

Physics

TARGET - AIIMS

ASSERTION & REASON



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SECTION - A (Complete XIth Syllabus)

Instructions

These questions consist of two statements each, printed as Assertion and Reason. While answering these Questions you are required to choose any one of the following four responses.

- A. If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
- B. If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
- C. If Assertion is True but the Reason is False.
- D. If both Assertion & Reason are False.

1. **Assertion:-** Dimensionally correct equation is always physically correct.

Reason:- All correct equations are dimensionally correct.

- (1) A (2) B (3) C (4) D

2. **Assertion:-** Principle of homogeneity state that two or more than two different dimensional variables can added or subtracted.

Reason:- Homogeneity means, variables have same dimensions.

- (1) A (2) B (3) C (4) D

3. **Assertion:-** Variable in physics always have non-zero dimension.

Reason:- Physical quantity vary with respect to another variable quantity.

- (1) A (2) B (3) C (4) D

4. **Assertion:-** Supplementary physical quantities have zero dimensions.

Reason:- Supplementary quantity are ratio of same dimensional variables.

- (1) A (2) B (3) C (4) D

5. **Assertion:-** Equation derived from dimensional analysis may be correct.

Reason:- Dimensionally correct equation always satisfy principle of homogeneity.

- (1) A (2) B (3) C (4) D



6. **Assertion:** 'Light year' and 'wave length', both measure distance.

Reason: Both have dimensions of time.

(3) C (4) D

7. **Assertion:** Both have dimensions of time.

Reason: They are independent of each other.

(3) C (4) D

8. **Assertion:** Density is a derived physical quantity.

(1) A

9. **Assertion:** Density cannot be derived from the fundamental physical quantities.

(2) B

10. **Assertion:** Density is a derived physical quantity.

(3) C (4) D

11. **Assertion:** Density cannot be derived from the fundamental physical quantities.

(1) A

12. **Assertion:** Surface tension and surface energy have the same dimensions.

Reason: Because both have the same S.I. unit.

(3) C (4) D

13. **Assertion:** If we change the unit of measurement of a quantity, its numerical value changes.

Reason: Smaller the unit of measurement, then smaller is its numerical value.

(1) A (2) B (3) C (4) D

14. **Assertion:** In $y = A \sin(wt - kx)$, where $wt - kx$ is dimensionless.

Reason: Dimension of $w = [M^0 L^0 T^{-1}]$.

(1) A (2) B (3) C (4) D

15. **Assertion:** Now a day's standard 'metre' is defined as in terms of the wavelength of light.

Reason: Light wavelength has no relation with length.

(1) A (2) B (3) C (4) D

16. **Assertion:** Work can't be added with torque.

Reason: Same dimensional variables can be added or subtracted in equations.

(1) A (2) B (3) C (4) D

14. **Assertion:** Parallel method cannot be used for measuring distance of stars more than 100 light year away.
Reason: Parallel angle reduces so much that it cannot be measured accurately.

(1) A (2) B (3) C (4) D

15. **Assertion:** Unit of rydberg constant are m^{-1} .
Reason: It follows Bohr's formula $f = R_c \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$, where the symbols have their usual meaning.

(1) A (2) B (3) C (4) D

16. **Assertion:** When one ball throw vertically up and another vertically down from top of tower at the same time then separation between them increase linearly till no one strike the ground.
Reason: Relative acceleration of one ball w.r.t. other is zero.

(1) A (2) B (3) C (4) D

17. **Assertion:** Two balls are thrown as shown in figure and when they meet their speed are equal.

$$\begin{array}{c} \bullet \\ \text{O} \downarrow u=0 \end{array}$$

$$\begin{array}{c} \uparrow \\ \text{O} \uparrow u=\sqrt{2gh} \end{array}$$

- Reason:** Downward ball travel 3 times distance travelled by upward ball when they meet.

(1) A (2) B (3) C (4) D

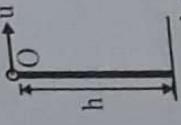
18. **Assertion:** A projectile is thrown from O at the same time when a person start running from same point to catch it with constant velocity. He will catch the ball if both have same horizontal velocity.



- Reason:** Person will success to catch the ball if velocity is equal to horizontal velocity of projectile, then the horizontal displacement of person is same as range of projectile.

(1) A (2) B (3) C (4) D

19. **Assertion:** One ball thrown horizontally and another is dropped from top of tower at same time then they will strike ground simultaneously.



Reason: They strike the ground same time because their initial vertical velocity and acceleration in y-direction is same.

- (4) D

(1) A

20. **Assertion:** A bus start with acceleration 'a' and initial velocity zero and a boy 'd' distance behind the bus start with constant velocity 'u' to catch the bus. Minimum value of 'u' to catch bus is $\sqrt{2ad}$.

Reason: Boy will catch the bus whatever the velocity of him.

- (4) D

(3) C

21. **Assertion:** A bus start with acceleration a with initial velocity zero and a boy distance behind the bus start with constant velocity u to catch bus. If $u > \sqrt{2ad}$ then there is two time catching the bus.

Reason: First boy take over the bus then after some time bus will pass the boy secondly.

- (4) D

(1) A

22. **Assertion:** Path of one projectile with respect another projectile is straight line.

Reason: Relative acceleration of one projectile w.r.t. other projectile is zero.

- (4) D

(1) A

23. **Assertion:** A hunter aims gun and fires a bullet directly towards a monkey sitting on a distant tree and at the same instant, when bullet leaves the barrel at gun, the monkey drops from tree freely. Bullet will definitely hit the monkey.

Reason: Bullet will hit the monkey if before reach the ground by monkey, bullet will cover the distance between tree and hunter.

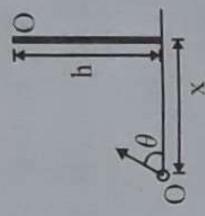
- (1) A

- (2) B

- (3) C

- (4) D

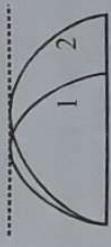
24. **Assertion:** A hunter fires a bullet directly to monkey and at same time monkey drop from tree freely. Bullet will hit the monkey if it's velocity is greater than. $\sqrt{\frac{g}{2h}(h^2 + x^2)}$.



Reason: Bullet will hit the monkey if before reaching the ground by monkey, bullet will cover the horizontal distance x.

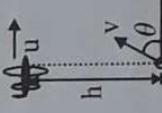
- (1) A (2) B (3) C (4) D

25. **Assertion:** Path of two projectile is shown in figure. Speed of projectile 2 is greater than speed of projectile 1.



Reason: Vertical component of velocity of both projectile is same but horizontal component of 2 is greater than 1.
(1) A (2) B (3) C (4) D

26. **Assertion:** A shell is fired with velocity v at angle theta to hit a aeroplane which is vertically above the gun when bullet is fired. For hitting the plane horizontal velocity of both must be same and h should be less than maximum height reached by shell.



Reason: At time of hitting plane, horizontal distance travelled by shell and plane must be same.

- (1) A (2) B (3) C (4) D

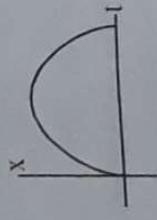
27. Assertion:- In river boat problem to follow the shortest path, velocity of boat should be greater than velocity of river flow.

Reason:- Time taken by boat to cross the river is proportional to

$$\frac{1}{\sqrt{V_{bw}^2 - V_w^2}} \quad \text{where } V_{bw} \text{ & } V_w \text{ are boat velocity and water velocity so getting real time } V_{bw} \text{ should be greater than } V_w.$$

- (1) A (2) B (3) C (4) D

28. Assertion:- A ball is thrown upwards with some velocity whose position time graph is shown in figure.



Reason:- It is first speeding down then speeding up.

- (1) A (2) B (3) C (4) D

29. Assertion:- The distance can never be less than magnitude of the displacement

Reason:- Distance covered can never decreases whereas displacement can.

- (1) A (2) B (3) C (4) D

30. Assertion:- If velocity is constant, speed will also be constant.

Reason:- If speed is constant, velocity may or may not be constant.

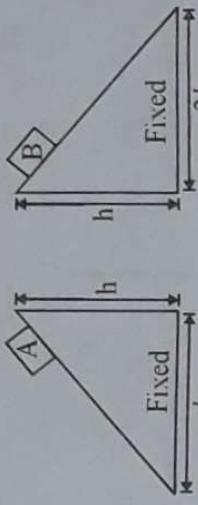
- (1) A (2) B (3) C (4) D

31. Assertion:- If an insect will crawl up on your body, the frictional force between your body surface and insect is static frictional force.

Reason:- Static friction does not produce heat.

- (1) A (2) B (3) C (4) D

32. Two blocks A and B are on two frictionless inclined plane as shown in figure.



Assertion:- B takes more time than A to reach at the bottom.

Reason:- The acceleration of A is greater than the acceleration of B.

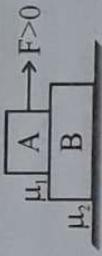
- (1) A (2) B (3) C (4) D

33. Assertion:- A man runs for a certain distance after getting out from a moving train.

Reason:- Man runs for certain distance in the direction of motion to maintain the same velocity of all parts of his body relative to the train, so that he may not fall forward due to the inertia of rest of the lower part of his body and inertia of motion of upper part of his body.

- (1) A (2) B (3) C (4) D

34. Assertion:- In the situation shown in the figure, the acceleration of block A is always greater or equal to the block B.



Reason:- The friction force by ground on block B may be zero in the given situation.

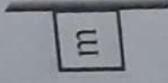
- (1) A (2) B (3) C (4) D

35. Assertion:- Mass is a measure of inertia.

Reason:- The change in momentum is the combined effect of force and time.

- (1) A (2) B (3) C (4) D

36. **Assertion:-** If you move up a block on rough wall by applying a force F , frictional force on the block is $\mu_k mg$ where μ_k is coefficient of kinetic friction.



42. **Assertion:-** A thief jumped from a building with a box of mass 10 kg on his head. During the fall, the weight of body felt by the thief is zero.

Reason:- The true weight of box during falling is zero.

- (1) A (2) B (3) C (4) D

43. **Assertion:-** When brake is applied, then the tyres of bicycle slips over the road. In this case, the friction between road and tyre is kinetic friction.

Reason:- Frictional force between tyre and ground is always static in nature.

- (1) A (2) B (3) C (4) D

44. **Assertion:-** A player lowers his hands while catching a cricket ball.

Reason:- The lowering his hands increases the time of catch.

- (1) A (2) B (3) C (4) D

45. **Assertion:-** Angle of repose is equal to the angle of limiting friction.

Reason:- When the body is just on the verge of motion, the force of friction at this stage is called the limiting friction.

- (1) A (2) B (3) C (4) D

46. **Assertion:-** A particle cannot exist in a region where the potential energy is greater than total mechanical energy.

Reason:- The kinetic energy of a particle can never be negative.

- (1) A (2) B (3) C (4) D

47. **Assertion:-** If the engine of an automobile delivers constant power, then the kinetic energy of the automobile linearly increases with time.

Reason:- In the above mentioned situation the net force acting on the automobile is inversely proportional to its instantaneous speed.

- (1) A (2) B (3) C (4) D

48. **Assertion:-** No work is done by a force on an object if the point of application of force is stationary but the object moves.

Reason:- No work is done by a force on an object if the object is stationary but the point of application of force moves.

- (1) A (2) B (3) C (4) D

36. **Assertion:-** If you move up a block on rough wall by applying a force F , frictional force on the block is $\mu_k mg$ where μ_k is coefficient of kinetic friction.

Reason:- The kinetic frictional force on a block is $f = \mu_k N$ where N is normal contact force between contact surfaces.

- (3) C (4) D

37. **Assertion:-** The driver in a vehicle moving with a constant speed on a straight road is in an inertial frame of reference.

Reason:- A reference frame in which Newton's law of motion are applicable is non-inertial.

- (2) B (3) C (4) D

38. **Assertion:-** The force of friction increase when surfaces in contact are smooth.

Reason:- Smoothness decreases friction.

- (3) C (4) D

39. **Assertion:-** For an observer moving downwards with an acceleration equal to g , a body falling freely under gravity becomes weightless.

Reason:- Reaction force acting on the body is $R = m(g-a)$.

- (3) C (4) D

40. **Assertion:-** A rocket does not move forward by pushing the surrounding air backward.

Reason:- The necessary thrust to move it forward is derived from Newton's third law of motion.

- (1) A (2) B (3) C (4) D

41. **Assertion:-** Assume that earth consists of only neutrons. The normal reaction on a mass standing on the surface of the earth is zero.

Reason:- Normal reaction is an electromagnetic force.

- (1) A (2) B (3) C (4) D

49. **Assertion:-** The work done by kinetic friction on an object may be positive.

Reason:- Whenever there is relative slipping between any two surfaces, then the energy is lost in the form of heat into the surroundings.

(4) D

(1) A

(2) B

(3) C

(4) D

50. **Assertion:-** A system having two blocks A and B connected with a massless spring are placed on a frictionless horizontal surface, if block 'A' is projected towards block 'B', then the work done by spring on block 'A' till maximum compression with respect to center of mass of the system is different from the work done with respect to ground.

Reason:- Work done by a force on an object is a relative quantity.

(4) D

(3) C

(2) B

(1) A

51. **Assertion:-** For a particle moving in any uniform circular motion, the rate at which work is done by all the forces acting on the particle is always zero.

Reason:- Whenever the speed of the particle increases then instantaneous power associated with the particle must be positive and vice-versa.

(4) D

(3) C

(2) B

(1) A

52. **Assertion:-** The work done by all the external forces (Neglecting internal non-conservative forces) acting on a particle or system is equal to the change in total energy of the particle or the system.

Reason:- The work done by all the forces acting on a particle or system is equal to the change in kinetic energy of the particle or system.

(4) D

(3) C

(2) B

(1) A

53. **Assertion:-** In a vertical spring mass system, if the frequency of oscillation is ' f ', then the power associated with the blocks varies with a frequency ' $2f$ '.

Reason:- If the oscillation frequency of spring mass system is ' f ', then the frequency of oscillation of its speed is ' $2f$ '.

(4) D

(3) C

(2) B

(1) A

54. **Assertion:-** Internal forces acting on a system do not have the potential to change the momentum of the system.

Reason:- Internal forces can change the kinetic energies of the constituent particles forming the system.

(4) D

(3) C

(2) B

(1) A

55. **Assertion:-** If the center of mass of the system of particles is at the origin, then the total mass of particles to the right of the origin is same as the total mass to the left of origin.

Reason:- If the center of mass of system of particles is at the origin, then if there is a particle on positive x-axis, there must be atleast one particle on the negative x-axis.

(4) D

(3) C

(2) B

(1) A

56. **Assertion:-** In an elastic collision the kinetic energy just before and just after collision is conserved.

Reason:- In an elastic collision, kinetic energy during collision is not conserved.

(4) D

(3) C

(2) B

(1) A

57. **Assertion:-** If the ball hits the floor and rebounds after an inelastic collision. Then the momentum of the ball and the earth system is conserved.

Reason:- In the above situation of the ball and earth are considered as a system then no external force acts on the system.

(4) D

(3) C

(2) B

(1) A

58. **Assertion:-** If an external force is acting on a system of N-balls of different masses, then the acceleration of its center of mass must be non-zero, but its velocity may or may not be zero.

Reason:- N-balls of different masses are thrown in air simultaneously, then the acceleration of the center of mass of the system is equal ' g ' and is vertically downwards.

(4) D

(3) C

(2) B

(1) A

59. Assertion:- A fast bullet collides inelastically with a finite heavy block at rest, then it is impossible for the system to come to rest after collision.

Reason:- In the above mentioned situation lesser energy is lost as heat if the bullet collides with a block of higher mass.

- (1) A (2) B (3) C (4) D

60. Assertion:- In an elastic collision of two identical balls, their velocities get interchanged after collision.

Reason:- When a stationary ball collides elastically with an identical ball, then the two balls may fly apart in perpendicular directions.

- (1) A (2) B (3) C (4) D

61. Assertion:- Moment of inertia depends only on the distribution of mass about axis of rotation.

Reason:- Moment of inertia is defined as $I = \sum_i m_i r_i^2$, where r_i is the shortest distance of the particle from axis.

- (1) A (2) B (3) C (4) D

62. Assertion:- The moment of inertia of hollow cylinder about its axis is maximum than any other parallel axis possible.

Reason:- Moment of inertia depend on distribution of mass about axis of rotation.

- (1) A (2) B (3) C (4) D

63. Assertion:- If $\sum \vec{F} = 0$ then body will be in equilibrium.

Reason:- If body is in equilibrium then it must be at rest.

- (1) A (2) B (3) C (4) D

64. Assertion:- The angular momentum of an isolated rotating sphere about its axis is conserved.

Reason:- When net torque acting a system is zero, then the angular momentum of the system is conserved.

- (1) A (2) B (3) C (4) D

65. Assertion:- Perpendicular axis theorem can not be applied for spherical and cylindrical bodies.

Reason:- Perpendicular axis theorem can be applied only for laminar bodies.

- (1) A (2) B (3) C (4) D

66. Assertion:- In pure rolling motion work done by friction is zero.

Reason:- In pure rolling motion the velocity of point of contact is always zero.

- (1) A (2) B (3) C (4) D

67. Assertion:- A cylinder is rolling without slipping on the rough inclined plane then its mechanical energy is not conserved.

Reason:- In rolling motion on rough surface mechanical energy is never conserved.

- (1) A (2) B (3) C (4) D

68. Assertion:- The angular momentum of an object under translatory motion is always zero.

Reason:- Objects under translatory motion have linear momentum, but no angular momentum as they are not rotating.

- (1) A (2) B (3) C (4) D

69. Assertion:- The angular momentum of projectile about point of projection is not conserved.

Reason:- In projectile motion the external torque about point of projection is zero.

- (1) A (2) B (3) C (4) D

70. Assertion:- A cylinder is projected horizontally on rough horizontal surface with some linear velocity then after some time it starts pure rolling.

Reason:- If there is sufficient friction on the ground then it prevents slipping of rolling bodies and tries to bring the point of contact at rest.

- (1) A (2) B (3) C (4) D

71. Assertion:- The instantaneous axis of rotation of a body is the point about which rolling objects appeared to be in pure rotation at the given instant.

Reason:- The instantaneous velocity of instantaneous axis of rotation is always zero.

- (1) A (2) B (3) C (4) D

72. Assertion:- In overturning of four-wheelers the inner side wheels leaves the contact first.

Reason:- During over turning of four wheeler the torque about the outer wheels becomes unbalanced zero.

- (1) A (2) B (3) C (4) D

73. Assertion:- Parallel axis theorem can be applied for all types of bodies.

Reason:- In parallel axis theorem one of the axis must pass through centre of mass of body.

- (1) A (2) B (3) C (4) D

74. Assertion:- The moment of inertia of any rigid body is minimum about axis which passes through its center of mass as compared to any other parallel axis.

Reason:- The entire mass of a body can be assumed to be concentrated at its centre of mass.

- (1) A (2) B (3) C (4) D

75. Assertion:- If two different axis are at some distance from centre of mass of a rigid body, then moment of inertia of the given rigid body about both axis will always be same.

Reason:- From parallel axis theorem $I = I_{cm} + md^2$, where all terms have usual meaning.

- (1) A (2) B (3) C (4) D

76. Assertion:- The percentage change in time period is 2% if length of simple pendulum increases by 3%.

Reason:- Time period is directly proportional to square root of length of pendulum.

- (1) A (2) B (3) C (4) D

77. Assertion:- The graph of potential energy or kinetic energy of a particle in S.H.M. with respect to position is parabola.

Reason:- Potential energy and kinetic energy do not vary linearly with position.

- (1) A (2) B (3) C (4) D

78. Assertion:- Two S.H.M.s, given by $y_1 = 10 \sin(3\pi t + \pi/4)$ and $y_2 = 5 [\sin(3\pi t) + \sqrt{3}\cos(3\pi t)]$, have amplitudes in the ratio 1:1.

Reason:- y_2 represents two waves each of amplitude 5 and so total amplitude is 10, same as that of y_1 .

- (1) A (2) B (3) C (4) D

79. Assertion:- The phase difference between acceleration and velocity in S.H.M. is 90° .

Reason:- The time period in case of S.H.M. is independent of amplitude of vibration.

- (1) A (2) B (3) C (4) D

80. Assertion:- When a girl sitting on a swing stand up, the periodic time of swing will increase.

Reason:- In standing position of girl, the length of swing will increase.

- (1) A (2) B (3) C (4) D

81. Assertion:- A particle is moving along x-axis. The net force 'F' acting on it at position 'x' is given by ' $F = -ax - b$ '. Where a & b are constants, then the motion of this particle will be S.H.M.

Reason:- In S.H.M. the force must be restoring and proportion to the displacement from mean position.

- (1) A (2) B (3) C (4) D

82. Assertion:- For a particle performing S.H.M., its speed decreases as it goes away from the mean position.

Reason:- In S.H.M. the acceleration is always opposite to the velocity of the particle.

- (1) A (2) B (3) C (4) D

- 83.** **Assertion:-** Motion of a ball bouncing elastically in vertical direction on a smooth horizontal floor is a periodic motion but not S.H.M.
Reason:- Motion is S.H.M. when the force is restoring and proportional to displacement from mean position.
- (1) A (2) B (3) C (4) D

- 84.** **Assertion:-** In case of oscillatory motion, the average speed for any time interval is always greater than or equal to its average velocity.
Reason:- Distance travelled by a particle can not be less than its displacement.
- (1) A (2) B (3) C (4) D

- 85.** **Assertion:-** In beats phenomenon maximum intensity of sound (Beats) can be heard only if difference between frequency of source of sound is small.

Reason:- For small beats frequency, the beats period is long and therefore observable for human being.

- (1) A (2) B (3) C (4) D

- 86.** **Assertion:-** Doppler's effect is observable only if there is a relative motion between sound source and observer.

Reason:- The number of waves received per second by the observer depends on the velocities of the source and the observer.

- (1) A (2) B (3) C (4) D

- 87.** **Assertion:-** In a sonometer wire, when we double the length of the wire keeping tension and linear mass density same, then its frequency of vibration become double.

Reason:- For a sonometer wire the frequency of vibration is proportional to its length.

- (1) A (2) B (3) C (4) D

- 88.** **Assertion:-** In interference, the variation of intensity take place with position.

Reason:- In interference phase difference varies according to distance of coherent sources from any position.

- (1) A (2) B (3) C (4) D

- 89.** **Assertion:-** In an organ pipes longitudinal stationary wave is formed.

Reason:- In organ pipes pressure waves after reflection from the closed or the open ends move in opposite directions and superimpose with the incident waves.

- (1) A (2) B (3) C (4) D

- 90.** **Assertion:-** The speed of sound predicted by newton's formula assuming the propagation of sound in gas as isothermal phenomenon was not compatible with the experimental results.

Reason:- The propagation of sound in gas is an adiabatic phenomenon.

- (1) A (2) B (3) C (4) D

- 91.** **Assertion:-** An ideal fluid is flowing through a horizontal pipe.

Reason:- Speed of fluid particles is more at places where pressure is low.

Reason:- Bernoulli's theorem can be derived from work energy theorem.

- (1) A (2) B (3) C (4) D

- 92.** **Assertion:-** A liquid can easily change its shape, but solid can not.

Reason:- Density of solid is greater than density of liquid.

- (1) A (2) B (3) C (4) D

- 93.** **Assertion:-** Static fluid exerts a force normal to a solid boundary.

Reason:- Because, $\vec{F} = P\vec{A}$.

- (1) A (2) B (3) C (4) D

- 94.** **Assertion:-** Upthrust on a solid block of iron when immersed in a lake will be less on the surface than on the bed of the lake.

Reason:- On the surface of the lake, density of water will be less than that at the bed.

- (1) A (2) B (3) C (4) D

- 95.** **Assertion:-** An ice cube is floating in water in a vessel at 0°C .

Reason:- Density of ice is less than density of water at 0°C .

- (1) A (2) B (3) C (4) D

- 96.** **Assertion:-** Specific weight of a liquid is a dimensionless quantity.

Reason:- It is ratio of density of liquid to density of water.

- (1) A (2) B (3) C (4) D

- 104. Assertion:-** Free surface of a liquid resting in an inertial frame is horizontal at earth surface.
- Reason:-** Net horizontal force on molecules of liquid at horizontal free surface is zero.
- (1) A (2) B (3) C (4) D
- 105. Assertion:-** Swimming is easier in sea water than in fresh water.
- Reason:-** Density of sea water is more than density of fresh water.
- (1) A (2) B (3) C (4) D
- 106. Assertion :-** Water is used as coolant in automobiles.
- Reason :-** Specific heat of water is large.
- (1) A (2) B (3) C (4) D
- 107. Assertion :-** Coefficient of volume expansion (γ) of water is negative between 0°C to 4°C .
- Reason :-** Density of water increases on increasing temperature from 0°C to 4°C .
- (1) A (2) B (3) C (4) D
- 108. Assertion :-** If a steel object and a wooden object are at same temperature, steel object appears colder or hotter than wooden object.
- Reason :-** Conductivity of steel is greater than wood.
- (1) A (2) B (3) C (4) D
- 109. Assertion :-** Good absorbers are good emitters.
- Reason :-** Absorptive power of perfectly black body is 1.
- (1) A (2) B (3) C (4) D
- 110. Assertion :-** Adiabatic process is a fast process.
- Reason :-** In adiabatic process the system does not exchange energy with the surroundings.
- (1) A (2) B (3) C (4) D
- 111. Assertion :-** Internal energy of a system is state function.
- Reason :-** Change in internal energy of a system is path dependent.
- (1) A (2) B (3) C (4) D

112. **Assertion :-** In adiabatic compression temperature of the system increases.

Reason :- In adiabatic process the system does not exchange energy with the surroundings.

- (1) A (2) B (3) C (4) D

113. **Assertion :-** Energy is radiated in the form of heat by the objects at all the temperatures.

Reason :- Energy radiated as heat per second is directly proportional to square of absolute temperature of body.

- (1) A (2) B (3) C (4) D

114. **Assertion :-** There are infinite possible ways in which the transition of a gas between two states can take place, hence the gas can assume infinite values of specific heat.

Reason :- Gases can not have negative value of specific heat.

- (1) A (2) B (3) C (4) D

115. **Assertion :-** Carnot cycle is a reversible cycle.

Reason :- All natural process are irreversible.

- (1) A (2) B (3) C (4) D

116. **Assertion :-** First law of thermodynamics is law of energy conservation in thermodynamical process.

Reason :- Internal energy of a system remains constant in any process.

- (1) A (2) B (3) C (4) D

117. **Assertion :-** Internal energy of an ideal gas depends on volume of the gas.

Reason :- In expansion, work is done on the gas.

- (1) A (2) B (3) C (4) D

118. **Assertion :-** The minimum possible temperature is 0 K.

Reason :- Liquification of real gasses takes place before 0 K.

- (1) A (2) B (3) C (4) D

119. **Assertion :-** Ideal gas obeys all the gas laws.

Reason :- Real gasses follows Boyle's and Charle's law.

- (1) A (2) B (3) C (4) D

120. **Assertion :-** Second law of thermodynamics explains the direction of flow of heat in an spontaneous process.

Reason :- It is a form of law of energy conservation.

- (1) A (2) B (3) C (4) D

These questions consist of two statements each, printed as Assertion and Reason. While answering these Questions you are required to choose any one of the following four responses.

- A. If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
 B. If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
 C. If Assertion is True but the Reason is False.
 D. If both Assertion & Reason are False.
-
1. **Assertion:-** The tangent at a point on a field line gives the direction of electric field at that point.
- Reason:-** A small test charge is initially at rest at a point in an electrostatic field of an electric dipole. When released, it will move along the line of force passing through that point.
- (1) A (2) B (3) C (4) D
2. **Assertion:-** If electric field is zero at a point the electric potential must also be zero at that point.
- Reason:-** Electric field is equal to the potential gradient.
- (1) A (2) B (3) C (4) D
3. **Assertion:-** If electric potential is constant in a certain region of space, the electric field in that region must be zero.
- Reason:-** Electric field is equal to the negative gradient of potential.
- (1) A (2) B (3) C (4) D
4. **Assertion:-** The workdone by the electric field of a nucleus in moving an electron around it in a circular orbit is zero.
- Reason:-** Electric field is always conservative.
- (1) A (2) B (3) C (4) D

SECTION - B (Complete XIIth Syllabus)

Instructions

5. **Assertion:-** Electrons move from a region of higher potential to a region of lower potential.
Reason:- An electron has less potential energy at a point where the potential is higher and vice-versa.
- (1) A (2) B (3) C (4) D

6. **Assertion:-** The equipotential surfaces corresponding to a constant electric field along x-direction are equidistant planes parallel to y-z plane.
Reason:- electric field is normal to every point on an equipotential surface.
- (1) A (2) B (3) C (4) D

7. **Assertion:-** The equipotential surface of the electric field of a point charge is a sphere with the charge at its centre.

- Reason:-** The electric field in the region around a point charge is non-uniform.
- (1) A (2) B (3) C (4) D

8. **Assertion:-** For practical purposes, the earth is used as a reference at zero potential in electrical circuits.

Reason:- The electric potential of a sphere of radius R with charge Q uniformly distributed on the surface is given by $\frac{Q}{4\pi\epsilon_0 R}$.

- (1) A (2) B (3) C (4) D

9. **Assertion:-** The electric potential due to a point charge at a distance r from it varies as $\frac{1}{r}$.
Reason:- Electric potential at a distance r from the centre of a charged sphere varies as $\frac{1}{r}$ provided r is less than radius of the sphere.
- (1) A (2) B (3) C (4) D

10. **Assertion:-** Electric field can exist only in material medium.
Reason:- Field lines are continuous in a medium.
- (1) A (2) B (3) C (4) D

11. **Assertion:-** Gauss law is a general law of electrostatics.

12. **Assertion:-** The gravitational flux over any closed surface be a negative quantity.
- (1) A (2) B (3) C (4) D

13. **Assertion:-** Absolute value of potential is not defined.

14. **Assertion:-** Free charges given to a conductor comes to the surface because of repulsion of like charges.

15. **Assertion:-** The force of interaction between point charges decreases in inverse square proportion to the distance between them.

16. **Assertion:-** The workdone by an external force to move a positive test charge q_0 between point A and B in an electric field E is

$$-q_0 \int_A^B \mathbf{E} \cdot d\ell.$$

- Reason:-** The work done is path dependent.

- (1) A (2) B (3) C (4) D

17. **Assertion:-** Fields lines are continuous in a medium.

- (1) A (2) B (3) C (4) D

18. **Assertion:-** In a wire of nonuniform cross-section, the current is same everywhere

- Reason:-** The current in a wire is due to the drift of electron along the wire.
- (1) A (2) B (3) C (4) D

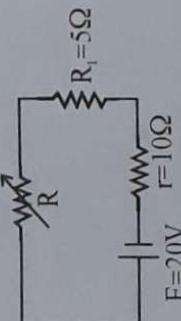
19. **Assertion:-** A conductor carrying electric current because electrically charged.

- Reason:-** A conductor carrying electric current contain unequal number of positive and negative charges.
- (1) A (2) B (3) C (4) D

18. **Assertion:** Direction of electronic current can not be from negative potential to positive potential.
Reason: Direction of current is in the direction of flow of electron.
 (1) A (2) B (3) C (4) D
19. **Assertion:** Insulators do not allow flow of current through them.
Reason: Insulators have no free charges carrier.
 (1) A (2) B (3) C (4) D
20. **Assertion:** If there is current in a wire, potential drop has to be there.
Reason: If potential drop is zero, the resistance may be zero.
 (1) A (2) B (3) C (4) D

21. **Assertion:** Constant potential difference is applied across a conductor. If temperature of conductor is increased, the drift speed of electron will decreases.
Reason: Resistivity increases with increase in temperature.
 (1) A (2) B (3) C (4) D

22. **Assertion:** For zero value of R in circuit, power transfer in external resistance will be maximum.



Reason: Since $R_i < r$ in the given circuit, so power transfer in external resistance will be maximum when $R=0$.
 (1) A (2) B (3) C (4) D

23. **Assertion:** A voltmeter is an inherently inaccurate instrument.

- Reason:** A voltmeter is always connected in parallel in a circuit.
 (1) A (2) B (3) C (4) D

24. **Assertion:** If potential difference between two points is zero and resistance between those points is zero, current may flow between the points.

Reason: Kirchhoff's 1st law is based on conservation of charge.
 (1) A (2) B (3) C (4) D

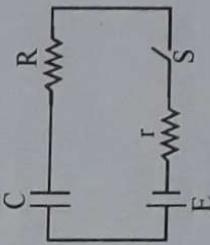
25. **Assertion:** Electric appliance with metallic body have three pin connection whereas electric bulb has two pin connection.

Reason: Three pin connection reduce the heating of connecting wires.
 (1) A (2) B (3) C (4) D

26. **Assertion:** Higher the range of an ammeter, greater is the resistance of ammeter.

Reason: To increase the range of ammeter, additional shunt needs to be used.
 (1) A (2) B (3) C (4) D

27. **Assertion:** The switch S shown in the figure is closed at $t=0$, initial current flowing through battery is $\frac{E}{R+r}$.



Reason: Initially capacitor was unchanged, so resistance offered by capacitor at $t=0$ is zero.
 (1) A (2) B (3) C (4) D

28. **Assertion:** When current through a bulb is increased by 2%, power increases by 4%.

Reason: Current passing through the bulb is inversely proportional to its resistance.
 (1) A (2) B (3) C (4) D

29. *Assertion* :- In meter bridge experiment, a high resistance is always connected in series with a galvanometer.

Reason :- As resistance increases, current through the circuit increases.

- (1) A (2) B (3) C (4) D

30. *Assertion* :- In a meter-bridge experiment, null point for an unknown resistance is measured, now the unknown resistance is put inside an enclosure maintained at a higher temperature. The null point can be obtained at the same point as before by decreasing the value of the standard resistance.

Reason :- Resistance of a metal increases with increase in temperature.

- (1) A (2) B (3) C (4) D

31. *Assertion* :- Magnetic flux density is a vector.

- (1) A (2) B (3) C (4) D

Reason :- Magnetic flux is a scalar quantity.

- (1) A (2) B (3) C (4) D

32. *Assertion* :- A proton and an electron are projected one by one with equal speeds in a uniform perpendicular magnetic field. The time period of revolution of proton is larger than that of electron.

Reason :- Time period of revolution of a charged particle in a uniform perpendicular magnetic field is directly proportional to its specific charge.

- (1) A (2) B (3) C (4) D

33. *Assertion* :- In a moving coil galvanometer, the magnetic field is made radial.

Reason :- Due to radial magnetic field, the plane of coil always remains perpendicular to the magnetic field.

- (1) A (2) B (3) C (4) D

34. *Assertion* :- Magnetic field lines always form closed loops while electric field lines may or may not.

Reason :- Magnetic force is velocity dependent while electric force is velocity independent.

- (1) A (2) B (3) C (4) D

35. *Assertion* :- If a beam of electrons passes undeflected through a region of space, then both electric field and magnetic field must be absent in that region.

Reason :- Presence of electric field and magnetic field in a region must accelerate a charged particle passing through that region.

- (1) A (2) B (3) C (4) D

36. *Assertion* :- Electrons and protons trapped in van Allen radiation belts bounce back and forth from one end to other.

Reason :- The path of motion of charged particles in van Allen radiation belts is parabolic.

- (1) A (2) B (3) C (4) D

37. *Assertion* :- The flux of magnetic field through any surface is always zero.

Reason :- Magnetic monopole does not exist.

- (1) A (2) B (3) C (4) D

38. *Assertion* :- Electromagnets are made of soft iron.

Reason :- Coercivity of soft iron is small.

- (1) A (2) B (3) C (4) D

39. *Assertion* :- A stationary charged particle in a magnetic field does not experience a force.

- (1) A (2) B (3) C (4) D

Reason :- The force acting on a charged particle is independent of the velocity of the particle.

- (1) A (2) B (3) C (4) D

40. *Assertion* :- A charged particle moving in a uniform magnetic field penetrates a layer of lead and loses half of its kinetic energy. The radius of curvature of its path is now reduced to half to its initial value.

Reason :- Kinetic energy is inversely proportional to radius of curvature.

- (1) A (2) B (3) C (4) D

41. **Assertion :** An electron and a proton enters a magnetic field with equal velocities, then the force experienced by the proton will be more than electron.

Reason : The mass of proton is 1837 times more than electron.
 (1) A (2) B (3) C (4) D

42. **Assertion :** The energy of charged particle moving in a uniform magnetic field does not change.

Reason : Work done by magnetic field on the charge is zero.
 (1) A (2) B (3) C (4) D

43. **Assertion :** When the radius of a circular loop carrying current is doubled, its magnetic dipole moment becomes four times.

Reason : Magnetic dipole moment depends on the area of the loop.
 (1) A (2) B (3) C (4) D

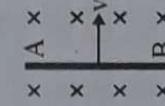
44. **Assertion :** The magnetic field of an atom is due to both, the orbital motion and spinning motion of every electron.

Reason : A charged particle produces magnetic field.
 (1) A (2) B (3) C (4) D

45. **Assertion :** A magnet of 3 Am^2 is held inside a cube of edge 2 m. the magnetic flux coming out of the cube will be zero.

Reason : In the above situation the number of magnetic field lines entering the cube is equal to the number of magnetic field lines entering the cube.
 (1) A (2) B (3) C (4) D

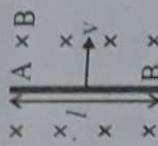
46. **Assertion :** An electric field will induced in the rod when it is moved in magnetic field.



Reason : Due to motion, free electron feel force and collect at end B so electric field will induced in rod.

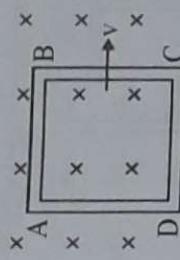
- (1) A (2) B (3) C (4) D

47. **Assertion :** When rod move in uniform magnetic field B then there is induced e.m.f. of $\epsilon = Bvl$ and A is higher potential than B.



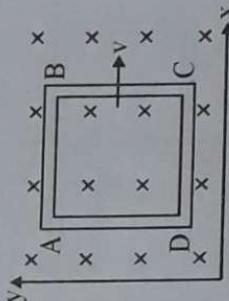
Reason : When rod move right then free electron feel force towards B so it collect on end B so A has higher potential than B.
 (1) A (2) B (3) C (4) D

48. **Assertion :** When metallic square loop is moving in uniform magnetic field then net induced e.m.f. will be zero.



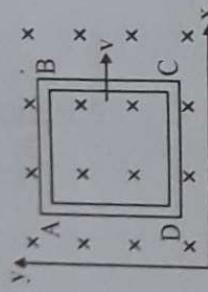
Reason : Because magnetic field through loop is constant so rate of change of flux is zero so net induced e.m.f. will be zero.
 (1) A (2) B (3) C (4) D

49. **Assertion :** There is non-uniform magnetic field given by $B = B_0 x$, so there is net induced current in loop.



Reason : Induced e.m.f. in section BC is greater than AD because magnetic field at BC is greater than at AD, so there is net induced e.m.f. in the rod.
 (1) A (2) B (3) C (4) D

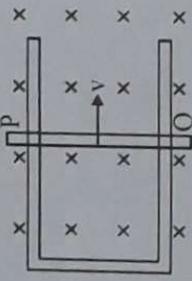
50. **Assertion:-** A square loop is moved in uniform magnetic field, first in +ve x-direction then y-direction. Then induced e.m.f. will be zero when move in x-direction and there is induced e.m.f. when move in y-direction.



Reason:- In section BC and AD, same e.m.f. will be induces.

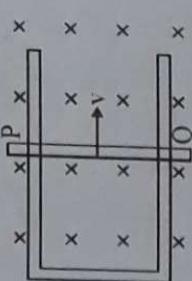
- (1) A (2) B (3) C (4) D

51. **Assertion:-** When rod PQ move right with constant velocity then there is induced current in anticlockwise direction.



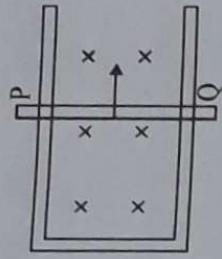
- Reason:-** Direction of induced current will be such that it will support the reason due to which it will be produced.
- (1) A (2) B (3) C (4) D

52. **Assertion:-** To make the rod to move with constant velocity in right direction , we have to apply an external force in right direction.



- Reason:-** Linear velocity will vary as $v=\omega x$ so induced electric field at distance x will be $E=\omega x B$.
- (1) A (2) B (3) C (4) D

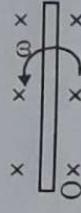
53. **Assertion:-** When a external force applied on the rod to move it with constant velocity, then rate of work done by external force is equal to rate of heat generated in resistance of loop.



Reason:- Lenz's law will depend on conservation of charge.

- (1) A (2) B (3) C (4) D

54. **Assertion:-** A rod is rotating with constant angular velocity in uniform magnetic field B. Then induced electric field in rod will vary linearly with distance x from O.



- Reason:-** Displacement current is produced by varying electric field as well as varying magnetic field.
- (1) A (2) B (3) C (4) D

55. **Assertion:-** If an E-m waves travels along z-axis then varying electric field & magnetic field will be along x & y-direction respectively.

- Reason:-** When $X_L = X_C$ then impedance of circuit is resistive so current in circuit is decided by resistor whose resistance is independent of frequency.
- (1) A (2) B (3) C (4) D

- Reason:-** When rod move in right direction then a current flow in rod PQ. so rod will feel a magnetic force F_m , so to make the rod move with constant velocity, we have to apply external force to make net force on rod zero.
- (1) A (2) B (3) C (4) D

57. **Assertion:-** In R-L circuit, supply voltage lead by supply current by ϕ where $\tan\phi = \frac{wL}{R}$.

Reason:- Phase difference between supply voltage and supply current depend on frequency.

- (1) A (2) B (3) C (4) D

58. **Assertion:-** Series resonant circuit is used as acceptor circuit in T.V. or radio tuning circuit.

Reason:- Series resonant circuit offer very small impedance for specific frequency signal out of many signal available of different frequency so only that tuned frequency signal will give high current out of many signal available.

- (1) A (2) B (3) C (4) D

59. **Assertion:-** In series R-L-C circuit, voltage across capacitor or inductor is Q times the applied voltage. (Q is quality factor of circuit)

$$\text{Reason:- } V_L = I_0 X_L = \left(\frac{wL}{R} \right) E_0 = Q E_0$$

- (1) A (2) B (3) C (4) D

60. **Assertion:-** A.C. meter measures both A.C. and D.C. voltage whereas D.C. meter measure only D.C. voltage.

Reason:- A.C. meter measures r.m.s. value whereas D.C. measures average-value.

- (1) A (2) B (3) C (4) D

61. **Assertion:-** The power of a spherical mirror depends upon the refractive index of the surroundings.

Reason:- The focal length of a spherical mirror is independent of the refractive index of the surroundings.

- (1) A (2) B (3) C (4) D

62. **Assertion:-** The real image of an erect object can never be erect.

Reason:- Real image is formed due to intersection of reflected rays in front of the mirror.

- (1) A (2) B (3) C (4) D

63. **Assertion:-** The mass density of an optically denser medium may be less than the mass density of an optically rarer medium.

Reason:- Mass density of turpentine is less than water but its optical density is higher than water.

- (1) A (2) B (3) C (4) D

64. **Assertion:-** The ratio of the power of a plano convex lens and an equi bi-convex lens from which it is sliced is always 0.5, irrespective of the surrounding medium.

Reason:- A bi-convex lens may behave as a diverging lens.

- (1) A (2) B (3) C (4) D

65. **Assertion:-** The converging or diverging power of a flat refracting or reflecting surface is always zero.

Reason:- The converging or diverging power of a reflecting or refracting surface depends inversely on the radius of curvature of the surface.

- (1) A (2) B (3) C (4) D

66. **Assertion:-** When a parallel beam of white light is incident of a thin convex lens, the blue light gets refracted more than the red light, this leads to chromatic aberration.

Reason:- In real optical systems non-paraxial rays also take part in image formation, therefore actual images depart from ideal image. This is called spherical aberration.

- (1) A (2) B (3) C (4) D

67. **Assertion:-** The optical fibers use the phenomenon of total internal reflection from the transmission of light from its one end to the other.

Reason:- Whenever a light ray moves from a denser medium towards a rarer medium at an angle greater than critical angle then it suffers total internal reflection.

- (1) A (2) B (3) C (4) D

68. **Assertion:-** Myopia is an eye defect in which the eye lens focuses the incoming light rays at a point in front of retina.

Reason:- A converging lens must be used to correct the defect called myopia.

(1) A (2) B (3) C (4) D

69. **Assertion:-** In a simple microscope, the angular size of the object equals the angular size of the image, yet it offers magnification.

Reason:- The angular magnifying of simple microscope in stressed eye case is more than its angular magnification in relaxed eye case.

(1) A (2) B (3) C (4) D

70. **Assertion:-** Interference and diffraction effects exists for longitudinal as well as transverse waves.

Reason:- Phenomenon of polarisation is observed only for transverse waves.

(1) A (2) B (3) C (4) D

71. **Assertion:-** When light is incident on a system of two polaroids whose transmission axis is mutually perpendicular to each other, then no light comes out of the combination.

(1) A (2) B (3) C (4) D

Reason:- In the above situation if another polaroid is placed in between the two polaroids, whose transmission axis is aligned at an angle $\theta (\neq \pi/2, \text{ Radians})$ with any one polaroids, then the some light will finally come out of the combination.

(1) A (2) B (3) C (4) D

72. **Assertion:-** A beam of light is divided into two or more beams after reflection and reflected beams finally interfere, this phenomenon of interference is known as division of amplitudes.

Reason:- A beam of light is allowed to fall on two closely spaced holes and the two beams emanating from the two holes interfere, this method is known as division of wave front.

(1) A (2) B (3) C (4) D

73. **Assertion:-** If the source of light in YDSE is changed from red to violet, then the separation between the interference fringes will increase.

Reason:- The wavelength of violet light is smaller than the wavelength of red light.

(1) A (2) B (3) C (4) D

74. **Assertion:-** In YDSE the dark fringes will be formed on the screen at points just in front of two slits, if the separation between the slits is an odd integral multiple of fringe width.

Reason:- In YDSE the dark fringes will be formed on the screen at points just in front of two slits, irrespective of the separation the two slits.

(1) A (2) B (3) C (4) D

75. **Assertion:-** The deviation of a ray after reflection, once from each of the two plane mirrors inclined at some angle ' θ ' is independent of the angle of incidence of the ray.

Reason:- The deviation of an incident ray after reflection from any reflecting surface depends upon the angle of incidence of the rays.

(1) A (2) B (3) C (4) D

76. **Assertion:-** The de-broglie wave length of an electron of mass m moving in n^{th} Bohr orbit of radius r is $\frac{2\pi r}{n}$.

Reason:- According to Bohr's theory, the magnitude of the angular momentum of an electron moving with velocity v in the n^{th} orbit is

$$L = \frac{nh}{2\pi}$$

(1) A (2) B (3) C (4) D

77. **Assertion:-** If the voltage of an x-ray tube is increased, the minimum wavelength of the emitted radiation decreases.

Reason:- The maximum frequency of the radiation in an x-ray tube is directly proportional to the voltage.

(1) A (2) B (3) C (4) D

78. **Assertion:-** A nucleus at rest splits into two nuclear parts having radii in the ratio 2:4. Their velocities will be in the ratio 8:1.

Reason:- The radius of a nucleus is proportional to cube root of its mass number.

- (1) A (2) B (3) C (4) D

79. **Assertion:-** Two radioactive sources A and B initially contain equal number of radioactive nuclei. Source A has half life of 1 hour and source B has a half life of 2 hours. At the end of 2 hours they will have the same rate of disintegration.

Reason:- The rate of disintegration at an instant is product of decay constant and active number of nuclei at an instant.

- (1) A (2) B (3) C (4) D

80. **Assertion:-** The nucleus ^{22}Ne absorbs energy and decays into two alpha particle and an unknown nucleus. The unknown nucleus must be carbon.

Reason:- In a nuclear reaction, the atomic number is conserved.

- (1) A (2) B (3) C (4) D

81. **Assertion:-** The number of α and β particles emitted when $^{238}_{92}\text{U}$ decays into $^{208}_{82}\text{Pb}$ is 6 and 8 respectively.

Reason:- In a nuclear reaction the mass number and atomic number are both conserved.

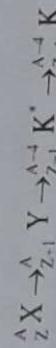
- (1) A (2) B (3) C (4) D

82. **Assertion:-** In two half life of a radioactive sample all nuclei will decay.

Reason:- The half life of radioactive sample is T. It will decay to $\frac{1}{16}$ of its initial value in a time $8T$.

- (1) A (2) B (3) C (4) D

83. **Assertion:-** The radioactive decay of nucleus X to nuclei Y and K is represented by

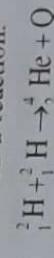


The sequence of emitted radiation is β , α and γ .

Reason:- In a nuclear reaction, the mass number and atomic number are both conserved.

- (1) A (2) B (3) C (4) D

84. **Assertion:-** The binding energy of deuteron (${}^2_1\text{H}$) is 1.15 MeV per nucleon and an alpha particle (${}^4_2\text{He}$) has binding energy of 7.1 MeV per nucleon. Then in a reaction.



The energy Q released is 23.8 MeV.

Reason:- Mass energy conservation is valid in nuclear reaction.

- (1) A (2) B (3) C (4) D

85. **Assertion:-** A particle of mass M at rest decays into two particles of masses m_1 and m_2 which move with velocities v_1 and v_2 respectively. Their respective de-broglie wavelengths are λ_1 and λ_2 . If $m_1 > m_2$, then $\lambda_1 > \lambda_2$.

Reason:- The de Broglie wave length of a particle having momentum P is $\lambda = \frac{h}{P}$.

- (1) A (2) B (3) C (4) D

86. **Assertion:-** The nucleus ${}^6_3\text{Li}$ can emit an alpha particle.

Reason:- Deuteron and alpha particle can undergo complete fusion.

- (1) A (2) B (3) C (4) D

87. **Assertion:-** The minimum wavelength of X-rays emitted from an X-ray tube operating at a voltage of 10^4 volt is roughly equal to 0.1 \AA^0 .

Reason:- The energy in monochromatic X-rays of wave length 0.1 \AA^0 is roughly equal to $2 \times 10^{-15} \text{ J}$.

- (1) A (2) B (3) C (4) D

88. **Assertion:** The de-Broglie wavelength of an electron moving in the n^{th} Bohr orbit of radius r is given by $\frac{2\pi r}{n}$.

Reason: The momentum of a particle of mass m and charge q is equal to that of a photon of wavelength λ . The speed of the particle is $\frac{h}{m\lambda}$.

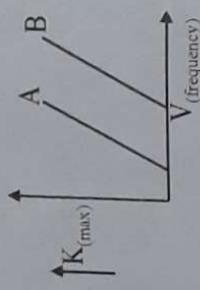
$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

89. **Assertion:** When the potential difference applied to an X-ray tube is increased, minimum wavelength of X-ray decreases.

Reason: In an X-ray tube, electrons accelerated through a very high potential difference strike a metal target. If the potential difference is increased, the speed of emitted X-rays increases.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

90. **Assertion:** Work function of metal B is greater than that of metal A.



Reason: The work function does not depend upon the slope of graph.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

91. **Assertion:** Net charge on p-type semiconductor is zero

Reason: In case of p-type semiconductor, the number density of holes is greater than that of electrons.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

92. **Assertion:** Conductivity of n-type semiconductor is greater than that of p-type semiconductor when both of these have same level of doping.

Reason: The majority carrier in an n-type semiconductor (electrons) have greater mobility than majority carrier in p-type semiconductor (holes) for a given applied electric field.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

93. **Assertion:** If we take a slab each of a p-type semiconductor and n-type semiconductor and joined them, then p-n junction diode is not formed.

Reason: Due to roughness of the surface of two slabs, the junction will not provide continuous contact between them, but instead will act as a discontinuity for the mobile charges.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

94. **Assertion:** The width of depletion layer is smaller in zener diode as compared to p-n junction diodes.

Reason: Zener diodes have lower dopant densities as compared to p-n junction diodes.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

95. **Assertion:** Si ($E_g \sim 1.1\text{eV}$) and GaAs ($E_g \sim 1.53\text{eV}$) are preferred materials for solar cells.

Reason: Solar radiation have maximum energy near 1.5 eV and for photoexcitation, $h\nu > E_g$.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

96. **Assertion:** In an unbaised p-n junction, diffusion current and drift current flows in opposite directions.

Reason: Diffusion current flows due to concentration gradient of different charge carriers on both sides while drift current flows due to drifting of majority charge carriers.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

97. **Assertion:** Zeener diode can be used as the D.C. voltage regulator.

Reason: Current through the dropping resistance changes and the resistance offered by zeener diode changes.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

98. **Assertion:** A p-n junction with reverse bias can be used as a photodiode to measure light intensity.

Reason: In reverse bias condition, the current is small but it is more sensitive to change in incident light intensity.

$$(1) A \quad (2) B \quad (3) C \quad (4) D$$

99. **Assertion:-** A transistor amplifier in common-emitter configuration has a low input impedance.
Reason:- The base to emitter region is forward biased.
- (1) A (2) B (3) C (4) D
100. **Assertion:-** The logic gate NOT can be built using diodes.
Reason:- The output voltage and input voltage of the diode have 180° phase difference.
- (1) A (2) B (3) C (4) D
101. **Assertion:-** Any gate can be constructed by using NAND gates.
Reason:- NAND gate can be converted to OR gate by simply joining its two inputs.
- (1) A (2) B (3) C (4) D
102. **Assertion:-** Electromagnetic waves with frequencies smaller than the critical frequency of ionosphere can not be used for communication using sky wave propagation.
Reason:- The refractive index of ionosphere becomes very high for frequencies higher than the critical frequency.
- (1) A (2) B (3) C (4) D
103. **Assertion:-** For TV broadcasting and medium wave band, surface wave propagation is used.
Reason:- The surface travel directly between transmitting and receiving antenna through the atmosphere.
- (1) A (2) B (3) C (4) D
104. **Assertion:-** The EM waves of shorter wavelengths can travel longer distances on earth's surface than those of longer wavelengths.
Reason:- Shorter the wavelength, the larger is the speed of propagation of the wave.
- (1) A (2) B (3) C (4) D
105. **Assertion:-** In case of frequency modulation, the frequency of RF carrier is changed by the AF signal and the change is proportional to the amplitude of the AF signal at any instant.
Reason:- When the AF signal is positive, the carrier frequency increases but it decreases when the AF signal is negative.
- (1) A (2) B (3) C (4) D

106. **Assertion:-** The binding energy per nucleon, for nuclei with atomic mass number $A > 100$, decreases with A.
Reason:- The nuclear force is weak for heavier nuclei.
- (1) A (2) B (3) C (4) D
107. **Assertion:-** When the speed of an electron increases, the specific charge decreases.
Reason:- Specific charge is the ratio of the charge to mass.
- (1) A (2) B (3) C (4) D
108. **Assertion:-** Neutrons penetrate matter more readily as compared to protons.
Reason:- Neutrons are slightly more massive than protons.
- (1) A (2) B (3) C (4) D
109. **Assertion:-** Heavy water is preferred to ordinary water as a moderator in the reactor.
Reason:- Heavy water used for slowing down the neutrons has lesser absorption than ordinary water.
- (1) A (2) B (3) C (4) D
110. **Assertion:-** Positive value of packing fraction implies a large value of binding energy.
Reason:- The difference between the mass of the nucleus and the mass number of the nucleus is called packing fraction.
- (1) A (2) B (3) C (4) D
111. **Assertion:-** The minimum wavelength of continuous spectrum of X-rays for tungsten target is greater at 40 kV as compared to that at 30 kV.
Reason:- The minimum wavelength decreases with the increasing accelerating potential.
- (1) A (2) B (3) C (4) D
112. **Assertion:-** The wavelength of X-ray corresponding to maximum intensity for tungsten is smaller at 50 kV as compared to that at 40 kV.
Reason:- The wavelength of X-ray corresponding to maximum intensity shifts towards the lower wavelength side as the accelerating potential is increased.
- (1) A (2) B (3) C (4) D

ANSWER KEY

113. Assertion:- $^{56}_{28}\text{Fe}$ is the most stable nuclei.
Reason:- Binding energy is greatest for $^{56}_{28}\text{Fe}$ nuclei.

(4) D

(3) C

(2) B

(1) A

114. Assertion:- Nuclear force acting between a neutron and a proton is same as that between two protons or two neutrons.

(4) D

(3) C

(2) B

(1) A

Reason:- Nuclear force is spin-dependent force.

(4) D

(3) C

(2) B

(1) A

115. Assertion:- Nuclear force is non-central force.

(4) D

(3) C

(2) B

(1) A

Reason:- Nuclear force is always attractive.

116. Assertion:- Nuclear force is mainly responsible for the stability of the nucleus.

(4) D

(3) C

(2) B

(1) A

117. Assertion:- Radioactivity is independent of the temperature, external pressure etc.

Reason:- Radioactivity is spontaneous and self-disruptive activity.

(4) D

(3) C

(2) B

(1) A

118. Assertion:- Various β -particles emitted in a decay of nucleus sample disintegrating by β -have different energy.

Reason:- Energy released in β -decays is shared by daughter nuclei, β -particle and antineutrino.

(4) D

(3) C

(2) B

(1) A

119. Assertion:- It is impossible for electron capture to occur in the ^1H atom.

Reason:- Sum of masses of proton and electron is lesser than the mass of neutron.

(2) B

(3) C

(4) D

(1) A

120. Assertion:- Nuclei also have discrete energy levels as atom do.

Reason:- Gamma ray emission usually follows α or β emission.

(3) C

(4) D

(2) B

(1) A