

**Some Multiple Choice** problems from the test bank used to construct the 1404 Final

Note that questions in Sample Test – 1 were from this file - so only Chpt 20-31 are included here.

1) Two long parallel wires carry equal currents. The magnitude of the force between the wires is  $F$ . The current in each wire is now doubled. What is the magnitude of the new force between the two wires?

- A)  $4F$       B)  $2F$       C)  $F/4$       D)  $F/2$

2) In a mass spectrometer a particle of mass  $m$  and charge  $q$  is accelerated through a potential difference  $V$  and allowed to enter a magnetic field  $B$ , where it is deflected in a semi-circular path of radius  $R$ . The magnetic field is uniform and oriented perpendicular to the velocity of the particle. A correct expression for the mass of the particle is  $M =$

- A)  $qB^2R^2/V$       B)  $qB^2R^2/(2V)$       C)  $q^2B^2R^2/V$       D)  $q^2B^2R^2/(2V)$

3) What is the force per meter on a straight wire carrying  $5.0$  A when it is placed in a magnetic field of  $0.020$  T? The wire makes an angle of  $27^\circ$  with respect to the magnetic field lines.

- A)  $0.022$  N/m      B)  $0.045$  N/m      C)  $0.17$  N/m      D)  $0.26$  N/m

4) A transformer is a device used to

- A) transform an alternating current into a direct current.      B) transform a direct current into an alternating current.  
C) increase or decrease an ac voltage.      D) increase or decrease a dc voltage.

5) A circular loop of radius  $0.10$  m is rotating in a uniform magnetic field of  $0.20$  T. Find the magnetic flux through the loop when the plane of the loop and the magnetic field vector are perpendicular.

- A) zero      B)  $3.1 \times 10^{-3}$  T·m<sup>2</sup>      C)  $5.5 \times 10^{-3}$  T·m<sup>2</sup>      D)  $6.3 \times 10^{-3}$  T·m<sup>2</sup>

6) A coil is wrapped with  $200$  turns of wire on a square frame with sides  $18$  cm. A uniform magnetic field is applied perpendicular to the plane of the coil. If the field changes uniformly from  $0.50$  T to  $0$  in  $8.0$  s, find the average value of the induced emf.

- A)  $2.1$  mV      B)  $4.1$  mV      C)  $0.21$  V      D)  $0.41$  V

7) The index of refraction of diamond is  $2.42$ . This means that a given frequency of light travels

- A)  $2.42$  times faster in air than it does in diamond.      B)  $2.42$  times faster in diamond than it does in air.  
C)  $2.42$  times faster in vacuum than it does in diamond.      D)  $2.42$  times faster in diamond than it does in vacuum.

8) An image is  $4.0$  cm behind a concave mirror with focal length  $5.0$  cm. Where is the object?

- A)  $2.2$  cm in front of the mirror      B)  $2.2$  cm behind the mirror  
C)  $9.0$  cm in front of the mirror      D)  $1.0$  cm behind the mirror

9) Light passes from air to water. The incoming ray is at an angle of  $17.0^\circ$  to the normal. The index of refraction is  $1.33$ . What is the angle in the water?

- A)  $22.9^\circ$       B)  $22.6^\circ$       C)  $18.3^\circ$       D)  $12.7^\circ$

10) Electromagnetic waves are

- A) longitudinal.      B) transverse.      C) both longitudinal and transverse.      D) neither longitudinal or transverse.

11) A radar receiver indicates that a transmitted pulse return as an echo in  $20$   $\mu$ s after transmission. How far away is the reflecting object?

- A)  $1.5$  km      B)  $3.0$  km      C)  $6.0$  km      D)  $9.0$  km

12) What is the wavelength of a  $92.9$ -MHz radio wave?

- A)  $32$  mm      B)  $32$  cm      C)  $3.2$  m      D)  $32$  m

13) Two beams of coherent light travel different paths arriving at point P. If the maximum destructive interference is to occur at point P, the two beams must

- A) travel paths that differ by a whole number of wavelengths.
- B) travel paths that differ by an odd number of half-wavelengths.

14) Monochromatic light is incident on a grating that is 75 mm wide and ruled with 50,000 lines. The second-order maximum is seen at  $32.5^\circ$ . What is the wavelength of the incident light?

- A) 202 nm
- B) 403 nm
- C) 605 nm
- D) 806 nm

15) Relative to a stationary observer, a moving clock

- A) always runs slower than normal.
- B) always runs faster than normal.
- C) keeps its normal time.
- D) can do any of the above. It depends on the relative velocity between the observer and the clock.

16) During a reaction,  $1.7 \times 10^{-4}$  J of energy is released. What change of mass would cause this?

- A)  $5.1 \times 10^{-4}$  kg
- B)  $1.5 \times 10^{-13}$  kg
- C)  $4.8 \times 10^{-18}$  kg
- D)  $1.9 \times 10^{-21}$  kg

17) A spaceship moves away from the Earth with a speed of  $0.80c$ . The spaceship then fires a missile with a speed of  $0.50c$  relative to the spaceship. What is the velocity of the missile measured by observers on the Earth if the missile is fired toward the Earth?

- A)  $0.30c$
- B)  $0.50c$
- C)  $0.93c$
- D)  $1.3c$

18) What is a photon?

- A) an electron in an excited state
- B) a small packet of electromagnetic energy that has particle-like properties
- C) one form of a nucleon, one of the particles that makes up the nucleus
- D) an electron that has been made electrically neutral

19) What frequency of electromagnetic radiation has an energy of  $58.1 \mu\text{eV}$ ?

- A) 1.4 MHz
- B) 711 MHz
- C) 7.1 GHz
- D) 14 GHz

20) An electron is accelerated by a potential difference of 100 V. What is its wavelength?

- A) 0.122 nm
- B) 0.212 nm
- C) 0.221 nm
- D) 0.313 nm

21) The orbital quantum number can have any integer value ranging from

- A) 0 to n.
- B) 0 to (n-1).
- C) 1 to n.
- D) 1 to (n+1).

22) In the ground state, the quantum numbers ( $n, l, m_l, m_s$ ) for hydrogen are, respectively,

- A) 1, 1, 1, 1.
- B) 1, 0, 0, 0.
- C) 1, 0, 0,  $\pm 1/2$ .
- D) 1, 1, 1,  $\pm 1/2$ .

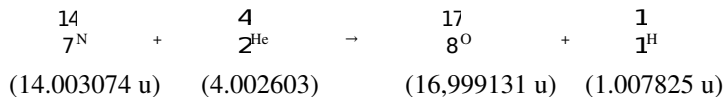
23) Suppose that the speed of an electron traveling 2000 m/s is known to an accuracy of 1 part in  $10^5$  (i.e., within 0.001%). What is the greatest possible accuracy within which we can determine the position of this electron?

- A) 2.9 mm
- B) 5.8 mm
- C) 8.7 mm
- D) 1.2 cm

24) A proton strikes an oxygen-18 nucleus producing fluorine-18 and another particle. What other particle is produced by this nuclear reaction?

- A) a neutron
- B) an alpha particle
- C) an  $\beta^-$  particle
- D) an  $\beta^+$  particle

25) Find the Q value of the following reaction:



- A) -0.001279 u                  B) -0.002179 u                  C) -0.007219 u                  D) -0.009721 u

26) An  $\alpha$  particle is also known as

- A) an electron.                  B) a positron.                  C) a helium nucleus.                  D) a photon.

27) An atom has 98 protons and 249 nucleons. If it undergoes alpha decay, what are the number of protons and neutrons, respectively, in the daughter nucleus?

- A) 100, 245                  B) 94, 247                  C) 96, 245                  D) 100, 249

ANS: 1 A, 2 B, 3 B, 4 C, 5 D, 6 D, 7 C, 8 A, 9 D, 10 B, 11 B, 12 C, 13 B, 14 B, 15 A, 16 D, 17 B, 18 B, 19 D, 20 A, 21 B, 22 C, 23 B, 24 A, 25 A, 26 C, 27 C