

BITSAT Solved Paper 2019

1. The number of which one of the following pairs of nuclei are isotones?

(A) ${}_{34}\text{Se}^{74}$, ${}_{31}\text{Ga}^{71}$
 (B) ${}_{38}\text{Sr}^{84}$, ${}_{38}\text{Sr}^{86}$
 (C) ${}_{42}\text{Mo}^{92}$, ${}_{40}\text{Zr}^{92}$
 (D) ${}_{20}\text{Ca}^{40}$, ${}_{16}\text{S}^{32}$

Correct Option: A

Solution:

2. If x , v and a denote the displacement, the velocity and the acceleration of a particle executing simple harmonic motion of time period T , then, which of the following does not change with time?

(A) $aT\lambda x$ (B) $al + 2\pi v$
 (C) aTv (D) $a^2\tau^2 + 4\pi^2 v^2$

Correct Option: A

Solution:

3. A man drives a car from station B towards station A at speed 60 km/h. A car leaves station A for station B every 10 minutes. The distance between A and B is 90 km. The car travels at the speed of 90 km/h. The man starts at the moment when first car leaves station B. How many cars would he meet on the route?

(A) 4 (B) 7 (C) 9 (D) 12

Correct Option: B

Solution:

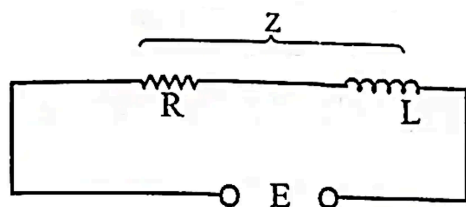
4. In an LR circuit $f = 50$ Hz, $L = 2$ H, $E = 5$ volts, $R = 1 \Omega$, then energy stored in the inductor is

(A) 50 J (B) 25 J
 (C) 100 J (D) None of these

Correct Option: D

Solution:

$$L = 2 \text{ H}, E = 5 \text{ volts}, R = 1 \Omega$$



$$I = \frac{E}{Z}$$

$$Z = \sqrt{R^2 + (\omega L)^2}$$

$$I = \frac{5}{\sqrt{R^2 + (\omega L)^2}} = \frac{5}{\sqrt{1 + 4\pi^2 \times 50^2 \times 4}} = \frac{5}{\sqrt{1 + (200\pi)^2}} = \frac{5}{200\pi}$$

$$\text{Energy in inductor} = \frac{1}{2} LI^2$$

$$= \frac{1}{2} \times 2 \times \left(\frac{5 \times 5}{200 \times 200\pi^2} \right) = 6.33 \times 10^{-5} \text{ joules}$$

5. If a rolling body's angular momentum changes by -20 units in 3 seconds, by a constant torque, then find the torque on the body.

(A) 20/3 SI units (B) 100/3 SI units
 (C) 20 SI units (D) 5 SI units

Correct Option: A

Solution:

6. Two bodies A and B are placed in an evacuated vessel maintained at a temperature of 27°C . The temperature of A is 327°C and that of B is 227°C . The ratio of heat lost from A and B is about

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

Correct Option: A

Solution:

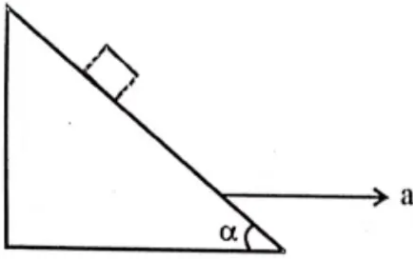
7. A man drags a block through 10 m on a rough surface with coefficient of friction $\mu = 0.5$. A force of $\sqrt{3}$ kN is acting at an angle of 30° to the horizontal. What is the work done by the applied force?

(A) zero (B) 7.5 kJ (C) 5 kJ (D) 10 kJ

Correct Option: B

Solution:

8. A block is kept on a frictionless inclined surface with an angle of inclination ' α '. The incline is given an acceleration 'a' to keep the block stationary. Then 'a' is equal to



- (A) $g \operatorname{cosec} \alpha$
 (B) $g / \tan \alpha$
 (C) $g \tan \alpha$
 (D) g

Correct Option: C

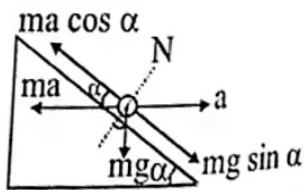
Solution:

From free body diagram,

For block to remain stationary,

$$mg \sin \alpha = ma \cos \alpha$$

$$\Rightarrow a = g \tan \alpha$$

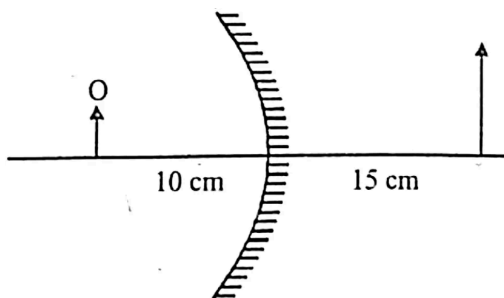


9. You are asked to design a shaving mirror assuming that a person keeps it 10 cm from his face and views the magnified image of the face at the closest comfortable distance of 25 cm. The radius of curvature of the mirror would then be :
- (A) 60 cm (B) -24 cm (C) -60 cm (D) 24 cm

Correct Option: C

Solution:

Concave mirror is used as a shaving mirror.



From question : $v = 15 \text{ cm}$, $u = -10 \text{ cm}$

Radius of curvature, $R = 2f = ?$

Using mirror formula, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{15} + \frac{1}{(-10)} = \frac{1}{f} \Rightarrow f = -30 \text{ cm}$$

Therefore radius of curvature,

$$R = 2f = -60 \text{ cm}$$

10. The time period of a satellite of earth is 5 hours. If the separation between the earth and the satellite is increased to 4 times the previous value, the new time period will become

(A) 10 hours (B) 80 hours (C) 40 hours (D) 20 hours

Correct Option: C

Solution:

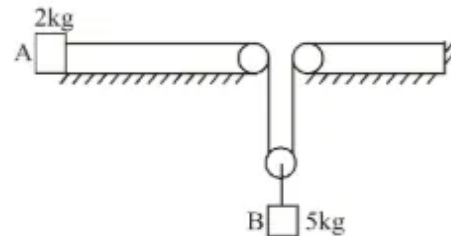
11. The young's modulus of a wire of length L and radius r is YN/m^2 . If the length and radius are reduced to $L/2$ and $r/2$, then its young's modulus will be

(A) $\frac{Y}{2}$ (B) Y
 (C) $2Y$ (D) $4Y$

Correct Option: C

Solution:

12. Find the acceleration of block A and B. Assume pulley massless.



(A) $\frac{10}{13} g, \frac{5}{13} g$
 (B) $\frac{1}{13} g, \frac{5}{13} g$
 (C) $\frac{9}{13} g, \frac{11}{13} g$
 (D) $\frac{13}{10} g, \frac{13}{5} g$

Correct Option: A

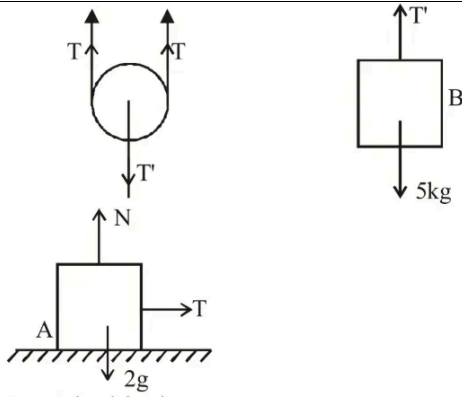
Solution:

Since A moves twice the distance moved by B.

If acceleration of B is ' a ', then acceleration of A is ' $2a$ '.

$$T' - (T + T) = 0 \text{ (since pulley is massless)}$$

$$\Rightarrow T' = 2T$$



For 5 kg block

$$5g - T' = 5a$$

for 2 kg block

$$\Rightarrow 5g - 2T = 5a$$

$$\dots (ii) [T' = 2T]$$

$$T = 2 \times (2a) = 4a \quad (iii)$$

From equations (ii) and (iii),

$$5g - (2 \times 4a) = 5a$$

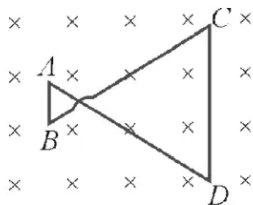
$$5g - 8a = 5a$$

$$5g = 13a$$

$$a = \frac{5g}{13}$$

$$a_A = 2a = \frac{10g}{13}; a_B = a = \frac{5g}{13}$$

13. A conducting wire frame is placed in a magnetic field which is directed into the paper. The magnetic field is increasing at a constant rate. The directions of induced current in wires AB and CD are



- (A) B to A and D to C (B) A to B and C to D
(C) A to B and D to C (D) B to A and C to D

Correct Option: A

Solution:

As the inward magnetic field increases, its flux also increases into the page and so induced current in bigger loop will be anticlockwise. i.e., from D to C in bigger loop and then from B to A in smaller loop.

14. In rotatory motion, linear velocities of all the particles of the body are

- (A) same (B) different
(C) zero (D) cannot say

Correct Option: B

Solution:

From $v = r\omega$, linear velocities (v) for particles at different distances (r) from the axis of rotation are different.

15. A straight wire of length 0.5 metre and carrying a current of 1.2 ampere is placed in uniform magnetic field of induction 2 tesla. The magnetic field is perpendicular to length of the wire. The force on the wire is

- (A) 2.4 N (B) 1.2 N (C) 3.0 N (D) 2.0 N

Correct Option: B

Solution:

$$F = BIl = 2 \times 1.2 \times 0.5 = 1.2 \text{ N}$$

16. Charge Q is distributed to two different metallic spheres having radii x and $2x$ such that both spheres have equal surface charge density, then charge on large sphere is

- (A) $\frac{4Q}{5}$ (B) $\frac{Q}{5}$
(C) $\frac{3Q}{5}$ (D) $\frac{5Q}{4}$

Correct Option: A

Solution:

Let q and q' be the charges on spheres of radii x and $2x$ respectively.

$$\text{Given, } q + q' = Q \quad (1)$$

Surface charge densities are

$$\sigma = \frac{q}{4\pi x^2} \text{ and } \sigma = \frac{q'}{4\pi (2x)^2}$$

$$\text{Given, } \sigma = \sigma'$$

$$\therefore \frac{q}{4\pi x^2} = \frac{q'}{4\pi (2x)^2}$$

$$q' = 4q$$

$$\text{From eq. (i), } q' = Q - q$$

$$\text{or, } 4q = Q - q$$

or, $Q = 5q$

.....(ii)

$$\therefore q' = Q - q = Q - \frac{Q}{5} = \frac{4Q}{5}$$

17. The fundamental frequency of an open organ pipe is 300 Hz. The first overtone of this pipe has same frequency as first overtone of a closed organ pipe. If speed of sound is 330 m/s, then the length of closed organ pipe is

(A) 41 cm (B) 30 cm (C) 45 cm (D) 35 cm

Correct Option: A

Solution:

For open pipe, $n_1 = \frac{v}{2\ell}$, where n_1 is the

fundamental frequency of open pipe.

length of open pipe is,

$$\therefore \ell = \frac{v}{2n} = \frac{330}{2 \times 300} = \frac{11}{20}$$

1st overtone of open pipe, $n_2 = 2n_1 = 2 \left(\frac{v}{2\ell} \right)$

1st overtone of closed pipe,

$$n_3 = 3n_1 = 3 \left(\frac{v}{4\ell'} \right)$$

where, $\ell' =$ length of closed pipe

As freq. of 1st overtone of open pipe = freq.

of 1st overtone of closed pipe

$$\therefore 2 \frac{v}{2\ell} = 3 \frac{v}{4\ell'} \Rightarrow \ell' = \frac{3\ell}{4} = \frac{3}{4} \times \frac{11}{20} = 41.25 \text{ cm}$$

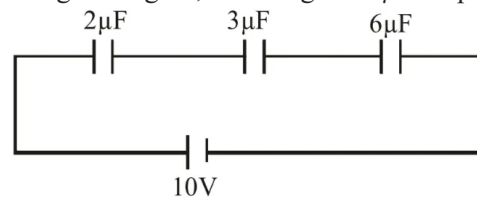
18. If a rigid body is rotating about an axis with a constant velocity, then

- (A) Velocity, Angular velocity of all particles will be same
(B) Velocity, Angular velocity of all particles will be different
(C) Velocity of all particles will be different but angular velocity will be same.
(D) Angular velocity of all particles will be different but velocity will be same.

Correct Option: C

Solution:

19. In the given figure, the charge on $3\mu\text{F}$ capacitor is



- (A) $10\mu\text{C}$ (B) $15\mu\text{C}$
(C) $30\mu\text{C}$ (D) $5\mu\text{C}$

Correct Option: A

Solution:

$C = \text{equivalent capacitance}$

$$\therefore \frac{1}{C} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} \Rightarrow C = 1\mu\text{F}$$

Charge on each capacitor in series circuit will be same.

$$\therefore q = CV = (1 \times 10^{-6}) \times 10 = 10\mu\text{C}$$

$\therefore$ Charge across $3\mu\text{F}$ capacitor will be $10\mu\text{C}$.

20. The angular speed of the electron in the n^{th} orbit of Bohr hydrogen atom is

- (A) directly proportional to n
(B) inversely proportional to $\sqrt{n}$
(C) inversely proportional to n^2
(D) inversely proportional to n^3

Correct Option: D

Solution:

Angular speed of electron in the n^{th} orbit of Bohr H-atom is inversely proportional to n^3

$$\omega_n \propto \frac{1}{n^3}$$

21. The amplitude of a damped oscillator becomes $\left(\frac{1}{3}\right)^{\text{rd}}$ in 2 seconds. If its amplitude after 6 seconds is $\frac{1}{n}$ times the original amplitude, the value of n is

- (A) 3^2 (B) 3^3
(C) $\sqrt[3]{3}$ (D) 2^3

Correct Option: B

Solution:

Amplitude of a damped oscillator

$$A = A_0 e^{-bt/2m}$$

Case 1 :-

$$\text{When } t = 2 \text{ s, } A = \frac{A_0}{3}$$

$$\therefore \frac{A_0}{3} = A_0 e^{-2b/2m} \Rightarrow \frac{1}{3} = e^{-b/m} \dots \quad (i)$$

Case 2 :-

$$\text{When } t = 6 \text{ s, } A = \frac{A_0}{n}$$

$$\therefore \frac{A_0}{n} = A_0 e^{-6b/2m} \Rightarrow \frac{1}{n} = (e^{-b/m})^3 \dots \quad (ii)$$

From (i) and (ii)

$$\frac{1}{n} = \left(\frac{1}{3}\right)^3 \Rightarrow \therefore n = 3^3$$

22. When a potential difference V is applied across a conductor at a temperature T , the drift velocity of electrons is proportional to

- (A) $\sqrt{V}$ (B) V
(C) $\sqrt{T}$ (D) T

Correct Option: B

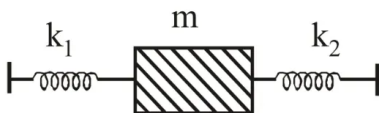
Solution:

Drift velocity,

$$v_d = \frac{i}{neA} = \frac{J}{ne} = \frac{\sigma E}{ne} = \frac{E}{\rho ne} \frac{V}{\ell ne}$$

$$\text{so } v_d \propto V$$

23. Two springs, of force constants k_1 and k_2 are connected to a mass m as shown. The frequency of oscillation of the mass is f . If both k_1 and k_2 are made four times their original values, the frequency of oscillation becomes



- (A) $2f$ (B) $f/2$ (C) $f/4$ (D) $4f$

Correct Option: A

Solution:

The two springs are in parallel.

$\therefore$ Effective spring constant,

$$k = k_1 + k_2$$

Now, frequency of oscillation is given by

$$f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$$

$$\text{or, } f = \frac{1}{2\pi} \sqrt{\frac{k_1 + k_2}{m}} \quad ($$

When both k_1 and k_2 are made four times their original values, the new frequency is given by

$$f' = \frac{1}{2\pi} \sqrt{\frac{4k_1 + 4k_2}{m}}$$

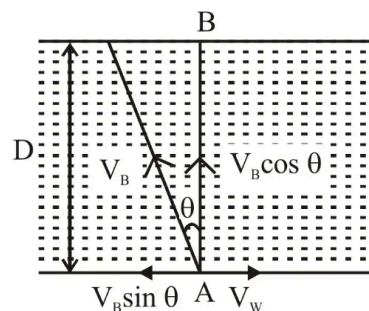
$$f' = \frac{1}{2\pi} \sqrt{\frac{4(k_1 + k_2)}{m}} = 2 \left(\frac{1}{2\pi} \sqrt{\frac{k_1 + k_2}{m}} \right) = 2f$$

24. A boat crosses a river from port A to port B, which is just on the opposite side. The speed of the water is V_w and that of boat is V_B relative to still water. Assume $V_w = 2 V_B$. What is the time taken by the boat, if it crosses the river directly on the AB line [D = width of the river]

- (A) $\frac{2D}{V_B \sqrt{3}}$ (B) $\frac{\sqrt{3}D}{2V_B}$
(C) $\frac{D}{V_B \sqrt{2}}$ (D) $\frac{D\sqrt{2}}{V_B}$

Correct Option: A

Solution:



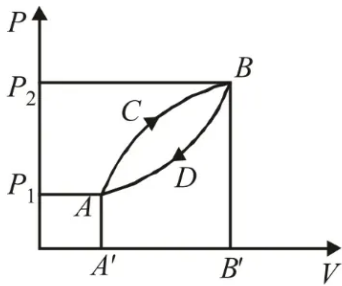
From figure, $V_B \sin \theta = V_w$

$$\sin \theta = \frac{V_w}{V_B} = \frac{1}{2} \Rightarrow \theta = 30^\circ \quad [\because V_B = 2 V_w]$$

Time taken to cross the river.

$$t = \frac{D}{V_B \cos \theta} = \frac{D}{V_B \cos 30^\circ} = \frac{2D}{V_B \sqrt{3}}$$

25. A thermodynamic system is taken from state A to B along ACB and is brought back to A along BDA as shown in the PV diagram. The net work done during the complete cycle is given by the area



- (A) $P_1ACBP_2P_1$ (B) $ACBB'A'A$
 (C) $ACBDA$ (D) $ADBB'A'A$

Correct Option: C

Solution:

Work done = Area under curve $ACBDA$

26. Water is flowing through a horizontal tube having cross-sectional areas of its two ends being A and A' such that the ratio A/A' is 5. If the pressure difference of water between the two ends is $3 \times 10^5 \text{ N m}^{-2}$, the velocity of water with which it enters the tube will be (neglect gravity effects)
- (A) 5 m s^{-1}
 (B) 10 m s^{-1}
 (C) 25 m s^{-1}
 (D) $50\sqrt{10} \text{ m s}^{-1}$

Correct Option: A

Solution:

According to Bernoulli's theorem

$$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2 \quad (i)$$

According to the condition,

$$P_1 - P_2 = 3 \times 10^5, \frac{A_1}{A_2} = 5$$

From equation of continuity,

$$A_1 v_1 = A_2 v_2$$

$$\text{so, } \frac{A_1}{A_2} = \frac{v_2}{v_1} = 5 \Rightarrow v_2 = 5v_1$$

From equation (i)

$$P_1 - P_2 = \frac{1}{2}\rho (v_2^2 - v_1^2)$$

$$\text{or } 3 \times 10^5 = \frac{1}{2} \times 1000 (25v_1^2 - v_1^2)$$

$$\Rightarrow 600 = 24v_1 \Rightarrow v_1^2 = 25$$

$$\therefore v_1 = 5 \text{ m/s}$$

27. Kepler's second law regarding constancy of areal velocity of a planet is a consequence of the law of conservation
- (A) Energy (B) Angular momentum
 (C) Linear momentum (D) None of these

Correct Option: B

Solution:

$$\frac{dA}{dt} = \frac{L}{2m} = \text{Constant}$$

28. A ball of mass 150 g, moving with an acceleration 20 m/s^2 , is hit by a force, which acts on it for 0.1 s. The impulsive force is
- (A) 0.5 N (B) 0.1 N (C) 0.3 N (D) 1.2 N

Correct Option: C

Solution:

$$\text{Mass} = 150 \text{ gm} = \frac{150}{1000} \text{ kg}$$

$$\text{Force} = \text{Mass} \times \text{acceleration}$$

$$= \frac{150}{1000} \times 20 \text{ N} = 3 \text{ N}$$

$$\text{Impulsive force} = F \cdot \Delta t = 3 \times 0.1 = 0.3 \text{ N}$$

29. A stone is thrown with a velocity u making an angle θ with the horizontal. The horizontal distance covered by its fall to ground is maximum when the angle θ is equal to
- (A) 0° (B) 30° (C) 45° (D) 90°

Correct Option: C

Solution:

Since range on horizontal plane is

$$R = \frac{u^2 \sin 2\theta}{g}$$

so it is maximum when, $\sin 2\theta = 1$

$$\theta = \frac{\pi}{4}$$

30. Number of significant figures in expression $\frac{4.327 \text{ g}}{2.51 \text{ cm}^3}$ is
- (A) 2 (B) 4 (C) 3 (D) 5

Correct Option: C

Solution:

In multiplication or division the final result should return as many significant figures as there are in the original

number with the least significant figures.

(Rounding off to three significant digits)

31. Forward biasing is that in which applied voltage
- (A) increases potential barrier (B) cancels the potential barrier
- (C) is equal to 1.5 volt (D) None of these

Correct Option: B

Solution:

Forward bias opposes the potential barrier and if the applied voltage is more than knee voltage it cancels the potential barrier.

32. With the increase in temperature, the angle of contact
- (A) decreases
- (B) increases
- (C) remains constant
- (D) sometimes increases and sometimes decreases

Correct Option: A

Solution:

sometimes increases and sometimes decreases

33. Two trains are moving towards each other with speeds of 20 m/s and 15 m/s relative to the ground. The first train sounds a whistle of frequency 600 Hz. The frequency of the whistle heard by a passenger in the second train before the train meets, is (the speed of sound in air is 340 m/s)
- (A) 600 Hz (B) 585 Hz (C) 645 Hz (D) 666 Hz

Correct Option: D

Solution:

$$f' = f \left(\frac{v + v_o}{v - v_s} \right)$$

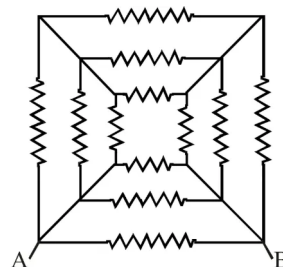
Here, $f = 600$ Hz, $v_o = 15$ m/s

$v_s = 20$ m/s, $v = 340$ m/s

$$f' = 600 \times \left[\frac{340 + 15}{340 - 20} \right]$$

$$\therefore f' = 600 \left(\frac{355}{320} \right) \approx 666 \text{ Hz}$$

34. Twelve resistors each of resistance 16Ω are connected in the circuit as shown. The net resistance between A and B is

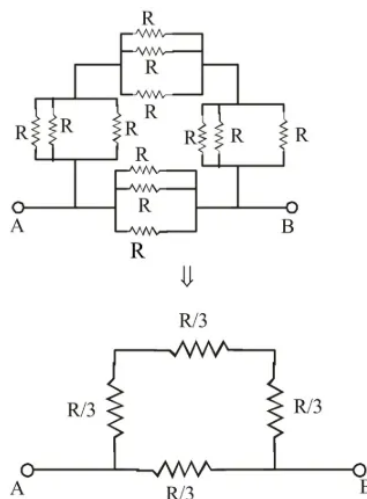


- (A) 1Ω (B) 2Ω (C) 3Ω (D) 4Ω

Correct Option: D

Solution:

Redraw the given circuit,



$$R_{net} \text{ between } AB = \frac{\frac{3R}{3} \times \frac{R}{3}}{\frac{3R}{3} + \frac{R}{3}} = \frac{R^2}{4R}$$

where, $R = 16\Omega$

$$R_{net} = 4\Omega$$

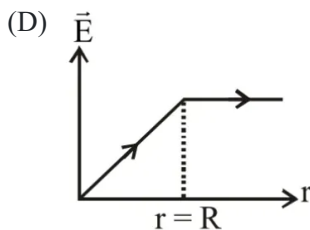
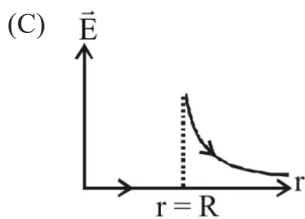
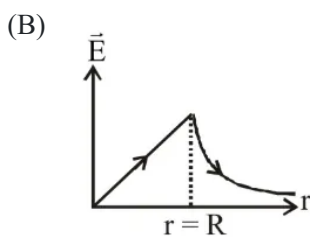
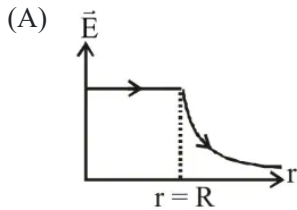
35. If $\vec{E}$ and $\vec{B}$ are the electric and magnetic field vectors e.m. waves then the direction of propagation of e wave is along the direction of
- (A) $\vec{E}$
- (B) $\vec{B}$
- (C) $\vec{E} \times \vec{B}$
- (D) None of these

Correct Option: C

Solution:

The direction of propagation of electromagnetic wave is perpendicular to the variation of electric field $\vec{E}$ as well as to the magnetic field $\vec{B}$.

36. Which one of the following graphs represents the variation of electric field with distance r from the centre of a charged spherical conductor of radius R ?



Correct Option: C

Solution:

The charged sphere is a conductor. Therefore the field inside is zero and outside it is proportional to $1/r^2$.

37. The Earth is assumed to be a sphere of radius R . A platform is arranged at a height R from the surface of the Earth. The escape velocity of a body from this platform is $f v$, where v is its escape velocity from the surface of the Earth. The value of f is:

- (A) $\frac{1}{3}$ (B) $\frac{1}{2}$
(C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{2}}$

Correct Option: D

Solution:

$$u = \sqrt{2gR}$$

$$\Rightarrow -\frac{GMm}{2R} + \frac{1}{2}mv_p^2 = 0 \Rightarrow v_p = \sqrt{\frac{GM}{R^2}R} = \sqrt{gR}$$

$$\sqrt{gR} = f\sqrt{2gR} \therefore f = \frac{1}{\sqrt{2}}$$

38. The ratio of the specific heats $\frac{C_p}{C_v} = \gamma$ in terms of degree of freedom (n) is given by:

- (A) $(1 + \frac{n}{3})$ (B) $(1 + \frac{2}{n})$
(C) $(1 + \frac{2}{n})$ (D) $(1 + \frac{1}{n})$

Correct Option: B

Solution:

The specific heat of gas at constant volume in terms of degree of freedom n is

$$C_v = \frac{n}{2}R.$$

$$\text{Also } C_p - C_v = R.$$

$$\text{So, } C_p = \frac{n}{2}R + R(1 + \frac{n}{2})$$

$$\text{Now, } \gamma = \frac{C_p}{C_v} = \frac{R(1 + \frac{n}{2})}{\frac{n}{2}R} = 1 + \frac{2}{n}.$$

39. A force of $2\hat{i} + 3\hat{j} + 4\hat{k}$ N acts on a body for 4 seconds producing a displacement of $(3\hat{i} + 4\hat{j} + 5\hat{k})$ m. The power used is:

- (A) 9.5 W (B) 7.5 W (C) 6.5 W (D) 4.5 W

Correct Option: A

Solution:

$$P = \frac{\vec{F} \cdot \vec{S}}{t} = \frac{(2\hat{i} + 3\hat{j} + 4\hat{k}) \cdot (3\hat{i} + 4\hat{j} + 5\hat{k})}{4} = \frac{38}{4} = 9.5 \text{ W}$$

40. In Young's double slit experiment, the distance between the slits is reduced to half and the distance between slit and the screen is doubled, then fringe width

- (A) Will not change (B) Will become half
(C) Will be doubled? (D) Will become four times

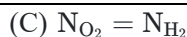
Correct Option: D

Solution:

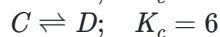
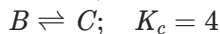
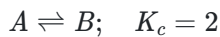
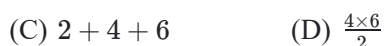
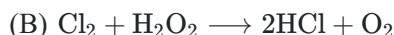
$$\beta = \frac{\lambda D}{d} \quad \beta' = \frac{\lambda \times 2D}{d/2} \therefore \beta' = 4\beta$$

41. 100 mL O_2 and H_2 kept at same temperature and pressure. What is true about their number of molecules?

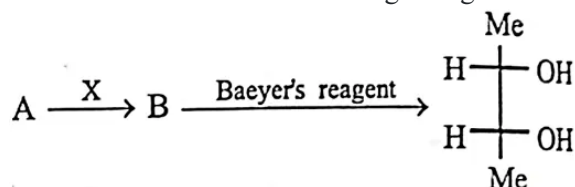
- (A) $N_{\text{O}_2} > N_{\text{H}_2}$
(B) $N_{\text{O}_2} < N_{\text{H}_2}$

**Correct Option: C****Solution:**

42. For the reactions

 K_c for the reaction $A \rightleftharpoons D$ is**Correct Option: A****Solution:**43. Which reaction shows oxidising nature of H_2O_2 ?**Correct Option: A****Solution:**

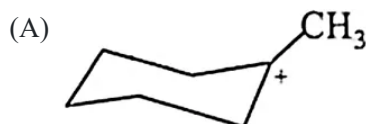
44. Which is correct for the following changes?



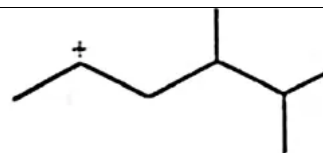
(A) X is Lindlar Catalyst, B is cis-2-butene

(B) A is 2-butyne, X is Na-liq. NH_3 (C) B is trans-2-butene, X is Na-liq. NH_3 (D) A is 2-butene, X is SeO_2 **Correct Option: A****Solution:**

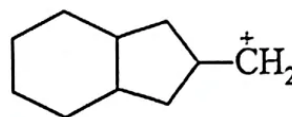
45. Most stable carbocation among the following is:



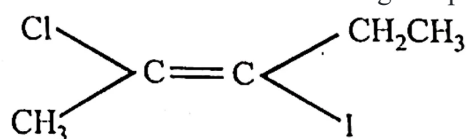
(B)



(C)

(D) $^+\text{CH}_3$ **Correct Option: A****Solution:**

46. The IUPAC name of the following compound is

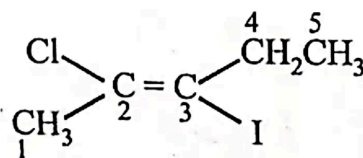


(A) trans-2-chloro-3-iodo-2-pentene

(B) cis-3-iodo-4-chloro-3-pentene

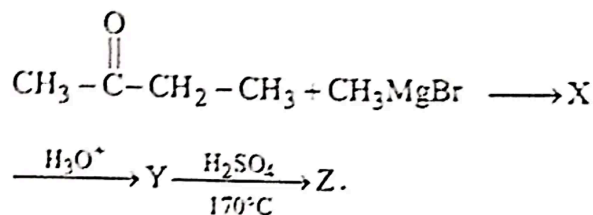
(C) trans-3-iodo-4-chloro-3-pentene

(D) cis-2-chloro-3-iodo-2-pentene

Correct Option: A**Solution:**

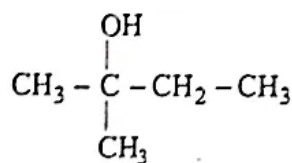
trans-2-Chloro-3-iodo-2-pentene

47.

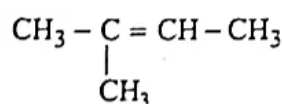


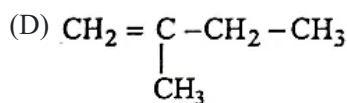
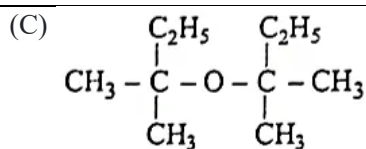
What is Z?

(A)



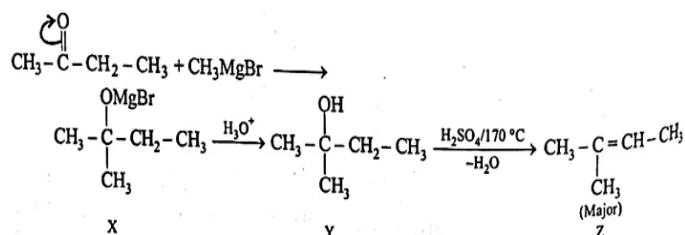
(B)





Correct Option: B

Solution:



48. When chlorine water is added to an aqueous solution of sodium iodide in the presence of chloroform, a violet colouration is obtained. On adding more of chlorine water and vigorous shaking, the violet colour disappears. This shows the conversion of _____ into _____

- (A) I_2 , HIO_3 (B) I_2 , HI
(C) HI , HIO_3 (D) I_2 , HOI

Correct Option: A

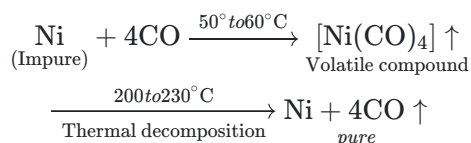
Solution:

49. In the purification of impure nickel by Monas process, metal is purified by :

- (A) Electrolytic reduction
(B) Vapour phase thermal decomposition
(C) Thermite reduction
(D) Carbon reduction

Correct Option: B

Solution:



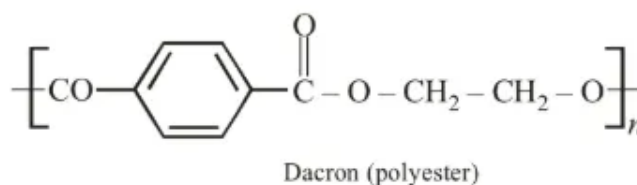
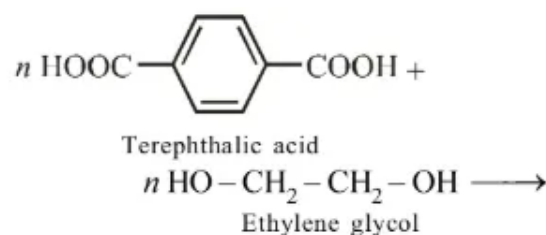
50. Which one is classified as a condensation polymer?

- (A) Dacron (B) Neoprene
(C) Teflon (D) Acrylonitrile

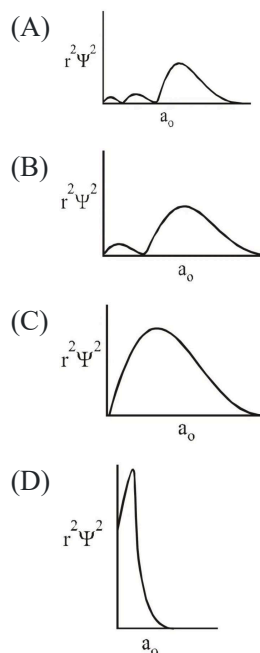
Correct Option: A

Solution:

Except dacron all are additive polymers. Terephthalic acid condenses with ethylene glycol to give dacron.



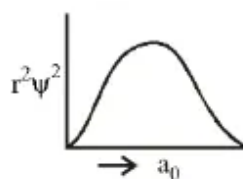
51. Which of the following radial distribution graphs correspond to $l = 2$ for the H atom?



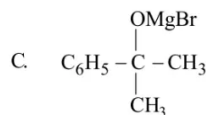
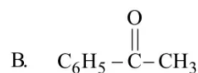
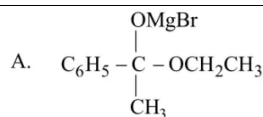
Correct Option: C

Solution:

$l = 2$ represent d orbital for which



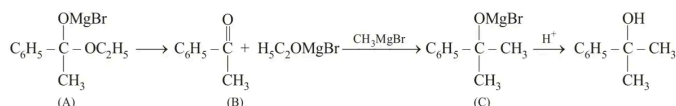
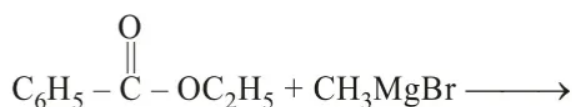
52. Which of the following are intermediates in the reaction of excess of CH_3MgBr with $\text{C}_6\text{H}_5\text{COOC}_2\text{H}_5$ to make phenyl-2-propanol?



(A) A and B (B) A,B And(C) A,C (D) B,C
C

Correct Option: B

Solution:

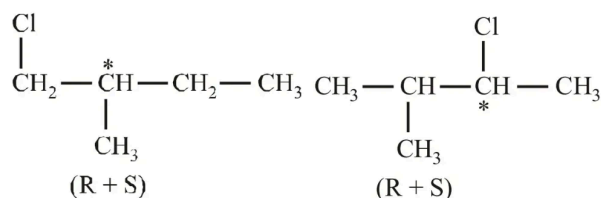


53. How many chiral compounds are possible on monochlorination of 2-methyl butane?

(A) 8 (B) 2 (C) 4 (D) 6

Correct Option: C

Solution:



Four monochloro derivatives are chiral.

54. In the clathrates of xenon with water, the nature of bonding between xenon and water molecule is

(A) covalent (B) hydrogen bonding
(C) coordinate (D) dipole-induced dipole

Correct Option: D

Solution:

Clathrate formation involves dipole-induced dipole interaction.

55. 3.6 g of oxygen is adsorbed on 1.2 g of metal powder. What volume of oxygen adsorbed per gram of the adsorbent at 1 atm and 273 K ?

(A) 0.19 L g⁻¹

(B) 1 L g⁻¹

(C) 2.1 L g⁻¹

(D) None of these

Correct Option: C

Solution:

Mass of O₂ absorbed per gram of adsorbent

$$= \frac{3.6}{1.2} = 3$$

No. of moles of O₂ absorbed per gram of adsorbent = $\frac{3}{32}$

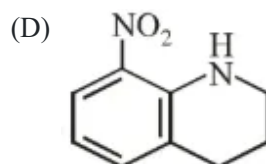
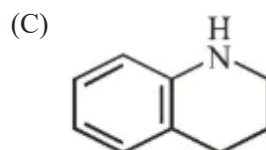
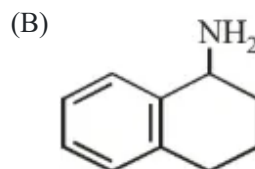
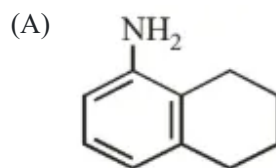
Volume of O₂ absorbed per gram of adsorbent

$$PV = nRT$$

$$V = \frac{nRT}{P}$$

$$= \frac{3}{32} \times \frac{0.0821 \times 273}{1} = 2.1$$

56. Which of the following is the strongest base?



Correct Option: B

Solution:

In compound (b), the lone pair of nitrogen is not involved in resonance therefore it is the strongest base.

57. Which of the following does not reduce Benedict's solution?

(A) Glucose (B) Fructose (C) Sucrose (D) Aldehy

Correct Option: C**Solution:**

Sucrose, being a non-reducing sugar, does not reduce Benedict's solution. Remember that fructose has an α -hydroxy ketonic group, which is also reducing group (different from ordinary ketonic group)

58. General formula of solid in zinc blende structure is:

- (A) AB_2 (B) AB_3
(C) AB (D) A_2B

Correct Option: C**Solution:**

Zn^{+2} present in alternate tetrahedral void

$$= \frac{1}{2} \times 8 = 4$$

S^{2-} present in ccp = 4

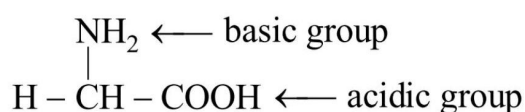
$\therefore Zn_4S_4 = ZnS$ i.e., AB type compound.

59. Glycine in alkaline solution exists as _____ and migrates to _____.

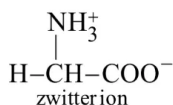
- (A) Cation, cathode (B) Neutral, anode
(C) Zwitter ion, cathode (D) anion, anode

Correct Option: D**Solution:**

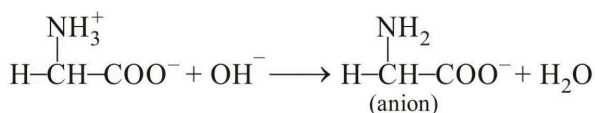
Glycine in alkaline solution exists as anion and migrates to anode.



Due to internal proton transfer of H^+ from the $-COOH$ group to the $-NH_2$, the amino acid exists as an ion with both a negative charge and a positive charge, called a Zwitter ion



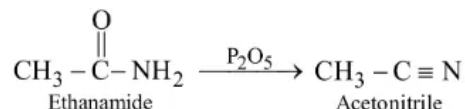
Adding an alkali to glycine



Now, during electrophoresis, glycine moves towards anode.

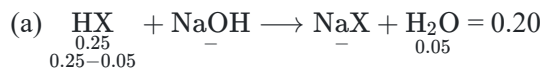
60. Product on reaction of ethanamide with phosphorus pentoxide is:

- (A) ethanamine (B) acetonitrile
(C) ethanol (D) ethane isonitrile

Correct Option: B**Solution:**

61. K_a of HX is 10^{-5} , then find concentration of H_3O^+ when equal volumes of 0.25 M HX and 0.05 M NaOH are mixed.

- (A) $4 \times 10^{-5} \text{M}$ (B) $6 \times 10^{-5} \text{M}$
(C) $8 \times 10^{-3} \text{M}$ (D) $2 \times 10^{-5} \text{M}$

Correct Option: A**Solution:**

$$K_a = \frac{[H^+][X^-]}{[HX]}$$

$$10^{-5} = \frac{[H^+] 0.05}{0.20}$$

$$[H^+] = \frac{0.20}{0.05} \times 10^{-5} = 4 \times 10^{-5} \text{M}$$

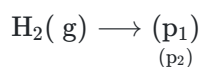
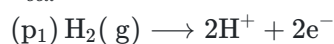
62. Net cell reaction of $\text{Pt} | \text{H}_2(640 \text{ mm}) | \text{HCl} | \text{H}_2(510 \text{ mm}) | \text{Pt}$.

- (A) 0.89 V (B) 0.93 V
(C) $2.91 \times 10^{-3} \text{ V}$ (D) $2.5 \times 10^{-2} \text{ V}$

Correct Option: C**Solution:**

Pt | H₂ (640 mm) | HCl | H₂ (510 mm) | Pt

$$E_{cell}^{\circ} = 0$$



$$E_{cell} = E_{cell}^{\circ} - \frac{0.0591}{n} \log \frac{p_2}{p_1}$$

$$= 0 - \frac{0.0591}{2} \log \frac{510}{640}$$

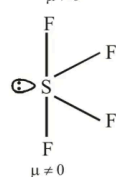
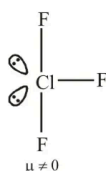
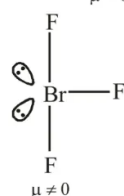
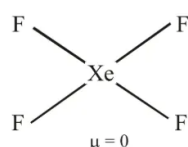
$$= 2.91 \times 10^{-3} \text{ V}$$

63. Which of the following has zero net dipole moment?

- (A) XeF₄ (B) BrF₃
(C) ClF₃ (D) SF₄

Correct Option: A

Solution:



XeF₄ has zero net dipole moment

64. Which of the following element has the highest ionisation enthalpy?

- (A) Boron (B) Aluminium (C) Germanium (D) Thallium

Correct Option: A

Solution:

Boron has the highest ionisation enthalpy amongst the following. Ionisation enthalpy decreases down the group and increases across the period.

65. Out of the elements with atomic numbers 7, 8, 9, and 13 which has the smallest size and highest ionization enthalpy?

- (A) 7 (B) 8 (C) 9 (D) 13

Correct Option: A

Solution:

Element with atomic number 7 has the smallest size and highest ionization enthalpy Nitrogen - Atomic Number 7



N has a stable half-filled electronic configuration therefore it is difficult to remove electron and hence it has a high ionization enthalpy.

66. Which of the following alkaline earth metal hydroxides is amphoteric in character?

- (A) Be(OH)₂ (B) Ca(OH)₂
(C) Sr(OH)₂ (D) Ba(OH)₂

Correct Option: A

Solution:

Be(OH)₂ is amphoteric while Ca(OH)₂, Sr(OH)₂ and Ba(OH)₂ are all basic.

67. The densities of two gasses are in the ratio of 1 : 16. The ratio of their rates of diffusion is

- (A) 16 : 1 (B) 4 : 1 (C) 1 : 4 (D) 1 : 16

Correct Option: B

Solution:

$$\frac{r_1}{r_2} = \sqrt{\frac{d_2}{d_1}} = \sqrt{\frac{16}{1}} = 4 : 1$$

68. If m_A gram of a metal A displaces m_B gram of another metal B from its salt solution and if the equivalent masses are E_A and E_B respectively then equivalent mass of A can be expressed as:

(A) $E_A = \frac{m_A}{m_B} \times E_B$

(B) $E_A = \frac{m_A \times m_B}{E_B}$

(C) $E_A = \frac{m_B}{m_A} \times E_B$

(D) $E_A = \sqrt{\frac{m_A}{m_B}} \times E_B$

Correct Option: A

Solution:

$$\text{Eq. of A} = \text{Eq. of B}$$



$$\frac{m_A}{E_A} = \frac{m_B}{E_B}; E_A = \frac{m_A}{m_B} \times E_B$$

69. Which one of the following set of quantum numbers is not possible for 4p electron?

- (A) $n = 4, l = 1, m = -1, m_s = +\frac{1}{2}$
 (B) $n = 4, l = 1, m = 0, m_s = +\frac{1}{2}$
 (C) $n = 4, l = 1, m = 2, m_s = +\frac{1}{2}$
 (D) $n = 4, l = 1, m = -1, m_s = -\frac{1}{2}$

Correct Option: C

Solution:

For 4p electron $n = 4, l = 1, m = -1, 0, +1$ and $s = +1/2$ or $-1/2$

70. Which of the following compounds is not an antacid?

- (A) Aluminium hydroxide (B) Cimetidine
 (C) Phenelzine (D) Ranitidine

Correct Option: C

Solution:

71. The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64), and Tb (Atomic No. 65) are

- (A) $[Xe]4f^7 6s^2, [Xe]4f^8 6s^2$ and $[Xe]4f^8 5d^1 6s^2$
 (B) $[Xe]4f^7 5d^1 6s^2, [Xe]4f^7 5d^1 6s^2$ and $[Xe]4f^9 6s^2$
 (C) $[Xe]4f^6 5d^1 6s^2, [Xe]4f^7 5d^1 6s^2$ and $[Xe]4f^8 5d^1 6s^2$
 (D) $[Xe]4f^7 6s^2, [Xe]4f^7 5d^1 6s^2$ and $[Xe]4f^9 6s^2$

Correct Option: D

Solution:

72. Mole fraction of the solute in a 1.00 molal aqueous solution is :

- (A) 0.1770 (B) 0.0177 (C) 0.0344 (D) 1.7700

NEET 2011

Correct Option: B

Solution:

$$n_{\text{solute}} = 1 \quad W_{\text{solvent}} = 1000 \text{ g}$$

$$n_{\text{solvent}} = \frac{1000}{18} = 55.56$$

$$x_{\text{solute}} = \frac{1}{1 + 55.56} = 0.0177 \text{ Ans.}$$

73. The group having isoelectronic species is:-

- (A) O^-, F^-, Na^+, Mg^{2+}
 (B) O^{2-}, F^-, Na, Mg^{2+}
 (C) O^-, F^-, Na, Mg^+
 (D) $O^{2-}, F^-, Na^+, Mg^{2+}$

JM 201'

Correct Option: D

Solution:

ions $O^{2-} \quad F^- \quad Na^+ \quad Mg^{2+}$

Atomic number = 8 9 11 12

No. of e^- = 10 10 10 10

therefore $O^{2-}, F^-, Na^+, Mg^{2+}$

are isoelectronic

74. Which of the following carbonyls will have the stronger C-O bond:

- (A) $Mn(CO)_6^+$ (B) $Cr(CO)_6$
 (C) $V(CO)_6^-$ (D) $Fe(CO)_5$

NEET 201

Correct Option: A

Solution:

The presence of +ve charge on the metal carbonyl would resist the flow of the metal electron charge to π^* orbitals of CO. This could increase the CO bond order and hence absorb at a higher frequency compared to its absorption in a neutral metal carbonyl.

75. Which of the following conditions will always lead to a non-spontaneous change?

- (A) ΔH and ΔS both +ve
 (B) ΔH is -ve and ΔS is +ve
 (C) ΔH and ΔS both -ve
 (D) ΔH is +ve and ΔS is -ve

Correct Option: D

Solution:

$$\Delta G = \Delta H - T\Delta S = +ve$$

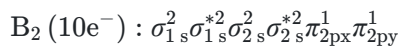
for spontaneous change $\Delta H > 0, \Delta S < 0$

76. Which of the following is paramagnetic?

- (A) B_2 (B) C_2
(C) N_2 (D) F_2

Correct Option: A

Solution:

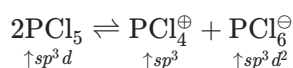


77. In the reaction $2PCl_5 \rightleftharpoons PCl_4^+ + PCl_6^-$, the change in hybridisation is from

- (A) $sp^3 d$ to sp^3 and $sp^3 d^2$
(B) $sp^3 d$ to sp^2 and sp^3
(C) $sp^3 d$ to $sp^3 d^2$ and $sp^3 d^3$
(D) $sp^3 d^2$ to sp^3 and $sp^3 d$

Correct Option: A

Solution:



78. The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence

- (A) $Tl < In < Ga < Al$ (B) $In < Tl < Ga < Al$
(C) $Ga < In < Al < Tl$ (D) $Al < Ga < In < Tl$

NEET 2015

Correct Option: D

Solution:

The stability of the +1 oxidation state increases down Group 13 elements due to the inert pair effect.

- As the elements get heavier (from Al down to Tl), the outermost s-electrons become increasingly difficult to remove for bonding.
- This reluctance to participate in bonding makes the lower (+1) oxidation state more stable for the heavier elements.
- Al is exclusively +3 stable, while Tl is most stable in the +1 state within this group.

79. $aK_2Cr_2O_7 + bKCl + cH_2SO_4 \longrightarrow xCrO_2Cl_2 + yKHSO_4 + zH_2O$

The above equation balances when

- (A) $a = 2, b = 4, c = 6$ and $x = 2, y = 6, z = 3$
(B) $a = 4, b = 2, c = 6$ and $x = 6, y = 2, z = 3$

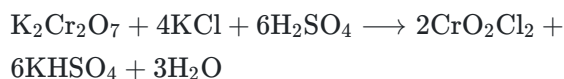
(C) $a = 6, b = 4, c = 6$ and $x = 6, y = 3, z = 2$

(D) $a = 1, b = 4, c = 6$ and $x = 2, y = 6, z = 3$

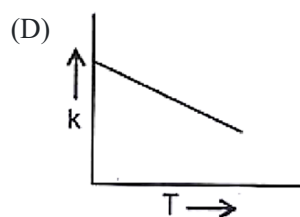
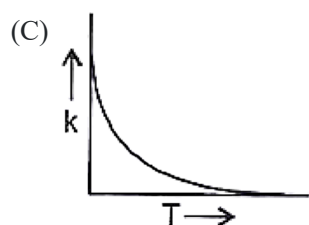
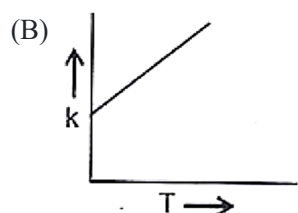
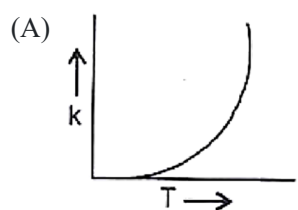
Correct Option: D

Solution:

The balanced chemical equation will be



80. Plots showing the variation of the rate constant (k) w temperature (T) are given below. The plot that follows Arrhenius equation is



JA 2010

Correct Option: A

Solution:

As per Arrhenius equation ($k = Ae^{-E_a/RT}$), the rate constant increases exponentially with temperature.

81. It had laid in the closet for a week before we found it.

- (A) It had laid (B) in the closet
(C) for a week before we (D) No error found it.



Correct Option: A

Solution:

82. I went there with a view to survey the entire procedure.
No error

(A) I went there (B) with a view to survey
(C) the entire procedure (D) No error

Correct Option: B

Solution:

83. When one hears of the incident about the plane crash he feels very somy: No error

(A) When one hears of the (B) about the plane crash incident
(C) he feels very somy (D) No error

Correct Option: B

Solution:

84. Like watering a plant, we grow our friendships [and all our relationships) by running them. Friendships need the same attention as other relationships. If they are to continue. These relationships can be delightfully non-judgemental, supportive, understanding and fun.

Sometimes a friendship can bring out the positive side that you never show in any other relationship. This may be because the pressure of playing a 'role' (daughter, partner or child) is removed. With a friend you are to be yourself and free to change. Of course, you are free to do this in all other relationships as well, but in friendships you get to have lats of rehearsals and discussion about changes as you experience them. It is an unconditional experience where you receive as much as you give. You can explain yourself to a friend openly without the fear of hurting a family member. How do friendships grow ? The answer is simple. By revealing yourself; being attentive: remembering what is most showing empathy; seeing the world through the eyes of your friend, you will understand the value of friendship. All this means learning to accept a person from a completely different family to your own or perhaps someone from a completely different cultural background. This is the way we learn tolerance. In turn we gain tolerance and acceptance for our own differences.

Friendships and relationships grow when they are

(A) compared (B) divided (C) favoured (D) nurtured

Correct Option: D

Solution:

85. Like watering a plant, we grow our friendships and our relationships by nurturing them. Friendships need same attention as other relationships if they are to continue. These relationships can be delightfully non-judgemental, supportive, understanding and fun.

Sometimes a friendship can bring out the positive side that you never show in any other relationship. This may be because the pressure of playing a 'role' (daughter, partner or child) is removed. With a friend, you are free to be yourself and free to change. Of course, you are free to do this in all other relationships as well, but in friendships you get to have lots of rehearsals and discussions about changes as you experience them. It is an unconditional experience where you receive as much as you give. You can explain yourself to a friend openly without the fear of hurting a family member. How do friendships grow? The answer is simple. By revealing yourself; being attentive; remembering what is most important; showing empathy; seeing the world through the eyes of your friend, you will understand the value of friendship. All this means learning to accept a person from a completely different family to your own or perhaps someone from a completely different cultural background. This is the way we learn tolerance. In turn, we gain tolerance and acceptance for our own differences.

Through strong friendships, we gain:

(A) only acceptance. (B) only attention.
(C) acceptance and tolerance. (D) only tolerance.

Correct Option: C

Solution:

86. Pernicious :

(A) Prolonged (B) Ruinous
(C) Ruthless (D) Beneficial

Correct Option: D

Solution:

87. Knack:

(A) Talent (B) Dullness (C) Dexterity (D) Balance

Correct Option: B

Solution:

88. Labyrinth

(A) Meandering (B) Rotating
(C) Pacing (D) Wriggling

Correct Option: A

Solution:



89. In the following questions, choose the word opposite in meaning to the given word. Opulence :

- (A) Luxury (B) Transparency
(C) Wealth (D) Poverty

Correct Option: D

Solution:

Opulence means wealthy.

90. Like watering a plant, we grow our friendships (and all our relationships) by running them. Friendships need the same attention as other relationships if they are to continue. These relationships can be delightfully non-judgmental, supportive, understanding and fun. Sometimes a friendship can bring out the positive side that you never show in any other relationship. This may be because the pressure of playing a 'role' (daughter, partner or child) is removed. With a friend you are free to be yourself and free to change. Of course, you are free to do this in all other relationships as well, but in friendships you get to have lots of rehearsals and discussion about changes as you experience them. It is an unconditional experience where you receive as much as you give. You can explain yourself to a friend openly without the fear of hurting a family member. How do friendships grow? The answer is simple. By revealing yourself; being attentive; remembering what is most important; showing empathy; seeing the world through the eyes of your friend, you will understand the value of friendship. All this means learning to accept a person from a completely different family to your own or perhaps someone from a completely different cultural background. This is the way we learn tolerance. In turn we gain tolerance and acceptance for our own differences.

In good friendships, we

- (A) give and receive. (B) neither give nor receive.
(C) only give. (D) only receive.

Correct Option: A

Solution:

(a) In good friendships, we receive as much as we give.

91. Like watering a plant, we grow our friendships and our relationships by nurturing them. Friendships need same attention as other relationships if they are to continue. These relationships can be delightfully non-judgmental, supportive, understanding, and fun. Sometimes friendship can bring out the positive side that you never show in any other relationship. This may be because of the pressure of playing a 'role' (daughter, partner or child) is removed. With a friend, you are free to be yourself and free to change. Of course, you are free to do this in all other relationships as well, but in friendships you get to have lots of rehearsals and discussions about changes as you experience them. It is an unconditional experience where you receive as much as you give. You can explain yourself to a friend openly without the fear of hurting a family member. How do friendships grow? The answer is simple. By revealing yourself; being attentive; remembering what is most important; showing empathy; seeing the world through the eyes of your friend, you will understand the value of friendship. All this means learning to accept a person from a completely different family to your own or perhaps someone from a completely different cultural background. This is the way we learn tolerance. In turn we gain tolerance and acceptance for our own differences.

Empathy means

- (A) someone else's misfortunes
(B) the ability to share and understand another's feelings
(C) skill and efficiency
(D) ability to do something

Correct Option: B

Solution:

(b) Empathy means the ability to show and understand the feelings of others.

92. There are not solitary, free-living creatures; every form of life is ____ other forms.

- (A) dependent on (B) parallel to
(C) overshadowed by (D) segregated from

Correct Option: A

Solution:

Dependent on = needing somebody / something in order to survive or be successful; affected or decided by something

93. I'll take ____ now as I have another's appointment somewhere else.

- (A) departure (B) your leave

(C) permission

(D) leave from work

Correct Option: B**Solution:**

Take your leave = to say good bye.

94. In the following questions below, out of the four alternatives, choose the one which best expresses the meaning of the given word.

Tinsel

(A) Tinkle

(B) Decoration

(C) Tin

(D) Colourful

Correct Option: B**Solution:**

The word Tinsel (Noun/Adjective) means : strips of shiny material like metal used as decorations.

95. In the following question, out of the four alternatives, choose the one which best expresses the meaning of the given word.

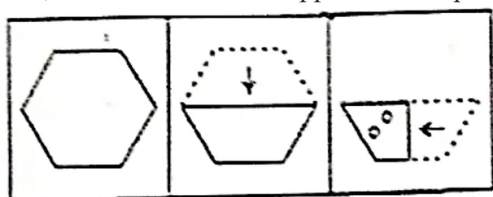
Garrulous

(A) Talkative (B) Sedative (C) Cocative (D) Positive

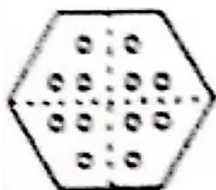
Correct Option: A**Solution:**

The word Garrulous (Adjective) means : talkative; talking a lot.

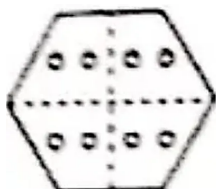
96. A piece of paper is folded and cut punched as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.



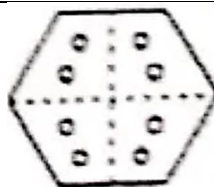
(A)



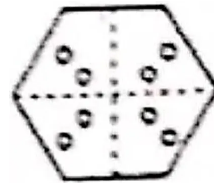
(B)



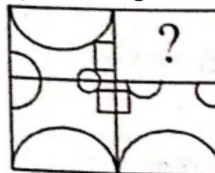
(C)



(D)

**Correct Option: D****Solution:**

97. Question figure.



(A)



(B)



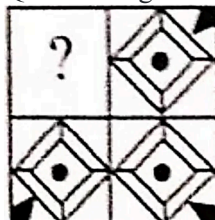
(C)



(D)

**Correct Option: C****Solution:**

98. Question Figures :



(A)



(B)



(C)



(D)

**Correct Option: B****Solution:**

99. Select the related word from the given alternatives:
Medicine : Patient :: Education : ?

(A) Teacher

(B) School

(C) Student

(D) Tuition

Correct Option: C**Solution:**

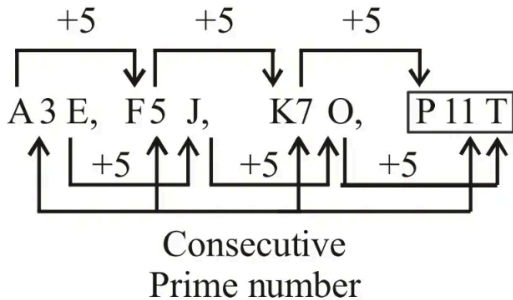
Medicine is given to patient. Similarly, Education is given to student.

100. Choose the correct alternative from the given ones that will complete the series.
A3E, F5J, K7O, _____

(A) Q11T (B) Q9V (C) P9T (D) P11T

Correct Option: D

Solution:



101. Which one of the following numbers lacks the common property in the series?
81, 36, 25, 9, 5, 16
- (A) 5 (B) 9 (C) 36 (D) 25

Correct Option: A

Solution:

Except 5, all numbers are perfect square numbers.

102. In a certain code language, "TIRED" is written as "56" and "BRAIN" is written as "44". How is 'LAZY' written in that code language?
- (A) 64 (B) 61 (C) 58 (D) 43

Correct Option: A

Solution:

As,

$$\text{TIRED} = 20 + 9 + 18 + 5 + 4 = 56$$

$$\text{BRAIN} = 2 + 18 + 1 + 9 + 14 = 44$$

Similarly,

$$\text{LAZY} = 12 + 1 + 26 + 25 = 64$$

103. Select the missing number from the given response.

8	7	6
8	7	6
88	77	?
5632	3773	3132

(A) 66 (B) 87 (C) 78 (D) 76

Correct Option: B

Solution:

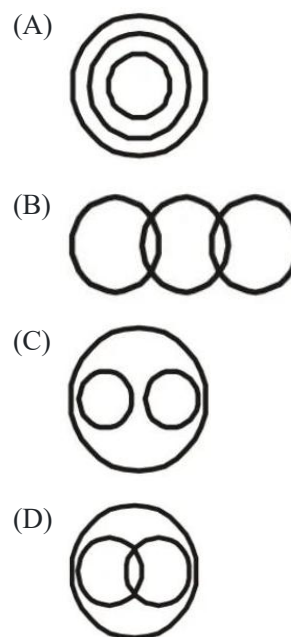
$$8 \times 8 \times 88 = 5632$$

$$7 \times 7 \times 77 = 3773$$

$$\text{Similarly, } 6 \times 6 \times ? = 3132$$

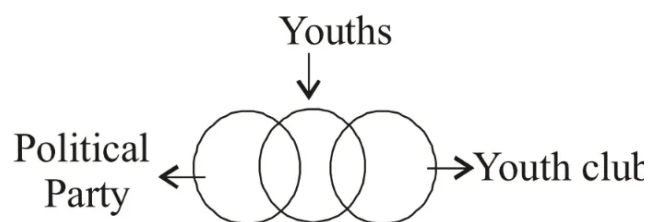
$$\therefore ? = \frac{3132}{6 \times 6} = 87$$

104. Which one of the following diagrams best depicts relationship among Human Society - Youth Cl Political Party and Youths?



Correct Option: B

Solution:



105. Among her children, Ganga's favourites are Ram and Rekha. Rekha is the mother of Sharat, who is loved most by his uncle Mithun. The head of the family is Ram Lal, who is succeeded by his sons Gopal and Mohan. Gopal and Ganga have been married for 35 years and have 3 children. What is the relation between Mithun and Mohan?

(A) Uncle (B) Son
(C) Brother (D) No relation

Correct Option: D

Solution:

Mohan is son of Ram Lal and uncle of Ram and Rekha. Mithun is uncle of Sharat who is son of Rekha. Rekha is niece of Mohan. Therefore, Mithun is brother of Rekha's husband.

106. Sum of n terms of the series $8 + 88 + 888 + \dots$ equals

- (A) $\frac{8}{81} [10^{n+1} - 9n - 10]$
 (B) $\frac{8}{81} [10^n - 9n - 10]$
 (C) $\frac{8}{81} [10^{n+1} - 9n + 10]$
 (D) None of these

Correct Option: A

Solution:

107. If $f(x) = (a - x^n)^{\frac{1}{n}}$, where $a > 0$ and $n \in \mathbb{N}$, then $f \circ f(x)$ is equal to:

- (A) a (B) x (C) x^n (D) a^n

Correct Option: B

Solution:

108. The value of $[\vec{a} + \vec{b} \quad \vec{b} + \vec{c} \quad \vec{c} + \vec{a}]$ is

- (A) $2[\vec{a} \quad \vec{b} \quad \vec{c}]$
 (B) $[\vec{a} \quad \vec{b} \quad \vec{c}]$
 (C) 1
 (D) None of these

Correct Option: A

Solution:

109. The value of λ , for which the circle $x^2 + y^2 + 2\lambda x + 6y + 1 = 0$ intersects the circle $x^2 + y^2 + 4x + 2y = 0$ orthogonally, is

- (A) $\frac{11}{8}$ (B) -1
 (C) $-\frac{5}{4}$ (D) $\frac{5}{2}$

Correct Option: C

Solution:

110. From the top of a cliff 50 m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 45° . The height of tower is

- (A) 50 m
 (B) $50\sqrt{3}m$

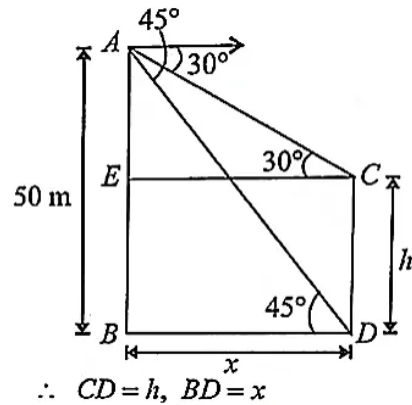
(C) $50(\sqrt{3} - 1)m$

(D) $50(1 - \frac{\sqrt{3}}{3})m$

Correct Option: D

Solution:

Let height of the tower be h m and distance between tower and cliff be x m.



In $\triangle ABD$, $\tan 45^\circ = \frac{AB}{BD}$ or $1 = \frac{50}{x}$

$x = 50$

In $\triangle AEC$

$$\tan 30^\circ = \frac{AE}{EC} = \frac{AB - EB}{EC} = \frac{AB - DC}{BD}$$

($\because EB = DC, EC = BD$)

$$\frac{1}{\sqrt{3}} = \frac{50 - h}{x} \text{ or } x = 50\sqrt{3} - h\sqrt{3}$$

$$\text{or } 50 = 50\sqrt{3} - h\sqrt{3} \quad [\text{From (i), } x = 50]$$

$$\text{or } h\sqrt{3} = 50\sqrt{3} - 50$$

$$\text{or } h = \frac{50(\sqrt{3}-1)}{\sqrt{3}} = 50(1 - \frac{1}{\sqrt{3}})$$

$$\therefore h = 50(1 - \frac{\sqrt{3}}{3})$$

111. The foci of the hyperbola $4x^2 - 9y^2 - 1 = 0$ are

- (A) $(\pm\sqrt{13}, 0)$
 (B) $(\pm\frac{\sqrt{13}}{6}, 0)$
 (C) $(0, \pm\frac{\sqrt{13}}{6})$

(D) None of these

Correct Option: B

Solution:

112. If $y = \sin x + e^x$, then $\frac{d^2x}{dy^2}$ is equal to

- (A) $\frac{\sin x - e^x}{(\cos x + e^x)^2}$
 (B) $\frac{\sin x - e^x}{(\cos x + e^x)^3}$
 (C) $\frac{\sin x + e^x}{(\cos x - e^x)^2}$
 (D) $(-\sin x + e^x)^{-1}$

Correct Option: B

Solution:

113. If 1, a and P are in A.P. and 1, g and P are in G.P., then

- (A) $1 + 2a + g^2 = 0$ (B) $1 + 2a - g^2 = 0$
 (C) $1 - 2a - g^2 = 0$ (D) $1 - 2a + g^2 = 0$

Correct Option: D

Solution:

114. If the sum of a certain number of terms of the A.P. 25, 22, 19, ___ is 116, then the last term is

- (A) 0 (B) 2 (C) 4 (D) 6

Correct Option: C

Solution:

115. The co-efficient of x^n in the expansion of $\frac{e^{7x} + e^x}{e^{3x}}$ is

- (A) $\frac{4^{n-1} + (-2)^n}{n!}$
 (B) $\frac{4^{n-1} + 2^n}{n!}$
 (C) $\frac{4^n + (-2)^n}{n!}$
 (D) $\frac{4^{n-1} + (-2)^{n-1}}{n!}$

Correct Option: C

Solution:

116. x and y are positive numbers. Let g and a be the G.M. and A.M. of these numbers, respectively. Also let G be the G.M. of $x + 1$ and $y + 1$. If G and g are roots of the equation $x^2 - 5x + 6 = 0$, then find the values of x and y .

- (A) $x = 2, y = \frac{3}{4}$
 (B) $x = \frac{3}{4}, y = 12$
 (C) $x = \frac{5}{2}, y = \frac{8}{5}$
 (D) $x = y = 2$

Correct Option: D

Solution:

117. If $f(x) = \begin{cases} \frac{e^{1/x} - e^{-1/x}}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ then

- (A) f is continuous at x , when $k = 0$
 (B) f is not continuous at $x = 0$ for any real k .
 (C) $\lim_{x \rightarrow 0} f(x)$ exist infinitely
 (D) None of these

Correct Option: B

Solution:

118. If the number of available constraints is 3 and the number of parameters to be optimized is 4, then

- (A) The objective function can be optimized
 (B) The constraint are short in number
 (C) The solution is problem oriented
 (D) None of these

Correct Option: B

Solution:

119. If $2 \cos^2 x + 3 \sin x - 3 = 0, 0 \leq x \leq 180^\circ$, then $x =$

- (A) $30^\circ, 90^\circ, 150^\circ$ (B) $60^\circ, 120^\circ, 180^\circ$
 (C) $0^\circ, 30^\circ, 150^\circ$ (D) $45^\circ, 90^\circ, 135^\circ$

Correct Option: A

Solution:

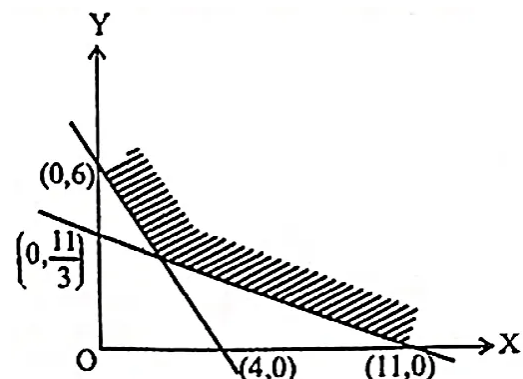
120. The limit $\lim_{x \rightarrow 0} \left(\frac{\log_e(1+x)}{x^2} + \frac{x-1}{x} \right)$

- (A) is equal to $\frac{1}{2}$ (B) is equal to $-\frac{1}{2}$
 (C) is equal to 2 (D) does not exist

Correct Option: A

Solution:

121. For the following feasible region, the linear constraints are:



- (A) $x \geq 0, y \geq 0, 3x + 2y \geq 12, x + 3y \geq 11$



(B) $x \geq 0, y \geq 0, 3x + 2y \leq 12, x + 3y \geq 11$

(C) $x \geq 0, y \geq 0, 3x + 2y \leq 12, x + 3y \leq 11$

(D) None of these

Correct Option: A

Solution:

122. The distance of a point $(2, 5, -3)$ from the plane $\mathbf{r} \cdot (6\hat{i} - 3\hat{j} + 2\hat{k}) = 4$ is

(A) 13 (B) $\frac{13}{7}$

(C) $\frac{13}{5}$ (D) $\frac{37}{7}$

Correct Option: B

Solution:

123. If $f(x) = 3x^4 + 4x^3 - 12x^2 + 12$, then $f(x)$ is

(A) increasing in $(-\infty, -2)$ and in $(0, 1)$

(B) increasing in $(-2, 0)$ and in $(1, \infty)$

(C) decreasing in $(-2, 0)$ and in $(0, 1)$

(D) decreasing in $(-\infty, -2)$ and in $(1, \infty)$

Correct Option: B

Solution:

Given : $f(x) = 3x^4 + 4x^3 - 12x^2 + 12$

Differentiating with respect to x , we get

$$f'(x) = 12x^3 + 12x^2 - 24x$$

For $f(x)$ to be increasing

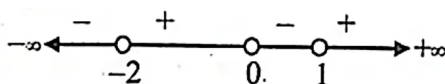
$$f'(x) > 0 \Rightarrow 12x^3 + 12x^2 - 24x > 0$$

$$\Rightarrow 12x(x^2 + x - 2) > 0$$

$$\Rightarrow 12x(x-1)(x+2) > 0$$

$$\Rightarrow x(x-1)(x+2) > 0$$

$$\Rightarrow -2 < x < 0 \text{ or } x > 1$$



It means $x \in (-2, 0) \cup (1, \infty)$.

Hence $f(x)$ is increasing in $(-2, 0)$ and $(1, \infty)$

124. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, then $\frac{dy}{dx} =$

(A) $\frac{x+1}{x}$ (B) $\frac{1}{1+x}$

(C) $\frac{-1}{(1+x)^2}$

(D) $\frac{x}{1+x}$

Correct Option: C

Solution:

125. $\frac{1+\sin A - \cos A}{1+\sin A + \cos A} =$

(A) $\sin \frac{A}{2}$

(B) $\cos \frac{A}{2}$

(C) $\tan \frac{A}{2}$

(D) $\cot \frac{A}{2}$

Correct Option: C

Solution:

126. Evaluate the integral $\int_1^2 (|x^2| - (|x|)^2) dx$.

(A) $4 + \sqrt{2} - \sqrt{3}$

(B) $4 - \sqrt{2} + \sqrt{3}$

(C) $4 - \sqrt{2} - \sqrt{3}$

(D) none of these

Correct Option: C

Solution:

127. The equation of the curve passing through the point $(a, -\frac{1}{a})$ and satisfying the differential equation $y - x \frac{dy}{dx} = a(y^2 + \frac{dy}{dx})$ is

(A) $(x+a)(1+ay) = -4a^2y$

(B) $(x+a)(1-ay) = 4a^2y$

(C) $(x+a)(1-ay) = -4a^2y$

(D) None of these

Correct Option: C

Solution:

128. If $a_1, a_2, a_3, \dots, a_n$ are in A.P. where $a_i > 0$ for all then

$$\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \dots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}} =$$

(A) $\frac{n+1}{\sqrt{a_1} + \sqrt{a_n}}$

(B) $\frac{n}{\sqrt{a_1} + \sqrt{a_n}}$

(C) $\frac{n-1}{\sqrt{a_1} + \sqrt{a_n}}$

(D) none of these

Correct Option: C

Solution:

129. If $x \cos \alpha + y \sin \alpha = P$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then

(A) $a \cos \alpha + b \sin \alpha = P^2$

(B) $a \sin \alpha + b \cos \alpha = P^2$

(C) $a^2 \cos^2 \alpha + b^2 \sin^2 \alpha = P^2$



$$(D) a^2 \sin^2 \alpha + b^2 \cos^2 \alpha = P^2$$

Correct Option: C

Solution:

$$\text{Given line is } x \cos \alpha + y \sin \alpha = P \dots\dots(1)$$

Any tangent to the ellipse is

$$\frac{x \cos \theta}{a} + \frac{y \sin \theta}{b} = 1 \dots\dots(2)$$

Comparing (1) and (2)

$$\begin{aligned} \frac{\cos \theta}{a \cos \alpha} &= \frac{\sin \theta}{b \sin \alpha} = \frac{1}{P} \\ \Rightarrow \cos \theta &= \frac{a \cos \alpha}{P} \text{ and } \sin \theta = \frac{b \sin \alpha}{P} \end{aligned}$$

Eliminate θ , $\cos^2 \theta + \sin^2 \theta$

$$= \frac{a^2 \cos^2 \alpha}{P^2} + \frac{b^2 \sin^2 \alpha}{P^2},$$

$$\text{or } a^2 \cos^2 \alpha + b^2 \sin^2 \alpha = P^2$$

130. In order to solve the differential equation

$$x \cos x \frac{dy}{dx} + y(x \sin x + \cos x) = 1$$

the integrating factor is:

- (A) $x \cos x$ (B) $x \sec x$
(C) $x \sin x$ (D) $x \operatorname{cosec} x$

Correct Option: B

Solution:

Given differential equation is:

$$x \cos x \frac{dy}{dx} + y(x \sin x + \cos x) = 1$$

Dividing both sides by $x \cos x$:

$$\begin{aligned} \Rightarrow \frac{dy}{dx} + \frac{xy \sin x}{x \cos x} + \frac{y \cos x}{x \cos x} &= \frac{1}{x \cos x} \\ \Rightarrow \frac{dy}{dx} + y \tan x + \frac{y}{x} &= \frac{1}{x \cos x} \\ \Rightarrow \frac{dy}{dx} + \left(\tan x + \frac{1}{x} \right) y &= \frac{\sec x}{x} \end{aligned}$$

which is of the form $\frac{dy}{dx} + Py = Q$

Here, $P = \tan x + \frac{1}{x}$ and $Q = \frac{\sec x}{x}$

$$\begin{aligned} \text{Integrating factor} &= e^{\int P dx} = e^{\int \tan x + \frac{1}{x} dx} \\ &= e^{(\log \sec x + \log x)} = e^{\log(\sec x \cdot x)} = x \sec x \end{aligned}$$

131. Equation of two straight lines are $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$. Then

- (A) The lines are non-coplanar
(B) The lines are parallel and distinct
(C) The lines intersect in unique point
(D) The lines are coincident

Correct Option: C

Solution:

Equation of the first line L_1 is $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and that of the second line L_2 is $\frac{x-4}{5} = \frac{y-1}{2} = \frac{z-0}{1}$. Clearly, these lines are not parallel (the ratios of D.R. are not equal). An point P on the first line is $(1 + 2\lambda, 2 + 3\lambda, 3 + 4\lambda)$ and an point Q on the second line is $(4 + 5\mu, 1 + 2\mu, \mu)$. If these two points P and Q are identical then.

$$1 + 2\lambda = 4 + 5\mu \dots\dots(1)$$

$$2 + 3\lambda = 1 + 2\mu \dots\dots(2)$$

$$3 + 4\lambda = \mu \dots\dots(3)$$

From (2) and (3), we get $\lambda = \mu = -1$, which also satisfies (1). Thus the two lines L_1 and L_2 ; intersect and the coordinates of the point of intersection are $(-1, -1, -1)$.

132. Consider $\frac{x}{2} + \frac{y}{4} \geq 1$ and $\frac{x}{3} + \frac{y}{2} \leq 1$, $x, y \geq 0$. Then number of possible solutions are:

- (A) Zero (B) Unique
(C) Infinite (D) None of these

Correct Option: C

Solution:

Consider $\frac{x}{2} + \frac{y}{4} \geq 1$, $\frac{x}{3} + \frac{y}{2} \leq 1$, $x, y \geq 0$. Convert them into equations and solve and draw the graph of these equations

we get $y = 1$ and $x = \frac{3}{2}$.

133. The value of definite integral $\int_0^{\frac{\pi}{2}} \log(\tan x) dx$ is

- (A) 0 (B) $\frac{\pi}{4}$
(C) $\frac{\pi}{2}$ (D) π

Correct Option: A

Solution:



$$\begin{aligned}
 I &= \int_0^{\frac{\pi}{2}} \log(\tan x) dx = \int_0^{\frac{\pi}{2}} \log \left\{ \tan \left(\frac{\pi}{2} - x \right) \right\} dx \\
 &= \int_0^{\frac{\pi}{2}} \log(\cot x) dx \\
 2I &= \int_0^{\frac{\pi}{2}} \log(\tan x) dx + \int_0^{\frac{\pi}{2}} \log(\cot x) dx \\
 &= \int_0^{\frac{\pi}{2}} [\log \tan x + \log \cot x] dx \\
 &= \int_0^{\frac{\pi}{2}} \log(\tan x \cdot \cot x) dx \\
 &= \int_0^{\frac{\pi}{2}} \log(1) dx = \int_0^{\frac{\pi}{2}} 0 dx = 0 \quad \therefore I = 0
 \end{aligned}$$

134. The general solution of differential equation $(e^x + 1) y dy = (y + 1) e^x dx$ is

- (A) $(y + 1) = k(e^x + 1)$
 (B) $y + 1 = e^x + 1 + k$
 (C) $y = \log \{k(y + 1)(e^x + 1)\}$
 (D) $y = \log \left\{ \frac{e^x + 1}{y + 1} \right\} + k$

Correct Option: C

Solution:

$$\text{Since, } (e^x + 1) y dy = (y + 1) e^x dx$$

$$\begin{aligned}
 \Rightarrow \frac{dx}{dy} &= \frac{y}{1 + y} + \frac{y}{(1 + y)e^x} \\
 \Rightarrow \frac{dx}{dy} &= \left(\frac{y}{1 + y} \right) \left(\frac{e^x + 1}{e^x} \right) \\
 \Rightarrow \left(\frac{y}{1 + y} \right) dy &= \left(\frac{e^x + 1}{e^x} \right) dx
 \end{aligned}$$

After integrating on both sides, we have

$$\begin{aligned}
 \int \frac{y}{1 + y} dy &= \int \frac{e^x}{1 + e^x} dx \\
 \Rightarrow \int 1 dy - \int \frac{1}{1 + y} dy &= \int \frac{e^x}{1 + e^x} dx \\
 \Rightarrow y - \log |1 + y| &= \log |1 + e^x| + \log k \\
 \text{Hence } y &= \log [k(1 + y)(1 + e^x)]
 \end{aligned}$$

135. What is the slope of the normal at the point $(at^2, 2at)$ of the parabola $y^2 = 4ax$?

- (A) $\frac{1}{t}$ (B) t
 (C) $-t$ (D) $-\frac{1}{t}$

Correct Option: C

Solution:

Equation of parabola is

$$\begin{aligned}
 y^2 &= 4ax \\
 \Rightarrow 2y \frac{dy}{dx} &= 4a \quad (\text{On differentiating w.r.t } x)
 \end{aligned}$$

$$\therefore \frac{dy}{dx} = \frac{2a}{y}, \quad [\text{slope of tangent}]$$

$$\begin{aligned}
 \text{So, slope of normal} &= - \left(\frac{dx}{dy} \right)_{(at^2, 2at)} \\
 &= - \left(\frac{y}{2a} \right) = - \frac{2at}{2a} = -t
 \end{aligned}$$

136. $\int_0^{\pi/2} x \sin^2 x \cos^2 x dx$ is equal to

- (A) $\frac{\pi^2}{32}$ (B) $\frac{\pi^2}{16}$
 (C) $\frac{\pi}{32}$ (D) None of these

Correct Option: A

Solution:

$$\text{Let } I = \int_0^{\pi/2} x \sin^2 x \cos^2 x dx \dots (i).$$

From the definite integral property

$$\int_0^a f(x) dx = \int_0^a f(a - x) dx$$

we have

$$I = \int_0^{\pi/2} \left(\frac{\pi}{2} - x \right) \sin^2 x \cos^2 x dx \dots (ii)$$

$$(\because \cos^2 x = \sin^2 \left(\frac{\pi}{2} - x \right) \& \sin^2 x = \cos^2 \left(\frac{\pi}{2} - x \right))$$

By adding (i) and (ii)

$$\begin{aligned}
 2I &= \frac{\pi}{2} \int_0^{\pi/2} \sin^2 x \cos^2 x dx \\
 \text{or } 2I &= \frac{\pi}{8} \int_0^{\pi/2} \sin^2 2x dx \\
 [\because \sin 2x &= 2 \sin x \cos x] \\
 &= \frac{\pi}{8} \int_0^{\pi/2} (1 - \cos 4x) dx \quad (\because \cos 2\theta = 1 - 2 \sin^2 \theta) \\
 \Rightarrow 2I &= \frac{\pi}{8} \left[x - \frac{\sin 4x}{4} \right]_0^{\pi/2}
 \end{aligned}$$

137. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$, where $i = \sqrt{-1}$, then what is x equal to ?

- (A) 3 (B) 2 (C) 1 (D) 0



Correct Option: D

Solution:

$$\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$$

$$\begin{aligned} &= 6i[3i^2 + 3] + 3i[4i + 20] + 1[12 - 60i] \\ &= 6i[-3 + 3] + 12i^2 + 60i + 12 - 60i \\ &= -12 + 12 = 0 = x + iy \\ \therefore x &= 0 \end{aligned}$$

138. If $y = \tan^{-1} \left(\frac{\sqrt{x-x}}{1+x^{3/2}} \right)$, then $y'(1)$ is equal to

- (A) 0 (B) $\frac{1}{2}$
(C) -1 (D) $-\frac{1}{4}$

Correct Option: D

Solution:

$$\begin{aligned} y &= \tan^{-1} \left(\frac{\sqrt{x-x}}{1+x^{3/2}} \right) = \tan^{-1} \left(\frac{\sqrt{x-x}}{1+\sqrt{x} \cdot x} \right) \\ &= \tan^{-1}(\sqrt{x}) - \tan^{-1}(x) \end{aligned}$$

On differentiating w.r.t. x , we get

$$\begin{aligned} y' &= \frac{1}{1+x} \cdot \frac{1}{2\sqrt{x}} - \frac{1}{1+x^2} \\ \Rightarrow y'(1) &= \frac{1}{2} \cdot \frac{1}{2} - \frac{1}{2} = -\frac{1}{4} \end{aligned}$$

139. The maximum area of rectangle inscribed in a circle of diameter R is

- (A) R^2 (B) $\frac{R^2}{2}$
(C) $\frac{R^2}{4}$ (D) $\frac{R^2}{8}$

Correct Option: B

Solution:

The diagonal = R

Thus the area of rectangle

$$= \frac{1}{2} \times R \times R = \frac{R^2}{2}$$

140. If A and B are two events, such that

$P(A \cup B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$, $P(A^c) = \frac{2}{3}$
where A^c stands for the complementary event of A , then $P(B)$ is given by:

- (A) $\frac{1}{3}$ (B) $\frac{2}{3}$
(C) $\frac{1}{9}$ (D) $\frac{2}{9}$

Correct Option: B

Solution:

From the given problem: $P(A \cup B) = \frac{3}{4}$,

$$\begin{aligned} P(A \cap B) &= \frac{1}{4} \\ P(A^c) &= \frac{2}{3} = 1 - P(A) \Rightarrow P(A) = 1 - \frac{2}{3} = \frac{1}{3} \\ P(A \cup B) &= P(A) + P(B) - P(A \cap B) \\ \Rightarrow P(B) &= P(A \cup B) + P(A \cap B) - P(A) \\ &= \frac{3}{4} + \frac{1}{4} - \frac{1}{3} = 1 - \frac{1}{3} = \frac{2}{3} \end{aligned}$$

141. $\int \cos \{2 \tan^{-1} \sqrt{\frac{1-x}{1+x}}\} dx$ is equal to

- (A) $\frac{1}{8}(x^2 - 1) + k$
(B) $\frac{1}{2}x^2 + k$
(C) $\frac{1}{2}x + k$
(D) None of these

Correct Option: B

Solution:

Put $x = \cos 2\theta$

$$\begin{aligned} \therefore I &= \int \cos \{2 \tan^{-1} \tan \theta\} (-2 \sin 2\theta) d\theta \\ &= - \int \sin 4\theta d\theta = -\frac{1}{4} \cos 4\theta + c \\ &= \frac{1}{4} (2x^2 - 1) + c = \frac{1}{2}x^2 + k \end{aligned}$$

142. The equation of chord of the circle $x^2 + y^2 = 8x$ bisected at the point $(4, 3)$ is

- (A) $x = 3$ (B) $y = 3$ (C) $x = -3$ (D) $y = -$

Correct Option: B

Solution:

$$\begin{aligned} T &= S_1 \Rightarrow x(4) + y(3) - 4(x+4) = 16 + 9 - 32 \\ \Rightarrow 3y - 9 &= 0 \Rightarrow y = 3 \end{aligned}$$

143. The coefficient of x^2 term in the binomial expansion of $\left(\frac{1}{3}x^{1/2} + x^{-1/4}\right)^{10}$ is:

- (A) $\frac{70}{243}$ (B) $\frac{60}{423}$
(C) $\frac{50}{13}$ (D) none of these

Correct Option: A

Solution:

General term of the given binomial series is given by:



$$T_{r+1} = {}^{10}C_r \left\{ \frac{x^{1/2}}{3} \right\}^{10-r} \cdot \{x^{-1/4}\}^r$$

Put $r = 4$, we get

$$\begin{aligned} T_5 &= {}^{10}C_4 \cdot \frac{1}{3^6} x^3 \cdot x^{-1} \\ &= \frac{10 \times 9 \times 8 \times 7}{4 \times 3 \times 2 \times 1} \cdot \frac{1}{3^6} x^2 = \frac{70}{243} x^2 \end{aligned}$$

Thus coefficient of $x^2 = \frac{70}{243}$.

144. The modulus of the complex number z such that $|z + 3 - i| = 1$ and $\arg(z) = \pi$ is equal to

(A) 3 (B) 2 (C) 9 (D) 4

Correct Option: A

Solution:

Let $z = x + iy$

$$\begin{aligned} \therefore |z + 3 - i| &= |(x + 3) + i(y - 1)| = 1 \\ \Rightarrow \sqrt{(x + 3)^2 + (y - 1)^2} &= 1 \dots\dots\dots (i) \\ \therefore \arg z = \pi &\Rightarrow \tan^{-1} \frac{y}{x} = \pi \\ \Rightarrow \frac{y}{x} = \tan \pi = 0 &\Rightarrow y = 0 \dots\dots\dots (ii) \end{aligned}$$

From equations (i) and (ii), we get

$$\begin{aligned} x = -3, y = 0 &\therefore z = -3 \\ \Rightarrow |z| &= |-3| = 3 \end{aligned}$$

145. Bag P contains 6 red and 4 blue balls and bag Q contains 5 red and 6 blue balls. A ball is transferred from bag P to bag Q and then a ball is drawn from bag Q . What is the probability that the ball drawn is blue?

(A) $\frac{7}{15}$ (B) $\frac{8}{15}$
(C) $\frac{4}{19}$ (D) $\frac{8}{19}$

Correct Option: B

Solution:

Let E_1, E_2 and A be the events defined as follows:

E_1 = red ball is transferred from bag P to bag Q

E_2 = blue ball is transferred from bag P to bag Q

A = the ball drawn from bag Q is blue

As the bag P contains 6 red and 4 blue balls,

$$P(E_1) = \frac{6}{10} = \frac{3}{5} \text{ and } P(E_2) = \frac{4}{10} = \frac{2}{5}$$

Note that E_1 and E_2 are mutually exclusive and exhaustive events.

When E_1 has occurred i.e., a red ball has already been transferred from bag P to Q , then bag Q will contain 6 red and 6 blue balls,

$$\text{So, } P(A | E_1) = \frac{6}{12} = \frac{1}{2}$$

When E_2 has occurred i.e., a blue ball has already been transferred from bag P to Q , then bag Q will contain 5 red and 7 blue balls,

$$\text{So, } P(A | E_2) = \frac{7}{12}$$

By using law of total probability, we get

$$\begin{aligned} P(A) &= P(E_1) P(A | E_1) + P(E_2) P(A | E_2) \\ &= \frac{3}{5} \times \frac{1}{2} + \frac{2}{5} \times \frac{7}{12} = \frac{8}{15} \end{aligned}$$

146. The number of 4-digit numbers that can be formed with the digits 1, 2, 3, 4 and 5 in which at least 2 digits are identical, is

(A) 505 (B) $4^5 - 5!$
(C) 600 (D) None of these

Correct Option: A

Solution:

Total number of 4-digit numbers

$$= 5 \times 5 \times 5 \times 5 = 625$$

(as each place can be filled by anyone of the numbers 1, 2, 3, 4 and 5)

Numbers in which no two digits are identical $= 5 \times 4 \times 3 \times 2 = 120$ (i.e. repetition not allowed)

(as 1^{st} place can be filled in 5 different ways, 2^{nd} place can be filled in 4 different ways and so on)

Number of 4-digits numbers in which at least 2 digits are identical

$$= 625 - 120 = 505$$

147. Consider the system of linear equations

$$x_1 + 2x_2 + x_3 = 3$$

$$2x_1 + 3x_2 + x_3 = 3$$

$$3x_1 + 5x_2 + 2x_3 = 1$$

The system has

(A) exactly 3 solutions (B) a unique solution

(C) no solution (D) infinite solutions

Correct Option: C

Solution:

$$D = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 3 & 5 & 2 \end{vmatrix} = 0; D_1 = \begin{vmatrix} 3 & 2 & 1 \\ 3 & 3 & 1 \\ 1 & 5 & 2 \end{vmatrix} \neq 0$$

$\Rightarrow$ Given system, does not have any solution.

$\Rightarrow$ No solution

- 148.** What is the value of y so that the line through $(3, y)$ and $(2, 7)$ is parallel to the line through $(-1, 4)$ and $(0, 6)$?

(A) 6 (B) 7 (C) 5 (D) 9

Correct Option: D

Solution:

Let $A(3, y)$, $B(2, 7)$, $C(-1, 4)$ and $D(0, 6)$ be the given points.

$$m_1 = \text{slope of } AB = \frac{7 - y}{2 - 3} = (y - 7)$$

$$m_2 = \text{slope of } CD = \frac{6 - 4}{0 - (-1)} = 2$$

Since AB and CD are parallel. $\therefore m_1 = m_2 \Rightarrow y = 9$.

- 149.** The locus of the mid point of a chord of the circle $x^2 + y^2 = 4$ which subtends a right angle at the origin is:

(A) $x + y = 2$

(B) $x^2 + y^2 = 1$

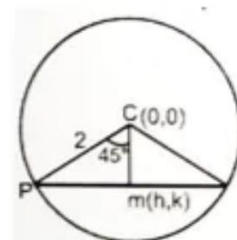
(C) $x^2 + y^2 = 2$

(D) $x + y = 1$

Correct Option: C

Solution:

$$\cos 45^\circ = \frac{\text{cm}}{\text{cp}} = \frac{\sqrt{h^2 + k^2}}{2}$$



Hence locus $x^2 + y^2 = 2$

- 150.** A pair of tangents are drawn from the origin to the circle $x^2 + y^2 + 20(x + y) + 20 = 0$. The equation of the pair of tangents is-

(A) $x^2 + y^2 + 5xy = 0$ (B) $x^2 + y^2 + 10xy = 0$

(C) $2x^2 + 2y^2 + 5xy = 0$ (D) $2x^2 + 2y^2 - 5xy = 0$

Correct Option: C

Solution:

Equation of pair of tangents is given by $SS_1 = T^2$

Here $S = x^2 + y^2 + 20(x + y) + 20$, $S_1 = 20$

$T = 10(x + y) + 20$

$\therefore S_1 = T^2$

$\Rightarrow 20\{x^2 + y^2 + 20(x + y) + 20\} = 10^2(x + y + 2)^2$

$\Rightarrow 4x^2 + 4y^2 + 10xy = 0 \Rightarrow 2x^2 + 2y^2 + 5xy = 0$

BITSAT Solved Paper 2019 - ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A	A	B	D	A	A	B	C	C	C
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	C	A	A	B	B	A	A	C	A	D
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	B	B	A	A	C	A	B	C	C	C
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	B	A	D	D	C	C	D	B	A	D
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	C	A	A	A	A	A	B	A	B	A
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	C	B	C	D	C	B	C	C	D	B
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	A	C	A	A	A	A	B	A	C	C
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	D	B	D	A	D	A	A	D	D	A
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	A	B	B	D	C	D	B	A	D	A
Que.	91	92	93	94	95	96	97	98	99	100
Ans.	B	A	B	B	A	D	C	B	C	D
Que.	101	102	103	104	105	106	107	108	109	110
Ans.	A	A	B	B	D	A	B	A	C	D
Que.	111	112	113	114	115	116	117	118	119	120
Ans.	B	B	D	C	C	D	B	B	A	A
Que.	121	122	123	124	125	126	127	128	129	130
Ans.	A	B	B	C	C	C	C	C	C	B

Que.	131	132	133	134	135	136	137	138	139	140
Ans.	C	C	A	C	C	A	D	D	B	B
Que.	141	142	143	144	145	146	147	148	149	150
Ans.	B	B	A	A	B	A	C	D	C	C