RAMAN SPACE MANTHAN | DEPARTMENT OF NUCLEAR PHYSICS (ISSI)

Grade 7 Science: Comprehensive Study Notes & MCQ Bank

Aligned with Revised NCERT Curriculum | Standard Level Question Bank

Mentor: Prof. Dr. Yuvraj Gaikwad
Subject: Science (Grade 7)
Official Portal: www.ramanspacemanthan.com
Target: Concept Mastery & Assessment

NCERT GRADE 7 SCIENCE • CHAPTER 1

The Ever Evolving World of Science

I. Key Concepts & Chapter Summary

- Science is a systematic and organized enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe.
- Scientific Inquiry involves observation, hypothesis formulation, experimentation, data analysis, and drawing evidence-based conclusions.
- Interdisciplinary Nature: Modern science integrates physics, chemistry, biology, space sciences, and engineering to solve real-world global problems.
- Ethical Practice in Science: Emphasizes accuracy, honesty, peer review, reproducible results, and responsible technological applications.

II. Essential Keywords & Definitions

Scientific Method: A structured step-by-step process of learning through observation, testing, and experimentation.

Hypothesis: A testable and proposed explanation for a physical or natural phenomenon.

Empirical Evidence: Information acquired by observation or experimentation that validates scientific claims.

Peer Review: Evaluation of scientific work by other experts in the same field before publication.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. What is the primary foundation of scientific knowledge?

(A) Blind belief
(B) Empirical evidence and testing
(C) Historical rumors
(D) Personal opinions

Q2. Which step usually comes first in a scientific investigation?

(A) Drawing conclusions
(B) Formulating a hypothesis
(C) Making observations
(D) Publishing results

Q3. A tentative, testable statement explaining an observation is called a:

(A) Law
(B) Hypothesis
(C) Theory
(D) Fact

Q4. Why is peer review important in science?

(A) To increase textbook cost
(B) To ensure validity and credibility
(C) To hide errors
(D) To speed up printing

Q5. Which field combines principles of biology and space science?

(A) Astrophysics
(B) Astrobiology
(C) Geology
(D) Petrology

Q6. What makes an experiment scientifically reliable?

(A) High cost
(B) Reproducibility
(C) Single trial execution
(D) Complex apparatus

Q7. A well-substantiated explanation of some aspect of the natural world based on a body of facts is a:

(A) Scientific Theory
(B) Hypothesis
(C) Guess
(D) Opinion

Q8. Which variable is intentionally changed by the experimenter?

(A) Dependent variable
(B) Independent variable
(C) Controlled variable
(D) Constant

Q9. The variable that is measured during an experiment is the:

(A) Independent variable
(B) Dependent variable
(C) Fixed variable
(D) Manipulated variable

Q10. Maintaining fixed conditions across experimental setups ensures a:

(A) Fair test
(B) Biased result
(C) Negative outcome
(D) Random output

Q11. Quantitative observations involve:

(A) Colors and textures
(B) Numerical measurements
(C) Personal tastes
(D) Aesthetic appeals

Q12. Qualitative observations are based on:

(A) Exact lengths
(B) Descriptive qualities
(C) Numerical scales
(D) Weight measurements

Q13. Which tool is best for measuring small liquid volumes precisely?

(A) Graduated cylinder
(B) Beaker
(C) Bucket
(D) Dropper

Q14. Scientific laws describe:

(A) Why things happen
(B) What happens consistently under specific conditions
(C) Guessed outcomes
(D) Unverifiable events

Q15. Which of the following is NOT a characteristic of scientific thinking?

(A) Skeptical inquiry
(B) Objectivity
(C) Dogmatic belief
(D) Open-mindedness

Q16. What is the primary role of control groups in experiments?

(A) To waste materials
(B) To provide a baseline for comparison
(C) To guarantee positive results
(D) To replace data

Q17. Data presented in graphs and tables helps scientists to:

(A) Hide facts
(B) Identify patterns and trends
(C) Confuse readers
(D) Reduce accuracy

Q18. Which instrument is used to study microscopic cellular structures?

(A) Telescope
(B) Microscope
(C) Barometer
(D) Periscope

Q19. In science, an inference is:

(A) A direct measurement
(B) A logical interpretation based on prior knowledge
(C) A physical tool
(D) A mathematical law

Q20. Ethical practice in scientific research requires:

(A) Fabrications
(B) Plagiarism
(C) Honesty and proper citation
(D) Secrecy

Q21. Which of these is a physical science?

(A) Botany
(B) Zoology
(C) Chemistry
(D) Ecology

Q22. Which of these is a life science?

(A) Genetics
(B) Astronomy
(C) Geology
(D) Mechanics

Q23. What leads to the modification of an existing scientific theory?

(A) New reproducible evidence
(B) Popular votes
(C) Authority demand
(D) Time passage

Q24. Which unit is standard for measuring length in the SI system?

(A) Inch
(B) Centimeter
(C) Meter
(D) Foot

Q25. Why do scientists use standard SI units worldwide?

(A) For seamless global collaboration
(B) To make math harder
(C) By coincidence
(D) To avoid decimals

Q26. A predictions in science is:

(A) A magical forecast
(B) An expected outcome based on evidence
(C) A wild guess
(D) A past event record

Q27. Technology is best described as:

(A) Pure science
(B) Applied science to solve practical problems
(C) Manual labor
(D) Computer gaming

Q28. Which attitude is vital for a scientist?

(A) Curiosity and perseverance
(B) Arrogance
(C) Hasty generalizations
(D) Rigidity

Q29. A balance scale measures:

(A) Volume
(B) Mass
(C) Temperature
(D) Time

Q30. Scientific communication is conducted through:

(A) Research papers and conferences
(B) Private secret letters
(C) Unverified blogs
(D) Social media posts

IV. Answer Key — Chapter 1

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	C	B	B	B	B	A	B	B	A

Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
B	B	A	B	C	B	B	B	B	C
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
C	A	A	C	A	B	B	A	B	A

NCERT GRADE 7 SCIENCE • CHAPTER 2

Exploring Substances: Acidic, Basic and Neutral

I. Key Concepts & Chapter Summary

- Acids are substances that taste sour and turn blue litmus paper red. Examples: Hydrochloric acid, Citric acid, Acetic acid.
- Bases are substances that taste bitter, feel soapy to touch, and turn red litmus paper blue. Examples: Sodium hydroxide, Calcium hydroxide.
- Neutral substances are neither acidic nor basic. They do not alter the color of indicators. Example: Pure water, Common salt solution.
- Indicators are special chemical substances used to test whether a solution is acidic or basic (e.g., Litmus, Turmeric, China rose, Phenolphthalein).
- Neutralization Reaction: Acid + Base → Salt + Water + Heat. Example: HCl + NaOH → NaCl + H2O.

II. Essential Keywords & Definitions

Indicator: A substance that changes color in the presence of an acid or a base.

Neutralization: A chemical reaction between an acid and a base forming salt and water.

Litmus: A natural indicator extracted from lichens.

pH Scale: A scale measuring hydrogen ion concentration to specify acidity or alkalinity (0-14).

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Which of the following tastes sour?

(A) Acids
(B) Bases
(C) Salts
(D) Alkalis

Q2. Litmus indicator is extracted naturally from:

(A) Algae
(B) Fungi
(C) Lichens
(D) Mosses

Q3. What color does blue litmus turn in an acidic solution?

(A) Green
(B) Red
(C) Yellow
(D) Pink

Q4. Bases feel:

(A) Sticky
(B) Soapy and slippery
(C) Rough
(D) Dry

Q5. Which indicator turns deep pink (magenta) in basic solutions?

(A) China rose
(B) Turmeric
(C) Phenolphthalein
(D) Litmus

Q6. Turmeric paper turns which color in contact with a base?

(A) Red
(B) Blue
(C) Green
(D) Colorless

Q7. The reaction between an acid and a base is known as:

(A) Oxidation
(B) Neutralization
(C) Fermentation
(D) Crystallization

Q8. The products of a neutralization reaction are:

(A) Acid and Base
(B) Salt and Water
(C) Gas and Metal
(D) Sugar and Water

Q9. Which acid is present in curd/yogurt?

(A) Acetic acid
(B) Lactic acid
(C) Citric acid
(D) Oxalic acid

Q10. Formic acid is present in:

(A) Citrus fruits
(B) Ant sting
(C) Tamarind
(D) Vinegar

Q11. Vinegar contains which organic acid?

(A) Acetic acid
(B) Tartaric acid
(C) Ascorbic acid
(D) Nitric acid

Q12. Amala and citrus fruits are rich sources of:

(A) Lactic acid
(B) Ascorbic acid (Vitamin C)
(C) Formic acid
(D) Oxalic acid

Q13. Calcium hydroxide is commonly known as:

(A) Slaked lime
(B) Quick lime
(C) Baking soda
(D) Washing soda

Q14. Milk of magnesia contains which base?

(A) Sodium hydroxide
(B) Magnesium hydroxide
(C) Ammonium hydroxide
(D) Potassium hydroxide

Q15. To treat hyperacidity in the stomach, doctors recommend:

(A) Vinegar
(B) Antacids
(C) Lemon juice
(D) Tomato juice

Q16. If soil is too acidic, farmers treat it with:

(A) Organic manure
(B) Quick lime or Slaked lime
(C) Hydrochloric acid
(D) Gypsum

Q17. When soil is too basic, farmers add:

(A) Organic matter (Manure)
(B) Lime
(C) Sodium hydroxide
(D) Chalk

Q18. Factory wastes are neutralized before discharge into water bodies because they contain:

(A) Harmful bases
(B) Harmful acids
(C) Pure water
(D) Excess oxygen

Q19. Phenolphthalein remains colorless in:

(A) Basic solution
(B) Acidic solution
(C) Strong alkali
(D) Soap solution

Q20. Which salt is formed when Sodium Hydroxide reacts with Hydrochloric Acid?

(A) Sodium chloride
(B) Sodium nitrate
(C) Calcium chloride
(D) Magnesium sulphate

Q21. Which of these is a natural indicator?

(A) Phenolphthalein
(B) Methyl orange
(C) China rose extract
(D) Universal indicator solution

Q22. Tamarind and grapes contain:

(A) Tartaric acid
(B) Citric acid
(C) Lactic acid
(D) Formic acid

Q23. Which of the following is neutral?

(A) Distilled water (B) Lime juice
(C) Soap solution (D) Vinegar

Q24. A solution turns red litmus blue. Its nature is:

(A) Acidic (B) Basic
(C) Neutral (D) Corrosive acid

Q25. Window cleaners usually contain:

(A) Ammonium hydroxide (B) Sodium hydroxide
(C) Magnesium hydroxide (D) Calcium hydroxide

Q26. Soap solution is basic because it turns:

(A) Blue litmus red (B) Red litmus blue
(C) Turmeric yellow (D) China rose green

Q27. Which gas is evolved when an acid reacts with active metals?

(A) Oxygen (B) Carbon dioxide
(C) Hydrogen (D) Nitrogen

Q28. Distilled water does not change the color of litmus because it is:

(A) Strongly acidic (B) Strongly basic
(C) Neutral (D) Salt solution

Q29. Spinach contains which acid?

(A) Oxalic acid (B) Formic acid
(C) Acetic acid (D) Tartaric acid

Q30. Neutralization reaction is always accompanied by the evolution of:

(A) Light (B) Heat
(C) Sound (D) Electricity

IV. Answer Key — Chapter 2

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
A	C	B	B	C	A	B	B	B	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
A	B	A	B	B	B	A	B	B	A
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**

C	A	A	B	A	B	C	C	A	B

NCERT GRADE 7 SCIENCE • CHAPTER 3

Electricity: Circuits and Their Components

I. Key Concepts & Chapter Summary

- An Electric Circuit is a closed continuous path through which electric current flows.
- Key Circuit Components: Cell/Battery (Source), Switch (Control device), Wires (Conductors), Bulb/Load (Consumer).
- Heating Effect of Current: When current flows through a high-resistance wire (e.g., Nichrome), electrical energy converts to heat (used in heaters, irons, fuses).
- Magnetic Effect of Current: Electric current flowing through a conductor creates a surrounding magnetic field (Oersted's discovery). Basis of Electromagnets and Electric Bells.
- Electric Fuse: A safety device with a low melting point wire designed to melt and break the circuit during overloading or short-circuiting.

II. Essential Keywords & Definitions

Circuit Diagram: A symbolic graphical representation of an electrical circuit.

Electromagnet: A temporary magnet produced by passing electric current through a coil wound on soft iron.

Fuse: A safety device that protects electrical appliances from excess current flow.

Solenoid: A cylindrical coil of insulated wire acting like a magnet when carrying current.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. In an electric circuit diagram, a longer vertical line in a cell symbol represents:

(A) Negative terminal
(B) Positive terminal
(C) Switch
(D) Filament

Q2. A combination of two or more cells connected together is called a:

(A) Battery
(B) Generator
(C) Transformer
(D) Fuse

Q3. Electric current flows in a circuit only when the switch is in the:

(A) OFF position
(B) ON position
(C) Broken state
(D) Neutral state

Q4. The thin metallic wire inside an incandescent bulb that glows is the:

(A) Filament
(B) Terminal
(C) Fuse wire
(D) Lead wire

Q5. Filament of an electric bulb is made of:

(A) Copper
(B) Tungsten
(C) Iron
(D) Aluminum

Q6. Which of the following converts electrical energy into heat energy?

(A) Electric bell
(B) Electric iron
(C) Electric fan
(D) Telegraph

Q7. The heating element of an electric iron is made of:

(A) Copper wire
(B) Nichrome wire
(C) Silver wire
(D) Rubber

Q8. Who discovered the magnetic effect of electric current?

(A) Michael Faraday
(B) Hans Christian Oersted
(C) Thomas Edison
(D) Benjamin Franklin

Q9. When electric current passes through a wire, it behaves like a:

(A) Insulator
(B) Magnet
(C) Resistor only
(D) Cell

Q10. An electromagnet works on the principle of:

(A) Chemical effect
(B) Magnetic effect of current
(C) Heating effect
(D) Optical effect

Q11. Soft iron core is used in electromagnets because:

(A) It retains magnetism forever
(B) It magnetizes and demagnetizes quickly
(C) It is non-magnetic
(D) It resists current

Q12. An electric fuse is connected in a circuit to prevent:

(A) Low voltage
(B) Damage due to heavy current
(C) Wastage of charge
(D) Shock from switches

Q13. An electric fuse wire must have a:

(A) High melting point
(B) Low melting point
(C) High resistance only
(D) Zero conductivity

Q14. Modern safety device replacing traditional wire fuses in households:

(A) MCB (Miniature Circuit Breaker) (B) Transformer

(C) Capacitor (D) Inverter

Q15. If a circuit is open, current will:

(A) Flow very fast (B) Not flow at all

(C) Cause short circuit (D) Increase voltage

Q16. Which metal is the best conductor of electricity?

(A) Iron (B) Copper

(C) Silver (D) Aluminum

Q17. An electric bell works on the application of:

(A) Heating effect (B) Magnetic effect

(C) Chemical effect (D) Nuclear effect

Q18. Short circuit occurs when:

(A) Direct touch between live and neutral wires (B) Circuit is switch off

(C) Fuse wire melts (D) Voltage drops

Q19. Overloading in a household circuit occurs due to:

(A) Connecting too many appliances to one socket (B) Low current supply

(C) Open switch (D) Using LED bulbs

Q20. Materials that do not allow electric current to pass through are:

(A) Conductors (B) Insulators

(C) Semiconductors (D) Electrolytes

Q21. Which of the following is an insulator?

(A) Copper (B) Rubber

(C) Human body (D) Tap water

Q22. In a circuit symbol, a closed switch represents:

(A) Connected path (B) Disconnected path

(C) Blown fuse (D) High resistance

Q23. Heat produced in a conductor depends on:

(A) Current magnitude (B) Resistance of wire

(C) Time of flow (D) All of these

Q24. Compact Fluorescent Lamps (CFLs) and LEDs are preferred because:

(A) They waste less energy as heat (B) They get hotter

(C) They use high current (D) They melt fuses

Q25. A compass needle near a current-carrying wire:

(A) Deflects (B) Remains still

(C) Rotates continuously (D) Breaks

Q26. Electromagnets are NOT used in:

(A) Electric crane (B) Electric bell

(C) Loudspeakers (D) Plain wooden furniture

Q27. Which mark ensures safety on electrical appliances in India?

(A) Agmark (B) ISI mark

(C) ISO logo (D) Hallmark

Q28. Connecting cells in series means connecting positive of one cell to:

(A) Positive of next (B) Negative of next

(C) Switch directly (D) Ground

Q29. Electric cell converts:

(A) Chemical energy to electrical energy (B) Heat to electrical

(C) Light to heat (D) Sound to electric

Q30. A device used to make or break an electric circuit is:

(A) Resistor (B) Switch

(C) Fuse (D) Galvanometer

IV. Answer Key — Chapter 3

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	A	B	A	B	B	B	B	B	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
B	B	B	A	B	C	B	A	A	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
B	A	D	A	A	D	B	B	A	B

The World of Metals and Non-Metals

I. Key Concepts & Chapter Summary

- Physical Properties of Metals: Malleable (can be beaten into thin sheets), Ductile (drawn into wires), Sonorous (produce ringing sound), Good conductors of heat and electricity, Metallic lustre.
- Physical Properties of Non-Metals: Non-malleable, Non-ductile, Dull appearance (except Iodine/Diamond), Poor conductors of heat and electricity.
- Chemical Reactions: Metals react with oxygen to form basic metallic oxides. Non-metals form acidic or neutral oxides.
- Reactivity Series & Displacement: A more reactive metal displaces a less reactive metal from its salt solution (e.g., $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$).
- Corrosion: Gradual degradation of metals due to environmental gases and moisture (e.g., Rusting of iron: $4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$).

II. Essential Keywords & Definitions

Malleability: Property of metals enabling them to be hammered into thin sheets without breaking.

Ductility: Property allowing metals to be drawn into thin long wires.

Displacement Reaction: Reaction where a more reactive metal replaces a less reactive metal from its compound.

Sonorous: Property of producing a deep or ringing sound when struck.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Which property allows metals to be hammered into thin sheets?

(A) Ductility
(B) Malleability
(C) Sonority
(D) Lustre

Q2. Which metal exists in liquid state at room temperature?

(A) Sodium
(B) Mercury
(C) Potassium
(D) Gallium

Q3. Which non-metal is a liquid at room temperature?

(A) Chlorine
(B) Bromine
(C) Iodine
(D) Sulfur

Q4. Property by which metals can be drawn into wires is called:

(A) Malleability
(B) Ductility
(C) Conductivity
(D) Hardness

Q5. Which non-metal is a good conductor of electricity?

(A) Diamond
(B) Graphite
(C) Sulfur
(D) Phosphorus

Q6. Metals generally react with oxygen to produce oxides that are:

(A) Acidic
(B) Basic
(C) Neutral
(D) Amphoteric only

Q7. Non-metallic oxides dissolved in water turn blue litmus paper:

(A) Red
(B) Blue
(C) Green
(D) Yellow

Q8. Which soft metal can be easily cut with a butter knife?

(A) Iron
(B) Sodium
(C) Copper
(D) Aluminum

Q9. Which non-metal is stored under water because it reacts vigorously with air?

(A) Sulfur
(B) Yellow/White Phosphorus
(C) Carbon
(D) Silicon

Q10. Sodium and Potassium are stored in kerosene because they react violently with:

(A) Air and Moisture
(B) Kerosene
(C) Glass
(D) Oil

Q11. Which gas is liberated when metals react with acids?

(A) Oxygen
(B) Carbon dioxide
(C) Hydrogen
(D) Nitrogen

Q12. Pop sound test confirms the presence of:

(A) Oxygen gas
(B) Hydrogen gas
(C) Chlorine gas
(D) Carbon dioxide

Q13. When Zinc is added to Copper Sulphate solution, the blue color changes to:

(A) Green
(B) Colorless
(C) Red
(D) Yellow

Q14. In the reaction Fe + CuSO4 -> FeSO4 + Cu, Iron displaces Copper because Iron is:

(A) Less reactive
(B) More reactive
(C) A non-metal
(D) Equal in reactivity

Q15. Can Copper displace Iron from Iron Sulphate solution?

(A) Yes
(B) No
(C) Only on heating
(D) Only in sunlight

Q16. Which metal is used for galvanization of iron sheets?

(A) Copper
(B) Zinc
(C) Tin
(D) Silver

Q17. Rusting of iron requires the presence of both:

(A) Air and Water/Moisture
(B) Nitrogen and Sunlight
(C) Carbon dioxide and Soil
(D) Acid and Base

Q18. Which metal is hardest naturally occurring substance?

(A) Iron
(B) Diamond (Carbon non-metal)
(C) Platinum
(D) Titanium

Q19. Metals produce a ringing sound when struck; this property is called:

(A) Acoustic
(B) Sonorous
(C) Resonant
(D) Lustrous

Q20. Which non-metal possesses natural lustre?

(A) Sulfur
(B) Iodine
(C) Carbon
(D) Oxygen

Q21. Aluminium foils are widely used for packaging food because of high:

(A) Ductility
(B) Malleability
(C) Magnetism
(D) Melting point

Q22. Which of the following is NOT a property of non-metals?

(A) Brittle
(B) Poor conductor
(C) Sonorous
(D) Non-malleable

Q23. Copper vessels form a greenish coating on exposure to moist air consisting of:

(A) $Cu(OH)_2$ and $CuCO_3$
(B) CuO
(C) $CuSO_4$
(D) $CuCl_2$

Q24. Which metal is most reactive among the following?

(A) Gold
(B) Silver
(C) Potassium
(D) Copper

Q25. Which metal is least reactive and found in noble state?

(A) Sodium (B) Magnesium
(C) Gold (D) Zinc

Q26. Sulfur dioxide dissolved in water forms:

(A) Sulfuric acid (B) Sulfurous acid
(C) Sulfur trioxide (D) Hydrogen sulfide

Q27. Which alloy is made of Copper and Zinc?

(A) Bronze (B) Brass
(C) Steel (D) Duralumin

Q28. Which metal is used in electric transmission lines due to high conductivity and light weight?

(A) Lead (B) Aluminum
(C) Mercury (D) Iron

Q29. Non-metals generally do NOT react with:

(A) Oxygen (B) Water
(C) Acids (D) Both B and C

Q30. Stainless steel is made by mixing Iron with Chromium, Nickel and:

(A) Carbon (B) Copper
(C) Lead (D) Zinc

IV. Answer Key — Chapter 4

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	B	B	B	B	A	B	B	A
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
C	B	B	B	B	B	A	B	B	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
B	C	A	C	C	B	B	B	D	A

NCERT GRADE 7 SCIENCE • CHAPTER 5

Changes Around Us: Physical and Chemical

I. Key Concepts & Chapter Summary

- Physical Changes: Changes in shape, size, state, or color where NO new chemical substance is formed. Generally reversible (e.g., Melting of ice, glowing of electric bulb).
- Chemical Changes: Changes in which one or more NEW substances with distinct properties are formed. Irreversible and accompanied by energy changes (heat, light, sound, gas evolution).
- Examples of Chemical Changes: Rusting of iron, burning of magnesium ribbon, digestion of food, curdling of milk.
- Crystallization: A process of obtaining pure solids in large crystalline form from their solutions. Physical change.
- Prevention of Rusting: Painting, greasing, galvanization (coating iron with zinc), alloying (stainless steel).

II. Essential Keywords & Definitions

Physical Change: A change altering physical properties without forming new chemical substances.

Chemical Change: A chemical transformation resulting in the creation of new substances.

Galvanization: Process of depositing a protective layer of zinc on iron to prevent rusting.

Crystallization: Purification method yielding pure solid crystals from a concentrated solution.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Which of the following is a physical change?

(A) Burning of wood
(B) Melting of ice
(C) Rusting of iron
(D) Cooking of food

Q2. A change in which a new substance is formed is called a:

(A) Physical change
(B) Chemical change
(C) Reversible change
(D) Temporary change

Q3. Which of the following is a chemical change?

(A) Tearing paper
(B) Curdling of milk
(C) Dissolving salt in water
(D) Crushing a can

Q4. Burning of magnesium ribbon in air forms magnesium oxide, which is a:

(A) Physical change
(B) Chemical change
(C) Reversible change
(D) Nuclear change

Q5. Ash of burned magnesium ribbon dissolved in water forms:

(A) Magnesium hydroxide
(B) Magnesium chloride
(C) Magnesium sulfate
(D) Magnesium carbonate

Q6. Magnesium hydroxide turns red litmus paper:

(A) Red
(B) Blue
(C) Green
(D) Yellow

Q7. Reaction between baking soda and vinegar produces bubbles of gas:

(A) Oxygen
(B) Carbon dioxide
(C) Hydrogen
(D) Nitrogen

Q8. When Carbon dioxide is passed through lime water, it turns milky due to formation of:

(A) Calcium carbonate
(B) Calcium hydroxide
(C) Calcium sulfate
(D) Calcium chloride

Q9. Chemical formula of rust is:

(A) FeO
(B) $Fe_2O_3.xH_2O$
(C) $FeSO_4$
(D) $FeCO_3$

Q10. Which process is used to prevent iron pipes from rusting?

(A) Galvanization
(B) Crystallization
(C) Evaporation
(D) Sublimation

Q11. Galvanization involves coating iron with a layer of:

(A) Copper
(B) Zinc
(C) Tin
(D) Silver

Q12. Obtaining large pure crystals of copper sulphate from its solution is called:

(A) Galvanization
(B) Crystallization
(C) Neutralization
(D) Distillation

Q13. Crystallization is an example of a:

(A) Chemical change
(B) Physical change
(C) Biological change
(D) Irreversible change

Q14. Photosynthesis is a:

(A) Physical change
(B) Chemical change
(C) Reversible process
(D) Mechanical process

Q15. Digestion of food in human digestive system is a:

(A) Physical change
(B) Chemical change
(C) Periodic change
(D) Slow physical process

Q16. Which of these signs indicates a chemical change?

(A) Change in color
(B) Gas evolution
(C) Heat/Light absorption or emission
(D) All of these

Q17. Glowing of an electric filament bulb is a:

(A) Physical change
(B) Chemical change
(C) Irreversible change
(D) Permanent change

Q18. Stretching of a rubber band is a:

(A) Reversible physical change
(B) Irreversible chemical change
(C) Chemical process
(D) Permanent change

Q19. Souring of milk is a:

(A) Physical change
(B) Chemical change
(C) Reversible change
(D) Non-chemical change

Q20. Cutting a log of wood into small pieces is a:

(A) Chemical change
(B) Physical change
(C) Both A and B
(D) Biological change

Q21. Boiling of water to form steam is a:

(A) Physical change
(B) Chemical change
(C) Irreversible change
(D) Atomic change

Q22. Explosion of a firecracker is a chemical change because it produces:

(A) Heat and Light
(B) Sound
(C) Unpleasant gases
(D) All of these

Q23. An apple slice turning brown on exposure to air is a:

(A) Physical change
(B) Chemical change
(C) Reversible change
(D) Mechanical change

Q24. Lime water turns milky when CO_2 passes through it. Lime water is chemically:

(A) Calcium carbonate
(B) Calcium hydroxide
(C) Calcium oxide
(D) Sodium hydroxide

Q25. Which metal is alloyed with Iron to make Stainless Steel resistant to rust?

(A) Copper
(B) Chromium and Nickel
(C) Aluminum
(D) Lead

Q26. Dissolving sugar in water is a:

(A) Chemical change
(B) Physical change
(C) Irreversible change
(D) Combustion

Q27. Ripening of fruits is a:

(A) Physical change
(B) Chemical change
(C) Reversible change
(D) Non-spontaneous change

Q28. Formation of clouds is a physical change because it involves:

(A) Evaporation and Condensation of water
(B) Chemical synthesis
(C) Burning
(D) Oxidation

Q29. Rusting of iron in coastal areas is faster because air contains higher:

(A) Nitrogen
(B) Moisture and Salt
(C) Carbon dioxide
(D) Argon

Q30. Baking a cake from flour and eggs is an example of:

(A) Reversible physical change
(B) Irreversible chemical change
(C) Simple mixture
(D) Sublimation

IV. Answer Key — Chapter 5

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	B	B	A	B	B	A	B	A
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
B	B	B	B	B	D	A	A	B	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
A	D	B	B	B	B	B	A	B	B

NCERT GRADE 7 SCIENCE • CHAPTER 6

Adolescence: A Stage of Growth and Change

I. Key Concepts & Chapter Summary

- Adolescence: The period of life between childhood and adulthood (roughly ages 11 to 19) leading to reproductive maturity.
- Puberty: The phase during which human body undergoes physical changes to attain sexual maturity.
- Secondary Sexual Characteristics: Changes such as voice deepening in boys (Adam's apple), facial hair, breast development in girls, height increase.
- Hormonal Control: Endocrine glands secrete chemical messengers (hormones) directly into the bloodstream (Pituitary, Thyroid, Adrenal, Testes, Ovaries).
- Reproductive Health: Balanced diet, personal hygiene, physical exercise, and avoidance of addictive substances (drugs, alcohol) are crucial.

II. Essential Keywords & Definitions

Puberty: Stage of physical maturation where an individual becomes capable of reproduction.

Hormones: Chemical substances secreted by endocrine glands that regulate body functions.

Adam's Apple: Protruding larynx or voice box visible in the neck of growing boys.

Target Site: Specific organ or body part on which a hormone acts.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. The period of growth leading to reproductive maturity is known as:

(A) Childhood
(B) Adolescence
(C) Infancy
(D) Old age

Q2. Adolescence generally begins around age 11 and lasts up to age:

(A) 15
(B) 19
(C) 25
(D) 30

Q3. The onset of puberty is marked by secretion of hormones from:

(A) Sweat glands
(B) Endocrine glands
(C) Exocrine glands
(D) Salivary glands

Q4. The protruding part of the throat/voice box in boys is called:

(A) Larynx
(B) Adam's Apple
(C) Pharynx
(D) Thyroid protrusion

Q5. Which hormone is responsible for male secondary sexual characteristics?

(A) Estrogen
(B) Testosterone
(C) Insulin
(D) Thyroxin

Q6. Which hormone is produced by ovaries to control female sexual characteristics?

(A) Testosterone
(B) Estrogen
(C) Adrenaline
(D) Growth Hormone

Q7. Master endocrine gland that controls other endocrine glands is:

(A) Thyroid
(B) Pituitary gland
(C) Adrenal
(D) Pancreas

Q8. Thyroid gland secretes which hormone?

(A) Insulin
(B) Thyroxin
(C) Adrenaline
(D) Estrogen

Q9. Deficiency of Thyroxin hormone causes which disease?

(A) Diabetes
(B) Goitre
(C) Anemia
(D) Rickets

Q10. Insulin hormone is produced by which gland?

(A) Liver
(B) Pancreas
(C) Pituitary
(D) Adrenal

Q11. Lack of insulin hormone in the body leads to:

(A) Goitre
(B) Diabetes
(C) Gigantism
(D) Scurvy

Q12. Adrenal glands produce adrenaline which helps body adjust to:

(A) Stress and Anger
(B) Digestion
(C) Sleep
(D) Growth

Q13. The legal age for marriage in India is currently:

(A) 18 for girls, 21 for boys
(B) 15 for girls, 18 for boys
(C) 21 for both
(D) 16 for both

Q14. How many pairs of chromosomes are present in human body cells?

(A) 22 pairs
(B) 23 pairs
(C) 24 pairs
(D) 46 pairs

Q15. The sex chromosomes present in a human male cell are:

(A) XX
(B) XY
(C) YY
(D) XO

Q16. The sex chromosomes present in a human female cell are:

(A) XX
(B) XY
(C) YY
(D) XO

Q17. Which parent's sex chromosome determines the sex of an unborn child?

(A) Mother (Egg)
(B) Father (Sperm)
(C) Both equally
(D) Environment

Q18. First menstrual flow that begins at puberty in girls is called:

(A) Menopause
(B) Menarche
(C) Ovulation
(D) Gestation

Q19. Stoppage of menstruation around age 45-50 is known as:

(A) Menarche
(B) Menopause
(C) Fertilization
(D) Lactation

Q20. Rupture and release of a mature egg from ovary is called:

(A) Menstruation
(B) Ovulation
(C) Implantation
(D) Gestation

Q21. A balanced diet for adolescents must include adequate:

(A) Fast food and sodas
(B) Proteins, carbohydrates, fats, vitamins & minerals
(C) Only carbohydrates
(D) Sweets and chips

Q22. Iron-rich food like green leafy vegetables and jaggery prevents:

(A) Goitre
(B) Anemia
(C) Rickets
(D) Night blindness

Q23. Sebaceous glands and sweat glands become highly active during puberty causing:

(A) Acne and pimples
(B) Dry skin
(C) Hair fall
(D) Vision improvement

Q24. Adolescents should strictly say 'NO' to drugs because:

(A) They cause addiction and physical damage
(B) They improve memory
(C) They are expensive
(D) They give energy

Q25. AIDS is caused by a dangerous virus called:

(A) HIV (B) H1N1

(C) Rhinovirus (D) Hepatitis B

Q26. Which of the following is NOT an endocrine gland?

(A) Pituitary (B) Thyroid

(C) Sweat gland (D) Adrenal

Q27. Growth hormone is secreted by:

(A) Thyroid (B) Pituitary

(C) Adrenal (D) Ovary

Q28. Metamorphosis in frogs from tadpole to adult is controlled by thyroxin, requiring presence of:

(A) Sodium (B) Iodine in water

(C) Calcium (D) Iron

Q29. Target sites of hormones are:

(A) Blood vessels (B) Specific body parts/organs

(C) Exocrine ducts (D) Nerves

Q30. Reproductive phase in human females lasts from:

(A) Menarche to Menopause (B) Birth to Death

(C) Puberty to 30 years (D) Infancy to Puberty

IV. Answer Key — Chapter 6

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	B	B	B	B	B	B	B	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
B	A	A	B	B	A	B	B	B	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
B	B	A	A	A	C	B	B	B	A

NCERT GRADE 7 SCIENCE • CHAPTER 7

Heat Transfer in Nature

I. Key Concepts & Chapter Summary

• Heat is a form of energy that flows from a body at a higher temperature to a body at a lower temperature.

- Conduction: Transfer of heat in solids through molecular vibrations without actual movement of particles. Requires medium.
- Convection: Transfer of heat in liquids and gases through actual physical movement of molecules (e.g., Sea breeze and Land breeze).
- Radiation: Transfer of heat energy through electromagnetic waves without requiring any physical medium (e.g., Sun's heat reaching Earth).
- Sea Breeze: Daytime breeze blowing from sea to land due to rapid heating of land. Land Breeze: Nighttime breeze blowing from land to sea.

II. Essential Keywords & Definitions

Conduction: Heat transfer in solids from hotter end to colder end without particle displacement.

Convection: Heat transfer in fluids via bulk motion of warm fluid rising and cold fluid sinking.

Radiation: Heat transfer through vacuum or space by electromagnetic waves.

Thermal Conductor: Material that allows heat to flow easily through it (e.g., Copper, Iron).

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Heat always flows from a body at:

(A) Lower to higher temperature
(B) Higher to lower temperature
(C) Equal temperature
(D) Any direction randomly

Q2. Mode of heat transfer predominant in solids is:

(A) Conduction
(B) Convection
(C) Radiation
(D) Advection

Q3. Mode of heat transfer in liquids and gases is:

(A) Conduction
(B) Convection
(C) Radiation
(D) Reflection

Q4. Heat energy from the Sun reaches the Earth through:

(A) Conduction
(B) Convection
(C) Radiation
(D) Insulation

Q5. Which medium is required for heat transfer by radiation?

(A) Solid medium
(B) Liquid medium
(C) Air
(D) No medium (Vacuum)

Q6. Substances that allow heat to pass through them easily are called:

(A) Insulators
(B) Conductors
(C) Radiators
(D) Reflectors

Q7. Which of the following is an insulator of heat?

(A) Aluminum
(B) Copper
(C) Wood
(D) Iron

Q8. Sea breeze blows during the:

(A) Day time
(B) Night time
(C) Evening only
(D) Midnight

Q9. Land breeze blows during the:

(A) Day time
(B) Night time
(C) Noon
(D) Morning

Q10. Sea breeze flows from:

(A) Land to Sea
(B) Sea to Land
(C) Sky to Earth
(D) Mountains to Valleys

Q11. Dark-colored clothes are preferred during winter because they:

(A) Absorb more heat
(B) Reflect heat
(C) Are lightweight
(D) Repel cold

Q12. Light-colored clothes are preferred in summer because they:

(A) Absorb heat
(B) Reflect most solar heat
(C) Are waterproof
(D) Store warmth

Q13. Why do stainless steel cooking pans often have copper bottoms?

(A) Copper is cheaper
(B) Copper is a better heat conductor than steel
(C) Copper looks shiny
(D) Steel melts easily

Q14. Thermos flask minimizes heat transfer by:

(A) Conduction
(B) Convection
(C) Radiation
(D) All three modes

Q15. The space between double walls of a vacuum flask is evacuated to prevent heat transfer by:

(A) Conduction and Convection
(B) Radiation only
(C) Evaporation
(D) Sublimation

Q16. Air is a:

(A) Good conductor of heat
(B) Poor conductor (Insulator) of heat
(C) Superconductor
(D) Radiator

Q17. Woolen clothes keep us warm in winter because wool traps air, which acts as an:

(A) Conductor
(B) Insulator
(C) Absorber
(D) Reflector

Q18. SI unit of heat energy is:

(A) Degree Celsius
(B) Joule
(C) Calorie
(D) Kelvin

Q19. Standard device used to measure body temperature precisely:

(A) Barometer
(B) Clinical Thermometer
(C) Anemometer
(D) Manometer

Q20. Range of a clinical thermometer is generally:

(A) 35°C to 42°C
(B) 0°C to 100°C
(C) -10°C to 110°C
(D) 20°C to 50°C

Q21. Normal average temperature of a healthy human body is:

(A) 37°C (98.6°F)
(B) 35°C (95°F)
(C) 40°C (104°F)
(D) 32°C (89.6°F)

Q22. Liquid traditionally used in clinical glass thermometers is:

(A) Water
(B) Alcohol
(C) Mercury
(D) Kerosene

Q23. Why is mercury used in thermometers?

(A) Expands uniformly and does not stick to glass
(B) Cheap
(C) Low boiling point
(D) Colorless

Q24. Laboratory thermometer range is typically:

(A) -10°C to 110°C
(B) 35°C to 42°C
(C) 0°C to 50°C
(D) 100°C to 200°C

Q25. Handle of a cooking utensil is made of wood or plastic because they are:

(A) Conductors
(B) Insulators
(C) Magnetic
(D) Heavy

Q26. In convection, warmer fluid rises up because it becomes:

(A) Denser (B) Less dense

(C) Heavier (D) Solidified

Q27. Which color is the best absorber and best emitter of heat radiation?

(A) White (B) Black

(C) Yellow (D) Silver

Q28. Shiny polished surfaces are good:

(A) Absorbers of heat (B) Reflectors of heat

(C) Conductors of electricity (D) Emitters of light

Q29. Heat transfer by convection cannot occur in:

(A) Water (B) Air

(C) Solids and Vacuum (D) Molten iron

Q30. What happens to temperature of a substance during melting (phase change)?

(A) Increases (B) Decreases

(C) Remains constant (D) Fluctuates

IV. Answer Key — Chapter 7

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	A	B	C	D	B	C	A	B	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
A	B	B	D	A	B	B	B	B	A
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
A	C	A	A	B	B	B	B	C	C

NCERT GRADE 7 SCIENCE • CHAPTER 8

Measurement of Time and Motion

I. Key Concepts & Chapter Summary

- Motion: Change in position of an object with time relative to a fixed reference point.
- Types of Motion: Rectilinear (straight path), Circular (curved/circular path), Periodic (repeats at regular intervals).
- Speed: Distance traveled by an object per unit time. Speed = Distance / Time. SI unit: meter/second (m/s).

- Simple Pendulum: Consists of a small metallic sphere (bob) suspended from a rigid stand by a thread. Exhibits periodic oscillatory motion.
- Time Period: Time taken by a pendulum bob to complete one full oscillation.
- Distance-Time Graph: Visual representation of motion. Straight sloping line indicates uniform speed; curved line indicates non-uniform speed.

II. Essential Keywords & Definitions

Speed: Distance covered per unit time by a moving body.

Time Period: Duration required to complete one complete oscillation of a pendulum.

Uniform Motion: Motion where an object covers equal distances in equal intervals of time.

Odometer: Instrument measuring total distance traveled by a vehicle.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Basic SI unit of speed is:

(A) km/h
(B) m/min
(C) m/s
(D) km/s

Q2. Formula to calculate speed is:

(A) Speed = Distance x Time
(B) Speed = Distance / Time
(C) Speed = Time / Distance
(D) Speed = Distance + Time

Q3. An instrument in vehicles measuring instantaneous speed is:

(A) Odometer
(B) Speedometer
(C) Anemometer
(D) Tachometer

Q4. An instrument measuring total distance traveled by a vehicle is:

(A) Speedometer
(B) Odometer
(C) Barometer
(D) Manometer

Q5. Motion of a simple pendulum is an example of:

(A) Rectilinear motion
(B) Periodic / Oscillatory motion
(C) Rotational motion
(D) Random motion

Q6. Time taken by a pendulum to complete one full oscillation is called its:

(A) Frequency
(B) Amplitude
(C) Time Period
(D) Speed

Q7. Metallic ball suspended in a simple pendulum is called the:

(A) Knot
(B) Bob
(C) Anchor
(D) Weight

Q8. If an object covers equal distances in equal intervals of time, its motion is:

(A) Non-uniform
(B) Uniform
(C) Accelerated
(D) Random

Q9. Distance-time graph for an object moving with uniform speed is a:

(A) Curved line
(B) Straight line inclined to time axis
(C) Horizontal line only
(D) Zig-zag line

Q10. Distance-time graph for a stationary object is a line:

(A) Parallel to time axis
(B) Parallel to distance axis
(C) Sloping upwards
(D) Curved downwards

Q11. Standard SI unit of time is:

(A) Minute
(B) Hour
(C) Second
(D) Day

Q12. 1 km/h is equal to how many m/s?

(A) 5/18 m/s
(B) 18/5 m/s
(C) 1000 m/s
(D) 60 m/s

Q13. To convert speed from m/s to km/h, multiply by:

(A) 5/18
(B) 18/5
(C) 1000
(D) 3600

Q14. Motion of a car moving along a straight flat road is:

(A) Circular motion
(B) Rectilinear motion
(C) Periodic motion
(D) Rotational motion

Q15. Motion of hands of a clock is:

(A) Rectilinear
(B) Periodic and Circular
(C) Random
(D) Oscillatory linear

Q16. A train travels 120 km in 2 hours. Its average speed is:

(A) 240 km/h
(B) 60 km/h
(C) 30 km/h
(D) 100 km/h

Q17. Clocks and watches use periodic motion of:

(A) Pendulums or Quartz crystals
(B) Water flow
(C) Sand glass only
(D) Sun shadows only

Q18. Microsecond is one:

(A) Thousandth of a second
(B) Millionth of a second
(C) Billionth of a second
(D) Hundredth of a second

Q19. Nanosecond is one:

(A) Thousandth of a second
(B) Millionth of a second
(C) Billionth of a second
(D) Tenth of a second

Q20. Historical device measuring time based on shadow cast by Sun:

(A) Sundial
(B) Clepsydra
(C) Hourglass
(D) Quartz clock

Q21. Famous historical sundial 'Jantar Mantar' is located at:

(A) Jaipur and New Delhi
(B) Mumbai
(C) Kolkata
(D) Chennai

Q22. Slope of distance-time graph represents:

(A) Acceleration
(B) Speed
(C) Total Distance
(D) Total Time

Q23. If speed of a car is 15 m/s, distance covered in 10 seconds is:

(A) 1.5 m
(B) 150 m
(C) 1500 m
(D) 25 m

Q24. A pendulum takes 40 seconds to complete 20 oscillations. Its time period is:

(A) 2 seconds
(B) 0.5 seconds
(C) 800 seconds
(D) 20 seconds

Q25. Frequency of oscillation is measured in:

(A) Meter
(B) Second
(C) Hertz (Hz)
(D) Joules

Q26. Number of oscillations per second is called:

(A) Time period
(B) Amplitude
(C) Frequency
(D) Velocity

Q27. Distance covered by an object is given by:

(A) Speed / Time
(B) Speed x Time
(C) Time / Speed
(D) Speed + Time

Q28. Motion of a child on a swing is:

(A) Rectilinear
(B) Periodic / Oscillatory
(C) Circular
(D) Non-periodic

Q29. Motion of Earth rotating around its axis is:

(A) Rotational and Periodic
(B) Rectilinear
(C) Random
(D) Oscillatory

Q30. A flat zero-slope distance-time graph implies:

(A) High uniform speed
(B) Accelerated motion
(C) Body is at rest
(D) Decreasing speed

IV. Answer Key — Chapter 8

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
C	B	B	B	B	C	B	B	B	A
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
C	A	B	B	B	B	A	B	C	A
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
A	B	B	A	C	C	B	B	A	C

Life Processes in Animals

I. Key Concepts & Chapter Summary

- Nutrition in Animals: Heterotrophic nutrition involving Ingestion, Digestion, Absorption, Assimilation, and Egestion.
- Human Digestive System: Mouth (Salivary amylase), Oesophagus, Stomach (HCl, Pepsin), Small Intestine (Bile, Pancreatic juice, absorption via Villi), Large Intestine (Water absorption).
- Respiration in Animals: Process of breaking down food (glucose) to release energy. Aerobic (with O2) and Anaerobic (without O2).
- Respiratory Organs across Species: Humans (Lungs), Earthworms (Moist skin), Insects (Spiracles and Trachea), Fish (Gills).
- Circulation & Excretion: Heart pumps blood through arteries and veins. Kidneys filter blood to remove nitrogenous waste (Urea/Uric acid).

II. Essential Keywords & Definitions

Ingestion: Process of taking food into the body.

Peristalsis: Wave-like muscular contractions pushing food along the alimentary canal.

Villi: Finger-like projections in small intestine increasing surface area for absorption.

Spiracles: Tiny respiratory openings on the body sides of insects.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Process of taking food into the body is called:

(A) Digestion
(B) Ingestion
(C) Absorption
(D) Egestion

Q2. Which digestive enzyme present in saliva breaks down starch into simple sugars?

(A) Pepsin
(B) Salivary Amylase
(C) Trypsin
(D) Lipase

Q3. Hydrochloric acid is secreted in the stomach to:

(A) Kill bacteria and create acidic medium
(B) Neutralize base
(C) Digest fats directly
(D) Absorb water

Q4. Digestive juice secreted by Liver stored in Gallbladder is:

(A) Gastric juice
(B) Bile juice
(C) Pancreatic juice
(D) Saliva

Q5. Bile juice plays a key role in digestion of:

(A) Carbohydrates
(B) Fats
(C) Proteins
(D) Vitamins

Q6. Complete digestion and absorption of nutrients occur in the:

(A) Stomach
(B) Small Intestine
(C) Large Intestine
(D) Esophagus

Q7. Finger-like inner projections in small intestine that absorb nutrients are:

(A) Flagella
(B) Villi
(C) Cilia
(D) Pseudopodia

Q8. Large intestine primarily functions to absorb:

(A) Proteins
(B) Fats
(C) Water and essential salts
(D) Glucose

Q9. Removal of undigested semi-solid waste from body via anus is:

(A) Assimilation
(B) Egestion
(C) Excretion
(D) Ingestion

Q10. Amoeba ingests food using temporary projections called:

(A) Tentacles
(B) Pseudopodia (false feet)
(C) Cilia
(D) Siphons

Q11. Grass-eating ruminant animals quickly swallow grass and store it in:

(A) Rumen
(B) Reticulum
(C) Omasum
(D) Abomasum

Q12. Partially digested food brought back from rumen to mouth for chewing is:

(A) Chyme
(B) Cud
(C) Bolus
(D) Bile

Q13. Cellular respiration breaking down glucose WITH oxygen is:

(A) Anaerobic respiration
(B) Aerobic respiration
(C) Fermentation
(D) Photosynthesis

Q14. Anaerobic breakdown of glucose in human muscle cells during strenuous exercise produces:

(A) Carbon dioxide and water
(B) Lactic acid and energy
(C) Alcohol and CO_2
(D) Citric acid

Q15. Accumulation of which substance causes muscle cramps?

(A) Lactic acid (B) Acetic acid

(C) Uric acid (D) Alcohol

Q16. Insects exchange gases through a network of air tubes called:

(A) Gills (B) Tracheae

(C) Lungs (D) Alveoli

Q17. Breathing organ in earthworms is their:

(A) Lungs (B) Gills

(C) Moist and slimy skin (D) Trachea

Q18. Fish breathe underwater using specialized structures called:

(A) Lungs (B) Spiracles

(C) Gills (D) Skin

Q19. Human heart has how many chambers?

(A) Two (B) Three

(C) Four (D) Six

Q20. Blood vessels carrying oxygen-rich blood away from heart to body organs are:

(A) Veins (B) Arteries

(C) Capillaries (D) Vena Cava

Q21. Blood vessels with thin walls carrying CO2-rich blood back to heart are:

(A) Arteries (B) Veins

(C) Aorta (D) Arterioles

Q22. Red color of blood is due to iron-containing pigment called:

(A) Chlorophyll (B) Hemoglobin

(C) Hemocyanin (D) Bilirubin

Q23. Blood cells that defend body against disease-causing germs are:

(A) RBCs (B) WBCs

(C) Platelets (D) Plasma

Q24. Blood clotting at a wound site is assisted by:

(A) RBCs (B) WBCs

(C) Platelets (D) Serum

Q25. Primary excretory organs in human body filtering blood are:

(A) Lungs (B) Liver

(C) Kidneys (D) Skin

Q26. Functional filtering units inside human kidneys are:

(A) Neurons (B) Nephrons

(C) Alveoli (D) Villi

Q27. Nitrogenous waste excreted by birds and reptiles in semi-solid paste form is:

(A) Urea (B) Ammonia

(C) Uric acid (D) Creatinine

Q28. Aquatic animals like fish excrete cellular waste directly as dissolved:

(A) Urea (B) Ammonia

(C) Uric acid (D) Nitrate

Q29. Pulse rate of a normal resting adult human is typically:

(A) 50-60 beats/min (B) 72-80 beats/min

(C) 100-120 beats/min (D) 40-50 beats/min

Q30. The artificial process of filtering blood using a machine in case of kidney failure is:

(A) Transfusion (B) Dialysis

(C) Electrocardiogram (D) Endoscopy

IV. Answer Key — Chapter 9

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	A	B	B	B	B	C	B	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
A	B	B	B	A	B	C	C	C	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
B	B	B	C	C	B	C	B	B	B

Life Processes in Plants

I. Key Concepts & Chapter Summary

- Photosynthesis: Autotrophic nutrition where green plants synthesize glucose using CO2, H2O, sunlight, and chlorophyll. Equation: 6CO2 + 6H2O + Sunlight → C6H12O6 + 6O2.
- Stomata: Tiny pores on leaf surfaces guarded by Guard Cells for gas exchange (CO2/O2) and transpiration.
- Transpiration: Evaporation of excess water from leaf stomata generating Transpiration Pull for water transport.
- Vascular Tissues: Xylem (transports water and minerals upwards) and Phloem (transports food/sugars from leaves to all plant parts).
- Plant Reproduction: Asexual (Vegetative propagation, Budding, Spore formation, Fragmentation) and Sexual (Pollination and Fertilization producing seeds).

II. Essential Keywords & Definitions

Photosynthesis: Process by which green plants manufacture glucose from CO2 and H2O using light.

Transpiration: Loss of water vapor from aerial parts (stomata) of a plant.

Xylem: Vascular tissue transporting water and dissolved minerals from roots.

Phloem: Vascular tissue transporting organic food (sucrose) from leaves to plant parts.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Green pigment in plant leaves essential for capturing light energy is:

(A) Carotene
(B) Xanthophyll
(C) Chlorophyll
(D) Anthocyanin

Q2. Tiny pores on leaf surfaces through which gas exchange occurs are:

(A) Hydathodes
(B) Stomata
(C) Lenticels
(D) Villi

Q3. Stomata openings are regulated and guarded by:

(A) Epidermal cells
(B) Guard cells
(C) Xylem vessels
(D) Companion cells

Q4. By-product gas released into atmosphere during photosynthesis is:

(A) Carbon dioxide
(B) Oxygen
(C) Nitrogen
(D) Methane

Q5. Food manufactured in leaves during photosynthesis is stored as:

(A) Glucose / Starch
(B) Proteins
(C) Fats
(D) Cellulose only

Q6. Vascular tissue transporting water and dissolved minerals from roots upward is:

(A) Phloem
(B) Xylem
(C) Cortex
(D) Pith

Q7. Vascular tissue carrying synthesized food from leaves to all plant parts is:

(A) Xylem
(B) Phloem
(C) Cambium
(D) Epidermis

Q8. Evaporation of water vapor from plant stomata is called:

(A) Respiration
(B) Transpiration
(C) Guttation
(D) Osmosis

Q9. Suction force that pulls water up to tall trees is generated by:

(A) Photosynthesis
(B) Transpiration pull
(C) Respiration
(D) Root growth

Q10. Non-green plants like fungi feed on dead decaying organic matter via:

(A) Autotrophic nutrition
(B) Saprotrophic nutrition
(C) Parasitic nutrition
(D) Insectivorous mode

Q11. Cuscuta (Amarbel) is an example of a:

(A) Autotroph
(B) Saprotroph
(C) Parasite
(D) Insectivore

Q12. Pitcher plant and Venus flytrap are examples of:

(A) Parasites
(B) Insectivorous plants
(C) Saprotrophs
(D) Symbionts

Q13. Symbiotic association between algae and fungi is known as:

(A) Mycorrhiza
(B) Lichen
(C) Rhizobium
(D) Moss

Q14. Bacterium present in leguminous root nodules that fixes atmospheric nitrogen is:

(A) Azotobacter
(B) Rhizobium
(C) Nitrosomonas
(D) E. coli

Q15. Reproduction involving single parent without production of seeds is:

(A) Sexual reproduction
(B) Asexual reproduction
(C) Fertilization
(D) Pollination

Q16. Vegetative propagation in potato occurs through:

(A) Roots
(B) Eyes (Buds on modified stem)
(C) Leaves
(D) Flowers

Q17. Bryophyllum reproduces vegetatively through buds present on its:

(A) Roots
(B) Stem
(C) Leaf margins
(D) Flowers

Q18. Yeast reproduces rapidly by an asexual process called:

(A) Fragmentation
(B) Budding
(C) Spore formation
(D) Binary fission

Q19. Spirogyra (green alga) reproduces asexually by:

(A) Budding
(B) Fragmentation
(C) Spore formation
(D) Seed formation

Q20. Fungi like bread mould reproduce via resistant reproductive structures called:

(A) Buds
(B) Spores
(C) Gametes
(D) Cuttings

Q21. Male reproductive organ of a flower is the:

(A) Pistil
(B) Stamen
(C) Petal
(D) Sepal

Q22. Female reproductive organ of a flower is the:

(A) Stamen
(B) Pistil / Carpel
(C) Anther
(D) Filament

Q23. Anther contains microscopic dust-like particles called:

(A) Ovules
(B) Pollen grains
(C) Eggs
(D) Zygotes

Q24. Transfer of pollen grains from anther to stigma of a flower is:

(A) Fertilization
(B) Pollination
(C) Germination
(D) Transpiration

Q25. Pollination occurring within the same flower or same plant is:

(A) Cross-pollination (B) Self-pollination

(C) Artificial pollination (D) Double fertilization

Q26. Fusion of male gamete with female gamete forms a single-celled:

(A) Embryo (B) Zygote

(C) Seed (D) Fruit

Q27. After fertilization, ovary matures and develops into a:

(A) Seed (B) Fruit

(C) Flower (D) Spore

Q28. After fertilization, ovules inside the ovary develop into:

(A) Fruits (B) Seeds

(C) Petals (D) Stamens

Q29. Seeds of dandelion and maple are dispersed by wind because they are:

(A) Winged or Hairy and lightweight (B) Heavy and fleshy

(C) Spiny with hooks (D) Waterproof

Q30. Seeds of Xanthium and Urena are dispersed by animals because they possess:

(A) Wings (B) Hooks / Spines

(C) Fibrous outer coats (D) Explosive pods

IV. Answer Key — Chapter 10

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
C	B	B	B	A	B	B	B	B	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
C	B	B	B	B	B	C	B	B	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
B	B	B	B	B	B	B	B	A	B

NCERT GRADE 7 SCIENCE • CHAPTER 11

Light, Shadows and Reflections

I. Key Concepts & Chapter Summary

• Rectilinear Propagation of Light: Light travels in a straight line path in a homogeneous medium.

- Transparent, Translucent, and Opaque Objects: Transparent allows full light, translucent allows partial light, opaque blocks light completely.
- Shadow Formation: Opaque object placed in the path of light blocks light rays forming a dark area (shadow). Requires light source, object, and screen.
- Reflection of Light: Bouncing back of light when it strikes a polished reflective surface. Laws of Reflection: Angle of Incidence = Angle of Reflection.
- Spherical Mirrors & Lenses: Concave Mirror (converging, forms real/virtual images, used in searchlights/ dentists), Convex Mirror (diverging, always forms virtual erect diminished image, rear-view mirror), Convex Lens (converging), Concave Lens (diverging).

II. Essential Keywords & Definitions

Rectilinear Propagation: Property of light traveling in straight lines.

Real Image: Image formed by actual intersection of light rays; can be captured on screen.

Virtual Image: Image formed when light rays appear to diverge; cannot be captured on screen.

Lateral Inversion: Apparent left-right reversal of an image in a plane mirror.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Which statement correctly describes the path of light?

(A) Light travels in curved zig-zag loops
(B) Light travels in straight lines
(C) Light travels in circles
(D) Light cannot travel in vacuum

Q2. Speed of light in vacuum/air is approximately:

(A) 3 x 10^8 m/s
(B) 300 m/s
(C) 3 x 10^5 m/s
(D) 3 x 10^10 m/s

Q3. Objects that emit their own light are called:

(A) Non-luminous objects
(B) Luminous objects
(C) Opaque objects
(D) Translucent objects

Q4. Which of the following is a non-luminous object?

(A) Sun
(B) Glow-worm
(C) Moon
(D) Burning candle

Q5. An object through which light passes completely and clearly is:

(A) Opaque
(B) Translucent
(C) Transparent
(D) Reflective

Q6. Butter paper and frosted glass are examples of:

(A) Transparent materials
(B) Translucent materials
(C) Opaque materials
(D) Luminous sources

Q7. To form a distinct shadow, we strictly need:

(A) Light source, opaque object, and screen
(B) Transparent object and water
(C) Only a mirror
(D) Only dark room

Q8. Shadows are always formed on the:

(A) Same side as light source
(B) Opposite side of light source
(C) Top of light source
(D) Perpendicular side

Q9. Image formed by a plane mirror is:

(A) Virtual, erect, and same size as object
(B) Real, inverted, and enlarged
(C) Real, erect, and magnified
(D) Virtual, inverted, and diminished

Q10. Phenomenon where right side of object appears as left side in mirror is:

(A) Refraction
(B) Lateral Inversion
(C) Dispersion
(D) Diffraction

Q11. A pinhole camera forms an image that is:

(A) Erect and real
(B) Real and inverted
(C) Virtual and erect
(D) Virtual and enlarged

Q12. Bouncing back of light into same medium when striking a surface is:

(A) Refraction
(B) Reflection
(C) Dispersion
(D) Absorption

Q13. Which spherical mirror forms a virtual, erect, and diminished image for all positions?

(A) Concave mirror
(B) Convex mirror
(C) Plane mirror
(D) Parabolic mirror

Q14. Rear-view side mirrors of automobiles are always:

(A) Concave mirrors
(B) Convex mirrors
(C) Plane mirrors
(D) Cylindrical mirrors

Q15. Dentists and doctors use which mirror to inspect teeth and inner throat?

(A) Convex mirror
(B) Concave mirror
(C) Plane mirror
(D) Glass plate

Q16. Solar furnaces use large mirrors to concentrate sunlight:

(A) Concave mirrors (B) Convex mirrors
(C) Plane mirrors (D) Convex lenses

Q17. A magnifying glass is made of a:

(A) Concave lens (B) Convex lens
(C) Plane glass sheet (D) Concave mirror

Q18. A lens which is thicker in middle and thinner at edges is a:

(A) Concave lens (B) Convex lens
(C) Cylindrical lens (D) Biconcave lens

Q19. A lens which is thinner in middle and thicker at edges is a:

(A) Convex lens (B) Concave lens
(C) Biconvex lens (D) Plano-convex lens

Q20. Convex lens is also known as a:

(A) Diverging lens (B) Converging lens
(C) Reflecting lens (D) Opaque lens

Q21. Concave lens always forms an image that is:

(A) Real and inverted (B) Virtual, erect, and diminished
(C) Real and magnified (D) Virtual and magnified

Q22. Splitting of white light into its seven constituent colors is called:

(A) Reflection (B) Refraction
(C) Dispersion (D) Scattering

Q23. White light splits into seven colors when passed through a glass:

(A) Slab (B) Prism
(C) Mirror (D) Lens

Q24. The band of seven colors produced by dispersion of white light is:

(A) Spectrum (B) Rainbow line
(C) Beam (D) Ray set

Q25. Sequence of seven colors in white light spectrum is abbreviated as:

(A) VIBGYOR (B) ROYGBIV
(C) GYORVIB (D) VIBGROY

Q26. Newton's disc demonstrated that combination of seven spectrum colors produces:

(A) Black color
(B) Red color
(C) White appearance
(D) Dark green

Q27. Primary optical phenomenon responsible for formation of rainbow in sky:

(A) Reflection only
(B) Dispersion and internal reflection of light by water droplets
(C) Absorption
(D) Diffraction

Q28. An image that CANNOT be obtained on a screen is called a:

(A) Real image
(B) Virtual image
(C) Inverted image
(D) Magnified image

Q29. An image that CAN be captured on a screen is called a:

(A) Virtual image
(B) Real image
(C) Erect image
(D) Lateral image

Q30. Periscope works on the principle of reflection using two plane mirrors inclined at:

(A) 90 degrees
(B) 45 degrees
(C) 60 degrees
(D) 180 degrees

IV. Answer Key — Chapter 11

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	A	B	C	C	B	A	B	A	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
B	B	B	B	B	A	B	B	B	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
B	C	B	A	A	C	B	B	B	B

NCERT GRADE 7 SCIENCE • CHAPTER 12

Earth, Moon and Sun

I. Key Concepts & Chapter Summary

- Earth's Motion: Rotation on axis (24 hours, causes day & night, tilted at 23.5°) and Revolution around Sun (365.25 days, causes seasons).
- The Moon: Earth's natural satellite. Revolves around Earth in ~27.3 days. Phases of Moon occur due to changing relative positions of Earth, Moon, and Sun.

- Eclipses: Solar Eclipse (Moon between Earth and Sun on New Moon) and Lunar Eclipse (Earth between Sun and Moon on Full Moon).
- Gravitational Force & Tides: Gravitational pull of Moon and Sun causes periodic rising and falling of ocean water level (High Tides & Low Tides).
- Solar System & Space Exploration: Sun as central star, 8 planets, satellites, asteroids, comets, and space missions (ISRO Chandrayaan & Aditya-L1).

II. Essential Keywords & Definitions

Rotation: Spinning motion of Earth on its axis taking 24 hours.

Revolution: Orbital movement of Earth around the Sun taking 365.25 days.

Phases of Moon: Varying shapes of illuminated visible portion of Moon as seen from Earth.

Solar Eclipse: Occurs when Moon passes directly between Sun and Earth, blocking sunlight.

III. Multiple Choice Questions (MCQs) — Standard Level (30 Questions)

Q1. Day and night on Earth are caused by Earth's:

(A) Revolution
(B) Rotation on its axis
(C) Precession
(D) Gravitational tilt

Q2. Change of seasons on Earth is caused by Earth's revolution and its:

(A) Spherical shape
(B) Tilted axis of rotation
(C) Distance from Moon
(D) Atmospheric pressure

Q3. Time taken by Earth to complete one full revolution around the Sun is:

(A) 24 hours
(B) 30 days
(C) 365.25 days (1 year)
(D) 12 months exactly

Q4. The Earth's axis is tilted at an angle of approximately:

(A) 23.5 degrees
(B) 45 degrees
(C) 90 degrees
(D) 0 degrees

Q5. Earth's only natural satellite is the:

(A) Sun
(B) Moon
(C) Titan
(D) Phobos

Q6. Time taken by Moon to complete one revolution around Earth is about:

(A) 24 hours
(B) 27.3 days
(C) 365 days
(D) 15 days

Q7. Day on which Moon is completely visible as a full illuminated circle is:

(A) New Moon day (Amavasya)
(B) Full Moon day (Poornima)
(C) Crescent day
(D) Gibbous day

Q8. Day on which Moon is not visible at all in night sky is:

(A) Full Moon day
(B) New Moon day (Amavasya)
(C) First quarter
(D) Third quarter

Q9. Various shapes of bright visible part of Moon seen during a month are:

(A) Eclipse stages
(B) Phases of the Moon
(C) Lunar tides
(D) Orbits

Q10. Moon has no atmosphere and no water, which means:

(A) Sound travels fast
(B) No life or sound propagation exists on Moon
(C) It glows by itself
(D) It has continuous rain

Q11. Who was the first human to step on the Moon's surface in 1969?

(A) Yuri Gagarin
(B) Neil Armstrong
(C) Rakesh Sharma
(D) Buzz Aldrin

Q12. When Moon comes directly between Sun and Earth, blocking sunlight, it causes a:

(A) Lunar Eclipse
(B) Solar Eclipse
(C) Equinox
(D) Solstice

Q13. Solar eclipse occurs only on a:

(A) Full Moon day
(B) New Moon day
(C) First quarter day
(D) Any random night

Q14. When Earth comes directly between Sun and Moon, casting shadow on Moon, it causes a:

(A) Solar Eclipse
(B) Lunar Eclipse
(C) Solar flare
(D) Tide

Q15. Lunar eclipse occurs only on a:

(A) New Moon day
(B) Full Moon day
(C) Crescent Moon day
(D) Half Moon day

Q16. Periodic rise and fall of ocean water level twice a day is called:

(A) Waves
(B) Tides
(C) Currents
(D) Tsunamis

Q17. Ocean tides are primarily caused by gravitational pull of the:

(A) Mars
(B) Moon and Sun
(C) Jupiter
(D) Venus

Q18. Highest tides occurring during New Moon and Full Moon days are:

(A) Neap tides
(B) Spring tides
(C) Low tides
(D) Rip tides

Q19. Lower tides occurring when Moon and Sun are at right angles to Earth are:

(A) Spring tides
(B) Neap tides
(C) High tides
(D) Ebb tides

Q20. Central star of our solar system is the:

(A) Sirius
(B) Sun
(C) Pole Star
(D) Alpha Centauri

Q21. Sun produces massive heat and light energy through nuclear reactions involving:

(A) Nuclear Fusion of Hydrogen into Helium
(B) Coal burning
(C) Chemical combustion
(D) Fission of Uranium

Q22. Which planet is closest to the Sun?

(A) Venus
(B) Mercury
(C) Earth
(D) Mars

Q23. Which planet is known as the 'Red Planet'?

(A) Venus
(B) Jupiter
(C) Mars
(D) Saturn

Q24. Which planet is the largest planet in our solar system?

(A) Saturn
(B) Jupiter
(C) Neptune
(D) Uranus

Q25. Small rocky bodies orbiting Sun between Mars and Jupiter form the:

(A) Kuiper belt
(B) Asteroid belt
(C) Oort cloud
(D) Saturn rings

Q26. Celestial object made of ice and dust with a glowing tail pointing away from Sun:

(A) Asteroid
(B) Comet
(C) Meteorite
(D) Black hole

Q27. India's successful lunar mission that landed near Moon's South Pole in 2023 was:

(A) Chandrayaan-1 (B) Chandrayaan-2

(C) Chandrayaan-3 (D) Mangalyaan

Q28. India's solar observatory mission launched to study the Sun in 2023 was:

(A) Aditya-L1 (B) Gaganyaan

(C) Astrosat (D) NISAR

Q29. Pole Star (Dhruva Tara) appears stationary in night sky because it lies above Earth's:

(A) Equator (B) Axis of rotation (North Pole)

(C) South Pole (D) Tropic of Cancer

Q30. Light from Sun takes approximately how long to reach Earth?

(A) 8 seconds (B) 8 minutes and 20 seconds

(C) 8 hours (D) 24 hours

IV. Answer Key — Chapter 12

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	C	A	B	B	B	B	B	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
B	B	B	B	B	B	B	B	B	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
A	B	C	B	B	B	C	A	B	B