10.1 Describing Fields

Question Paper

Course	DP IB Physics
Section	10. Fields (HL only)
Topic	10.1 Describing Fields
Difficulty	Medium

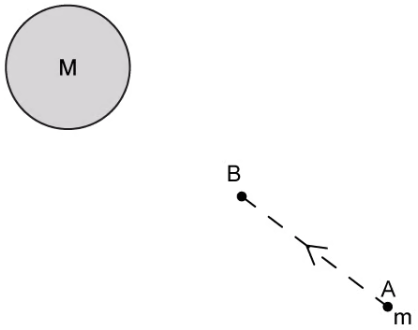
Time allowed: 20

Score: /10

Percentage: /100

Question 1

A test mass *m* moves between position A and B as shown, in the presence of a source mass *M*.



Which of the following statements is correct?

A. Negative work is done on *m* by the gravitational field from A to B

B. The gravitational field of *M* does negative work on *m*

C. *m* moves along an equipotential

D. The gravitational field of *M* does work on *m*

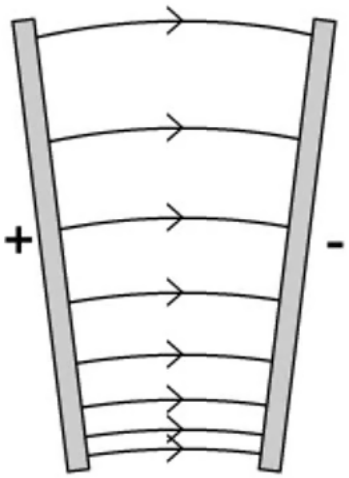
[1 mark]

Question 2

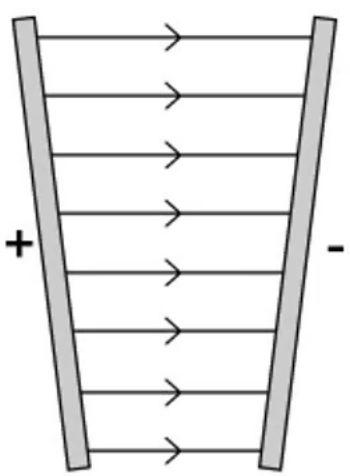
A potential difference is applied between two metal plates that are not parallel.

Which diagram shows the electric field between the plates?

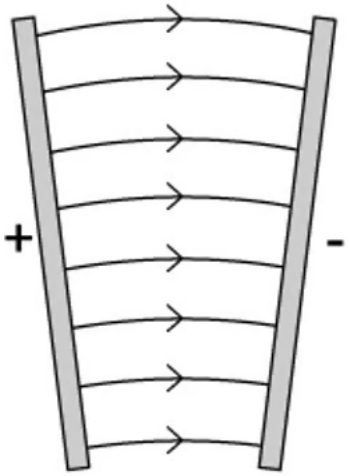
A



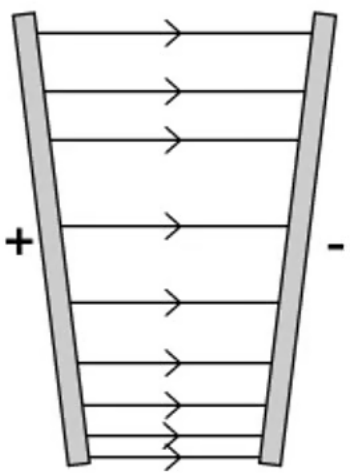
B



C



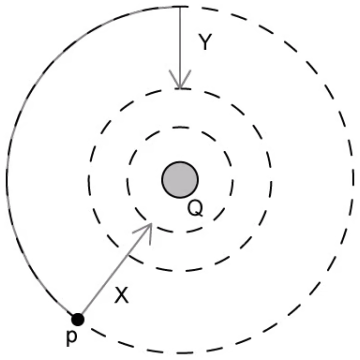
D



[1 mark]

Question 3

A positive charge Q is deposited on the surface of a small sphere. The dotted lines represent equipotentials.



A small positive point charge is moved from point P closer to the sphere along two different paths X and Y. What is the best comparison of the work done along X and Y, W_X and W_Y?

A. $W_X = W_Y$

B. $W_X < W_Y$

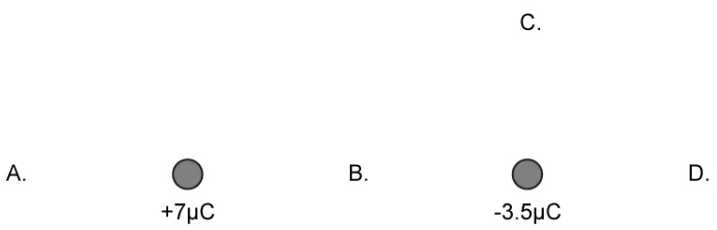
C. $W_X > W_Y$

D. $W_X \approx W_Y$

[1 mark]

Question 4

Two point charges are at rest as shown. Four positions, each of distance *r* from the nearest point charge, are marked in the image.



At which position is the electric field strength greatest?

[1 mark]

Question 5

Equipotential surfaces corresponding to lines of constant gravitational potential are conventionally drawn so that the difference in potential between any two adjacent surfaces is the same.

Consider the equipotential surfaces for a spherical mass *M*. Which of the following statements is incorrect?

A. Equipotential surfaces are spheres of constant radius around *M*

B. The distance between equipotential surfaces increases with distance from *M*

C. No work is done by the gravitational field of *M* if a test mass moves along an equipotential surface

D. The radius of each equipotential surface depends on the diameter of *M*

[1 mark]

Question 6

A helium nucleus is accelerated from rest across a potential difference of 5.0 kV.

If m_p and m_n is the rest mass of a proton and neutron respectively, which expression for the final velocity of the nucleus is correct?

A. $\sqrt{\frac{2e}{m_p + m_n}}$

B. $50\sqrt{\frac{2e}{m_p + m_n}}$

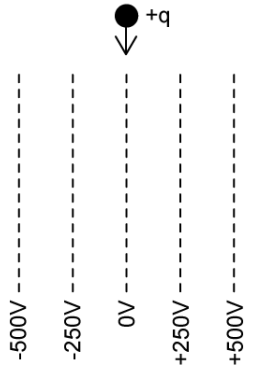
C. $100\sqrt{\frac{e}{m_p + m_n}}$

D. $\sqrt{\frac{e}{m_p + m_n}}$

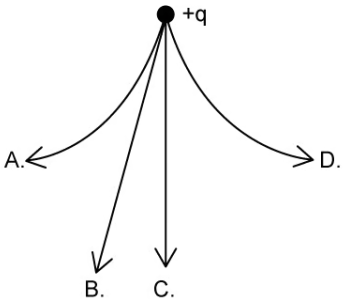
[1 mark]

Question 7

A small point charge +q descends vertically into a region where there is an electric field. The equipotentials of this field are shown.



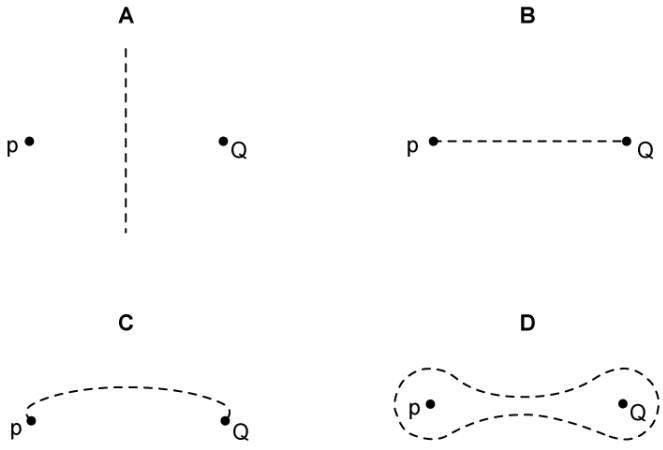
What is the subsequent path followed by the particle?



[1 mark]

Question 8

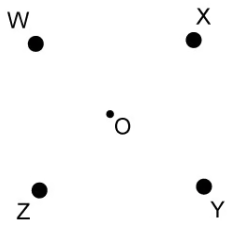
Which diagram shows a correct equipotential line due to two point charges P and Q of equal sign?



[1 mark]

Question 9

Four point charges, W, X, Y and Z, are fixed to the edges of a square with midpoint O.



W, X and Z are negatively charged, and Y is positively charged. What is the direction of the resultant electric field at O?

A. Towards W

B. Towards X

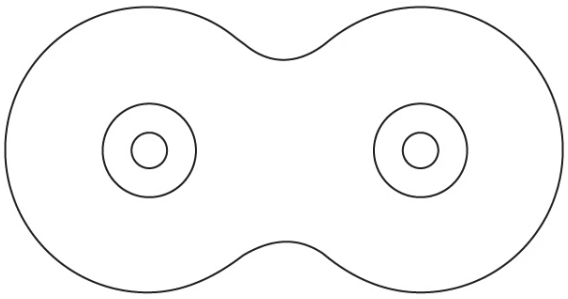
C. Horizontally right

D. Towards Z

[1 mark]

Question 10

The diagram shows equipotential lines around two sources.



Possible combinations of sources for this potential field are:

I. Two equal point charges of the opposite sign
II. Two equal point charges of same sign
III. Two equal point masses

What is/are the possible source(s) for the equipotential lines?

A. I and III only

B. II and III only

C. I only

D. II only

[1 mark]