable and healthy. Sanitary products should be changed regularly and disposed of properly.
(c) Any two: it helps adolescents understand the changes in their bodies and not feel anxious about them; it helps them avoid myths and wrong information; it helps them protect themselves from infections; it helps them know when and where to seek medical help.
OR (d): Any two: they help couples plan the size of their family and the gap between children; they protect the health of the mother by preventing too many pregnancies close together; they help a family care properly for each child.

16. Pollen grains are carried from the anther to the stigma (pollination). A pollen grain on the stigma grows a pollen tube down through the style to the ovule. The male gamete travels down the tube and fuses with the female gamete (egg) in the ovule (fertilisation), forming a zygote. The zygote grows into an embryo. The ovule develops into a seed, and the ovary develops into a fruit. The petals, sepals and stamens usually wither and fall.
OR: Pisces: live in water, breathe through gills, have scales and fins; rohu, shark. **Amphibia:** live both on land and in water, have moist skin without scales; frog, toad. **Reptilia:** have dry scaly skin, most lay eggs with tough shells on land; lizard, snake. **Aves:** have feathers, beaks and wings, and lay hard-shelled eggs; sparrow, crow. **Mammalia:** have hair, and feed their young on milk; human, cow.

Section B

17. Mass number $= 11 + 12 = 23$. **Answer: (b)**

18. Isobars have the same mass number but different atomic numbers. **Answer: (d)**

19. Fog is tiny water droplets spread through air. **Answer: (a)**

20. Chlorine (2, 8, 7) gains one electron to complete its octet, which is why its valency is 1. **Answer: (a)**

21. Thomson described the atom as a sphere of positive charge with electrons embedded in it, like seeds in a watermelon. It was given up because it could not explain Rutherford's alpha scattering results, which showed that the positive charge is packed into a tiny nucleus.

22. Salt $= 12\%$ of 250 g $= 30$ g. Water $= 250 - 30 = 220$ g.

23. Electrons revolve round the nucleus only in certain fixed orbits called shells (energy levels), named K, L, M, N. While an electron stays in one of these orbits, it does not lose energy. Each shell can hold a fixed maximum number of electrons.

24. An ion is a charged particle formed when an atom gains or loses electrons. A cation is positively charged and forms when an atom loses electrons, for example Na^+. An anion is negatively charged and forms when an atom gains electrons, for example Cl^-. Polyatomic ion: SO_4^{2-}, NH_4^+ or OH^- (any one).

25. Total mass of reactants $= 5.3 + 6.0 = 11.3$ g. Total mass of products $= 2.2 + 0.9 + 8.2 = 11.3$ g. The masses are equal, so mass is neither created nor destroyed in the reaction.
OR: Calcium phosphate: $Ca_3(PO_4)_2$. Aluminium sulphate: $Al_2(SO_4)_3$. Ammonium chloride: NH_4Cl. Working, for calcium phosphate: Ca has valency 2 and PO_4 has valency 3. Crossing over the valencies gives $Ca_3(PO_4)_2$.

26. (a) Alum makes the fine mud particles stick together into larger clumps that settle quickly (loading, or coagulation).
(b) Filtration through sand and gravel.
(c) Chlorine kills germs. The water is not a pure substance; it still has dissolved salts and gases, so it is a mixture.
OR (d): Filtration separates insoluble solid particles by passing the mixture through a filter. Centrifugation spins the mixture very fast, so the heavier particles are forced to the bottom. Use: separating cream from milk, or blood cells from plasma in testing labs.

27. (i) Atomicity is the number of atoms in one molecule of an element. O_3: 3; P_4: 4.
(ii) $6(12) + 12(1) + 6(16) = 72 + 12 + 96 = 180$ u.
(iii) $6 + 12 + 6 = 24$ atoms.
OR: (i) R is inactive, because its outer shell is complete with 8 electrons.
(ii) P gives its one outer electron to Q. P becomes P^+ and Q becomes Q^-, and the opposite charges hold them together. Formula: PQ; the bond is ionic. (P is sodium and Q is chlorine, so the compound is NaCl.)

Section C

28. The displacement does not change with time. **Answer: (c)**

29. $KE = \frac{1}{2}mv^2 = \frac{1}{2} \times 4 \times 9 = 18$ J. **Answer: (a)**

30. **Answer: (d) frequency**

31. **Answer: (b)**

32. Each blade is a lever, with the rivet as the fulcrum. **Answer: (c)**

33. 1 kWh $= 1000$ W $\times$ 3600 s $= 3.6 \times 10^6$ J. **Answer: (d)**

34. Both are true, but sound being longitudinal does not explain why it is faster in steel. That depends on the properties of the medium (steel is far more elastic). **Answer: (b)**

35. Speed $= \frac{2\pi r}{t} = \frac{2 \times \frac{22}{7} \times 70}{44} = \frac{440}{44} = 10$ m/s.
Her direction of motion keeps changing, so her velocity keeps changing. A change in velocity means she is accelerating.

36. Inertia is the tendency of an object to stay at rest, or to keep moving with the same velocity. The cricket ball has more inertia because it has more mass, and inertia depends on mass. Example: dust falls out of a carpet when it is beaten, or passengers jerk forward when a bus stops suddenly.
OR: $a = \frac{0-20}{0.1} = -200$ m/s^2. $F = ma = 0.15 \times 200 = 30$ N (opposite to the ball's motion).
Pulling the hands back makes the ball stop over a longer time. The rate of change of momentum is smaller, so the force on his hands is smaller and they hurt less.

37. $\lambda = \frac{v}{f} = \frac{330}{440} = 0.75$ m.
Loudness depends on the amplitude of the wave: a larger amplitude gives a louder sound. Pitch depends on frequency: a higher frequency gives a shriller, higher-pitched sound.

38. (a) $v = u + gt = 0 + 10 \times 3 = 30$ m/s.
(b) $h = ut + \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times 9 = 45$ m.
(c) A straight line from the origin rising to 30 m/s at 3 s (constant acceleration). The area under the graph gives the distance fallen: $\frac{1}{2} \times 3 \times 30 = 45$ m.
OR (d): At the top, $v = 0$. $v^2 = u^2 - 2gh$ gives $0 = 400 - 20h$, so $h = 20$ m. Time $t = \frac{u}{g} = \frac{20}{10} = 2$ s.

39. (i) $W = mgh = 200 \times 10 \times 15 = 30{,}000$ J.
(ii) $P = \frac{30000}{60} = 500$ W.
(iii) Electrical energy used by the motor is changed into potential energy of the water (with some lost as heat and sound).

OR: (i) A fixed pulley changes the direction of the effort: pulling down to lift a load up is easier and safer, because we can use our body weight.
(ii) A single movable pulley has a mechanical advantage of 2, so the effort is $\frac{400}{2} = 200$ N.