

Science 3101
Test II

Multiple Choice (3 points each, place answer on the answer sheet)

- The vibrations of a longitudinal wave move in a direction
 - along the direction of wave travel.***
 - at right angles to the direction of wave travel.
 - at a tangent to the direction of wave travel.
- A standing wave occurs when
 - two waves overlap
 - a wave reflects on itself***
 - the speed of the wave is zero or near zero
 - the amplitude of a wave exceed its wavelength
- If the frequency of a certain wave is 10 Hz, its period is
 - 0.1s***
 - 10s
 - 100s
 - none of these
- A bow wave is produced when a wave source moves
 - nearly as fast as the waves it produces.
 - as fast as the waves it produces.
 - faster than the waves it produces.***
- A Doppler effect occurs when a source of sound moves
 - towards you
 - away from you
 - at right angles to you
 - A and B***
- When the speed of sound near the ground is greater than higher in the air, sound tends to be bent
 - upward***
 - downward
 - proceed undisturbed
- Consider light energy that is momentarily absorbed in glass and then reemitted. Relative to the absorbed light, the frequency of the emitted light is
 - considerably less
 - the same***
 - slightly more
 - considerable more
- The color of an opaque object is the same as the light that is
 - transmitted
 - absorbed
 - reflected***
 - none of these
- The complementary color of blue is
 - red
 - green
 - yellow***
 - green
- Cyan is really a mixture of
 - red and blue light
 - red and green
 - blue and green***
 - yellow and magenta

11. The sky is blue because air molecules in the sky act as tiny
a. mirrors that reflect only blue light **b. resonators that scatter blue light**
c. sources of white light d. none of these
12. A blue object will appear black when illuminated with
a. blue light b. cyan light **c. yellow light** d. magenta light
13. Diffuse reflection occurs when the size of surface irregularities is
a. small compared to the wavelength of the light used.
b. large compared to the wavelength of the light used.
14. A diver shines light up to the surface of a smooth pond at a 10 degree angle to the normal. Some of the light passes into the air above, and the part that reflects back into the water makes an angle to the normal of
a. less than 10 degrees **b. 10 degrees**
c. more than 10 degrees d. can not predict
15. A mirage is a result of atmospheric
a. refraction b. scattering c. dispersion d. aberrations
16. Different colors are dispersed by a prism because different colors in the prism have different
a. directions b. absorbances **c. speeds** d. none of these
17. The critical angle for a transparent material is the angle at and beyond which all light within the material is
a. reflected b. absorbed c. dispersed d. diffused
18. A “burning glass” used to concentrate sunlight in a tiny spot is a
a. converging lens b. diverging lens
c. either d. neither
19. Which of the following is electrically neutral?
a. proton **b. neutron** c. electron d. quark
20. What makes an element distinct?
a. the number of protons b. the number of neutrons
c. the number of electrons d. none of these
21. Most alpha particles fired at a gold foil pass through undeflected because the
a. electrical field is zero inside the gold.
b. gold atoms, unlike most other metal atoms, are relatively far apart.
c. atoms of gold, like any others, are mostly empty space.
d. net charge of the gold atoms is zero.

3. (5 points) Gusts of wind make the Sears Building in Chicago sway back and forth at a vibration frequency of about 0.1 Hz. What is its period?

$$\begin{aligned} \text{period} &= \frac{1}{\nu} \\ &= \frac{1}{0.1\text{s}^{-1}} \\ &= 10\text{sec} \end{aligned}$$

5. (10 points) Complete the following light combinations:

Red + Blue = *magenta*

Green + Red = *yellow*

Cyan - Green = *blue*

White light - yellow = *blue*

Magenta + Green = *white light*