PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 48

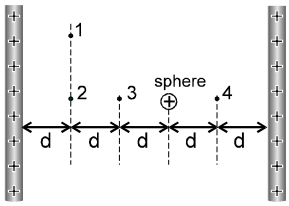
Total Marks : 25

Max. Time : 25 min.

Topics : Electrostatics, Friction, Circular Motion, Current Electricity

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.2	**(3 marks, 3 min.)**	**[6, 6]**
Multiple choice objective ('–1' negative marking) Q.3	**(4 marks, 4 min.)**	**[4, 4]**
Comprehension ('–1' negative marking) Q.4 to Q.8	**(3 marks, 3 min.)**	**[15, 15]**

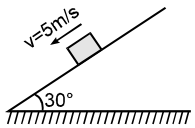
1. The figure shows two large, closely placed, parallel, nonconducting sheets with identical (positive) uniform surface charge densities, and a sphere with a uniform (positive) volume charge density. Four points marked as 1, 2, 3 and 4 are shown in the space in between. If E_1, E_2, E_3 and E_4 are magnitude of net electric fields at these points respectively then :



(A) $E_1 > E_2 > E_3 > E_4$ (B) $E_1 > E_2 > E_3 = E_4$

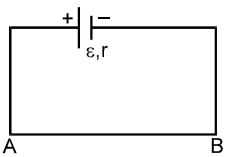
(C) $E_3 = E_4 > E_2 > E_1$ (D) $E_1 = E_2 = E_3 = E_4$

2. A particle of mass 5 kg is moving on rough fixed inclined plane (making an angle 30° with horizontal) with constant velocity of 5 m/s as shown in the figure. Find the friction force acting on a body by the inclined plane.
(take g = 10m/s^2)



(A) 25 N (B) 20 N (C) 30 N (D) none of these

3. AB is a potentiometer wire of length L, which is connected to an accumulator. The potential gradient in AB can be decreased by:



(A) increasing the radius of AB (B) decreasing the radius of AB

(C) increasing a resistance in series with AB (D) all the above.

COMPREHENSION

A high tension wire is at a high potential with respect to a wire which is well grounded called 'Earth wire'. You must have seen such wires stretched parallel to roads. There is a high tension wire between two points A and B, 1 km apart. The distance between HT wire and earth wire is 1 m. The resistance of the HT (and also the earth wire) is 1 Ω/ m. This wire is at a potential of 11 KV at point A w.r. to earth wire., and its is carrying 1A current which returns back to the generator by through the earth wire. This wire is quite a thick wire. There is a sign board at a pole over which this wire is stretched reading 'DANGER, 11 KV'. You might think what would happen if one touched this wire. Will one feel a shock or not. Well ! it depends on whether the current through our body exceeds a particular value, which we may call CRITICAL CURRENT.

4. Why is H.T. wire thick wire. Select the most appropriate option
(A) so that more current may flow
(B) so that resistance may be less thereby reducing power loss in the transmission line.
(C) so that it may bear high tension & therefore sag less.
(D) so that when in future population increases, the existing wire may serve the purpose.

5. Consider a bird having effective resistance 10Ω between its feet sitting on this high tension wire. The distance between its feet is 10 cm. Find the potential difference between the feet of the bird is approximately.
(A) 0.1 V (B) 1 V (C) 10 V (D) 0.05 V

6. In the above question find the current through the bird.
(A) 10 A (B) 1 A (C) 0.01 A (D) 0.005 A

7. If the potential difference between H.T. and earth wire is 11 kV at point A, find p.d. between these wires at point B.
(A) 1 KV (B) 2 KV (C) 9 KV (D) 10 KV

8. If the 'Critical Current' for the bird is 0.1 A, find the maximum power at 11 KV can be transmitted at point A so that the bird may not get shock. Assume that the distance between the feet is 10 cm.

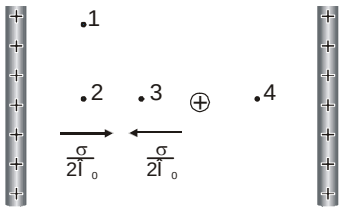
(A) 111 KW (B) 11 KW (C) 101 KW (D) 110011 KW

Answers Key

1.	(C)	**2.**	(A)	**3.**	(A,C)	**4.**	(B)
5.	(A)	**6.**	(C)	**7.**	(C)	**8.**	(A)

Hints & Solutions

1.



Electric field due to both the plates will be cancelled out for all the points. So the net electric field at the points will be governed only by the sphere. Farther the point from the sphere, lesser the magnitude of electric field.

Therefore $E_3 = E_4 > E_2 > E_1$

2. Since the block slides down the incline with uniform velocity, net force on it must be zero. Hence mg sinθ must balance the frictional force 'f' on the block.

Therefore f = mg sinθ = $5 \times 10 \times ½$ = 25 N.