Exam 2--PHYS 102--S14

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Consider this circuit. What is the equivalent capacitance?
   [Diagram of a circuit with capacitors and voltages]
   a. 4 \( \mu F \)
   b. 2 \( \mu F \)
   c. 1 \( \mu F \)
   d. 2.5 \( \mu F \)

2. For the circuit in the previous question, what is the voltage across \( C_3 \)?
   a. 12 V
   b. 8 V
   c. 6 V
   d. 4 V
   e. 3 V

3. For the circuit in the previous question, what is the charge on \( C_1 \)?
   a. 8 \( \mu C \)
   b. 12 \( \mu C \)
   c. 24 \( \mu C \)
   d. 4 \( \mu C \)
   e. 6 \( \mu C \)

4. A farad is the same as a:
   a. N/C
   b. V/C
   c. V/J
   d. C/V
   e. J/V

5. Each plate of a capacitor stores a charge of magnitude 1 mC when a 100-V potential difference is applied. The capacitance is:
   a. 5 \( \mu F \)
   b. 10 \( \mu F \)
   c. 50 \( \mu F \)
   d. 100 \( \mu F \)
   e. none of these

6. The plate areas and plate separations of five parallel plate capacitors are:
   capacitor 1: area A, separation d
   capacitor 2: area 2A, separation 2d
   capacitor 3: area 2A, separation d/2
   capacitor 4: area A/2, separation 2d
   capacitor 5: area A, separation d/2

Rank these according to their capacitances, least to greatest.

   a. 4, 1 and 2 tie, then 5, 3
   b. 5,4,3,2,1
   c. 3, 5, 1 and 2 tie, 4
   d. 1,2,3,4,5
   e. 5, 3 and 4 tie, then 1, 2
7. Two identical capacitors are connected in series and two, each identical to the first, are connected in parallel. The equivalent capacitance of the series connection _________is the equivalent capacitance of parallel connection.

   a. twice
   b. four times
   c. half
   d. one-fourth
   e. the same as

8. A 20 \( \mu F \) capacitor is charged to 200V. Its stored energy is:

   a. 4000 J
   b. 4 J
   c. 0.4 J
   d. 2000 J
   e. 0.1 J

9. Consider this circuit. What is the charge on \( C_2 \)?

10. What is the equivalent capacitance of these 3 capacitors?

   \[
   \begin{array}{c}
   3 \mu F \\
   \hline
   3 \mu F \\
   \hline
   3 \mu F \\
   \end{array}
   \]

   a. 9 \( \mu F \)
   b. \( \frac{1}{9} \mu F \)
   c. 3 \( \mu F \)
   d. 1 \( \mu F \)
   e. 27 \( \mu F \)

11. What is the equivalent capacitance of these 3 capacitors?

   \[
   \begin{array}{c}
   3 \mu F \\
   \hline
   3 \mu F \\
   \hline
   3 \mu F \\
   \end{array}
   \]

   a. 9 \( \mu F \)
   b. 1 \( \mu F \)
   c. 3 \( \mu F \)
   d. 27 \( \mu F \)
   e. \( \frac{1}{9} \mu F \)

12. A parallel-plate capacitor initially has a potential difference of 200 V and is then disconnected from the charging battery. If the area of the plates is now doubled, what is the new value of the voltage?

   a. 400 V
   b. 800 V
   c. 100 V
   d. 200 V

   a. 6 \( \mu C \)
   b. 24 \( \mu C \)
   c. 4 \( \mu C \)
   d. 2 \( \mu C \)
   e. 12 \( \mu C \)
13. Consider this circuit. All three capacitors are identical. What is the voltage across C₃?

![Circuit Diagram]

- a. 8 V
- b. 12 V
- c. 3 V
- d. 4 V
- e. 6 V

14. What is the equivalent capacitance of this circuit?

![Circuit Diagram]

- a. 12 µF
- b. 0.62 µF
- c. 3.0 µF
- d. 5.0 µF

15. For the circuit in the previous figure, what is the charge on C₁?

- a. 6.0 µC
- b. 24 µC
- c. 3.0 µC
- d. 12 µC

16. A parallel-plate capacitor has a plate area of 0.2m² and a plate separation of 0.0001 m. If the charge on each plate has a magnitude of 4 µC the potential difference across the plates is approximately:

- a. .004 V
- b. 200 V
- c. 100 V
- d. 4x10⁸ V
- e. 0 V

17. Let Q denote charge, V denote potential difference, and U denote stored energy. Of these quantities, capacitors in parallel must have the same:

- a. Q only
- b. Q & U only
- c. U only
- d. V & U only
- e. V only

18. Two capacitors with Cₐ greater than Cₚ and are connected in series with a battery. Which of the following is true?

- a. There is more charge stored on Cₚ.
- b. There is the same charge stored on each capacitor.
- c. There is the same potential difference across both capacitors.
- d. There is more charge stored on Cₐ.
19. Current has units:
   a. kilowatt hour
   b. ohm
   c. coulomb
   d. volt
   e. coulomb/second

20. Consider this circuit. What is the current through the resistor?

   ![Circuit Diagram]

   a. 4 A
   b. 36 A
   c. 0.25 A
   d. 3 A

21. The conventional direction of current in circuit for the previous question would be:
   a. clockwise
   b. counter-clockwise
   c. there is not current

22. Which of these has the greater resistance, a incandescent light bulb (60 W) or a bathroom heater (1000 W)?

   a. both the same
   b. heater
   c. bulb

23. Current is a measure of:

   a. speed with which a charge moves past a point
   b. force that moves a charge past a point
   c. energy used to move a charge past a point
   d. amount of charge that moves past a point per unit time
   e. resistance to the movement of a charge past a point

24. If the potential difference across a resistor is doubled:
   a. only the current is doubled
   b. only the current is halved
   c. only the resistance is doubled
   d. only the resistance is halved
   e. both the current and resistance are doubled

25. Consider these 2 wires. Wire A has four times the area and twice the length of wire B. How do their resistances compare?

   ![Wire Diagram]

   a. \( R_A = \frac{1}{4} R_B \)
   b. \( R_A = \frac{1}{8} R_B \)
   c. \( R_A = \frac{1}{2} R_B \)
   d. \( R_A = 4R_B \)
   e. \( R_A = 2R_B \)

26. A wire carries a steady current of 0.1 A over a period of 20 s. What total charge passes through the wire in this time interval?

   a. 2 C
   b. 20 C
   c. 0.005 C
   d. 200 C

27. For a certain diode, the current flows unimpeded in one direction. For current in the opposite direction, the ________________.

   a. resistance is zero.
   b. resistance is very large.
   c. voltage is very small.
   d. current is very large.
   e. resistivity is very small.
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Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1
2. ANS: C PTS: 1
3. ANS: B PTS: 1
4. ANS: D PTS: 1
5. ANS: B PTS: 1
6. ANS: A PTS: 1
7. ANS: D PTS: 1
8. ANS: C PTS: 1
9. ANS: B PTS: 1
10. ANS: D PTS: 1
11. ANS: A PTS: 1
12. ANS: C PTS: 1
13. ANS: D PTS: 1
14. ANS: D PTS: 1
15. ANS: B PTS: 1
16. ANS: B PTS: 1
17. ANS: E PTS: 1
18. ANS: B PTS: 1
19. ANS: E PTS: 1
20. ANS: A PTS: 1
21. ANS: A PTS: 1
22. ANS: C PTS: 1
23. ANS: D PTS: 1
24. ANS: A PTS: 1
25. ANS: C PTS: 1
26. ANS: A PTS: 1
27. ANS: B PTS: 1