73+10=83? B Good for some.

Now 833/900 = 92.6% lower A avg.

J6

PHYSICS 242 EXAM 10dS12 PAGE 1 OF 2 NAME James Haynes

AT THE RIGHT OF THE PAGE, FILL IN THE "o" OF THE BEST ANSWER, FOR EXAMPLE, d●.

>IF YOU DON'T KNOW IT, RULE OUT THE OBVIOUSLY WRONG ANSWERS AND THEN *GUESS*.<

1. As we discussed in class last Wednesday, a plane "moving at Mach 2" has a Mach number of 2. Therefore its shock wave makes an angle of _____ with its straight line path.

a) arc sin $\frac{1}{2}$ b) $(\frac{1}{2})^\circ$ c) arc sin 2 d) 2° a● bo co do 1.

2. Jasmine is speeding east in her Prius at 33 m/s on a day when the speed of sound is 345 m/s. You are moving east at 22 m/s on the same narrow road ahead of Jasmine. Jasmine sends out an intense tone from a loudspeaker on her Prius that *she* hears to be 880 Hz. Her loudspeaker vibrates at Jasmine ○→ 33 m/s you ○→ 22 m/s

a) $f_S \neq 880$ Hz (to be calculated from the data given) c) $f_S = 880$ Hz
b) $f_L \neq 880$ Hz (to be calculated from the data given) d) $f_L = 880$ Hz ao bo co● do 2.

3. In Problem 2 above, the frequency you hear is

a) $f_S \neq 880$ Hz (to be calculated from the data given) c) $f_S = 880$ Hz
b) $f_L \neq 880$ Hz (to be calculated from the data given) d) $f_L = 880$ Hz ao bo● co do 3.

4. In Problem 2 above, v_L = _____ m/s.

a) +33 b) –33 c) +22 d) –22 ao bo co● do 4.

5. In Problem 2 above, v_S = _____ m/s.

a) +33 b) –33 c) +22 d) –22 a● bo co do 5.

6. In Problem 2 above, 345 m/s equals

a) $|v_L|$ b) $|v_S|$ c) c d) v ao bo co do● 6.

7. The phenomenon in Problem 2 above is called

a) the Doppler effect b) a plane wave c) polarization d) a shock wave a● bo co do 7.

8. A linearly polarized em wave travels at 1.7×10^8 m/s in a dielectric. Its electric field magnitude is 0.023 V/m at a particular point and time. Its magnetic field magnitude is _____ T at that same point and time.

v = 1.7E8 m/s E = 0.023 V/m

a) $\frac{0.023}{1.7 \times 10^8}$ b) $(1.7 \times 10^8)(0.023)$ c) $(3.0 \times 10^8)(0.023)$ d) $\frac{0.023}{3.0 \times 10^8}$ a● bo co do 8.

9. In the em spectrum, which of the following bands contains the highest frequencies (lowest wavelengths)?

a) visible light b) microwaves c) ultraviolet d) infrared ao bo co● do 9.

10. A linearly polarized em wave travels at 1.7×10^8 m/s in a dielectric. Its magnetic field magnitude is 0.023 T at a particular point and time. Its electric field magnitude is _____ V/m at that same point and time.

a) $\frac{0.023}{1.7 \times 10^8}$ b) $(1.7 \times 10^8)(0.023)$ c) $(3.0 \times 10^8)(0.023)$ d) $\frac{0.023}{3.0 \times 10^8}$ ao b● co do 10.

11. Em waves have the property of _____—that is, the direction of $\vec{E}$ is *not* arbitrary.

a) antiarbitraring b) pointing c) polarization d) electromagnetizing ao bo co● do 11.

12. To three significant figures, *all* electromagnetic waves move *in vacuum* at _____ m/s.

a) 3.00×10^8 b) 2.99×10^{-8} c) 2.99×10^8 d) 345 a● bo co do 12.

13. In the equation for the speed of an em wave in a dielectric, ε is the _____ of the dielectric in F/m.

a) permeability b) permittivity c) Poynting vector d) polarization ao b● co do 13.

14. If the dielectric in Question 13 above is diamagnetic at room temperature, then μ approximately equals

a) K_m b) 8.854×10^{-12} F/m c) $4\pi \times 10^{-7}$ T·m/A d) 1 ao bo co● do 14.

15. In vacuum, in terms of B_{max}, rather than E_{max}, S_{av} =

a) $\frac{B_{max}^2}{2\mu_0 c}$ b) $\frac{\varepsilon_0 B_{max}^2}{2c}$ c) $\frac{B_{max}^2}{2\mu_0}$ d) $\frac{1}{2}\varepsilon_0 c^3 B_{max}^2$ ao bo co do 15.

16. In Question 15 above, B_{max} is the amplitude of the

a) sound level b) electric field c) radiation pressure d) magnetic field ao bo co do 16.

17. An em wave arrives perpendicular to a perfectly absorbing surface in vacuum. It exerts a radiation pressure of 6×10^{-6} Pa on the surface. The em wave's intensity is _____ W/m^2.

a) $6 \times 10^{-6} \times 3 \times 10^8$ c) $\frac{6 \times 10^{-6} \times 3 \times 10^8}{2}$

b) $\frac{2(6 \times 10^{-6})}{3 \times 10^8}$ d) $\frac{6 \times 10^{-6}}{3 \times 10^8}$ ao bo co do 17.

18. A dielectric with $K = 3$ completely fills the volume between two perfectly reflecting parallel plane walls. A standing electromagnetic wave is set up in the dielectric. The lowest allowed frequency of the standing wave is

a) $\frac{v}{2L}$ b) $\frac{c}{3L}$ c) $\frac{c}{2L}$ d) $\frac{v}{L}$ ao bo co do 18.

19. Maxwell's equations tell us that accelerated charges produce _____ waves.

a) sound b) electromagnetic c) shock d) no ao bo co do 19.

20. An em wave hits normal to a perfectly reflecting surface in vacuum. Its radiation pressure equals

a) $\varepsilon_0 c^2 E_{max}^2$ b) $\frac{E_{max} B_{max}}{\mu_0 c}$ c) $\frac{E_{max}^2}{\mu_0}$ d) $\mu_0 E_{max}^2$ ao bo co do 20.

21. A nonmagnetic dielectric has a dielectric constant of 9 (that is, $K = 3^2 = \sqrt{81}$). Therefore, electromagnetic waves move through this dielectric with a speed of

a) $\frac{c}{9}$ b) $\frac{c}{3}$ c) c d) $\frac{c}{81}$ ao bo co do 21.

22. In a(n) _____, the oscillations *all* have the same phase over any flat surface that is perpendicular to the wave's velocity.

a) polarization b) heat wave c) em spectrum d) plane wave ao bo co do 22.

23. The intensity of a certain electromagnetic wave in vacuum is 18.0 W/m^2. If its electric field amplitude were one-third as large, the em wave's intensity in vacuum would be _____ W/m^2.

a) $3 \times 18.0 = 54$ b) $3^2 \times 18.0 = 162$ c) $\frac{18.0}{3} = 6.0$ d) $\frac{18.0}{3^2} = 2.0$ ao bo co do 23.

24. As mentioned last Wednesday and done in class yesterday, by squaring this block's equation for the speed of em waves in vacuum, we find $\frac{1}{4\pi\varepsilon_0}$ equals

a) $4\pi \times 10^{-7}$ T·m/A b) 8.854×10^{-12} F/m c) $\frac{\mu_0 c^2}{4\pi}$ d) $(\frac{E_{max}}{B_{max}})^2$ ao bo co do 24.

25. At one instant and position in a linearly-polarized em wave, the electric field is into the paper (⊗) and the magnetic field is left (←). Therefore, the direction of the velocity of the wave is _____.

a) out of the paper (⊙) b) right (→) c) toward the top (↑) d) toward the bottom (↓) ao bo co do 25.

26. At one instant and position in a linearly-polarized em wave, the electric field is left (←) and the Poynting vector is into the paper (⊗). The corresponding magnetic field is directed _____.

a) out of the paper (⊙) b) right (→) c) toward the top (↑) d) toward the bottom (↓) ao bo co do 26.