

**Test:** 2021 Physics NCE

### Question 1 of 75

To prevent excess current, a fuse or circuit breaker must be placed

- A) in series with other circuits
- B) in parallel with other circuits
- C) in resistance with other circuits
- D) independent of the current's circuit

### Question 2 of 75

To determine the appropriate fuse or circuit breaker, one must find

- A) the total current only
- B) the equivalent resistance
- C) the minimum resistance
- D) the parallel resistors

### Question 3 of 75

As more resistors added in parallel, what happens to the current in the wires of a circuit

- A) current decreases with additional resistors
- B) current stays constant regardless
- C) current increases with additional resistors
- D) current increases for first 3 resistors then decreases

### Question 4 of 75

Why was Rutherford's model of the atom discarded?

- A) a planetary model was too simplistic
- B) the increasing frequency of emitted radiation would cause collapse
- C) alpha particles would cause catastrophic deflections
- D) centripetal acceleration would cause increasing orbital distance making it unstable

**Question 5 of 75**

$N > Z$  is required for atoms to overcome

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- A) Coulomb Repulsion
- B) Beta Reverberations
- C) Electromagnetic Force Resistance
- D) Ohm's Equivalence

**Question 6 of 75**

The rate at which an object radiates energy is proportional to the fourth power of the absolute temperature. This is known as:

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- A) Planck's Law
- B) Stefan's Law
- C) Henry Jones' Postulate
- D) Wein's Displacement Law

**Question 7 of 75**

Metals are not to be put into microwave ovens because

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- A) Microwave radiation will be prevented from heating the liquid in foods and warming it
- B) Metals absorb the water in food necessary to heat the food
- C) Microwave energy loses electrons to the surface of the metals
- D) Microwave energy can dislodge electrons on the metals causing sparking and damage

**Question 8 of 75**

When you switch from AM to FM band radio, what happens to the capacitance of the receiving circuit

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- A) capacitance is increased
- B) resonant frequency is decreased
- C) capacitance is decreased
- D) inductance is increased

**Question 9 of 75**

What is the advantage to using a Fresnel lens?

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- A) they are heavier and less susceptible to stresses
- B) they are thicker and project clearer images
- C) they create concentric circles projected on a screen
- D) they are thin, lighter with same optical properties

**Question 10 of 75**

Radiation intensity should increase as wavelengths go to zero, but beyond violet, this does not occur. This phenomena is called

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- A) ultraviolet catastrophe
- B) post-violet aberration
- C) stopping potential
- D) period of oscillation

**Question 11 of 75**

Fluorescence is caused by

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- A) excited electrons returning to ground level in one jump
- B) excited electrons falling one energy level
- C) electrons at the  $n=4$  level falling to ground state in 2 or more jumps
- D) electrons jumping up 2 or more energy levels

**Question 12 of 75**

In using lasers, when more atoms are in the excited state than ground state it is called

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- A) spontaneous emission
- B) absorption
- C) coherency
- D) population inversion

**Question 13 of 75**

By conservation of charge, a positron can be created only with simultaneous creation of an electron in a process called

- A) pair production
- B) pair simulation
- C) pair annihilation
- D) simultaneous pairing

**Question 14 of 75**

In electrostatic equilibrium, the electric field just below the surface of a charged conductor is

- A) the same as the field above the surface
- B) zero
- C) negative
- D)  $kq/R$

**Question 15 of 75**

A Gaussian surface surrounds an object with a net charge of  $-0.5 \mu\text{C}$ . Which of the following is true?

- A) more electric field lines point out than in
- B) net number of field lines through surface is zero
- C) more electric field lines point in than out
- D) net number of field lines through surface  $> 10$

**Question 16 of 75**

Michael Faraday began conducting experiments to

- A) determine if energy transfer from mechanical to heat was equivalent
- B) to determine the existence of electromagnetic waves
- C) to determine mathematical framework for electricity and magnetism
- D) to demonstrate electromagnetic induction

**Question 17 of 75**

Which two scientists independently discovered the existence of electromagnetic waves

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- A) Heinrich Hertz and Oliver Lodge
- B) Camille Pissarro and Pierre- Auguste Renoir
- C) Michael Faraday and James Prescott Joule
- D) Joseph Henry and Rudolph Clausius

**Question 18 of 75**

The quantity of energy needed to break a nucleus in to unbound nucleons is called

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- A) nuclear energy
- B) binding energy
- C) energy of massless particles
- D) tared energy

**Question 19 of 75**

When a radioactive nucleus undergoes beta decay what particle(s) are emitted?

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- A) just energy
- B) electrons
- C) either positrons or electrons
- D) alpha particles

**Question 20 of 75**

The conservation of nucleon number and charge apply specifically to

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- A) nuclear reactions
- B) energy transformations
- C) mass-space irregularities
- D) decomposition reactions

**Question 21 of 75**

How can instantaneous velocity be found on a graph showing an exponential position-time graph?

- A) instantaneous velocity can't be determined on an exponential curve
- B) taking slope of line using first and last data points
- C) taking slope of the line tangent to the curve at instant desired
- D) utilizing change in time over change in position

**Question 22 of 75**

Time dilation occurs when

- A) 2 different observers see the same phenomenon
- B) the speed of light traveling linearly is the same
- C) time speeds up
- D) There is a difference in elapsed time as measured by two clocks

**Question 23 of 75**

If one ball is thrown upward and one ball is thrown downward at the same speed, compare their velocities when they hit the ground.

- A) The ball thrown downward has greater speed than the one thrown upward
- B) The ball thrown upward will have greater speed than the one thrown downward
- C) They will both have the same speed when they hit the ground
- D) Without numerical values it is impossible to compare final velocities

**Question 24 of 75**

Multiplying or dividing vectors by scalars results in

- A) vectors
- B) scalars
- C) values with no units
- D) ratios

**Question 25 of 75**

How does the horizontal displacement of a projectile change?

- A) The horizontal displacement increases as projectile rises and decreases as projectile falls.
- B) The horizontal displacement increases each time interval
- C) The horizontal displacement is constant for each time interval
- D) The horizontal displacement decreases each time interval

**Question 26 of 75**

If an object is thrown upward at an angle greater than  $45^\circ$ , how would the horizontal and vertical components of the object compare?

- A) The horizontal component would be greater than vertical
- B) The vertical component would be greater than horizontal
- C) The horizontal and vertical components would be equal
- D) The horizontal and vertical components are directly related

**Question 27 of 75**

How does a ball dropped by a girl walking 1 m/s as seen by a stationary nearby viewer?

- A) Appears to drop straight down
- B) Appears to fall behind the girl
- C) appears to fall well ahead of the girl
- D) Appears to move in a parabola

**Question 28 of 75**

According to Einstein's Special Theory of Relativity, how does light move?

- A) The speed of light slows down in space-time
- B) The speed of light is absolute, independent of all frames of reference
- C) The speed of light varies depending on which observer is measuring
- D) The speed of light speeds up in space-time

**Question 29 of 75**

Polymer foam insulation is sometimes blown into the space between inner and outer walls. Air is a good insulator so why is this needed?

- A) to prevent heat loss by convection
- B) to prevent heat loss by conduction
- C) for fireproofing
- D) To prevent radiative heat loss

**Question 30 of 75**

The greenhouse effect warms the earth due to what factors?

- A) Visible sunlight striking the earth and destruction of the ozone layer
- B) Energy in the form range of radio waves being reradiated and greenhouse gases in atmosphere
- C) Infrared energy being reradiated and the presence of greenhouse gases in the atmosphere
- D) The atmosphere warming by radiation and the destruction of the ozone layer

**Question 31 of 75**

An ideal gas has an absolute temperature  $T$ . The average random kinetic energy of the molecules of the gas is

- A) independent of  $T$ .
- B) equal to  $T$ .
- C) proportional to  $T$ .
- D) inversely proportional to  $T$ .

**Question 32 of 75**

Which of the following is a condition for an object to be in translational equilibrium?

- A) The object must be moving at constant speed.
- B) The velocity of the object in any direction must be zero.
- C) The forces acting horizontally on the object must equal the forces acting vertically on the object.
- D) The resultant force acting on the object must be zero.



**Question 33 of 75**

The amount of energy required to completely free an electron from an atom, producing an ion is called

- 
- A) Binding Energy
  - B) Disassociation Energy
  - C) Activation Energy
  - D) Bonding Energy

**Question 34 of 75**

Images produced by mirrors, like plane mirrors are

- 
- A) Real Images
  - B) Virtual Images
  - C) Complex Images
  - D) Diverging Images

**Question 35 of 75**

The focal length of a spherical mirror is

- 
- A) Equal to the radius of curvature
  - B) Equal to 2 times the radius of curvature
  - C) Equal to  $\frac{1}{2}$  the radius of curvature
  - D) Is not related to the radius of curvature

**Question 36 of 75**

When parallel rays, in a converging lens, passing through different regions of the lens and do not come together on a common focal plane, the result can be

- 
- A) An incomplete image
  - B) A complete image
  - C) An astigmatism
  - D) A spherical aberration

**Question 37 of 75**

The amount of energy required to raise the temperature of 1 kg of a substance 1 °C is called

- A) Specific Heat
- B) Heat of Fusion
- C) Activation Energy
- D) Latent Heat

**Question 38 of 75**

If  $A + B = 0$ , what can say about the components of the two vectors?

- A) The vectors are equal in magnitude and in the same direction
- B) The vectors are equal in magnitude and opposite in direction
- C) The vectors are unequal in magnitude and opposite in direction
- D) The vectors unequal in magnitude and in the same direction

**Question 39 of 75**

How does a person standing on a train platform appear to someone on the train traveling north?

- A) Appear to be not moving
- B) Appear to be moving north at a slower speed than the train
- C) Appear to be moving south at a slower speed than the train
- D) Appear to be moving south at a speed equal to that of the train

**Question 40 of 75**

A man is standing up in a moving bus. He drops a pencil. Where will the pencil fall relative to the man?

- A) The pencil falls in front of the man
- B) The pencil falls behind the man
- C) The pencil falls at the man's feet
- D) Where the pencil falls depends on the speed of the bus

**Question 41 of 75**

How can a person climbing up the face of a pyramid in Egypt, knowing the height and width, determine how far they climbed?

- A) By using midline of the height and dividing by 2
- B) By using the Pythagorean theorem
- C) By using the formula for the area of a triangle
- D) By using the formula for the area of a rectangle divided by 2

**Question 42 of 75**

What type of trajectory does a projectile follow?

- A) A parabolic trajectory
- B) A trajectory described by a straight upward sloping line
- C) A trajectory described by a straight horizontal line
- D) A trajectory described by a straight downward sloping line

**Question 43 of 75**

Scalar values have

- A) magnitude and direction
- B) direction only
- C) neither magnitude nor direction
- D) magnitude only

**Question 44 of 75**

When a ball is thrown upward, what is its acceleration at the ball's maximum height?

- A) acceleration is increasing
- B) acceleration is decreasing
- C) acceleration is constant due to gravity
- D) acceleration is zero

**Question 45 of 75**

A ball is thrown upward. Describe the displacement of the ball

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- A) The displacement decreases with decreasing altitude
- B) When the ball is caught, the displacement is zero
- C) The displacement increases with increasing altitude
- D) The displacement increases going up and decreases coming down

**Question 46 of 75**

If a car is traveling northward, can its acceleration be southward?

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- A) Yes, if the northward bound car is slowing down
- B) No, acceleration is always the same direction as velocity
- C) No, acceleration does not have direction
- D) Yes, if the northward bound car is speeding up

**Question 47 of 75**

If the average velocity of an object is zero in a given time interval, what is the displacement?

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- A) The object's displacement is negative
- B) The object's displacement fluctuates
- C) There is not enough information to calculate the displacement
- D) The object's displacement must also be zero

**Question 48 of 75**

How are scientific laws different from scientific theories?

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- A) Laws are explanations of natural phenomenon, theories are statements of fact
- B) Laws can change but theories can't change
- C) Laws are observations of natural phenomenon and theories are explanations
- D) Theories don't change but neither do laws

**Question 49 of 75**

Angular displacement is

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- A) Inversely related to the change in arc length
- B) Inversely related to distance from the axis
- C) Directly related to the distance from the axis
- D) Describes linear motion

**Question 50 of 75**

An object's acceleration is considered negative if

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- A) When an object with positive displacement is slowing down
- B) The displacement is positive
- C) When an object with negative displacement is slowing down
- D) When an object with positive displacement is speeding up

**Question 51 of 75**

All objects falling will hit the ground at the same time

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- A) When dropped simultaneously
- B) When objects are of different mass
- C) At heights above 200 meters
- D) In the absence of air resistance

**Question 52 of 75**

Objects in free fall experience

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- A) increasing acceleration
- B) decreasing acceleration
- C) constant acceleration
- D) constant speed

**Question 53 of 75**

The area beneath the curve of a velocity-time graph equals

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- A) Speed
- B) Displacement
- C) Velocity
- D) Time

**Question 54 of 75**

Vectors are measurements that

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- A) magnitude and direction
- B) magnitude only
- C) direction only
- D) neither direction nor magnitude

**Question 55 of 75**

If the slope of a position-time graph is linear

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- A) velocity is increasing
- B) velocity is decreasing
- C) position is constant
- D) velocity is constant

**Question 56 of 75**

What is the relationship between velocity and time

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- A) time is directly related to velocity
- B) as time increases, velocity increases
- C) As time increases, velocity decreases
- D) the relationship depends on displacement

**Question 57 of 75**

When studying motion, displacement

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- A) can be positive only
- B) can be positive or negative
- C) can be negative only
- D) has no directional component

**Question 58 of 75**

A neutron can be transformed into a proton and an electron during

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- A) beta decay
- B) alpha decay
- C) gamma decay
- D) Lao's transformation

**Question 59 of 75**

When a radioactive nucleus undergoes beta decay what particle(s) are emitted?

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- A) electrons only
- B) positrons only
- C) alpha particles
- D) electrons or positrons

**Question 60 of 75**

Which form of radiation emits no particles

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- A) alpha
- B) beta
- C) gamma decay
- D) delta

**Question 61 of 75**

The emission of photons and particles from unstable nuclei is called

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- A) conduction
- B) radiation
- C) isotopic decay
- D) convection

**Question 62 of 75**

For heavy nuclei to be stable they must have

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- A) more protons than neutrons
- B) more neutrons than protons
- C) less neutrons than protons
- D) more electrons than neutrons

**Question 63 of 75**

The equation  $E = mc^2$  details the relationship between a particle's

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- A) Rest energy and mass
- B) Mass and frequency
- C) Nuclear force and speed of light
- D) Strong force and rest energy

**Question 64 of 75**

Which scientist won a Nobel Prize in Chemistry and also won a Nobel Peace Prize

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- A) Albert Einstein
- B) Otto Hahn
- C) Richard Feynman
- D) Linus Pauling



**Question 65 of 75**

Which scientist received two Nobel prizes, in two different science fields

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- A) Niels Bohr
- B) Lise Meitner
- C) Marie Curie
- D) Albert Einstein

**Question 66 of 75**

Light given off by an atomic gas of different wavelengths passed through a prism is displayed as a

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- A) an emission spectrum
- B) an absorption spectrum
- C) a chromatograph
- D) primary wave

**Question 67 of 75**

Rutherford's gold foil experiment led to the discovery of

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- A) Positively charged alpha particles
- B) Negatively charged adjacent electrons
- C) Positively charged central nucleus
- D) Evenly distributed atomic mass

**Question 68 of 75**

The pressure on an elastic body is described by

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- A) a modulus
- B) stress
- C) work
- D) strain

**Question 69 of 75**

Linear momentum has units of

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- A) N/m
- B)  $\text{N/s}^2$
- C)  $\text{kg(m/s)}$
- D) all of these

**Question 70 of 75**

Which of the following is not a unit of power?

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- A) W (s)
- B) J/s
- C) ft-lb/s
- D) hp (horsepower)

**Question 71 of 75**

A change in gravitational potential energy

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- A) is always positive
- B) depends on the reference point
- C) depends only on the initial and final heights
- D) depends on path

**Question 72 of 75**

Negative work means that

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- A) energy is always lost
- B) the force and displacement are in opposite directions
- C) the change in energy is zero
- D) energy is always gained

**Question 73 of 75**

In general, the frictional force

- A) greater for smooth surfaces
- B) depends on slow sliding speeds
- C) depends on the surface area
- D) is proportional to the load

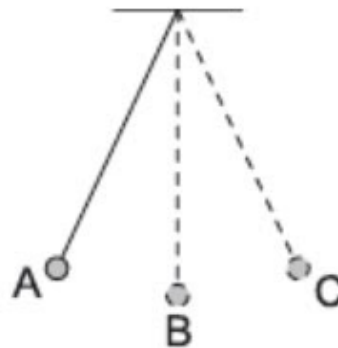
**Question 74 of 75**

Distance is always

- A) greater than or equal to the magnitude of the corresponding displacement
- B) equal to the magnitude of the corresponding displacement
- C) less than or equal to the magnitude of the corresponding displacement
- D) equal to the magnitude of the velocity vector

**Question 75 of 75**

A simple pendulum bob oscillates as shown.



At which position is the resultant force on the pendulum bob zero?

- A) At position A
- B) At position B
- C) At position C
- D) Resultant force is never zero during the oscillation