**HALF ADDER**

```
module half_adder(
  input a,b,
  output sum,carry
);
  assign sum = a ^ b;
  assign carry = a & b;
endmodule
```

**// Testbench**

```
module half_adder_tb;
  reg a, b;
  wire sum, carry;

  // Instantiate half adder
  half_adder uut(
    .a(a),
    .b(b),
    .sum(sum),
    .carry(carry)
  );

  initial begin

    $monitor ("a=%0t, b=%b | sum=%b carry=%b ", a, b, sum, carry);

    // Apply test cases
```

```
    a = 0; b = 0; #10;
    a = 0; b = 1; #10;
    a = 1; b = 0; #10;
    a = 1; b = 1; #10;

    $finish;
  end
endmodule
```