PART-A: PHYSICS

I. Multiple Choice Questions (2×1=2)

1. Instrument to measure potential difference:

- **Answer: (C) Voltmeter, in parallel connection**
- Explanation: Voltmeter measures potential difference and is always connected in parallel across the component.

2. Lens identification from magnification table:

- **Answer: (B) A; convex lens and B; concave lens**
- Explanation: Convex lens produces negative magnification (real image), concave lens produces positive magnification less than 1 (virtual, diminished image).

II. Short Answer Questions (2×1=2)

3. Right Hand Thumb Rule:

- If you hold a current-carrying conductor in your right hand such that the thumb points in the direction of current, then the curled fingers indicate the direction of the magnetic field around the conductor.

4. Symbol diagram of Variable Resistance (Rheostat):

plain

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—/\/\/\/\—
↑     ↓
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Arrow indicating variable contact

Or standard circuit symbol: A resistor symbol with an arrow across it (↗)

III. Short Answer Questions (3×2=6)

5. Factors affecting resistance of a conductor:

- Length of the conductor ($R \propto L$)
- Cross-sectional area ($R \propto 1/A$)
- Nature of material (resistivity ρ)
- Temperature

6. Definitions:

- **i) Tyndall effect:** The phenomenon of scattering of light by colloidal particles in a medium, making the path of light visible.

- **ii) Dispersion of light:** The splitting of white light into its constituent colors (spectrum) when passed through a prism.

7. Direction of force on electron:

- **Direction:** Perpendicular to both magnetic field and velocity, acting **into the page/screen** (downward if electron moves up and field is leftward)
- **Justification:** Using Fleming's Left-Hand Rule (modified for negative charge). Electron moves upward (conventional current downward), magnetic field leftward, so force is perpendicular inward.

IV. Long Answer Questions (3×3=9)

8. Myopia (Nearsightedness):

- **Definition:** Eye defect where distant objects appear blurry but near objects are clear
- **Causes:**
    - Eyeball too long
    - Excessive curvature of cornea
- **Remedy:** Using concave (diverging) lens of suitable focal length

OR

Stars twinkle but planets don't:

- Stars are point sources of light. Atmospheric turbulence causes continuous refraction, making stars appear to twinkle.
- Planets are extended sources (disc-like), so the average effect of atmospheric refraction is nullified, making them appear steady.

9. Electromagnet from soft iron rod:

- Wind insulated copper wire around soft iron rod (solenoid)
- Pass electric current through the coil
- Rod becomes magnetized temporarily
- **Ways to increase magnetic field:**
    - Increase number of turns in coil
    - Increase current strength
    - Use soft iron core (high permeability)

OR

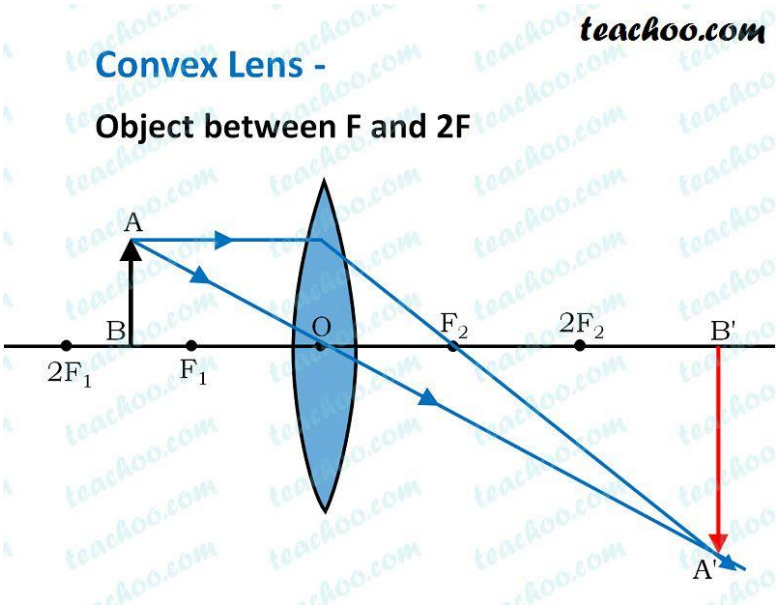
Activity to draw field lines around bar magnet:

- Place bar magnet on white paper

- Place compass near North pole, mark needle positions
- Move compass so that South pole of needle points to previous North mark
- Continue marking points to form a continuous line
- Join points to get field lines
- Repeat from different positions to get pattern

10. Ray diagram: Object between $2F_1$ and F_1 of convex lens:

Plain



Real, inverted, magnified image beyond 2F

- **Position:** Beyond $2F_2$ (on opposite side)
- **Size:** Magnified (enlarged)

V. Long Answer Questions (2×4=8)

11. a) Light travels faster in ice:

- Speed of light v = c/n (c = speed in vacuum, n = refractive index)
- n_ice = 1.31, n_water = 1.33
- Lower refractive index means higher speed
- Therefore, light travels faster in ice

b) Emergent ray parallel to incident ray in glass slab:

- Light bends towards normal when entering denser medium (air to glass)
- Light bends away from normal when exiting (glass to air)
- Angle of incidence = Angle of emergence

- Lateral displacement occurs but direction remains parallel

OR

a) Pencil appears bent in water:

- Due to refraction of light
- Light from pencil bends away from normal when going from water to air
- Our eye traces light back in straight line
- Apparent position is different from actual position, making pencil appear bent at water surface

b) Differences between spherical mirror and spherical lens:

Table

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Spherical Mirror	**Spherical Lens**
Reflects light	Refracts light
Has single focal point	Has two focal points
Made from one reflecting surface	Made from transparent material with two refracting surfaces

12. Circuit calculation:

- **Given:** 12Ω, 8Ω, 16Ω in parallel; 3Ω in series; V = 9V

Step 1: Parallel combination (1/Rp = 1/12 + 1/8 + 1/16)

- 1/Rp = (4+6+3)/48 = 13/48
- Rp = 48/13 ≈ 3.69Ω

Step 2: Total resistance (Rs = Rp + 3 = 3.69 + 3 = **6.69Ω** or exactly **87/13 Ω**)

Step 3: Total current (I = V/R = 9/(87/13) = 117/87 = **1.34 A** or **39/29 A**)

Step 4: Power (P = V×I = 9×1.34 = **12.06 W** or **351/29 W**)

PART-B: CHEMISTRY

VI. Multiple Choice Questions (3×1=3)

13. Compound reacting with both acid and base (Amphoteric oxide):

- **Answer: (A) Aluminium oxide** (Al_2O_3)

14. Compound from carboxylic acid + alcohol:

- **Answer: (D) an ester** (Esterification reaction)

15. Reactivity series conclusion:

- **Answer: (C) Copper is more reactive than silver but less reactive than iron**
- Explanation: Fe displaces Cu (Fe > Cu), Cu displaces Ag (Cu > Ag), so Fe > Cu > Ag

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VII. Short Answer Questions (3×1=3)

16. Rancidity:

- The oxidation of fats and oils in food materials when exposed to air, causing unpleasant smell and taste.

17. Chemical formula of baking soda:

- **$NaHCO_3$** (Sodium bicarbonate/Sodium hydrogen carbonate)

18. Homologous series:

- **Series-2** (CH_3OH, C_2H_5OH...) - Alcohol series
- Series-1 represents alkenes/alkynes with general formula CnH2n

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VIII. Short Answer Questions (3×2=6)

19. Catenation:

- The property of carbon atoms to link together through covalent bonds to form long chains, branched chains, or rings.
- **Simplest hydrocarbon:** Methane (CH_4)

20. Pure mercury from cinnabar (HgS):

- Roast cinnabar in air: $HgS + O_2 \rightarrow Hg + SO_2$
- Mercury vaporizes and is condensed to liquid mercury
- Further purification by distillation

OR

Calcium reaction with water:

- Calcium reacts with water to form $Ca(OH)_2$ and H_2 gas
- The hydrogen gas produced does not catch fire because calcium reacts slowly with cold water, and the heat produced is not sufficient to ignite hydrogen.

21. Heating ferrous sulphate crystals:

- **Colour change:** Pale green to white, then to brown/black (Fe_2O_3)
- **Crystalline nature:** Lost (becomes amorphous powder)

- **Reason:** Thermal decomposition: $2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$
- Water droplets observed on cooler parts of test tube (water of crystallization released)

IX. Long Answer Questions (3×3=9)

22. Chemical equations:

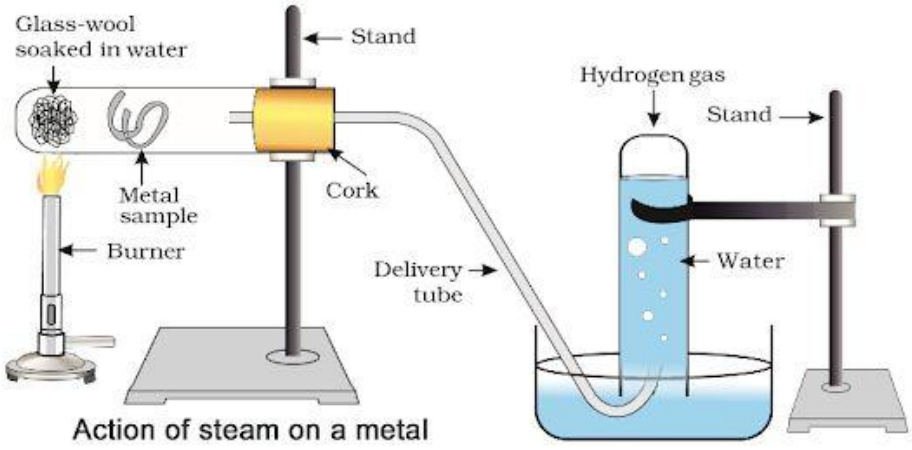
- i) $C + O_2 \rightarrow CO_2$
- ii) $ZnCO_3 \rightarrow ZnO + CO_2$ (heating)
- iii) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

OR

Balancing chemical equations:

- According to Law of Conservation of Mass, atoms are neither created nor destroyed.
- **Observations for chemical reaction:**
    - Change in color
    - Evolution of gas
    - Change in temperature
    - Formation of precipitate

23. Diagram: Steam on metal (Zinc/Aluminum):



Action of steam on a metal

24. a) Decreasing acid concentration:

- **Always add acid to water** (never water to acid)
- Take required amount of distilled water in beaker
- Add concentrated acid slowly with constant stirring

- Heat is evolved, so slow addition prevents splashing

b) Milk of magnesia for indigestion:

- Milk of magnesia [$Mg(OH)_2$] is a mild base/antacid
- Neutralizes excess stomach acid (HCl)
- Provides relief from acidity

X. Long Answer Questions (1×4=4)

25. a) Carbon doesn't form C^{4-} or C^{4+}:

- **C^{4+}:** Requires too much energy to remove 4 electrons (high ionization energy)
- **C^{4-}:** Gaining 4 electrons makes nucleus unable to hold them effectively
- Carbon overcomes this by **covalent bonding** (sharing electrons)

Structural formulas:

- **Butyne (C_4H_6):** $CH{\equiv}C\text{-}CH_2\text{-}CH_3$ or $CH_3\text{-}C{\equiv}C\text{-}CH_3$
- **Cyclohexane (C_6H_{12}):** Hexagonal ring with single bonds

OR

a) Cleansing action of soap:

- Soap molecules have hydrophilic (water-loving) head and hydrophobic (oil-loving) tail
- Hydrophobic tail dissolves in oil/dirt
- Hydrophilic head dissolves in water
- Forms micelles around dirt particles
- Dirt is lifted and washed away with water

b) Saturated vs Unsaturated compounds:

Table

Copy

Saturated	**Unsaturated**
Single bonds only (C-C)	Double/triple bonds (C=C, C≡C)
Less reactive	More reactive
General formula CnH2n+2	General formula CnH2n or CnH2n-2

Saturated	Unsaturated
Undergo substitution	Undergo addition reactions

PART-C: BIOLOGY

XI. Multiple Choice Questions (3×1=3)

26. Blood vessel with oxygenated blood from heart:

- **Answer: (C) Aorta** (Systemic aorta carries oxygenated blood to body)

27. Organisms reproducing by fission:

- **Answer: (D) Plasmodium, Amoeba, Leishmania**
- (All are unicellular/protozoans reproducing by binary/multiple fission)

28. Tropic movement (Pollen tube growth):

- **Answer: (B) Chemotropism**
- (Pollen tube grows towards ovule due to chemical stimulus/sugars)

XII. Short Answer Questions (3×1=3)

29. Heredity:

- The transmission of genetic characters/traits from parents to offspring through genes/DNA.

30. Low rate of gaseous exchange:

- **Figure (a)** represents low rate
- **Reason:** Stomata is partially closed/narrow opening
- Less surface area for gas exchange compared to wide-open stomata in figure (b)

31. Variations and similarities:

- **Figure-2 causes variations** (Meiosis - crossing over and independent assortment)
- **Figure-1 causes similarities** (Mitosis - identical daughter cells)

XIII. Short Answer Questions (2×2=4)

32. a) Reflex arc:

- The neural pathway through which reflex action occurs
- Components: Receptor → Sensory neuron → Spinal cord (CNS) → Motor neuron → Effector

b) Hormones for sexual maturation:

- **Testosterone** (in males)
- **Estrogen and Progesterone** (in females)

OR

a) Function of neuron:

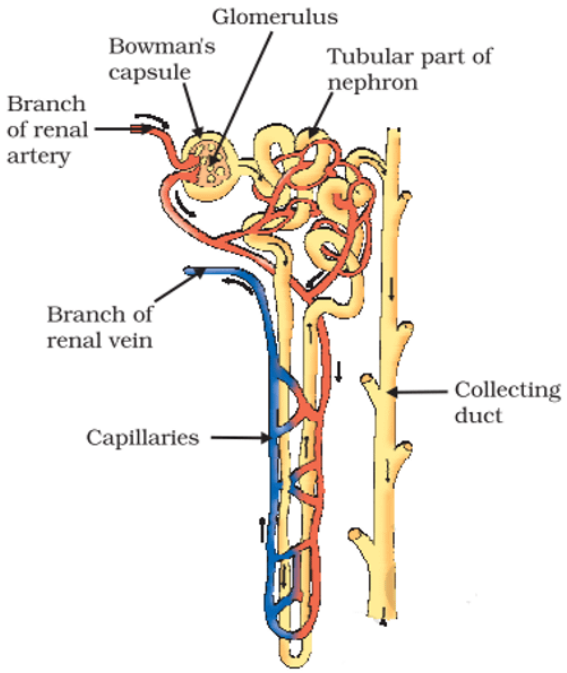
- Transmits electrical impulses/nerve signals from one part of body to another
- Receives stimuli and transmits information

b) Plant hormones:

- **Stem growth:** Auxin, Gibberellin
- **Wilting of leaves:** Abscisic acid (ABA)

33. Diagram: Structure of Nephron

Plain



XIV. Long Answer Questions (3×3=9)

34. Monohybrid cross: Tall (TT) × Short (tt)

F1 generation: All Tt (Tall)

F2 generation (Checkerboard):

Table

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	T	**t**
T	TT	Tt
t	Tt	tt

Genotypic ratio: 1 TT : 2 Tt : 1 tt (1:2:1) **Phenotypic ratio:** 3 Tall : 1 Short (3:1)

OR

a) Sex determination in humans:

- Females: 44+XX (homogametic, produces only X eggs)
- Males: 44+XY (heterogametic, produces X and Y sperm in 50:50 ratio)
- If X sperm fertilizes egg → Female (XX)
- If Y sperm fertilizes egg → Male (XY)
- **Father determines sex of child**

b) Dominant vs Recessive traits:

Table

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Dominant	**Recessive**
Expressed in both homo and heterozygous condition	Expressed only in homozygous condition
Represented by capital letter	Represented by small letter
Example: Tall stem (T)	Example: Short stem (t)

35. Trophic levels:

- **i) T5 (Eagle) has more harmful chemicals:** Due to **biomagnification** - concentration of toxic substances increases at each trophic level. Top predators accumulate maximum toxins.
- **ii) Energy flow:** According to 10% law, only 10% energy transfers to next level. So Zoo plankton (T2) has more energy than Large fish (T4) as energy decreases at successive levels.

36. Diagram: Human Brain

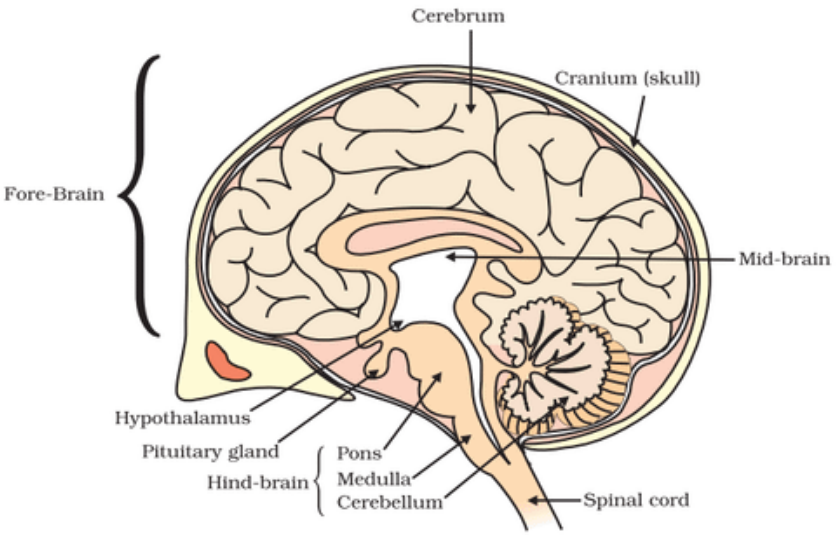

Figure 7.3 *Human brain*

XV. Long Answer Questions (1×4=4)

37. a) Transporting tissues in plants:

- **Xylem:** Transports water and minerals from roots to aerial parts (unidirectional)
- **Phloem:** Transports food from leaves to other parts (bidirectional)

b) Methods of waste elimination in plants:

1. Transpiration (water vapor through stomata)
2. Abscission (shedding of leaves containing wastes)
3. Storage in vacuoles/leaves (gums, resins)
4. Excretion through roots into soil
5. Shedding of bark

OR

a) i) Site of complete digestion: Small intestine **ii) Organ secreting bile juice:** Liver

b) Anaerobic respiration:

- Respiration in absence of oxygen
- **Products:** Ethanol + CO_2 + Energy (in yeast)
- Lactic acid + Energy (in muscle cells during exercise)

XVI. Long Answer Questions (1×5=5)

38. a) Development of egg into foetus:

- Fertilization occurs in fallopian tube → Zygone formed

- Zygote divides repeatedly → Embryo
- Embryo implants in uterus wall (endometrium)
- Develops into foetus with organs

Nourishment of embryo:

- Through **placenta** (connection between mother and embryo)
- Umbilical cord contains blood vessels
- Diffusion of nutrients, oxygen from mother's blood to embryo
- Waste products diffuse back to mother's blood

b) Functions of testes:

- Produce male gametes (sperms)
- Secrete male sex hormone testosterone

OR

a) Advantages of vegetative propagation:

1. Preserves desirable characteristics of parent
2. Faster method of reproduction
3. Plants bear fruits earlier
4. Useful for plants that don't produce viable seeds
5. Helps in propagation of seedless varieties

b) Pollination:

- Transfer of pollen grains from anther to stigma of flower

Changes in flower after fertilization:

- Ovary develops into fruit
- Ovules develop into seeds
- Petals, sepals wither and fall off
- Style and stigma dry up
- Zygote develops into embryo
