PHYSICS

BOOKS - AIIMS PREVIOUS YEAR PAPERS

AIIMS 2011

Physics

1. In Young's double slit experiment carried out with wavelength $\lambda = 5000\text{Å}$, the distance

between the slits is 0.2 mm and the screen is 2 m away from the slits. The central maxima is at n=0. the third maxima will be at a distance x (from central maxima) is equal to
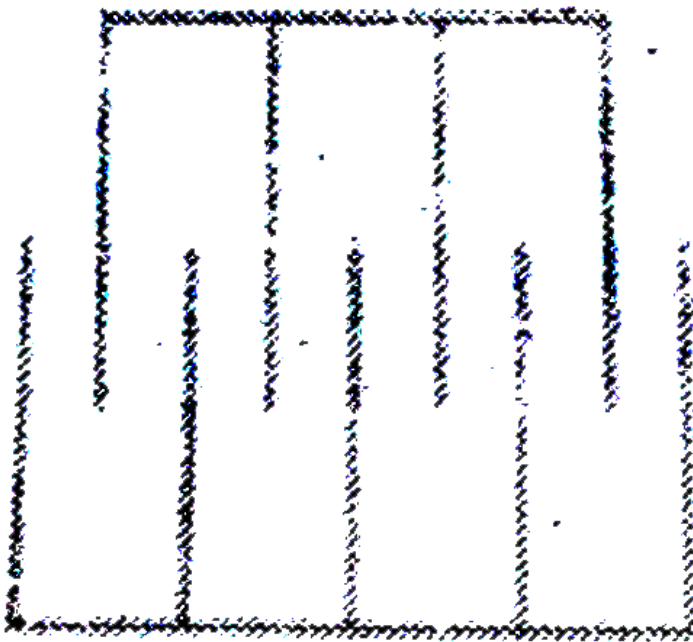
A. 5.0 cm

B. 0.5 cm

C. 4.67 cm

D. 1.5 cm

Answer: D

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2. A gang capacitor is formed by interlocking a number of plates as shown in figure. The distance between the consecutive plates is 0.885 cm annd the overlapping area of the plates is 5 cm^2. The capacity of the unit is

A. 1.06 pF

B. 4 pF

C. 6.36 pF

D. 12.72 pF

Answer: B

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3. The reezer in a refrigeratror is located at the

top section so that

A. the entire chamber of the refrigerator is

cooled quickly due to convection

B. the motor is not heated

C. the heat gained from the environment is

high

D. the heat gained from the environment is

low

Answer: A

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4. A choke coil is preferred to a resistance for reducing current in an ac circuit because .

A. choke is cheap

B. there is not wastage of powerr

C. choke is compact in size

D. choke is a good absorber of heat

Answer: C

5. A thin prism P with angle $4°$ and made from glass of refractive index 1.54 is combined with another thin prism P made from glass of refractive index 1.72 to produce dispersion without deviation The angle of prism P is

A. $4°$

B. $5.33°$

C. $2.6°$

D. $3°$

Answer: D

6. Calculate the number of photons emitted per second by a 10 watt sodium vapor lamp. Assume that 90% of the consumed energy is converted into light. Wavelength of sodium light is 590nm. $h = 6.62 \times 10^{-34} Js$

A. $0.256x10^{18}$

B. 0.267×10^{19}

C. 0.267×10^{20}

D. 0.267×10^{17}

Answer: C

7. $200MeV$ of energy may be obtained per fission of U^{235}. A reactor is generating $1000kW$ of power. The rate of nuclear fission in the reactor is.
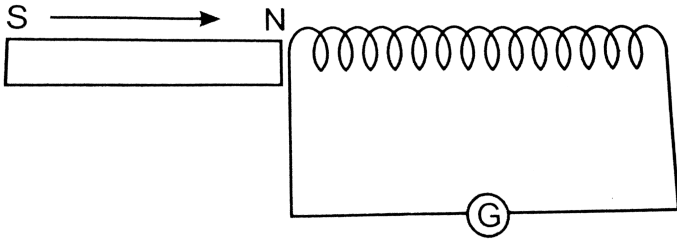
A. 1000

B. 2×10^8

C. 3.125×10^{16}

D. 931

Answer: C

8. As shown in the figure, a magnetic is moved with a a fast speed towards a coil at rest. Due to this, induced electromotive force, induced charge in the coil are E, I and Q respectively. If the speed of magnetic is doubled, the

incorrect statement is

A. E increases

B. I increases

C. Q remains same

D. Q decreases

Answer: D

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9. Which one of the following is not made of soft iron?

A. Electromagnet

B. Core of transformer

C. Core of dynamo

D. Magnet of loudspeaker

Answer: D

10. Two tangent galvanometers having coils of the same radius are connected in series. A current flowing in them produces deflections of $60°$ and $45°$ respectively. The ratio of the number of turns in the coils is

A. $4/3$

B. $\left(\sqrt{3}+1\right)/1$

C. $\sqrt{3}/1$

D. $\left(\sqrt{3}+1\right)/\left(\sqrt{3}-1\right)$

Answer: C

11. A bar magnet having a magnetic moment of $1.0 \times 10^4 JT^{-1}$ is free to rotate in a horizontal plane. A horizontal magnetic field $B = 4 \times 10^{-5}T$ exists in the space. Find the work done in rotating the magnet slowly from a direction parallel to the field to a direction $60°$ from the field.

A. 0.2 J

B. 2 J

C. 4.18 J

D. $2 \times 10^2 J$

Answer: A

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12. An ideal coil of 10 henry is joined in series with a resistance of 5 ohm and a battery of 5 volt. 2 second after joining, the current flowing in ampere in the circuit will be

A. e^{-1}

B. $\left(1 - e^{-1}\right)$

C. $(1 - e)$

D. e

Answer: B

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13. A rocket is fired upward from the earth's surface such that it creates an acceleration of 19.6 m/sec . If after 5 sec its engine is switched

off, the maximum height of the rocket from earth's surface would be

A. 245 m

B. 490 m

C. 980 m

D. 735 m

Answer: A

14. A 60 kg weight is dragged on a horizontal surface by a rope upto 2 metres. If coefficient of friction is $\mu = 0.5$ the angle of rope with the surface is $60°$ and $g = 9.8m/\sec^2$, then work done is

A. 294 J

B. 15 J

C. 588 J

D. 197 J

Answer: A

15. A small uncharged metallic sphere is positioned exactly at a point midway between two equal and opposite point charges. If the sphere is slightly displaced towards the positive charge and released then

    A. it will oscillate about its original position

    B. it will move further towards the positive charge

C. its electric potential energy will decrease
and kinetic energy will increase

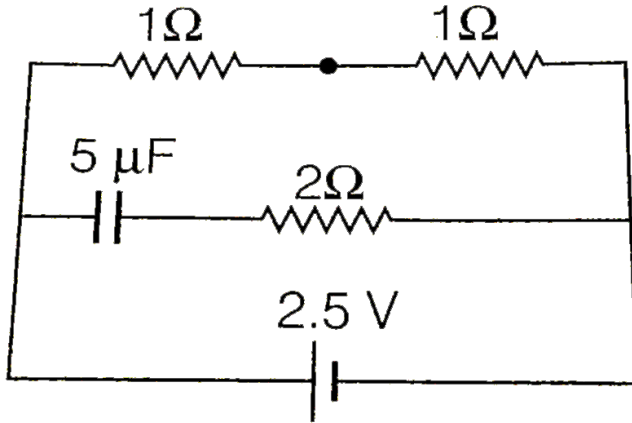D. its total energy remains constant but is
non-zero

Answer: D

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16. A capacitor of capacitaance $5\mu F$ is connected as shown in the figure.The internal resistane of the cell is 0.5ω The amount of

charge on the cap[acitor plates is

A. zero

B. $5\mu C$

C. $10\mu C$

D. $25\mu C$

Answer: C

17. The resistance of a circular coil of 50 turns and 10 cm diameter is 5Ω. What must be the potential difference across the ends of the coil so as to nullify the earth's magnetic field (H=0.314 gauss) at the centre of the coil? How should the coil be placed to achieve this result?

A. 0.5 V with plane of coil normal to the magnetic meridian

B. 0.5 V with plane of ocil in the magnetic

meridian

C. 0.25 V with plane of coil normal to the

magnetic meridian

D. 0.25 V with plane of coil in the magnetic

meridian

Answer: C

18. If C and L denote capacitance and inductance respectively, then the dimensions of LC are

A. $\left[M^0L^0T^0\right]$

B. $\left[M^0L^2T^{-2}\right]$

C. $\left[MLT^{-2}\right]$

D. $\left[M^0L^0T^0\right]$

Answer: A

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19. The K_α line from molybdenum (atomic number=42) has a wavelength off .7078Å. The wavelength off K_α line of zinc (atomic number=30) will be

A. 1Å

B. 1.3872Å

C. 0.3541Å

D. 0.5Å

Answer: B

20. A body of mass $0.5kg$ is projected under the gravity with a speed of $98m/s$ at an angle of $30°$ with the horizontal. The change in momentum (in magnitude) of the body when it strikes the ground is

A. 24.5 N-s

B. 49.0 N-s

C. 98.0 N-s

D. 50.0 N-s

Answer: B

21. The diameter of the objective of the telescope is 0.1 metre and wavelength of light is 6000Å. Its resolving power would be approximately

A. $6 \times 10^{-5} rad$

B. $6 \times 10^{4} \text{rad}$

C. $6 \times 10^{-3} \text{rad}$

D. 6×10^{-6} rad

Answer: D

22. The dispersive powers of glasses of lenses used in an achromatic pair are in the ratio 5 : 3. If the focal length of the concave lens is 15 cm , then the nature and focal length of the other lens would be

A. convex, 9 cm

B. concave, 9 cm

C. convex, 25 cm

D. concave, 25 cm

Answer: A

23. A certain charge Q is divided into two parts q and $Q - q$, wheich are then separated by a cetain distance. What must q be in terms of Q

to maximum the electrostatic repulsion between the two charges?

A. 2

B. $1/2$

C. 4

D. $1/4$

Answer: A

24. A rectangular vessel when full of water takes 10 minutes to be emptied through an orifice in its bottom. How much time will it take to be emptied when half filled with water

A. 9 min

B. 7 min

C. 5 min

D. 3 min

Answer: B

25. If there were no gravity, which of the following will not be there for a fluid ?

A. Viscosity

B. Surface tension

C. Pressure

D. Archimedes' upwards thrust

Answer: D

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26. $A = 4i + 4j - 4k$ and $B = 3i + j4k,$

then angle between vectors A and B is

A. $180°$

B. $90°$

C. $45°$

D. $0°$

Answer: D

27. Consider the following statements

(i) for a permanent magnet the area of a hysteresis loop is allowed to be large

(ii) Coercivity o the material in permanent magnets should be small.

Which of the following statements is/are true?

    A. (i) but not (ii)

    B. (ii) but not (i)

    C. Both (i) and (ii)

    D. Neither (i) nor (ii)

Answer: A

28. Two capacitors of $10\mu F$ and $20\mu F$ are connected in series with a $30V$ battery. The charge on the capacitors will be, respectively

    A. $100\mu C$, $100\mu C$

    B. $200\mu C$, $100\mu C$
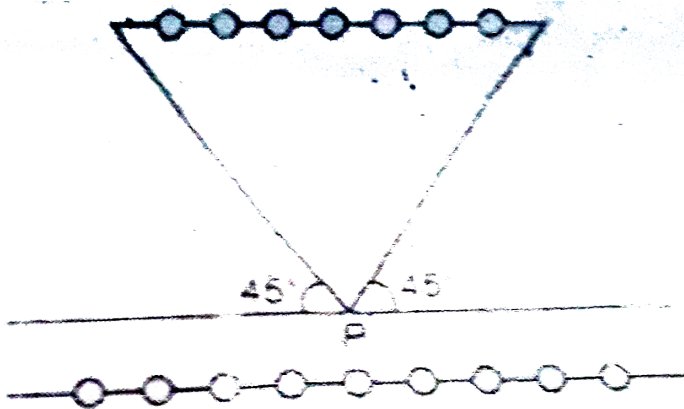
    C. $200\mu C$, $200\mu C$

    D. $100\mu C$, $200\mu C$

Answer: C

29. The magnetic field at P on the axis of a solenoid having 100 turn/m and carrrying a currennt of 5A is

A. $250\mu_0$

B. $500\sqrt{2}\mu_0$

C. $500\mu_0$

D. $250\sqrt{2}\mu_0$

Answer: D

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30. In an isobaric process of an ideal gas. The

ratio of heat supplied annd work done by the

system $\left[i.\,e.\,,\ \left(\dfrac{Q}{W} \right) \right]$ is

A. $\dfrac{\gamma - 1}{\gamma}$

B. γ

C. $\dfrac{\gamma}{\gamma - 1}$

D. 1

Answer: C

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31. The velocity of sound in air at $0°C$ is 331 m/s. Find its velocity when temperature rises to $91°C$ and its pressure is doubled.

    A. 330 m/s

    B. 165 m/s

    C. $330\sqrt{2}m/s$

    D. $330/\sqrt{2}m/s$

Answer: C

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32. Dopper's effect is sound in addition of relative velocity between source and observer, also depends while source and observer or both are moving. Doppler effecct in light depennd only on the relative velocity of source and observer. The reason of this is

    A. Einstein mass-energy relation

    B. Einstein theory of relativity

    C. Photoelectric effect

    D. none of the above

Answer: B

33. In a LR circuit of 3 mH dinductance and 4Ω resistance, emf $E = 4\cos 1000t$ volt is applied. The amplitude of current is

A. $\dfrac{4}{\sqrt{7}}A$

B. $1.0A$

C. $\dfrac{4}{7}A$

D. $0.8A$

Answer: D

34. Two coherent monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are

A. 5I and I

B. 5I and 3I

C. 3I and I

D. 9I and I

Answer: D

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35. An X-ray tube is operated at 50 kV. The minimum wavelength produced is

A. 0.5 Å

B. 0.75 Å

C. 0.25 Å

D. 1.0 Å

Answer: C

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36. The energy gap between conductionband

and valence band is of the order of 0.07 eV. It

is a/an

A. insulator

B. conductor

C. semiconductor

D. alloy

Answer: C

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37. The earth circles the sun once a year. How much work would have to be done on the earth to bring it to rest relative to the sun, (ignore the rotation of earth about - its own axis) Given that mass of the earth is 6×10^{24}

kg and distance between the sun and earth is

1.5×10^8 km-

A. $2.7 \times 10^{30} J$

B. $2.7 \times 10^{31} J$

C. $-2 \times 10^{33} J$

D. $+2.7 \times 10^{33} J$

Answer: C

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38. A longitudinal wave is represented by

$$x = x_0 \sin 2\pi \left(nt - \frac{x}{\lambda} \right)$$

The maximum particle velocity will be four times the wave velocity if

A. $\lambda = \dfrac{nx_0}{4}$

B. $\lambda = 2\pi x_0$

C. $\lambda = \dfrac{\pi x_0}{2}$

D. $\lambda = 4\pi x_0$

Answer: C

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39. The rate of dissipation of heat by a black body at temperature T is Q. What will be the the rate of dissipation of heat by another body at temperature $2T$ and emissivity 0.25?

A. 16 Q

B. 4Q

C. 8Q

D. 4.5Q

Answer: B

40. Radius of gyration of a body about an axis at a distance 6 cm from its centre of mass is 10 cm. Find its radius of gyration about a parallel axis through its centre of mass.

A. 800 cm

B. 8 cm

C. 0.8 cm

D. 80 m

Answer: B

41. Statement (I):The projectile has only vertical component of velocity at the highest point of its trajectory.

Statement (II) : At the highest point, only one component of velocity is present.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: D

42. Assertion : Thrust on a rocket depends only on velocity of exhaust gases Rate of decrease of mass is irrelevant

Reason : Larger the velocity greater is the thrust .

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true

but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

43. Assertion: When a ball collised elastically with a floor, it rebounds with the same velocity as with it strikes.

Reason: Momentum of earth + ball system remains constant.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: B

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44. Assertion: When a body accelerates down an incline rolling purely. Static friction force acts on the body.

Reason: Point of contact of the body with incline remains at rest.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

45. Statement I: A small drop of mercury is spherical where bigger drops are oval in shape.

Statement II: Surface tension of liquid decreases with increase in temperature.

A. If both assertion and Reason are true and the Reason is the correct

explanation of the assertion.

B. If both assertion and Reason are true

but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

46. Assertion: C_p can be less than C_V.

Reason: $C_p C_V = R$ is valid only for ideal gases.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: B

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47. In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as

(a) If both assertion and reason are true and reason is the correct explanation of assertion.

(b) If both assertion and reason are true but

reason is not the correct explanation of

assertion.

(c) If assertion is true but reason is false.

(d) If assertion and reason are false.

Q. Assertion: Bulk modulus of elasticity B

represents incompressibility of the material

Reason: $B = - \dfrac{\triangle P}{\dfrac{\triangle V}{V}}$, where symbols have

their usual meaning.

A. If both assertion and Reason are true

and the Reason is the correct

explanation of the assertion.

B. If both assertion and Reason are true

but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

48. Assertion: To floats, a body must displace liquid whose weight is greater than actual weight of the body.

Reason: The body will experience no net downward force in that case.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: D

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49. Assertion : It is hotter over the top of a fire than at the same distacne of the side.

Reason : Air surrounding the fire conducts more heat upward

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

50. Assertion : The molecules of a monatomic gas has three degrees freedom.

Reason : The molecules of a diatomic gas has five degrees of freedom.

   A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

   B. If both assertion and Reason are true but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: B

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51. Assertion: In a stationary wave, there is no transfer of energy.

Reason: There is no outward motion of the

distubance from one particle to adjoing particle in a stationary wave.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: B

52. Assertion: Through large number of free electron are present in the metal, yet there is no current in the absent of electric field.

Reason: In the absence of electric field, electrons move remdomly in all directions

A. If both assertion and Reason are true and the Reason is the correct

explanation of the assertion.

B. If both assertion and Reason are true

but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

53. Assertion: the value of temperature coefficient of resistance is positive is for metals.

Reason: The temperature coefficient of resistance for insulator is also positive.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: C

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54. Asertion: magnetic field due to a infinite stragith conductor varies inversely as the distance from it.

Reason: the magentic field at the centre of the

circular coil is zero

A. If both assertion and Reason are true

and the Reason is the correct

explanation of the assertion.

B. If both assertion and Reason are true

but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: B

55. Statement I: The resistance of an ideal voltmeter should be infinite.

Statement II: Lower resistance of voltmeters gives a reading lower than the actual potential difference across the terminals.

A. If both assertion and Reason are true and the Reason is the correct

explanation of the assertion.

B. If both assertion and Reason are true

but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

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56. Assertion: The centripetal forces and centrifugal forces never cancel out.

Reason: They do not act at the same time.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: C

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57. Assertion: A quick collision between two bodies is more violent that show collision , even when initial and final velocity are identical.

Reason: The rate of change of momentum determine that force is small or large.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: A

58. Assertion: The length of the day is slowly increasing.

Reason: The dominant effect causing a slowdown in the rotation of the earth is the gravitational pull of other planets in the solar system.

 A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true

but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: D

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59. Assetion In α-decay atomic number of daughter nucleus reduces by 2 units from the parent nucleus.

Reason An α particle carries four units of mass.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct

explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: B

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60. Assertion : When baseregion has larger width, the collector current increases.

Reason : : Electron hole combination in base result in increase of base current.

A. If both assertion and Reason are true and the Reason is the correct explanation of the assertion.

B. If both assertion and Reason are true but the reason is not the correct explanation of the assertion

C. If assertion is true but reason is false

D. If both assertion and reason are false.

Answer: D