

PHSC 1011 Exam 3

$$F = ma$$

$$W = mg$$

$$g = 10 \text{ m/s}^2$$

$$a = \frac{\Delta v}{t}$$

$$v_{\text{ave}} = \frac{d}{t}$$

$$d = \frac{1}{2}at^2$$

$$v = at$$

$$F = G \frac{m_1 m_2}{r^2}$$

$$1000 \text{ m} = 1 \text{ km}$$

$$1.609 \text{ km} = 0.622 \text{ mi}$$

$$1 \text{ hr} = 3600 \text{ s}$$

$$1 \text{ m} = 3.28 \text{ ft}$$

$$W = F_{\parallel} d \text{ (work)}$$

$$P = \frac{W}{t}$$

$$KE = \frac{1}{2}mv^2$$

$$PE = mgh$$

$$p = mv$$

$$\Delta p = F \Delta t$$

$$\theta_i = \theta_f$$

$$n = \frac{c}{v}$$

$$c = \lambda f$$

$$E = hf$$

$$V = IR$$

$$P = IV$$

$$R_{\text{total}} = R_1 + R_2 + R_3$$

$$\frac{1}{R_{\text{total}}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Name Key B

$$T_F = \frac{9}{5}T_C + 32^\circ$$

$$T_C = \frac{5}{9}(T_F - 32^\circ)$$

$$T_K = T_C + 273$$

$$f = \frac{1}{T}$$

$$v = f\lambda$$

$$v = 331 + .6 \times T(\text{in } ^\circ\text{C})$$

$$F = k \frac{q_1 q_2}{r^2}$$

$$I = \frac{q}{t}$$

PHSC 1011

Test 3

Multiple Choice/True or False

Choose the one alternative that best completes the statement or answers the question. Each correct Multiple Choice answer is worth 2 points and each True or false question is worth 1 point. Circle the correct answer in the exam first then after you are done transfer the answers to the scan-a-tron sheet.

TRUE/FALSE (Blue side of scan-a-tron form)

- 1) The volt is a measure of the difference in electrical potential energy between two points.
 a) True
 b) False
- 2) The radiation from the Sun is most intense near the yellow-green wavelength.
 a) True
 b) False
- 3) Electrons move from the power plant to homes in an alternating current.
 a) True
 b) False
- 4) The slower light travels in a given media, the greater the index of refraction.
 a) True
 b) False
- 5) The angle of incidence is equal to the angle of refraction.
 a) True
 b) False
- 6) Charge moving through a wire produces a magnetic field around the wire.
 a) True
 b) False
- 7) Longer wavelengths are affected more by a prism or water droplets than are the shorter wavelengths.
 a) True
 b) False
- 8) The change in the direction of light as it passes through the boundary between two media is called refraction.
 a) True
 b) False
- 9) The reading on your electric bill shows the amount of power you have used in a month.
 a) True
 b) False

North end of a suspended magnet will point to the magnetic north pole.

- a) True
- b) False

11) Thomas Edison argued that our electrical system should use direct current because he felt that alternating current was dangerous.

- a) True
- b) False

12) Ultraviolet light carries more energy than infrared radiation.

- a) True
- b) False

13) Interference is a property of light most easily explained by the particle model.

- a) True
- b) False

14) Light can act like a particle

- a) True
- b) False

15) Magnets can have only one pole.

- a) True
- b) False

16) Transformers can only increase the Voltage of a source.

- a) True
- b) False

17) If you have lights connected in series and one of them goes out the rest stay on.

- a) True
- b) False

18) Light is made up of Electric and Magnetic fields.

- a) True
- b) False

19) Radio waves and Gamma waves have different speeds.

- a) True
- b) False

20) Virtual images are produced on screens.

- a) True
- b) False

MULTIPLE CHOICE (Green side of Scan-a-tron form)

- 1) The photoelectric effect could not be adequately explained with a wave model of light because
 - a) the number of electrons ejected from a metal depended upon the intensity.
 - b) the number of electrons ejected from a metal depended upon the wavelength.
 - c) the energy of the ejected electrons did not depend upon the intensity.
 - d) the energy of the electrons ejected from a metal varied directly with the intensity.

- 2) A copper wire from a large spool is cut into two lengths to make extension cords, one 50 feet long and the other 75 feet long. Which of the following is true?
 - a) The shorter cord will have a smaller voltage.
 - b) The longer cord will have more resistance.
 - c) The shorter cord will dissipate more power.
 - d) The longer cord will be able to carry more current.

- 3) Light is refracted as it crosses the interface between two different media because
 - a) it becomes polarized.
 - b) it changes frequency.
 - c) it changes speed.
 - d) it loses energy.

- 4) Under the correct conditions, two light waves can produce regions of reinforcement and regions of cancellation. This phenomenon is known as
 - a) interference.
 - b) reflection.
 - c) polarization.
 - d) refraction.

- 5) Total internal reflection can occur when a light ray moves across a boundary between different materials in which direction?
 - a) exactly perpendicular to the surface, no matter what the indices of refraction.
 - b) from the material with the faster speed of light, into the material with the slower speed of light.
 - c) from a material with a slower speed of light to a material with a faster speed of light.
 - d) parallel to the surface, but only if the ray is polarized.

- 6) Which of the following object does not emit light?
 - a) a burning coal
 - b) the Sun
 - c) the Moon
 - d) a candle flame

- 7) A magnetic compass points towards the north geographic pole of the Earth because
- a) there is a south magnetic pole near the north geographic pole.
 - b) the static electricity in the atmosphere causes the alignment of the compass.
 - c) there is a north magnetic pole near the north geographic pole.
 - d) all magnetic poles, north or south, point that way due to the spin of the Earth.
- 8) A converging lens
- a) always has two curved surfaces.
 - b) refracts all light toward the focal point.
 - c) always has a real image.
 - d) is thicker in the center than the edges.
- 9) Phenomena such as diffraction and interference can be most easily explained in terms of the
- a) wave model of light.
 - b) particle model of light.
 - c) photoelectric effect.
 - d) ray model of light.
- 10) Which of these will always produce a magnetic field?
- a) A negative charge at rest
 - b) A positive charge at rest
 - c) Another magnetic field
 - d) A moving charge
- 11) We explain light today
- a) as something completely unknown.
 - b) as having both wave and particle behavior.
 - c) mostly with particle models.
 - d) mostly as a wave phenomenon.
- 12) When light is reflected from a smooth, plane mirror
- a) the angle of reflection is the same as the angle of incidence.
 - b) the light is changed to a lower frequency.
 - c) the wave characteristics are predominant.
 - d) most of the light is scattered into multiple directions.
- 13) In many ways, an electric circuit is like the plumbing system in your home. The voltage on an electric circuit corresponds to the _____ in a plumbing system.
- a) drain
 - b) faucet or valve
 - c) trap
 - d) pressure

- 14) Two lightbulbs are installed in two sockets connected in parallel and power is then applied to the combination so that both bulbs light. If one of the bulbs is then removed from its socket, the other one will
- a) go out.
 - b) get brighter.
 - c) remain equally bright.
 - d) get dimmer.
- 15) Ohm's law states
- a) that the current in a circuit increases if the potential difference increases.
 - b) a relationship between voltage, current, and charge.
 - c) that for constant voltage, a greater resistance means more current will flow.
 - d) that less current flows when a higher voltage is applied.
- 16) An electric current is
- a) an electrical equivalent of gravitational potential difference.
 - b) measured in joules per coulomb.
 - c) a flow of charge.
 - d) a movement of electrons at near the speed of light.
- 17) A transformer is used to either increase or decrease the voltage in an AC circuit. When the output voltage is greater than the input voltage of a transformer then
- a) the power output is the same as the power input.
 - b) the power output depends on the ratio of turns in the primary and secondary.
 - c) the power output is smaller than the power input.
 - d) the power output is larger than the power input.
- 18) A magnetic field
- a) is produced by an excess of stationary electric charges.
 - b) is produced by a deficiency of stationary electric charges.
 - c) attracts or repels stationary electric charges.
 - d) is produced by moving charges.
- 19) For visible light, which property of visible electromagnetic waves changes with color?
- a) Wavelength.
 - b) Amplitude.
 - c) Frequency.
 - d) Amplitude and frequency.
 - e) Frequency and wavelength.

- 20) The unit of electric potential difference between two points is
- a) an ampere.
 - b) a coulomb.
 - c) a joule.
 - d) a volt.
- 21) The unaided nearsighted human eye focuses light from a distant object
- a) behind the retina.
 - b) in front of the retina.
 - c) on the retina.
 - d) acceptably but is too short for the focusing power of the cornea.
- 22) What is it that travels through an electric circuit at near the speed of light?
- a) an electric field
 - b) a potential difference
 - c) electrons
 - d) protons
- 23) If you load up a circuit in your home with too many devices, like lightbulbs or stereos, in _____, then you can overload the circuit and trip a circuit breaker or blow a fuse.
- a) parallel
 - b) summer
 - c) duplicate
 - d) series
- 24) The resistance of a wire depends on
- a) the length of the wire.
 - b) the cross-sectional area of the wire.
 - c) the temperature of the wire.
 - d) All of the above.
- 25) Three different resistance lightbulbs are connected to a 120-V outlet. The most power will be consumed by the circuit when
- a) the bulbs are in series.
 - b) the bulbs are in parallel.
 - c) The arrangement is unimportant because the voltage is the same in all cases.
 - d) the least resistive bulb is in parallel with a series of the other two.
 - e) the most resistive bulb is in parallel with a series of the other two.

- 26) Electrical resistance is a property of conductors that is measured in units of
- a) coulomb.
 - b) amp.
 - c) volt.
 - d) ohm.
- 27) You are able to see non-luminous objects because light has undergone
- a) a change in speed.
 - b) diffuse reflection.
 - c) constructive interference.
 - d) refraction.
- 28) A permanent magnet is produced when
- a) electrical fields exchange electrons with the magnetic fields.
 - b) magnetic fields of large groups of individual atoms are permanently aligned.
 - c) current is made to circulate in a clockwise direction in a loop of wire.
 - d) electrons become stuck and cease to move.
- 29) What are the units of h in the equation $E = hf$?
- a) $J \cdot s$
 - b) $\frac{J}{s}$
 - c) $W \cdot m$
 - d) $\frac{W}{s}$
- 30) When light enters a medium with a higher index of refraction it
- a) is bent towards the normal.
 - b) is bent away from the normal.
 - c) is absorbed.
 - d) continues in the same direction.
- 31) Convex (converging) lenses are worn by
- a) a farsighted person to make rays from a distant object diverge more strongly.
 - b) a nearsighted person to make rays from a nearby object diverge less strongly.
 - c) a nearsighted person to make rays from a distant object diverge more strongly.
 - d) a farsighted person to make rays from a nearby object diverge less strongly.

PROBLEMS

Solve the following problems using the formulas and information given on the front of the exam. Show all work and proper units or you will not get any credit. Partial credit may be given. 3 points each

- 1) A heater is rated to dissipate 1440 W when connected to a 120 V source. The current drawn by the device is

$$P = IV$$

$$I = \frac{P}{V}$$

$$I = \frac{1440 \text{ W}}{120 \text{ V}}$$

$$I = 12 \text{ A}$$

- 2) A certain kind of lightbulb carries 0.5 amperes of current when connected to a 120 volt AC circuit. What is its power rating?

$$P = IV$$

$$P = (0.5 \text{ A})(120 \text{ V})$$

$$P = 60 \text{ W}$$

- 3) The voltage drop across a resistor is 4.0 V for a current of 1.0 A in the resistor. What is the current that will produce a voltage drop of 2.0 V across the resistor?

$$V = IR$$

$$R = \frac{V}{I} = \frac{4 \text{ V}}{1 \text{ A}}$$

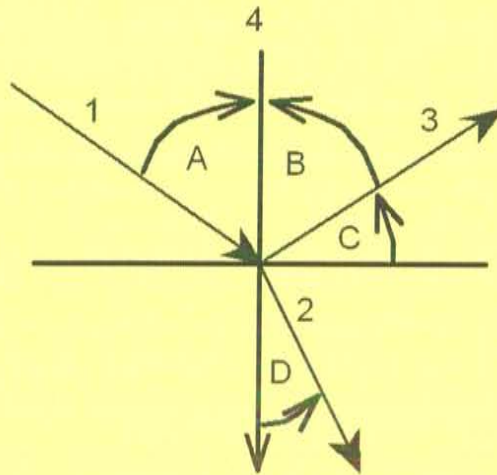
$$R = 4 \Omega$$

$$V = IR$$

$$I = \frac{V}{R}$$

$$I = \frac{2 \text{ V}}{4 \Omega}$$

$$I = 0.5 \text{ A}$$



4) If 1 is the incident ray, what is the angle of reflection?

B

5) If angle A is 60° , what does angle C measure?

30°

6) What is the refracted ray indicated by?

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