NMAT Physics Practice Questions

Set 2

Directions: Choose the letter that corresponds to the correct answer.

1. An object moves along the x-axis with a constant acceleration of 6 m/s² and an initial velocity of –24 m/s. It is located at x = 6 m when t = 0 s. What is its position when its velocity is zero?

A. 6 m

B. –42 m

C. –90 m

D. –96 m

2. Which of the following is the primary goal of scientific inquiry?

A. finding technological solutions to human problems

B. discovering the fundamental principles that govern nature

C. developing mathematical techniques for solving problems

D. investigating fundamental principles that transcend the material world

3. Which of the following experiments led most directly to the quantum theory of light?

A. Michelson's and Morley's effort to detect the luminiferous ether

B. Röntgen's discovery of the emission of X-rays from a vacuum tube

C. Planck's analysis of the spectrum emitted by a blackbody

D. Hertz's detection of electromagnetic radiation

4. The speed of sound in air is 340 m/s. At what pitch must a 170-cm-tall person sing to produce a sound wave with a wavelength equal to the person's height?

A. 24.5 Hz

B. 200 Hz

C. 255 Hz

D. 578 Hz

5. A car on a highway has an initial speed of 23 m/s. The car accelerates at a constant rate for 10 s to a final speed of 29 m/s. How far does the car travel during this time interval?

A. 230 m

B. 260 m

C. 275 m

D. 290 m

6. An organ pipe is closed at one end. As the temperature of the gas inside the pipe increases, which of the following will also increase?

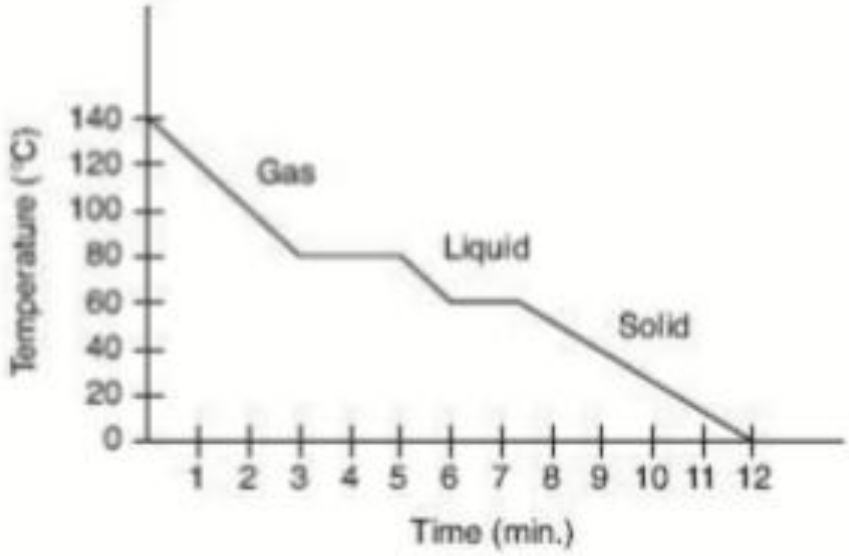
A. the wavelength of the fundamental frequency

B. the ratio of the harmonics produced in the pipe

C. the speed of the waves produced in the pipe

D. the number of overtones produced in the pipe

7. The following diagram shows the response of 2 kilograms of a gas at 140°C. Heat is released at a rate of 6 kilojoules per minute.



The melting point of this substance is

A. 0°C

B. 60°C

C. 80°C

D. 140°C

8. A beam of parallel rays is reflected from a smooth plane surface. After reflection the rays will be

A. converging

B. diverging

C. parallel

D. diffused

9. An elementary particle moving at 0.99c with respect to the laboratory frame has a half-life of 16 μs in the laboratory frame. What is the half-life of the particle in its own frame of reference?

A. 0.50 μs

B. 2.3 μs

C. 4.0 μs

D. 15 μs

10. The acceleration toward the center of an object moving with constant speed around a given circle

A. is proportional to its velocity

B. is proportional to the square of its speed

C. is proportional to the square root of its speed

D. is inversely proportional to its velocity

11. According to Maxwell's equations, a time-dependent magnetic field will be produced under which of the following circumstances?

A. The total magnetic flux through a surface is equal to zero.

B. A field exists that is the gradient of a scalar function.

C. An electric field varies with time.

D. The electric flux through surface is zero.

12. The angular speed of a star spinning about its axis increases as the star begins to contract to a smaller radius. Which of the following quantities associated with the star must decrease as this occurs?

A. moment of inertia

B. angular momentum

C. rotational kinetic energy

D. net external torque

13. Which of the following is one of Einstein's postulates of special relativity?

A. Events that are simultaneous for one observer are not simultaneous for another observer in motion relative to the first.

B. The energy of a photon is directly proportional to the frequency of the light.

C. The momentum of an object approaches infinity as its speed approaches that of light.

D. The speed of light in a vacuum has the same value in all inertial reference frames.

14. A piece of string, fixed at both ends, is struck to produce a wave in the string. Given that μ is the string's linear mass density and T is its tension, which of the following combinations of values will produce the greatest wave speed?

A. μ = 0.1 kg/m, T = 0.1 N

B. μ = 0.1 kg/m, T = 1.0 N

C. μ = 1.0 kg/m, T = 0.1 N

D. μ = 1.0 kg/m, T = 1.0 N

15. Use the diagram below to answer the question that follows.

A 36 V battery is in series with a parallel plate capacitor, as shown in the diagram above. The plate separation is 0.20 m. The plates are large, so that the electric field is approximately constant between them. What is the magnitude and direction of the field?

A. 7.2 N/C to the left

B. 7.2 N/C to the right

C. 180 N/C to the left

D. 180 N/C to the right

16. Boyle's law describes the behavior of a gas when

A. its pressure is kept constant

B. its volume is kept constant

C. its density is kept constant

D. its mass is kept constant

17. A positive charge is moving with constant speed at right angles to a uniform magnetic field. If the speed of the charge were doubled, the force exerted on the particle by the magnetic field would be

A. unaffected

B. quadrupled

C. doubled

D. halved

18. Light passes through two parallel slits and falls on a screen. The pattern produced is due to interference and

A. reflection

B. refraction

C. polarization

D. diffraction

19. Which of the following statements is (are) correct about the photoelectric effect?

I. The number of electrons emitted is independent of the intensity of the incident light.

II. The stopping potential decreases with increased frequency.

III. In a graph of maximum kinetic energy versus incident frequency, all metals have different threshold frequencies, but all have the same slope.

IV. The maximum kinetic energy of the emitted electrons is independent of the intensity of the incident light.

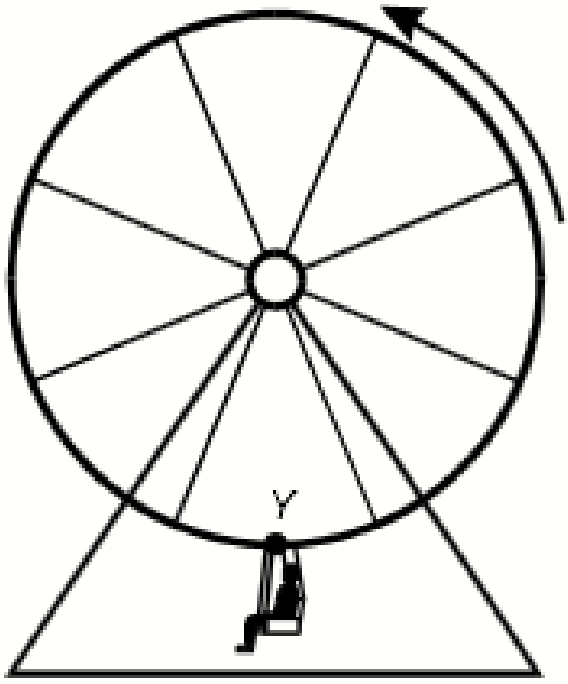
A. I only

B. III only

C. II and IV

D. III and IV

20. Use the diagram below to answer the question that follows.



The diagram above represents a Ferris wheel rotating at a constant speed. Which of the following vectors represents the acceleration of a person on the wheel at point Y?

A. ⬆

B. ➡

C. ⬇

D. ↗

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21. When a beam of light goes from a rarer to a denser medium such as glass and has an angle of incidence equal to zero, which of the following properties of the beam of light does (do) NOT change?

I. Amplitude

II. Speed

III. Wavelength

IV. Direction

A. I, II, and III only

B. I and III only

C. II and IV only

D. IV only

22. A circular loop of wire is connected in series with a voltage source V and a resistor R. The strength of the magnetic field in the middle of the loop is directly proportional to:

A. VR.

B. V/R

C. V^2R

D. V^2/R

23. A man standing in an elevator is taken up by the elevator at constant speed. Which of the following is (are) true of the push that the man exerts on the floor of the elevator?

I. It is equal to his weight.

II. It is equal to less than his weight.

III. It is equal to more than his weight.

IV. It is dependent on the value of the constant speed.

A. I only

B. II only

C. III only

D. IV only

24. Which of the following particles, all moving with the same velocity, will have the longest de Broglie wavelength?

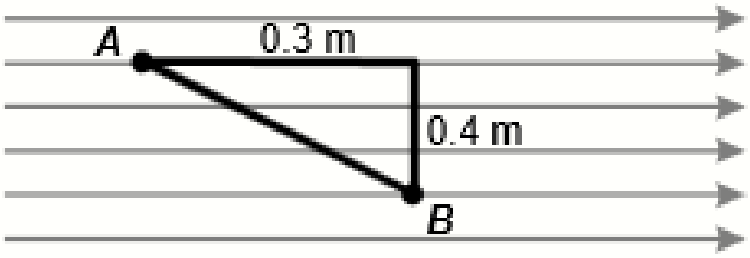
A. An electron

B. A proton

C. A neutron

D. An alpha particle

25. Use the diagram below to answer the question the follows.



The diagram above shows an electric field of 10 N/C that is constant in magnitude and direction. What is the electrostatic potential between points A and B?

A. 3 V

B. 4 V

C. 5 V

D. 7 V