QUICK DRILL · CBSE CLASS 12

Electrostatic Potential and Capacitance

Physics · Chapter 2 · 15 MCQs · 20 minutes · PYQ-tagged with time budgets

DATE	TOTAL MARKS	DURATION	MARKING	TARGET
_____	15	20 min	+1 / 0	≥ 12/15

OBJECTIVES

Reinforce the four core topics of Electrostatic Potential and Capacitance via 15 PYQ-derived MCQs. Identify weak sub-topics via concept-node IDs (see answer key). Build per-question time budget habit.

INSTRUCTIONS

Attempt all 15. Time budget shown per Q (use it as pacing guide). Mark answers (A/B/C/D) in the margin. Answer key + explanations on the last page. **Don't peek — score yourself honestly.**

SECTION · QUICK DRILL

Q 1–15 · 20 MIN

Q1. Electric potential V is defined as:

(A) Work done per unit positive charge from infinity
(B) Electric field × distance
(C) Force × distance
(D) Charge × distance

PYQ 2018 · Delhi · 1m · ⏱ 30s

Q2. Electric field E and potential V are related by:

(A) E = dV/dr
(B) E = −dV/dr
(C) E = V × r
(D) E = V/r

PYQ 2019 · All India · 1m · ⏱ 30s

Q3. V at a point due to multiple charges is computed by:

(A) Vector addition
(B) Algebraic (signed scalar) sum
(C) Geometric mean
(D) Cross product

PYQ 2020 · Delhi · 1m · ⏱ 30s

Q4. V on the equatorial plane of an electric dipole at distance r is:

(A) $+kp/r^2$
(B) $-kp/r^2$
(C) 0
(D) kp/r

PYQ 2017 · Delhi · 1m · ⏱ 45s

Q5. Equipotential surfaces are:

(A) Parallel to E
(B) Perpendicular to E
(C) At 45° to E
(D) Random orientation

PYQ 2020 · All India · 1m · ⏱ 30s

Q6. Work done in moving a charge ON an equipotential surface is:

(A) Maximum
(B) Minimum
(C) Zero
(D) Equal to qE

PYQ 2018 · Outside Delhi · 1m · ⏱ 30s

Q7. Capacitance of a capacitor depends on:

(A) Charge stored Q
(B) Voltage applied V
(C) Geometry + dielectric only
(D) Time elapsed

PYQ 2019 · Delhi · 1m · ⏱ 30s

Q8. Parallel-plate capacitor with vacuum and area A, separation d has capacitance:

(A) $\varepsilon_o A/d$
(B) $\varepsilon_o d/A$
(C) $A\varepsilon_o d$
(D) $\varepsilon_o Ad$

PYQ 2018 · All India · 1m · ⏱ 30s

Q9. Inserting dielectric K in parallel-plate capacitor:

(A) Increases C by K times
(B) Decreases C by K times
(C) Does not change C
(D) Increases C by K^2

PYQ 2020 · Standard · 1m · ⏱ 45s

Q10. Series combination of capacitors: 1/C_eq =

(A) $C_1 + C_2 + \ldots$ **(B)** $1/C_1 + 1/C_2 + \ldots$
(C) $C_1 \times C_2$ **(D)** $C_1 - C_2$

PYQ 2017 · All India · 1m · ⏱ 30s

Q11. Parallel combination of capacitors: C_eq =

(A) $1/C_1 + 1/C_2 + \ldots$ **(B)** $C_1 + C_2 + \ldots$
(C) $(C_1 \times C_2)/(C_1 + C_2)$ **(D)** $C_1 - C_2$

PYQ 2019 · Delhi · 1m · ⏱ 30s

Q12. Energy stored in a capacitor of capacitance C with voltage V is:

(A) CV **(B)** CV^2
(C) $\frac{1}{2}CV^2$ **(D)** $\frac{1}{2}C^2V$

PYQ 2018 · Delhi · 1m · ⏱ 30s

Q13. When two charged capacitors are connected together:

(A) Charge is conserved AND energy is conserved **(B)** Charge is conserved; energy is NOT conserved (heat + radiation)
(C) Energy is conserved; charge is not **(D)** Neither is conserved

PYQ 2022 · Standard · 1m · ⏱ 45s

Q14. Energy density in the electric field between plates is:

(A) $\frac{1}{2}\varepsilon_0 E$ **(B)** $\frac{1}{2}\varepsilon_0 E^2$
(C) $\varepsilon_0 E$ **(D)** $\varepsilon_0 E^2$

PYQ 2021 · Standard · 1m · ⏱ 30s

Q15. Two parallel-plate capacitors $C_1 = 4\mu F$ and $C_2 = 6\mu F$ are in series. C_eq = ?

(A) 2.4 μF **(B)** 10 μF
(C) 5 μF **(D)** 1.5 μF

PYQ 2020 · Outside Delhi · 2m · ⏱ 90s

ANSWER KEY & EXPLANATIONS

Q 1–15 · MARK YOUR SCORE

Q1. Answer: A

V = W/q where W is work done from infinity (against field) to bring unit positive charge to that point.

Q2. Answer: B

E = −dV/dr. The minus sign means E points in direction of DECREASING V.

Q3. Answer: B

V is scalar — algebraic sum of individual potentials. This is the key computational advantage over electric field (which requires vector addition).

Q4. Answer: C

On equatorial line, distances to +q and −q are equal — contributions cancel exactly. V = 0.

Q5. Answer: B

Always perpendicular to E. If they had a component along E, V would change along the surface (contradiction).

Q6. Answer: C

W = qΔV; on equipotential surface ΔV = 0, so W = 0.

Q7. Answer: C

C is a structural property — area, separation, dielectric. Q and V are RESULTS of applying V to the capacitor; C is independent of them.

Q8. Answer: A

Derived from $E = \sigma/\varepsilon_0$ and $V = E \cdot d$: $C = Q/V = \varepsilon_0 A/d$.

Q9. Answer: A

$C = K\varepsilon_0 A/d$. Dielectric polarises, reducing internal field — lower V for same Q means higher C.

Q10. Answer: B

Series: 1/C_eq = Σ 1/C_i (reciprocals add — OPPOSITE to resistors).

Q11. Answer: B

Parallel: C_eq = Σ C_i (direct sum — OPPOSITE to resistors).

Q12. Answer: C

$U = \frac{1}{2}CV^2 = \frac{1}{2}Q^2/C = \frac{1}{2}QV$ (three equivalent forms). The ½ factor comes from integration during charging.

Q13. **Answer: B**

Total Q is conserved. Energy is LOST as heat in wires + EM radiation. Lost amount = ½ × $C_1C_2(V_1-V_2)^2/(C_1+C_2)$.

Q14. **Answer: B**

$u = \frac{1}{2}\varepsilon_o E^2$. This is energy stored in the field itself, per unit volume.

Q15. **Answer: A**

1/C_eq = 1/4 + 1/6 = 5/12 → C_eq = 12/5 = 2.4 μF.