Model Paper Complete Solution (2026-2027)

Subject: Science & Technology | Class: 10th (English Medium)

> ***Teacher's Note:*** *Dear students, here is the accurate and detailed solution for your Science model paper. To score well, pay attention to the flow of answers, terminology, and clear diagrams. Science is not just about memorizing, but understanding concepts!*

SECTION - A (OBJECTIVE TYPE QUESTIONS)

Q.1 A solution turns red litmus blue, its pH is likely to be -

(A) Less than 7

(B) 7

(C) More than 7

(D) None of these

Answer: **(C) More than 7**

Explanation: Solutions that turn red litmus blue are basic in nature. The pH value of a basic solution is always greater than 7.

Q.2 Which of the following is a displacement reaction?

(A) $3H_2 + N_2 \rightarrow 2NH_3$

(B) $CaCO_3 \rightarrow CaO + CO_2$

(C) $2AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + 2Ag$

(D) $2H_2 + O_2 \rightarrow 2H_2O$

Answer: **(C) $2AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + 2Ag$**

Explanation: In this reaction, Copper (Cu), being more reactive, displaces Silver (Ag) from its salt solution ($AgNO_3$).

Q.3 Which of the following human activities has resulted in an increase of non-biodegradable substances?

(A) Organic farming

(B) Increase in tree plantation

(C) Use of plastic as packaging material

(D) Composting of kitchen waste

Answer: **(C) Use of plastic as packaging material**

Explanation: Plastics are non-biodegradable, meaning they cannot be broken down by microorganisms, leading to environmental pollution.

Q.4 The function of villi is to -

(A) Decrease surface area of absorption

(B) Increase surface area of absorption

(C) Facilitate digestion

(D) Speed up enzyme action

Answer: **(B) Increase surface area of absorption**

Explanation: Villi are finger-like projections in the inner lining of the small intestine that vastly increase the surface area for the efficient absorption of digested food.

Q.5 What would happen if human blood becomes acidic (low pH)?

(A) Oxygen carrying capacity of haemoglobin is decreased

(B) Oxygen carrying capacity of haemoglobin is increased

(C) RBC count increases

(D) RBC count decreases

Answer: **(A) Oxygen carrying capacity of haemoglobin is decreased**

Explanation: This is known as the Bohr effect. Lower pH (acidic) causes hemoglobin to release oxygen more readily, reducing its ability to carry or bind oxygen efficiently.

Q.6 Centre of reflex action is -

(A) Spinal cord

(B) Cerebrum

(C) Cerebellum

(D) Nerve cell

Answer: **(A) Spinal cord**

Explanation: Reflex actions are sudden, involuntary responses. The spinal cord processes these signals to provide an immediate response without waiting for the brain's input.

Q.7 Name the following compound: H - C(=O) - H

(A) Ethanal

(B) Propanal

(C) Butanal

(D) Methanal

Answer: **(D) Methanal**

Explanation: The compound contains one carbon atom ('meth') and an aldehyde functional group (-CHO, suffix '-al'). Hence, it is Methanal (commonly known as formaldehyde).

Q.8 What is the standard domestic electricity supply in India?

(A) 110V, 50Hz

(B) 220V, 50Hz

(C) 220V, 60Hz

(D) 240V, 60Hz

Answer: **(B) 220V, 50Hz**

Q.9 A metallic wire is stretched in such a way that its new length becomes twice the original length. How does its specific heat capacity (or resistivity) change?

(A) Becomes double

(B) Becomes 4 times

(C) Becomes 8 times

(D) Remains the same

Answer: **(D) Remains the same**

Explanation: Intrinsic properties like specific heat capacity and resistivity depend only on the *nature of the material* and temperature, not on the physical dimensions (length or area) of the wire.

Q.10 Name a mirror that can give an erect and enlarged image of an object -

(A) Concave mirror

(B) Convex mirror

(C) Plane mirror

(D) All of the above

Answer: **(A) Concave mirror**

Explanation: When an object is placed between the pole (P) and the principal focus (F) of a concave mirror, it forms a virtual, erect, and magnified (enlarged) image.

Q.11 Where does fertilization occur in humans?

(A) Ovary

(B) Fallopian Tube

(C) Uterus

(D) Cervix

Answer: **(B) Fallopian Tube**

Q.12 The blood glucose level in a patient was very high. It may be due to inadequate secretion of:

(A) Growth hormone from pituitary gland

(B) Oestrogen from ovary

(C) Insulin from pituitary gland

(D) Insulin from pancreas

Answer: **(D) Insulin from pancreas**

Explanation: Insulin is secreted by the pancreas and regulates blood sugar levels. Its deficiency causes diabetes, leading to high blood glucose.

SECTION - B (VERY SHORT ANSWER TYPE)

Q.13 What is neutralisation reaction? Give an example.

Answer: The reaction between an acid and a base to give a salt and water is known as a neutralisation reaction. In this reaction, the acidic and basic properties mutually cancel each other out.

Example (Chemical Equation):

$\mathrm{HCl\ (Acid) + NaOH\ (Base) \rightarrow NaCl\ (Salt) + H_2O\ (Water)}$

(Hydrochloric acid + Sodium hydroxide → Sodium chloride + Water)

Q.14 What is aqua regia? What is its Use in jewellary industry?

Answer: Aqua regia (Latin for 'royal water') is a freshly prepared mixture of concentrated hydrochloric acid (HCl) and concentrated nitric acid (HNO_3) in the **ratio of 3:1**.

Use in Jewellery Industry: It is a highly corrosive and fuming liquid. It is one of the few reagents that is able to **dissolve noble metals like gold and platinum**. Therefore, jewellers use it to melt, clean, and refine gold ornaments.

Q.15 Terrestrial animals use lungs to breathe while aquatic animals like fishes use gills to absorb dissolved oxygen in water. While Frogs can survive both in water and on land.
(a) How does a frog acquire oxygen while it is underwater?
(b) Why do aquatic animals have a higher breathing rate than terrestrial animals?

Answer:

(a) When underwater, frogs acquire oxygen through their moist, permeable **skin** (cutaneous respiration). Dissolved oxygen from the water diffuses directly through the skin into their blood vessels.

(b) The amount of dissolved oxygen in water is fairly low compared to the amount of oxygen in the air. Therefore, aquatic animals have to breathe at a much faster rate to obtain sufficient oxygen for their body needs compared to terrestrial animals.

Q.16 When some particle (like sand on dust) fall into our eyes, our eyes start to water on their own and we blink to get the particle out of our eyes.
(a) Is the above mentioned reaction involuntary or voluntary? How?
(b) What is the name given to the organ that responds to a stimulus?

Answer:

(a) This reaction is an **involuntary action (specifically, a reflex action)**. It occurs automatically and instantaneously without our conscious thought or control, to protect the eye from damage.

(b) The organ that responds to a stimulus is called an **Effector**. In this case, the eye muscles (for blinking) and the tear glands (for watering) act as the effectors.

Q.17 How does the concentration of hydrogen ions [H_3O^+] change when a solution of an acid is diluted with water?

Answer: When an acid is diluted with water, the volume of the solution increases. As a result, the concentration of hydronium ions [H_3O^+] **decreases per unit volume**. This process weakens the acidic strength of the solution.

Q.18 What is the role of saliva in the digestion of food?

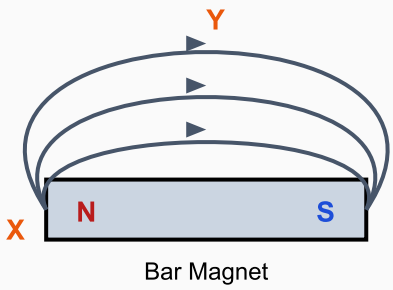
Answer: Saliva plays two main roles in digestion:

1. **Chemical Digestion:** Saliva contains an enzyme called **salivary amylase**, which breaks down complex carbohydrates (starch) present in the food into simpler sugars.
2. **Lubrication:** It wets the food, making it soft, slippery, and easy to chew and swallow down the esophagus.

Q.19 Magnetic field lines are shown in the given diagram. A student makes a statement that the magnetic field at X is stronger than at Y.
(i) Explain with reason if the student's claim is correct.
(ii) Also redraw the diagram and mark the direction of magnetic field lines.

Answer (i): Yes, the student's claim is **correct**.
Reason: The relative strength of a magnetic field is shown by the degree of closeness of the field lines. Since point X is near the pole, the magnetic field lines are crowded (closer together), indicating a stronger magnetic field compared to point Y, where the lines are farther apart.

Answer (ii): Redrawn diagram with directions:
(Note: Outside a magnet, field lines always emerge from the North (N) pole and merge into the South (S) pole.)



Bar Magnet

Q.20 A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Answer: The light ray will bend **towards the normal**.

Reason: Air is an optically rarer medium, whereas water is an optically denser medium. When a ray of light travels from a rarer medium to a denser medium, its speed decreases, causing it to bend towards the normal according to the laws of refraction.

Q.21 Why does sun appear reddish during sunrise?

Answer: During sunrise (and sunset), the sun is near the horizon. Light from the sun has to travel through a much thicker layer of the Earth's atmosphere and cover a longer distance to reach our eyes.

During this long journey, most of the shorter wavelength colors (like blue and violet) are scattered away by the atmospheric particles. Only the longer wavelengths (like red and orange) are able to reach our eyes. This phenomenon is called the **scattering of light**, which makes the sun appear reddish.

SECTION - C (SHORT ANSWER TYPE)

Options for Assertion (A) and Reason (R) questions:
(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.

Q.22 (i) Assertion (A) - Sour taste of curd is due to the presence of lactic acid in it. Reason (R) - During the fermentation of milk lactic acid bacteria convert lactose into lactic acid.

Answer: (a) Both A and R are true and R is the correct explanation of A.
Explanation: Milk contains lactose sugar. When a starter is added, Lactobacillus bacteria ferment the lactose and convert it into lactic acid, which curdles the milk and gives the curd its characteristic sour taste.

Q.22 (ii) Assertion (A) - A compass needle is placed near a current carrying wire. The deflection of the compass needle decreases when the magnitude of the current in the wire is increased.
Reason (R) - The strength of magnetic field at a point near the conductor increases on increasing the current.

Answer: (d) A is false, but R is true.
Explanation: According to Oersted's experiment, when the current in the wire is increased, the strength of the magnetic field also increases (Reason is true). Because the field gets stronger, the deflection of the compass needle should **increase**, not decrease. Hence, the Assertion is false.

Q.22 (iii) Assertion (A) - The gap between two adjacent neurons is called synapse.
Reason (R) - The impulse is transmitted from one neuron to other through synapse.

Answer: (a) Both A and R are true and R is the correct explanation of A.
Explanation: The microscopic gap between the axon terminal of one neuron and the dendrite of the next is the synapse. Nerve impulses cross this gap chemically (via neurotransmitters) to continue their journey.

Q.23 Radha wrote the names of four compounds as the first members of their homologous series: Methanol, Methanal, Methanone, Methanoic Acid. Which name she has written incorrectly? Justify your answer.

Answer: Radha has written the name **"Methanone"** incorrectly.

Justification:
The suffix '-one' represents the Ketone functional group. The formula for the ketone group is **>C=O**, which must be attached to two other carbon atoms on either side.
Since a ketone group requires at least two other carbons surrounding it, the simplest ketone must have a minimum of **3 carbon atoms**.
Therefore, a 1-carbon ketone (Methanone) or a 2-carbon ketone (Ethanone) cannot exist. The first member of the ketone homologous series is actually **Propanone (Acetone)**.

OR: A mixture of oxygen and ethyne is burnt for welding. Can you tell why mixture of ethyne and air is not used?

Answer: Welding metals requires extremely high temperatures to melt them properly.

When ethyne (acetylene) is burnt in pure oxygen, it undergoes complete combustion to produce a very hot blue flame (oxy-acetylene flame) with temperatures around 3000°C, which is ideal for welding.

However, air contains a large amount of inert nitrogen gas (approx. 78%). If air is used instead of pure oxygen, this nitrogen absorbs much of the heat, leading to incomplete combustion and a cooler, sooty flame. This lower temperature is not sufficient to melt metals for welding.

Q.24 Label the parts A, B, C and D of following diagram (Neuron).

Answer: The labelled parts of the neuron (nerve cell) are:

- **A - Dendrite:** These are branching, thread-like structures that receive impulses (information) from other neurons.
- **B - Cell Body (Soma):** The main part of the cell containing the nucleus and cytoplasm.
- **C - Axon:** A long fiber that transmits electrical impulses away from the cell body.
- **D - Nerve Ending (Axon Terminal):** The endpoints that release chemicals to transmit the impulse across the synapse to the next cell.

Q.25 (a) Why are household appliances connected in parallel instead of series?
(b) What happens to the total resistance of a circuit when more appliances are added in parallel?

Answer:

(a) Reasons for connecting in parallel:

1. **Independent Operation:** If one appliance stops working or is switched off, the other appliances continue to work normally because their circuit is not broken.
2. **Same Voltage:** In a parallel circuit, every appliance gets the same potential difference (usually 220V from the mains supply), allowing them to operate at their rated power.
3. **Separate Switches:** Each appliance can have its own independent switch.

(b) Effect on Total Resistance:
When more appliances are added in parallel, the **total (equivalent) resistance of the circuit decreases**. This is because adding more parallel paths gives the current multiple routes to flow, effectively increasing the overall conductivity of the circuit.

Q.26 Study the food chain given below:
Leaf → Caterpillar → Chameleon → Mongoose → Snake
(a) If the amount of energy available at the third trophic level is 100 Joules, then how much energy will be available at producer level? Justify your answer.
(b) Is it possible to have 2 more trophic levels in this food chain just before the Fourth trophic level? Justify your answer.

Answer:

(a) According to Lindeman's 10% Law: Only 10% of the energy is transferred from one trophic level to the next. The rest is lost as heat to the environment.
Energy at 3rd trophic level (Chameleon) = 100 Joules (J)
This is 10% of the 2nd level. So, 2nd level (Caterpillar) = 100 J × 10 = 1000 J
This is 10% of the 1st level. So, 1st level / Producer (Leaf) = 1000 J × 10 = **10,000 Joules (J)**
Therefore, **10,000 J of energy** will be available at the producer level.

(b) Is it possible to have 2 more trophic levels?
No, it is not possible. Natural food chains generally consist of only 3 to 4, or at most 5 trophic levels. Because 90% of energy is lost at each step, adding two more levels would leave virtually zero energy for the higher trophic levels to survive.

SECTION - D (LONG ANSWER TYPE)

Q.27 (A) Three solutions A, B and C when tested with universal Indicator showed pH as 7, 11 and 5 respectively. Which solution is (i) Neutral (ii) Acidic? (iii) Arrange the pH in increasing Hydrogen ion concentration.

Answer:
Given: pH of A = 7, B = 11, C = 5.

(i) Neutral: Solution A. (Pure water and neutral solutions have a pH of exactly 7.)

(ii) Acidic: Solution C. (Solutions with a pH less than 7 are acidic.)

(iii) Increasing order of Hydrogen ion [H^+] concentration:

Remember: The **lower** the pH value, the **higher** the hydrogen ion [H^+] concentration.
So, arranging from lowest concentration to highest:
Solution B (pH 11) < Solution A (pH 7) < Solution C (pH 5)

Q.27 (B) Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

Answer: Formation of Micelle: A soap molecule has two ends—a hydrophobic (water-repelling) hydrocarbon tail and a hydrophilic (water-attracting) ionic head.
When soap is added to water, the hydrophobic tails try to escape the water by clustering inwards, while the hydrophilic heads point outwards towards the water. This spherical cluster of soap molecules is called a **Micelle**.

Will it form in Ethanol?
No, a micelle will not be formed in ethanol. The hydrophobic hydrocarbon tail of the soap molecule is completely soluble in organic solvents like ethanol. Because the soap molecules dissolve fully, they do not need to form specialized clusters (micelles) to hide from the solvent.

Q.27 (OR): Explain the importance of pH in everyday life.

Answer: The pH scale plays a highly crucial role in our everyday life. Some key importances are:

1. **Sensitivity of Plants and Animals:** The human body works optimally within a narrow pH range of 7.0 to 7.8. Similarly, aquatic organisms need specific pH levels in river water to survive.
2. **Acid Rain:** When the pH of rainwater drops below 5.6, it is called acid rain. When this acidic water flows into rivers, it lowers the pH of the river water, making the survival of aquatic life very difficult.
3. **pH in our Digestive System:** Our stomach produces hydrochloric acid (pH ~ 1.2) to help digest food. During indigestion, the stomach produces excess acid, causing pain and irritation. To cure this, we use mild bases called **antacids** (like Milk of Magnesia) to neutralize the excess acid.
4. **pH as the cause of Tooth Decay:** Tooth decay starts when the pH of the mouth falls below 5.5. Bacteria in the mouth degrade leftover food particles and produce acids. This corrodes the tooth enamel. Using basic toothpastes helps neutralize these acids.
5. **Soil pH for Plant Growth:** Plants require a specific pH range for healthy growth. If the soil becomes too acidic, farmers treat it with bases like quicklime (CaO); if it's too alkaline, they use organic manure or gypsum.

Q.28 Hema bought some unripe tomatoes and left half of them in a brown paper bag and left the other half in an open tray. After two days, the tomatoes in the paper bag had ripened, but the ones in the open tray had not.
(a) Which hormone facilitated the ripening of tomatoes?
(b) Why did the tomatoes in the paper bag ripen faster?
(c) What will be the effect on ripening of mangoes if kept in a brown paper bag?

Answer:

(a) The plant hormone that facilitated the ripening of tomatoes is **Ethylene**. It is a gaseous hormone primarily responsible for fruit ripening.

(b) When tomatoes are placed in a closed brown paper bag, the 'ethylene gas' they naturally release gets trapped inside. This rapidly increases the concentration of ethylene around the fruits, causing them to ripen much faster than the ones in the open tray (where the gas escapes into the room air).

(c) If mangoes are kept in a brown paper bag, their ripening process will also be **accelerated**. Mangoes are climacteric fruits that produce ethylene. The bag will trap the gas, helping the mangoes ripen faster and more evenly.

Q.28 (OR): Explain the Human digestive system in detail with a well-labelled diagram.

Answer: Human Digestive System

The human digestive system consists of the alimentary canal and its associated digestive glands. Its main function is to break down complex food components into simpler, absorbable molecules. The key organs are:

[Space for Labelled Diagram - Human Digestive System]
(Students should draw the diagram showing Mouth, Oesophagus, Stomach, Liver, Pancreas, Small Intestine, and Large Intestine clearly as per the NCERT book.)

1. **Mouth (Buccal Cavity):** Digestion begins here. Teeth crush the food. The salivary glands secrete saliva, which contains **salivary amylase**. This enzyme starts breaking down starch into simple sugars.
2. **Oesophagus (Food Pipe):** It is a muscular tube connecting the mouth to the stomach. It pushes the food downward via rhythmic muscle contractions called **peristaltic movements**.
3. **Stomach:** A J-shaped muscular bag. Its inner lining secretes gastric juice containing **Hydrochloric acid (HCl)**, pepsin (enzyme), and mucus. HCl creates an acidic medium for pepsin to digest proteins and kills harmful bacteria. Mucus protects the stomach lining from the acid.
4. **Liver and Gall Bladder:** The liver is the largest gland. It secretes **Bile juice**, stored in the gall bladder. Bile makes the food alkaline and breaks down large fat globules into smaller ones (Emulsification).
5. **Pancreas:** Situated below the stomach, it secretes pancreatic juice containing enzymes like trypsin (for digesting proteins) and lipase (for fats).
6. **Small Intestine:** This is the site of **complete digestion** of carbohydrates, proteins, and fats. Its inner walls have numerous finger-like projections called **villi**, which absorb the digested food into the blood.

7. **Large Intestine:** Undigested food is sent here. The large intestine absorbs excess **water** from this material. The remaining solid waste is stored in the rectum and expelled via the anus.

Q.29 Describe the structure and functions of different parts of Human eye with a well-labelled diagram.

Answer: Human Eye

The human eye is an extremely valuable and sensitive sense organ that enables us to see the colorful world around us. It acts like a camera. The eyeball is approximately spherical with a diameter of about 2.3 cm.

[Space for Labelled Diagram - Human Eye]
(Students should draw a neat diagram indicating Cornea, Iris, Pupil, Crystalline Lens, Retina, and Optic Nerve.)

Major Parts and their Functions:

- **1. Cornea:** It is the transparent, bulging outer surface of the eye. Most of the refraction (bending) for the light rays entering the eye occurs at the outer surface of the cornea.
- **2. Iris:** A dark muscular diaphragm located behind the cornea. It determines the color of the eye and **controls the size of the pupil**.
- **3. Pupil:** The small opening in the center of the iris. It **regulates and controls the amount of light** entering the eye (shrinking in bright light and expanding in dim light).
- **4. Crystalline Lens:** A transparent, flexible, convex lens located behind the pupil. It focuses light to form a real and inverted image on the retina. Ciliary muscles help the lens change its focal length (Power of Accommodation).
- **5. Retina:** It is a delicate light-sensitive membrane at the back of the eye. It acts as a screen and contains numerous light-sensitive cells (rods and cones) which get activated and generate electrical signals.
- **6. Optic Nerve:** It carries the electrical signals generated by the retina to the brain. The brain interprets these signals so we perceive objects as they are.

Q.29 (OR): An electric lamp, whose resistance is 20 Ω, and a conductor of 4 Ω resistance are connected to a 6V battery as shown in figure. Calculate:
(a) the total resistance of the circuit,
(b) the current through the circuit, and
(c) the potential difference across the electric lamp and conductor.

Answer: Numerical Solution

Given:

Resistance of the electric lamp (R_1) = 20 Ω

Resistance of the conductor (R_2) = 4 Ω

Total potential difference of the battery (V) = 6 V

Since they are connected end-to-end in a single loop, this is a **Series Combination**.

(a) Total Resistance of the Circuit (R):

In a series circuit, total resistance $R = R_1 + R_2$

$R = 20\ \Omega + 4\ \Omega$

R = 24 Ω

Thus, the total resistance of the circuit is 24 ohms.

(b) Total Current through the Circuit (I):

According to Ohm's Law, $V = I \times R$

Therefore, Current, $I = V / R$

$I = 6 / 24$

$I = 1 / 4$

I = 0.25 A (Ampere)

Thus, the current flowing through the circuit is 0.25 Ampere.

(c) Potential Difference across the Lamp and Conductor:

In a series circuit, the current (0.25 A) remains the same throughout, but the potential difference splits across the components.

Potential difference across the Electric Lamp (V_1):

$V_1 = I \times R_1$

$V_1 = 0.25 \times 20$

V_1 = 5 V (Volts)

Potential difference across the Conductor (V_2):

$V_2 = I \times R_2$ $V = 0.25 \times 4$

2

V_2 = 1 V (Volts)

(Verification: Total V = V_1 + V_2 = 5V + 1V = 6V, which matches the battery voltage.)

All the Best!

This concludes the complete and detailed English Medium solution for your Science Model Paper. Keep practicing regularly, write down important points, and success will surely be yours!