

SCIE 3101
Test III

MULTIPLE CHOICE.

- 1) Strip electrons from an atom and the atom becomes a
A) *positive ion.* B) different element. C) negative ion.
- 2) When the distance between two charges is halved, the electrical force between the charges
A) halves. **B) quadruples.** C) doubles.
D) is reduced by one-quarter. E) none of these
- 3) If you use 10 J of work to push a coulomb of charge into an electric field, its voltage with respect to its starting position is
A) less than 10 V. B) more than 10 V. **C) 10 V.**
- 4) An ampere is a unit of electrical
A) *current.* B) resistance. C) pressure.
D) all of these E) none of these
- 5) In an ac circuit, the electric field
A) is the same everywhere. B) is nonexistent.
C) changes magnitude and direction with time. D) increases via the inverse square law.
E) none of these
- 6) The electric power of a lamp that carries 2 A at 120 V is
A) 60 W. **B) 240 W.** C) 2 W. D) 20 W. E) 1/6 W.
- 7) When two lamps are connected in series to a battery, the electrical resistance that the battery senses is
A) less than the resistance of either lamp. **B) more than the resistance of either lamp.**
C) none of these
- 8) Like kinds of magnetic poles repel while unlike kinds of magnetic poles
A) *attract.* B) may attract or repel. C) repel also.
- 9) Magnetic field lines about a current-carrying wire
A) extend radially from the wire. **B) circle the wire in closed loops.**
C) both of these D) neither of these
- 10) Electromagnetic induction occurs in a coil when there is a change in
A) voltage in the coil. B) electromagnetic polarity.
C) magnetic field intensity in the coil. D) the coil's polarity.
E) electric field intensity in the coil.
- 11) Voltage can be induced in a wire by
A) changing the current in a nearby wire. B) moving a magnet near the wire.
C) moving the wire near a magnet. **D) all of these**
E) none of these
- 12) A device that transforms electrical energy to mechanical energy is a
A) *motor.* B) generator.
C) transformer. D) magnet. E) none of these

- 13) Voltage produced by a generator alternates because
A) the changing magnetic field that produces it alternates.
 B) alterations in the mechanical energy input.
 C) the current it produces alternates.
 D) in effect it is an ac motor in reverse.
 E) unlike a battery, it produces alternating current.
- 14) Transformers use ac so there will be the required
 A) transfer of energy from coil to coil. B) change in input current.
C) change in magnetic field for operation. D) voltage for transformation.
 E) magnetic field intensities.
- 15) Rapid changes of a magnetic field induces
 A) a magnetic field of greater magnitude. B) an electric field.
 C) a magnetic field of the same magnitude.
- 16) A wiggle in time is a
 A) vibration. B) wave. C) both D) neither
- 17) Which of the following is not a transverse wave?
 A) sound B) radio C) light D) all of these E) none of these
- 18) A mass on the end of a spring bobs up and down 1 complete cycle every 2 s. Its frequency is
 A) 2 Hz. B) 0.5 Hz. C) neither of these
- 19) The Doppler effect is characteristic of
 A) sound waves. B) light waves. C) water waves.
D) all of these E) none of these
- 20) A bow wave is produced when a wave source moves
A) faster than the waves it produces. B) nearly as fast as the waves it produces.
 C) as fast as the waves it produces.
- 21) For light, a red shift indicates the light source moves
A) away from you. B) toward you. C) at right angles to you.
 D) actually, all of these E) none of these
- 22) When the speed of sound near the ground is greater than higher in the air, sound tends to be bent
A) upward. B) downward.
- 23) The phenomenon of beats results from sound
A) interference. B) refraction. C) reflection.
 D) all of these E) none of these
- 24) The loudness of a musical sound is a measure of the sound wave's
 A) frequency. B) speed. C) amplitude.
 D) wavelength. E) all of these
- 25) High pitched sound has a high
 A) speed. B) number of partial tones. C) frequency.
 D) all of these E) none of these

(5 points) Calculate the resistance of a circuit when two resistors (10 ohms and 100ohms) are placed in parallel.

$$\begin{aligned}\frac{1}{R_{tot}} &= \frac{1}{R_1} + \frac{1}{R_2} \\ &= \frac{1}{10ohm} + \frac{1}{100ohm} \\ \frac{1}{R_{tot}} &= \frac{11}{100ohm} \\ R_{tot} &= 9.09ohm\end{aligned}$$

(5 points) How much does it cost to operate a 100W lamp continuously for 1 week if the power utility rate is 20cents/kWh?

$$\begin{aligned}\text{cost} &= 100W \left(\frac{1kW}{1000W} \right) (7days) \left(\frac{24\text{ hours}}{1\text{ day}} \right) \left(\frac{20cents}{1kW / hr} \right) \\ &= 336cents \\ &= \$3.36\end{aligned}$$

(5 points) An ideal transformer has 50 turns in its primary and 250 turns in its secondary. 12V AC is connected to the primary. Calculate the voltage available at the secondary.

$$\begin{aligned}\frac{\text{Primary Voltage}}{\text{Primary Turns}} &= \frac{\text{Secondary Voltage}}{\text{Secondary Turns}} \\ \frac{12V}{50\text{ turns}} &= \frac{x\text{ volts}}{250\text{ turns}} \\ x &= 60\text{ volts}\end{aligned}$$

(5 points) What is the frequency in hertz, which corresponds to the following period: 5 seconds?

$$\begin{aligned}\text{Frequency} &= \frac{1}{\text{period}} \\ &= \frac{1}{5\text{seconds}} \\ &= 0.2\text{hertz}\end{aligned}$$

(5 points) What two physics mistakes occur in a science-fiction movie that shows a distant explosion in outer space, where you see and hear the explosion at the same time?

First, in outer space there is no air or other material to carry sound. Second, if there were, the faster-moving light would reach you before the sound.