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Sample Paper
PHYSICS

Time: 20 min
Max Marks: 40

10 Questions (Mixed: Section A & B)

1. A particle moves with velocity $v = at^2$. What is its acceleration at time t?
(A) 2at (B) at^2
(C) t^2 (D) constant

2. A body is projected at 45° with speed u. The ratio of horizontal range (R) to maximum height (H) is:
(A) 2 (B) 4
(C) 8 (D) 1

3. Unit of electric flux is:
(A) Nm^2/C (B) N/C
(C) J (D) W

4. Two resistors of 4 Ω and 6 Ω are connected in parallel. The equivalent resistance is:
(A) 2.4 Ω (B) 10 Ω
(C) 1 Ω (D) 5 Ω

5. In SHM, the total mechanical energy of the system depends on:
(A) Displacement (B) $Amplitude^2$
(C) Time (D) Phase

6. A capacitor charged to potential V is disconnected from the battery and a dielectric slab is inserted fully between the plates. What happens to V?
(A) Decreases (B) Increases
(C) Remains same (D) Becomes zero

7. Magnetic force on a moving charge is maximum when the angle between velocity and magnetic field is:
(A) 0° (B) 90°
(C) 180° (D) 45°

8. A wire of length L and resistance R is stretched so that its new length becomes 2L (volume constant). New resistance is:
(A) R/2 (B) R
(C) 2R (D) 4R

9. Escape velocity from the surface of a planet depends on:
(A) Mass of body only
(B) Radius of planet only
(C) Both mass and radius of planet
(D) Neither

10. According to Lenz's law, the direction of induced emf is such that it:
(A) Opposes the change in magnetic flux
(B) Supports the change in magnetic flux
(C) Always remains constant
(D) Becomes maximum

ANSWER KEY

Q.No.	1	2	3	4	5	6	7	8	9	10
Ans	A	B	A	A	B	A	B	D	B	A

EXPLANATIONS

1 **(A) 2at**
$v = at^2 \Rightarrow a = \frac{dv}{dt} = 2at.$

2 **(B) 4**
$R = \frac{u^2}{g}$ $H = \frac{u^2}{/4g} \Rightarrow \frac{R}{H} = 4.$

3 **(A) Nm^2/C**
Electric flux $\Phi = EA \Rightarrow$ unit $= (N/C)\cdot m^2 = Nm^2/C.$

4 **(A) 2.4 Ω**
$\frac{1}{R} = \frac{1}{4} + \frac{1}{6} = \frac{5}{12} \Rightarrow R = \frac{12}{5} = 2.4\ \Omega.$

5 **(B) $Amplitude^2$**
Total energy in SHM: $E = \frac{1}{2} kA^2\omega^2 \propto A^2.$

6 **(A) Decreases**
Dielecttic ↑ ⇒ C ↑. Since Q constant (battery disconnected), V = Q/C ⇒ V decreases.

7 **(B) 90°**
Magnetic force $F = qvB \sin\theta \Rightarrow$ max at $\sin\theta = 1 \Rightarrow \theta = 90°.$

8 **(D) 4R**
$R = \frac{\rho L}{A}$. If $L \to 2L$ and $A \to \frac{A}{2}$ (volume constant), $R' = \frac{\rho(2L)}{\rho(4/2)} = 4R.$

9 **(B) Radius of planet only**
$v_e = \sqrt{\frac{2GM}{R}} \Rightarrow$ depends on M & R of planet, not mass of body.

10 **(A) Opposes the change in magnetic flux**
Lenz's law: induced emf direction opposes the change that produces it.

End of Sample Paper

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Sample Paper

CHEMISTRY

Time: 20 min
Max Marks: 40

10 Questions (Mixed: Section A & B)

1 pH of 10^{-3} M HCl is:
(A) 1 (B) 3
(C) 10 (D) -3

2 Atomic number determines:
(A) Mass (B) Identity
(C) Volume (D) Charge

3 Rate law depends on:
(A) Products (B) Experimental data
(C) Catalyst (D) Stoichiometry

4 Hybridization of CO_2 is:
(A) sp (B) sp^2
(C) sp^3 (D) sp^{3d}

5 H_2O_2 is an _____ of hydrogen peroxide.
(A) Structural formula (B) Empirical formula
(C) Condensed formula (D) Molecular formula

6 Which is the strongest acid?
(A) HCl (B) H_2SO_4
(C) HNO_3 (D) $HClO_4$

7 Catalyst:
(A) Is same for all reactions.
(B) Does not change overall enthalpy
(C) Changes activation energy
(D) Changes equilibrium constant

6 A capacitor charged to potential V is disconnected from the battery an h acticle slab is inserted fully between the plates! W?
(A) HCl (B) H_2SO_4
(C) HNO_3 (D) $HClO_4$

7 Catalyst:
(A) Is same for all reactions,
(B) Does not change overall enthalpy
(C) Changes activation energy
(D) Changes equilibrium constant

8 Buffer solution is given by mixing:
(A) Strong acid and weak base
(B) Weak acid and its salt
(C) Strong acid and strong base
(D) Strong acid and its salt

9 Oxidation is:
(A) Loss of electrons
(B) Gain of electrons
(C) Loss of protons

10 atomic radius in the periodic table because
(A) Decreases down a group
(B) Increase across a period
(C) Increases down a group;
(D) Become fully filled.

ANSWER KEY

Q.No.	1	2	3	4	5	6	7	8	8	9	10
Ans	B	B	B	A	A	B	A	B	D	B	A

EXPLANATIONS

1 **(A)** $pH = -\log[H^1] = -\log(10^{-3}) = 3$,

2 **(B)** Atomic number is the number of protors, determines the atom's identity.

3 **(B)** Rate law depends on:
(A) Products data (B) Experimental data
(C) Catalyst (D) Stoichiometry

4 Hybridization of CO_2 is:
(A) sp (B) sp^2
(C) sp^3d (D) sp^3d

6 **(D)** $HClO_2$ is the strongest comnon acid.

7 **(C)** Catalyst changes the rate of a reaction by lowering the activation energy.

8 **(B)** Buffer = Weak acid + its salt
weak base + its salt, Reasts pH Change

9 **(A)** Oxidation is defined as the loss of electrons.

10 **(C)** H_2O_2 is represented as H-O-O-H, same empirical and molecular formula.

Empirical; simplest whole number rato of a dements, Molecula = real fiams.

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Sample Paper

BIOLOGY

Time: 20 min
Max Marks: 40

10 Questions (Mixed: Section A & B)

ZOOLOGY (1–5)

1 Mitochondria are:
(A) Powerhouse of the cell
(B) Control center of the cell
(C) Storage organelle
(D) Protein synthesis site

2 Assertion (A): DNA replication is semi-conservative.
Reason (R): Each strand of DNA serves as template for new strand.

3 Hormones secreted from pancreas are:
(A) Insulin (B) Pepsin
(C) Estrogen (D) Testosterone

4 ABO blood group shows:
(A) Multiple alleles (B) Estrogen
(C) Incomplete dominance (C) Pleiotropy
(D) Epistasis (D) Epistasis

5 Glycolysis occurs in:
(A) Cytoplasm (B) Mitochondria
(C) Thylakoid (D) Ribosome

BOTANY (6–10)

6 Nitrogen fixing bacteria is:
(A) Azotobacter (B) Nitrosomonas
(C) Pseudomonas (D) Rhizobium

7 According to Mendel's law of segregation, each allele:
(A) Joins with similar allele.
(B) Segregates into gametes
(C) Segregates independently

8 Constituent of xylem for water transport is:
(A) Phloem
(B) Collenchyma
(C) Sieve tubes

9 CAM plants live in:
(A) Cold climate
(B) Desert condition
(C) Humid areas
(D) Freshwater ponds

ANSWER. KEY

Q.No.	1	2	3	4	5	6	7	8	8	9	9	10
Ans	A	A	A	A	A	D	B	B	D	B	B	C

EXPLANATIONS

1 **(A)** Mitochondria are powerhouses of cell producing ATP during respiration.

2 **(A)** DNA replication is semi-conservative as each strand of DNA serves as template for new strand.

3 **(A)** Hormones secreted from pancress include insulin, which regulates glucose/blood sugar.

4 **(A)** ABO blood groups controlled by multiple alleles, genes (f', ⅂, and i).

5 **(A)** Glycolysis is the first step of cellular respiration and occurs in cytoplasm.

6 **(D)** Rhizobium is a nitrogen fixing bacteria in legume root nodules.

7 **(B)** During gamets formation, the two alleles segregate such that one gamete only gets one allele from pair.

8 **(D)** Tracheids and vessels are specialized for conducting water and minerals.

9 **(B)** CAM plants live in and desert conditions, and open stomata at night to fix CO_2.

10 **(C)** Abscisic acid (ABA) promotes seed dormancy and inhibits seed germination.

— End of Sample Paper —