

Chapter A: Short Wave Diathermy – Production & Circuits

1. A final-year BPT student is posted in the electrotherapy department. The senior resident asks: “In one sentence, what do we mean by ‘production’ of Short Wave Diathermy in the machine?” Write the exact expected answer.
2. All SWD machines have TWO main circuits. Name them clearly (0.5 mark each).
3. The Machine (Oscillator) circuit is the “heart” of the SWD unit. Name the two electrodes (or parts) between which high-frequency oscillation is primarily generated in the classic valve machine.
4. In a traditional valve-based SWD machine, which electronic component is responsible for actually generating the 27.12 MHz high-frequency current?
5. Draw a simple block diagram (in words) of the sequence of components in the machine circuit: Power supply → ? → ? → Tuning capacitor → Oscillator valves → Patient circuit.
6. The Patient (Resonator) circuit must be tuned with the machine circuit. What is the single most important reason why the two circuits must be in resonance?
7. When the patient circuit is perfectly tuned, what visible/audible sign do you get on a classic SWD machine? (Name any two signs)
8. Your SWD machine has a “tuning knob” on the patient circuit. If you treat a thin patient versus a very obese patient, in which case will you turn the tuning knob to a HIGHER capacitance value and why? (one-line answer)
9. Mechanism of heat production: In the condenser field method, heat is produced primarily due to _____ currents, whereas in the cable method it is due to _____ currents.
10. True or False: In modern solid-state SWD machines, triode valves are still used for oscillation. Justify in one sentence.
11. Safety feature: Most standard SWD machines will NOT produce output unless the patient circuit is tuned within acceptable limits. Name this protective mechanism (exact term).
12. You switch ON the machine, set intensity, but the tuning neon lamp remains brightly glowing even after adjusting the patient tuning knob. What is the most likely fault? (one cause)
13. Clinical scenario: While treating a patient’s shoulder, you notice that maximum heat sensation is felt at the edges of the pad electrodes (ring-shaped heating). What does this indicate about circuit tuning?
14. Historical question: The original Schliephake SWD machine (1926–1928) used which type of oscillator circuit configuration that is still taught as the “classical” machine circuit in textbooks?

15. Modern machines often display “Resonance %” or “Tuning meter”. What is the ideal range for safe and effective output? (e.g., 80–100%)

ANSWER KEY:

1. Production of SWD means generation of high-frequency alternating current (27.12 MHz) inside the machine and transferring maximum energy to the patient circuit via resonance.
2. (A) Machine circuit / Oscillator circuit (B) Patient circuit / Resonator circuit / Tank circuit
3. Between the anode and the grid (or between the two plates of the tuning capacitor in the oscillator).
4. Triode valves (or vacuum tubes) working in push-pull or parallel configuration.
5. Power supply → RF choke → Variable tuning capacitor → Oscillator valves (triode) → Patient circuit (through coupling).
6. To achieve maximum transfer of energy from machine circuit to patient circuit with minimum loss (resonance = maximum power transfer).
7. Any two:
 - Tuning neon lamp glows minimally or goes off
 - Tuning meter needle shows maximum deflection
 - Audible hum/pitch changes and becomes steady
 - Output meter shows maximum reading at given intensity
8. Obese patient → higher capacitance required because larger tissue mass increases the capacitance of the patient circuit.
9. Condenser method → Displacement currents Cable method → Eddy currents
10. False – modern machines use solid-state transistors or MOSFET oscillators; valves are obsolete.
11. Fail-safe mechanism / Detuning protection / Automatic cut-off if not in tune.
12. Open circuit in patient circuit (broken cable, loose connection, electrode not applied).
13. Patient circuit is out of tune (detuned) → standing waves are formed → overheating at edges.
14. Hartley oscillator circuit (or tuned anode-tuned grid circuit).
15. 90–100% (or maximum possible on that machine; some accept 80–100%).

Use this puzzle in class – it forces students to visualize the circuit and understand resonance clinically!