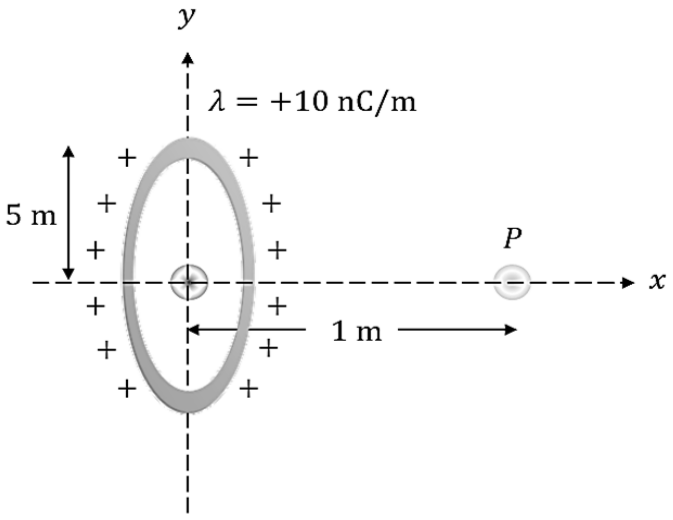
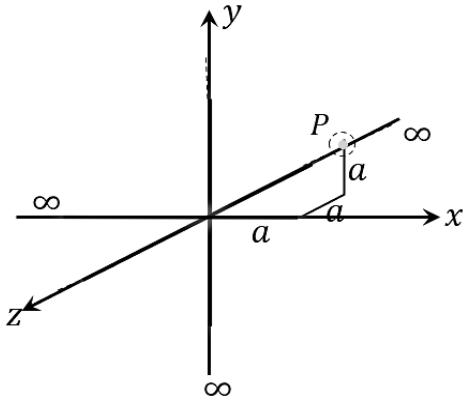
Q.1 For the given uniformly charged ring of linear charge density +10 nC/m, the electric field in y − direction at point P is



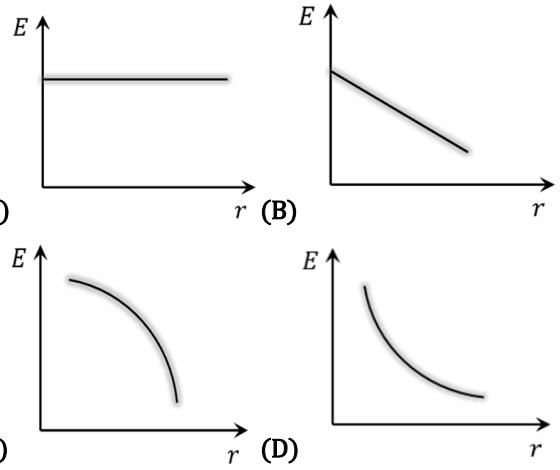
(A) 100 N/C **(B)** 100 N/C **(C)** Zero **(D)** 100 N/C

Q.2 Find the electric field vector at P(a, a, a) due to three infinitely long lines of charges along the x, y and z − axis, respectively. The charge density, i.e., charge per unit length of each wire is λ.

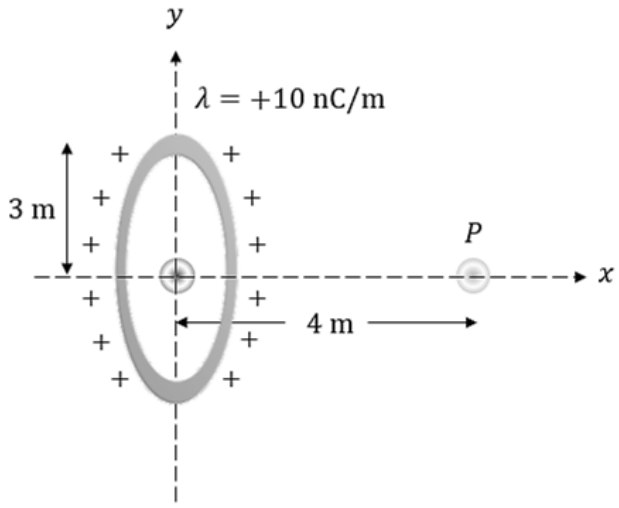


(A) $\frac{\lambda}{3\pi\epsilon_0 a}(\hat{i}+\hat{j}+\hat{k})$ **(B)** $\frac{\lambda}{2\pi\epsilon_0 a}(\hat{i}+\hat{j}+\hat{k})$ **(C)** $\frac{\lambda}{2\sqrt{2}\pi\epsilon_0 a}(\hat{i}+\hat{j}+\hat{k})$ **(D)** $\frac{\sqrt{2}\lambda}{\pi\epsilon_0 a}(\hat{i}+\hat{j}+\hat{k})$

Q.3 Which of the following graph shows curve between electric field (E) versus distance (r) from infinite line charge having constant positive charge density.

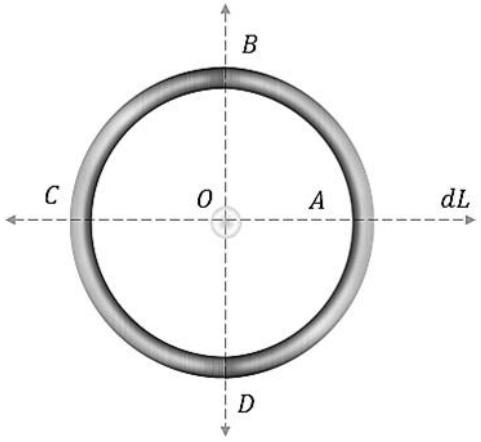


Q.4 For the given uniformly charged ring, magnitude of the net electric field at point *P* is



(A)11.3 N/C **(B)**54.3 N/C **(C)**31.3 N/C **(D)**41.3 N/C

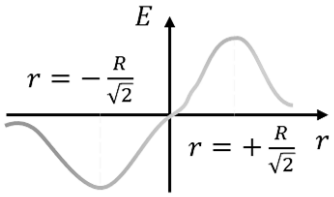
Q.5 A circular wire loop of radius a carries a total charge −Q distributed uniformly over its length. A small length dL of the wire is cut - off at A, then the direction of electric field at the centre due to the remaining wire is along.



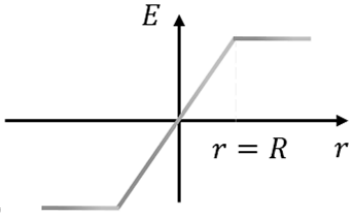
(A)OA **(B)**OB **(C)**OC **(D)**OD

Q.6 Which of the following graphs correctly represent the variation of electric field E vs r for a ring, where r represents the distance from the centre of ring along its axis.

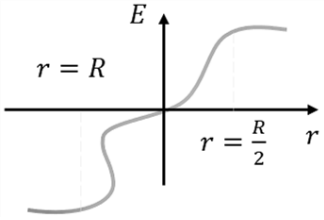
(A)



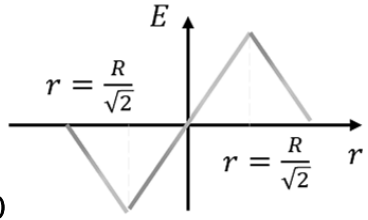
(B)



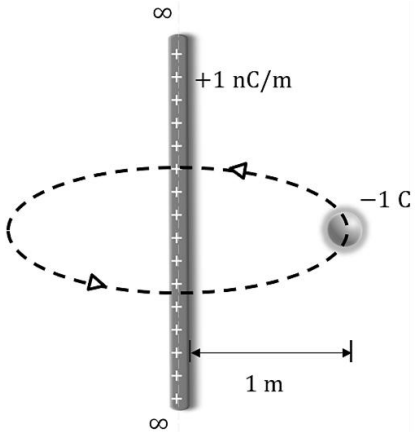
(C)



(D)

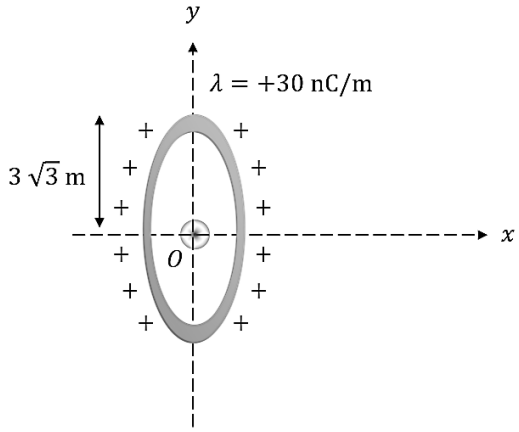


Q.7 A particle of charge -1 C and mass 0.2 g moves in a circle of radius 1 m around an infinite long line charge of linear charge density $+1$ nC/m. The time period of motion is



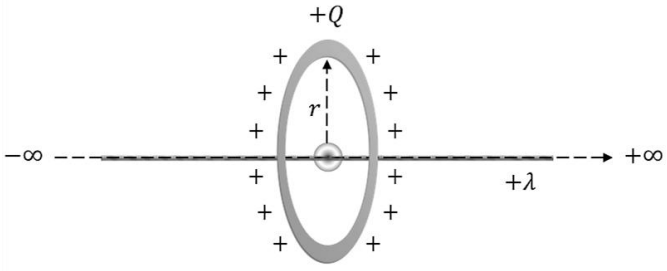
(A) $\frac{\pi}{150}$ s **(B)** $\frac{\pi}{75}$ s **(C)** $\frac{\pi}{100}$ s **(D)** $\frac{\pi}{60}$ s

Q.8 For the given uniformly charged ring, what will be the maximum value of electric field?



(A) 116 N/C **(B)** 126 N/C **(C)** 136 N/C **(D)** 146 N/C

Q.9 Find the force Interaction between the ring and Infinite line charge kept along the axis of the ring.



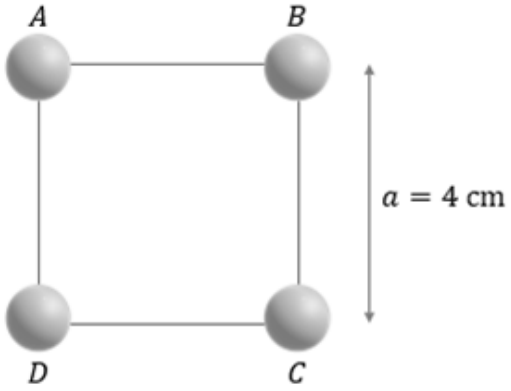
(A) $\frac{k\lambda Q}{r}$ **(B)** $\frac{\sqrt{2}k\lambda Q}{r}$ **(C)** $\frac{2k\lambda Q}{r}$ **(D)** Zero

Q.10 A point charge $-q$ having mass m is placed at the centre of a uniformly charged ring of charge Q and radius R. Find the time period of oscillation if the point charge is slightly displaced and released.

(A) $T = 2\pi\sqrt{\frac{mR^3}{KQq}}$ **(B)** $T = 2\pi\sqrt{\frac{mR^2}{KQq}}$ **(C)** $T = 2\pi\sqrt{\frac{mR^3}{2KQq}}$ **(D)** $T = 2\pi\sqrt{\frac{mR^3}{2KQq}}$

WORK SHEET

Q.1 Four solid spheres each of diameter $\sqrt{5}$ cm and mass 0.5 kg are placed with their centres at the corners of a square of side 4 cm. The moment of inertia of the system about the diagonal of the square is $N \times 10^{-4}$ kgm^2, then N is

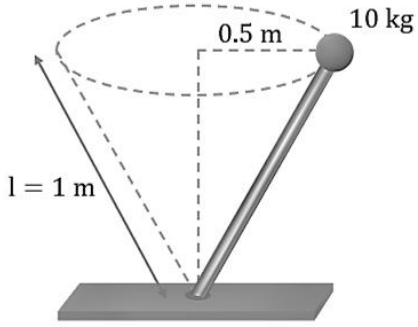


(A)7 **(B)**8 **(C)**9 **(D)**10

Q.2 A man is standing on a cart which has a mass double that of the man as shown in the figure. Initially, the cart is at rest. Now, the man jumps horizontally with velocity 2 m/s relative to the cart. Then work done by the man during the process of jumping will be

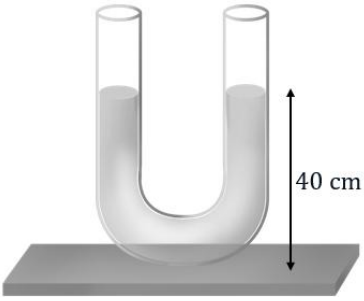
(A)40 J **(B)**60 J **(C)**80 J **(D)**90 J

Q.3 A 10 kg ball attached at the end of a rigid massless rod of length 1 m rotates at constant speed in a horizontal circle of radius 0.5 m with a period of 1.58 s, as shown in the figure. The force exerted by the rod on the ball is



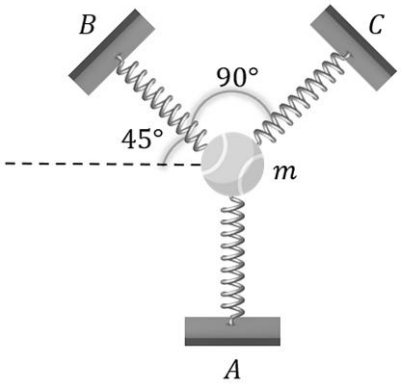
(A)158 N **(B)**128 N **(C)**110 N **(D)**98 N

Q.4 For the given U-tube, if water inside one of the arms is displaced slightly down, then the resulting oscillation has a time period of



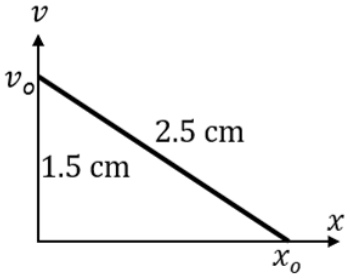
(A)0.25 s **(B)**1.25 s **(C)**2.25 s **(D)**3.25 s

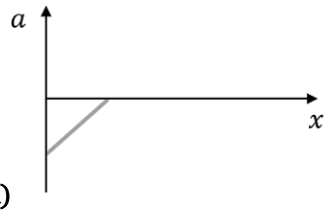
Q.5 A particle of mass m is attached to three identical springs A, B and C each of force constant k as shown in figure. If the particle of mass m is pushed slightly against the spring A and released, then the time period of oscillation is



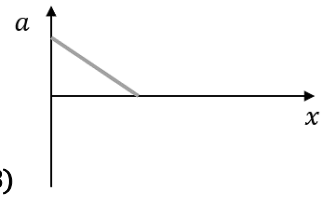
(A) $2\pi\sqrt{\frac{2m}{k}}$ **(B)** $2\pi\sqrt{\frac{m}{2k}}$ **(C)** $2\pi\sqrt{\frac{m}{k}}$ **(D)** $2\pi\sqrt{\frac{m}{3k}}$

Q.6 The given graph shows the variation of velocity with displacement. Which one of the graphs given below correctly represents the variation of acceleration with displacement?

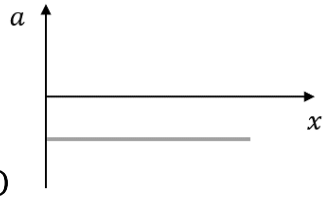




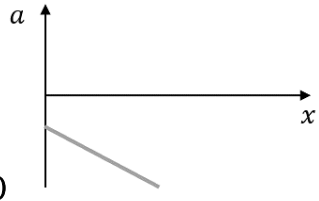
(A)



(B)

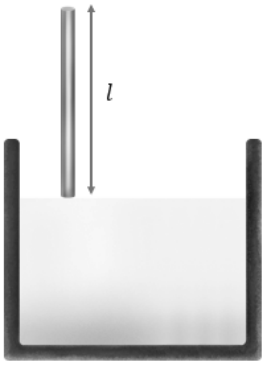


(C)



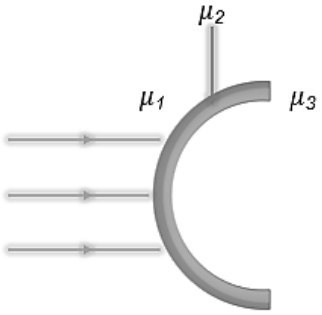
(D)

Q.7 A long metal rod of length l and relative density σ is held vertically with its lower end just touching the surface of water. The speed of the rod when it just sinks in water is given by:



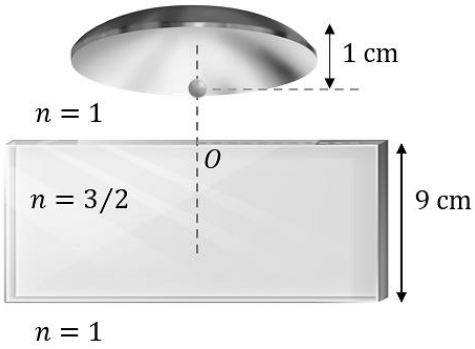
(A) $\sqrt{2gl}$ **(B)** $\sqrt{2gl\sigma}$ **(C)** $\sqrt{2gl\left(1-\frac{1}{2\sigma}\right)}$ **(D)** $\sqrt{2gl(2\sigma-1)}$

Q.8 In the figure, light is incident on a thin lens from the left as shown. The radius of curvature for both the surfaces is R. Determine the focal length of this system.



(A) $\frac{\mu_1 R}{\mu_3-\mu_1}$ **(B)** $\frac{\mu_2 R}{\mu_3-\mu_1}$ **(C)** $\frac{\mu_3 R}{\mu_3-\mu_1}$ **(D)** None of these

Q.9 A concave mirror of focal length 2 cm is placed on a glass slab as shown in the figure. The image of point object O is formed due to reflection at the mirror and then refraction through the slab. Then, the image

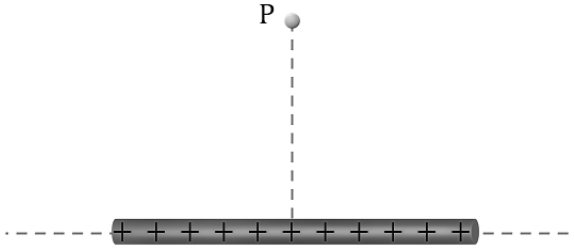


(A) is virtual and 2 cm from the pole of the concave mirror
(B) is virtual and on the pole of the concave mirror.
(C) is real and on the object itself.
(D) is virtual and on the object itself.

Q.10 Gas molecules has RMS speed 200 m/s at 27°C and 1 atm pressure. If the RMS speed changes to $\frac{x}{\sqrt{3}}$ m/s when temperature becomes 127°C and pressure becomes 2 atm, then the value of x is

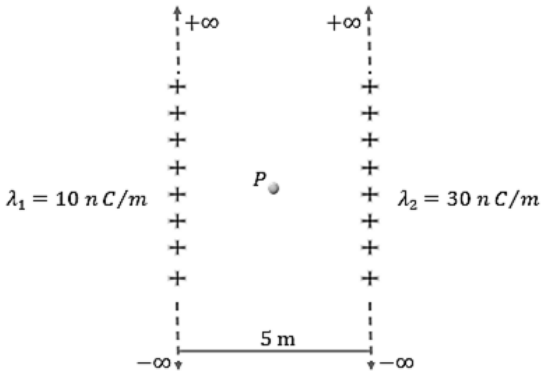
(A) 100 **(B)** 200 **(C)** 300 **(D)** 400

Q.11 For a finite line charge, the net electric field at any point on equatorial line makes an angle of _____ with the axis of line charge.



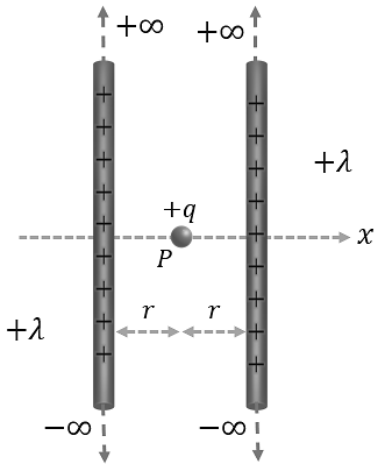
(A)45° **(B)**60° **(C)**75° **(D)**90°

Q.12 For the two fixed infinite line charges, the net electric field is zero at a point P between them. The distance of the pointP from the left infinite line charge is



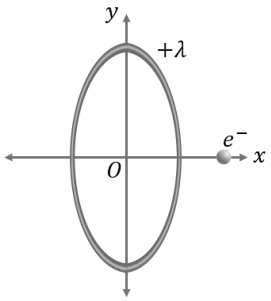
(A)0.25 m **(B)**1.25 m **(C)**2.25 m **(D)**3.25 m

Q.13 Two infinitely long static line charge of constant positive line charge density λ are kept parallel to each other. If a point charge $+q$ is kept in equilibrium between them and is given small displacement along x −axis about its equilibrium position then the correct statement is



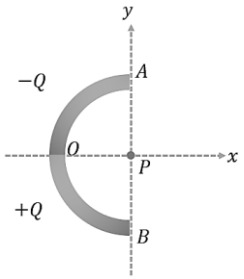
(A) Charge executes simple harmonic motion
(B) Charge continues to move in the direction of its displacement
(C) Charge takes circular path
(D) Charge takes parabolic path

Q.14 A uniformly charged thin ring of linear charge density $+\lambda$ is shown in figure. An electron is placed on the ring's axis at a distance of r from the centre of the ring and is constrained to stay on the axis of the ring. The motion of the electron when it is released from the rest is



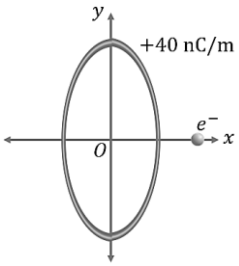
(A) Along a straight line and continuous to move toward +x axis.
(B) Oscillatory about O
(C) Along straight line and continuous to move toward −x axis
(D) The electron will remain stationary.

Q.15 Find the direction of the electric field at point P due to the charge −Q and +Q distributed uniformly along the quarter as shown in figure.



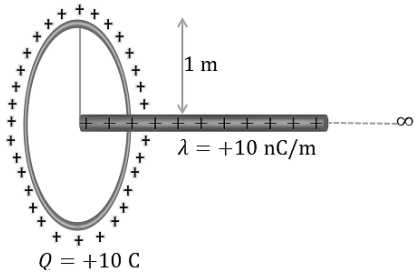
(A) Along $+x-$ axis **(B)**Along $-x-$ axis **(C)**Along $+y-$ axis **(D)**Along $-x$ - axis

Q.16 A particle of mass 1 kgand charge -10^{-2} C is constrained to move along the axis of a ring of radius $\sqrt{2}$ m. The ring carries a uniform charge density +40 nC/m along its length. Initially, the particle is in the centre of the ring where the force on it is zero. The period of oscillation of the particle when it is displaced slightly from its equilibrium position is given by



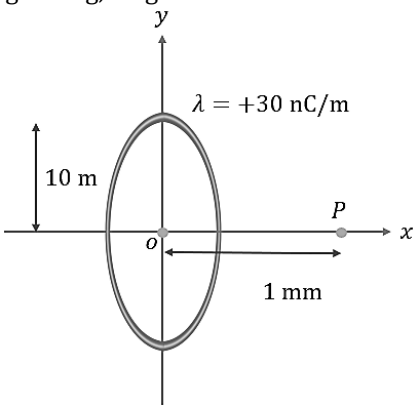
(A)0.25 πs **(B)**0.45 πs **(C)**0.65 πs **(D)**0.85 πs

Q.17 A thin uniformly charged ring of radius 1 m, charge +10 C and a semi-infinite charged wire of $\lambda =$ +10 nC/m, oriented along the axis of ring with one of its ends coinciding with the centre of the ring, form a system. Find the force of interaction between the ring and wire.



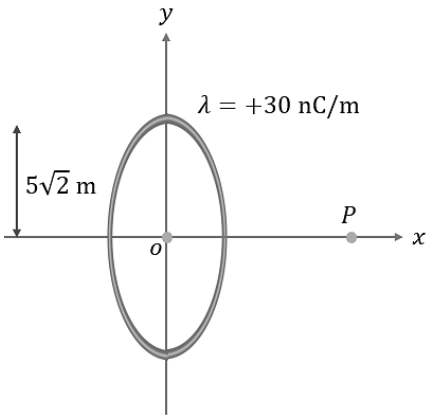
(A)600N **(B)**700 N **(C)**800 N **(D)**900 N

Q.18 For the given uniformly charged ring, magnitude of net electric field at point P is



(A)0.035 N/C **(B)**0.023 N/C **(C)**0.010 N/C **(D)**0.017 N/C

Q.19 At what distance from the centre of a uniformly charged ring, maximum value of electric field will be obtained?



(A)3 m **(B)**5 m **(C)**7 m **(D)**9 m

Q.20 For the given semi-infinite rod, if a positive test charge at rest is kept at point P, then it will take path

(A)PT **(B)**PR **(C)**PS **(D)**PQ

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(A)	(B)	(D)	(B)	(C)	(A)	(A)	(B)	(D)	(A)
WORK SHEET										
Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(C)	(C)	(B)	(B)	(B)	(A)	(C)	(C)	(D)	(D)
Q.	11	12	13	14	15	16	17	18	19	20
Sol.	(D)	(B)	(A)	(B)	(C)	(C)	(D)	(D)	(B)	(C)