Year 13 Science: Capacitors

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Two parallel plates, each of area 0.0100 m², are 0.200 mm apart in air. Find the capacitance.

2. Find the total capacitance of 6.0 µF and 3.0 µF in series, and in parallel.

3. How much energy does a 10 µF capacitor store at 12 V?

4. A 4.7 mF capacitor discharges through a 1.0 kΩ resistor. Find the time constant and roughly how long it takes to discharge fully.

Exam-style question: a camera flash

A camera flash stores energy in a 220 µF capacitor charged to 330 V. After each flash, it is recharged from a 330 V supply through a 1.50 kΩ resistor.

5. Calculate the charge and energy stored when the capacitor is full.

6. Calculate the time constant, the starting recharge current, and the current after one time constant.

7. Explain why the recharge current is largest at the start and falls to zero.

8. A designer suggests two 220 µF capacitors charged from the same 330 V supply. Explain, with calculations, how much energy they store connected in parallel compared with in series across 330 V.

Fix the mistake

9. Correct this statement: "6.0 µF and 3.0 µF in series make 9.0 µF."

10. Correct this statement: "$\tau = RC = 2.20 \times 470 = 1034$ s, with kΩ and µF left as they are."

11. Correct this statement: "After one time constant the capacitor is half charged."

12. Correct this statement: "When the capacitor is fully charged the current is at its maximum because the most charge is stored."