85 + 10 = 95% A Excellent

Now $\frac{370}{400} = 92.5\%$ A Amy

J6 JAMES HAYNES

PHYSICS 242 EXAM 4dS12 PAGE 1 OF 2 NAME James Haynes

AT THE RIGHT OF THE PAGE, FILL IN THE "o" OF THE BEST ANSWER, FOR EXAMPLE, do.
>IF YOU DON'T KNOW IT, RULE OUT THE OBVIOUSLY WRONG ANSWERS AND THEN *GUESS.*<

1. A capacitor has a capacitance of 0.5 F and a charge stored of 1.2 C. When the charge stored is made one-third as much (0.4 C), the capacitance is ____ F.

C = 0.5 F Q = 1.2 C $C = \frac{Q}{3V}$ 0 it, no.

a) $\frac{0.5}{3}$ b) $\frac{0.5}{3^2}$ c) still 0.5 d) $3^2 \times 0.5$ ao bo (co) do 1.

2. The quantity ε_0 equals _____ $\frac{F}{m}$.

a) 8.988×10^9 b) 8.854×10^{-12} c) 9.0×10^{-9} d) 1.602×10^{-19} ao bo co do 2.

3. The **permittivity** of **air** is

a) exactly 1 c) exactly ε_0
b) slightly greater than 1 d) slightly greater than ε_0 ao bo co do 3.

4. The **dielectric constant** of **vacuum** is

a) exactly 1 c) exactly ε_0
b) slightly greater than 1 d) slightly greater than ε_0 ao bo co do 4.

5. The electric potential energy stored in the electric field of a capacitor is 4 J when the potential difference is 7 V. Therefore, the charge stored is _____ C. Hint: When you must algebraically solve an equation for an unknown, always substitute your final result back into the original equation to check your algebra.

U = 4J V = 7 $U = \frac{1}{2}QV$ $2U = Q$

a) (4)(7) b) $\frac{2(4)}{7}$ c) $\frac{1}{2}(4)(7)$ d) $\frac{1}{2}(4)(7)^2$ ao bo co do 5.

6. The _____ is the magnitude of the maximum electric field that an insulator can withstand without breaking down and conducting.

a) dielectric strength b) polarization c) dielectric constant d) permittivity ao bo co do 6.

7. A 3.3 F capacitor stores ____ J of electric potential energy in its electric field with a potential difference of 6.2 V.

$U = \frac{1}{2}CV^2$

a) $\frac{1}{2}(3.3)(6.2)^2$ b) $\frac{(6.2)^2}{2(3.3)}$ c) (3.3)(6.2) d) $\frac{1}{2}(3.3)(6.2)$ ao bo co do 7.

8. A 3.3 F capacitor stores ____ J of electric potential energy with a charge stored of 6.2 C.

$U = \frac{Q^2}{2C}$ $V = \frac{Q}{C}$ $U = \frac{1}{2}\frac{Q^2}{C^2}C$

a) $\frac{1}{2}(3.3)(6.2)^2$ b) $\frac{(6.2)^2}{2(3.3)}$ c) (3.3)(6.2) d) $\frac{1}{2}(3.3)(6.2)$ ao bo co do 8.

9. A 3.3 F capacitor stores ____ C of charge with a potential difference of 6.2 V.

$CV = Q$

a) $\frac{1}{2}(3.3)(6.2)^2$ b) $\frac{(6.2)^2}{2(3.3)}$ c) (3.3)(6.2) d) $\frac{1}{2}(3.3)(6.2)$ ao bo co do 9.

10. The two plates of a parallel-plate capacitor are 0.0005 m apart. Each has area 0.04 m^2. The volume between the plates is filled with an insulator of permittivity 2×10^{-11} F/m. To find its capacitance, we use 2×10^{-11} F/m =

a) E b) ε c) e d) K ao bo co do 10.

11. In question 10 above, 0.04 m^2 =

a) $2A$ b) A c) $\frac{A}{2}$ d) d^2 ao bo co do 11.

12. In question 10 above, 0.0005 m =

a) y b) x c) d d) z ao bo co do 12.

13. When there is vacuum between two concentric spherical conducting shells, $V_{ab} = \frac{(0.0088\ m^{-1})Q}{\varepsilon_0}$. After we completely fill the volume between the shells with a dielectric, V_{ab} =

a) $K\frac{(0.0088\ m^{-1})Q}{\varepsilon}$ b) $K\frac{(0.0088\ m^{-1})Q}{E_0}$ c) ε d) $\frac{(0.0088\ m^{-1})Q}{K\varepsilon_0}$ ao bo co do 13.

14. The equation $V_{ab} = Ed$ holds true for _____ capacitor.

a) any b) a spherical c) a cylindrical d) a parallel-plate ao bo co do● 14.

15. The _____ of a dielectric is its net electric dipole moment per volume.

a) polarization b) dielectric strength c) permittivity d) energy density ao bo co do● 15.

16. The potential difference is 120 V between the plates of a parallel-plate capacitor. The distance between the plates is 0.00040 m. Thus the magnitude of the electric field between the plates is _____ N/C.

a) $\frac{120}{0.00040}$ b) $\frac{0.00040}{120}$ c) $\frac{1}{2}(0.00040)(120)^2$ d) $(120)(0.00040)$ ao● bo co do 16.

17. *Before* a dielectric is slipped between the charged conducting parallel plates of a vacuum capacitor, the _____ on the surfaces of the _____ give an electric field between the plates of magnitude E_0.

a) free charges, dielectric
b) free charges, plates
c) bound charges, dielectric
d) bound charges, plates
ao bo● co do 17.

18. If Q remains constant while a dielectric is slipped between the parallel plates of a capacitor, the induced _____ on the surfaces of the _____ give an opposing electric field that results in a decreased electric field.

a) free charges, dielectric
b) free charges, plates
c) bound charges, dielectric
d) bound charges, plates
ao bo co● do 18.

19. The potential difference between the plates of a capacitor equals (1603 V/C)Q. Thus its capacitance is ____ F.

a) 1603 b) $1603Q^2$ c) $\frac{1}{2}(1603)^2$ d) $\frac{1}{1603}$ ao bo co do● 19.

20. We use u (lower case italic) to stand for the _____ of the electric field in Block 4.

a) unit b) potential energy c) energy density d) electric potential ao bo co● do 20.

21. A parallel-plate air capacitor has a capacitance of 5 pF when its plates are 0.4 mm apart. When the same parallel plates in air are three times as far apart (1.2 mm), the capacitance is _____ pF.

a) 3×5 b) $3^2 \times 5$ c) $\frac{5}{3}$ d) $\frac{5}{3^2}$ ao bo co● do 21.

22. The electric field magnitude in vacuum equals $\frac{(0.0666\ \text{m}^{-2})Q}{\varepsilon_0}$ at a point. The vacuum is then filled with a dielectric, keeping the symmetry, so that electric field magnitude becomes

a) $\frac{(0.0666\ \text{m}^{-2})Q}{\varepsilon}$ b) $\frac{(0.0666\ \text{m}^{-2})Q}{K\varepsilon}$ c) $K\varepsilon_0$ d) $K\frac{(0.0666\ \text{m}^{-2})Q}{E_0}$ ao● bo co do 22.

23. As done in class last Wednesday for the volume between the plates of an ideal parallel-plate capacitor: by definition, the electric field's energy density equals

a) $\frac{|Q|}{volume}$ b) $\frac{E}{volume}$ c) $\frac{u}{volume}$ d) $\frac{U}{volume}$ ao bo co do● 23.

24. If the electric field magnitude in a dielectric is made three times as large without exceeding the dielectric strength (for example, changed from 4 kV/m to 12 kV/m), the energy density becomes _____ as large.

a) nine times b) three times c) one-third d) one-ninth ao● bo co do 24.

25. The energy density of the electric field between the parallel plates of a capacitor equals (with $V = V_{ab}$)

a) $\frac{1}{2}CV^2$ b) $\frac{1}{2}kE_0\frac{V^2}{d^2}$ c) $\frac{1}{2}kE_0V^2d^2$ d) $\frac{1}{2}\varepsilon\frac{V^2}{d^2}$ ao bo co do● 25.

26. The capacitance of a parallel-plate capacitor equals

a) QEd b) $\frac{Qd}{E}$ c) $\frac{1}{2}QEd$ d) $\frac{Q}{Ed}$ ao bo co do● 26.