

12 ADV

PHYSICS Final Revision

2024

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Final Revision Physics 12 ADV – T1

2023 – 2024

charges are quantized

An object with a charge of $(-6 \times 10^{-12} \text{ C})$, **how many electrons** must the body loss or gain until its charge becomes $(-1.2 \times 10^{-12} \text{ C})$?

- A. gain 1.13×10^7
- B. lose 1.13×10^7
- C. gain 3×10^7
- D. lose 3×10^7

A metal sphere has a charge of **+8.0 μC** . What is the **net charge** after **6.0×10^{13} electrons** have been placed on it?

- A. - 1.6 μC
- B. + 9.6 μC
- C. - 9.6 μC
- D. + 1.6 μC

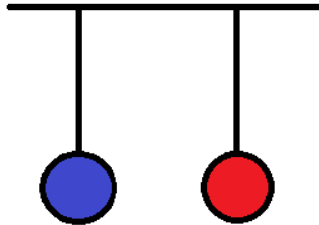
A glass rod that has been charged to $+8 \times 10^{-9} \text{ C}$ is touched to a metal can. Afterward, the glass rod's charge is $+6 \times 10^{-9} \text{ C}$. **How many electrons were transferred from the can to the rod?**

يتم لمس قضيب زجاجي مشحون بشحنة $+8 \times 10^{-9} \text{ C}$ إلى علب معدنية. بعد ذلك ، تبلغ شحنة قضيب الزجاج $+6 \times 10^{-9} \text{ C}$ كم عدد الإلكترونات التي تم نقلها من العلب إلى القضيب؟

A	1.88×10^{10} ELECTRONS
B	1.25×10^{10} ELECTRONS
C	3.75×10^{10} ELECTRONS
D	2.50×10^{10} ELECTRONS

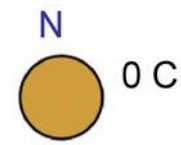
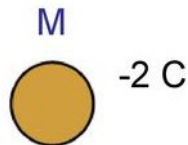
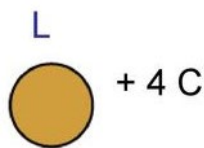
The figure shows a blue ball which initially has a charge $+6.4 \times 10^{-8} \text{ C}$ then it touches a neutral red ball. After the balls are separated, the red ball has a charge of $+2.6 \times 10^{-8} \text{ C}$, **what is the charge on the blue ball?**

يوضح الشكل كرة زرقاء تحتوي في البداية على شحنة $+6.4 \times 10^{-8} \text{ C}$ ثم تلمس كرة حمراء متعادلة. بعد فصل الكرات ، تكون الكرة الحمراء مشحونة بشحنة $+2.6 \times 10^{-8} \text{ C}$ ، **ما هي الشحنة على الكرة الزرقاء؟**



A	$+ 3.8 \times 10^{-8} \text{ C}$
B	$- 3.8 \times 10^{-8} \text{ C}$
C	$- 6.4 \times 10^{-8} \text{ C}$
D	0

Three identical metal balls **L**, **M** and **N** initially have charge **4 C**, **-2 C** and **0 C**, respectively, as shown below.



What is the **charge on N** after you let L first touch M, and then remove L and let M touch N?

A	2
B	1
C	$\frac{4}{3}$
D	0.5

What fraction of the electrons would you have to remove from a 10.0 mg sphere of iron ($Z = 26$, $A = 56$) in order to make its charge 1.00 C?

- a. 0.224 %
- b. 0.482 %
- c. 2.24×10^{-4}
- d. 4.82×10^{-4}
- e. 4.00×10^{-7}

ما هي نسبة الإلكترونات التي يجب عليك إزالتها من كرة 10.0 mg من الحديد ($Z = 26$ ، $A = 56$) لجعل شحنتها 1.00 C ؟

- a. 0.224 %
- b. 0.482 %
- c. 2.24×10^{-4}
- d. 4.82×10^{-4}
- e. 4.00×10^{-7}

A piece of a metal with a charge of (-6.4C) contains (2.0×10^{20} protons). What is the number of electrons in this piece?

conductors, nonconductors (insulators), semiconductors, and superconductors

Conductors	Insulators
Metals are good conductors of electricity because they contain free electrons	insulators such as plastic and rubber do not generally contain free electrons and so are poor conductors of electricity

Semiconductors

- The first widespread use of semiconductors was in transistors
- Semiconductors are of two kinds: intrinsic and extrinsic. Examples of **intrinsic semiconductors** are **chemically pure crystals** of gallium arsenide, germanium, or, especially, silicon.

Engineers produce **extrinsic semiconductors by doping**

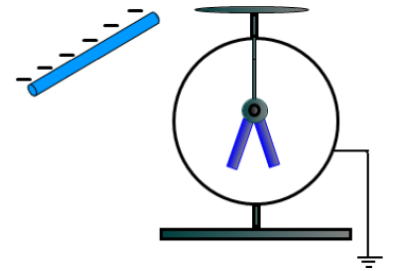
Superconductors are materials that have zero resistance to the conduction of electricity

- Materials are superconducting only at very low temperatures

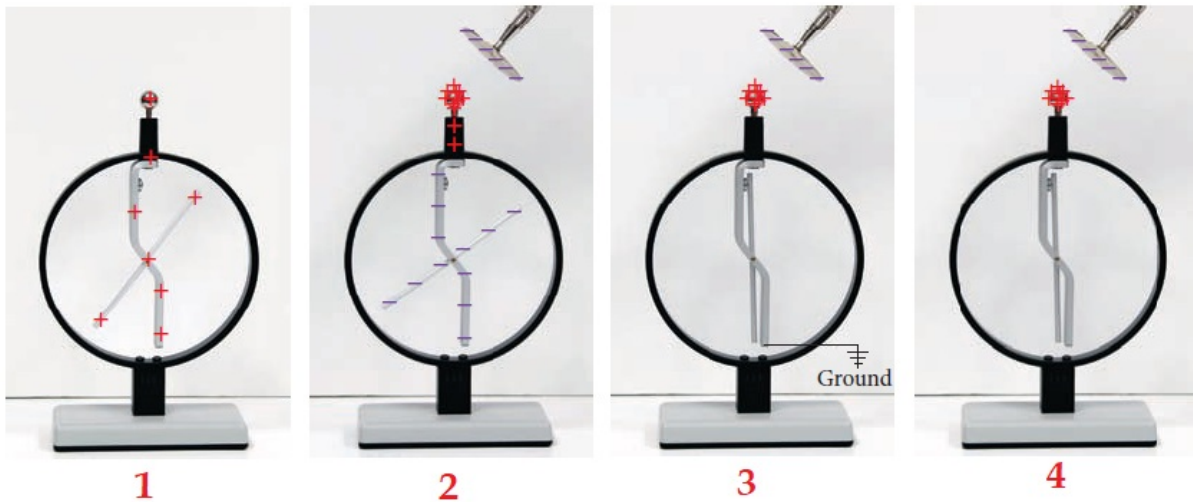
Describe the charging of an electroscope by contact and by induction

A **negatively charged** rod is brought near an uncharged, grounded electroscope. Which of the following statements is **true**?

- A. The positive charge flows from the electroscope to the ground
- B. The positive charge flows from the ground to the electroscope
- C. The negative charge flows from the electroscope to the ground
- D. The negative charge flows from the ground to the electroscope



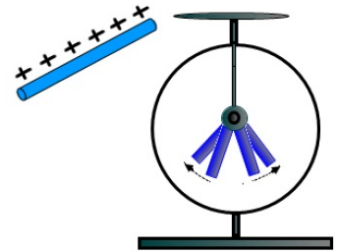
What is the **correct** order for a neutral telescope to be charged by **induction**



A	1 – 2 – 3 – 4
B	2 – 3 – 4 – 1
C	4 – 1 – 2 – 3
D	4 – 2 – 3 – 1

positively charged rod is brought near a charged electroscope. As a result of doing this, the electroscope **leaves move further apart**. What is the **charge on the electroscope**?

- A. Positive
- B. Negative
- C. It is neutral
- D. It depends on the distance between the electroscope and the rod



Apply Coulomb's law to relate the magnitude of the electrostatic force

Two identical small conducting spheres, separated by distance of 20.0 cm, have equal electric charge. **How many excess electrons must be present on each sphere** if the magnitude of the force of repulsion between them is $3.33 \times 10^{-21} \text{ N}$?

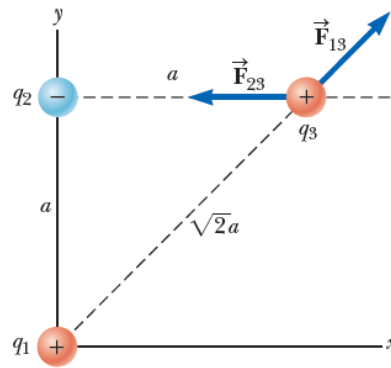
كرتان موصلين متطابقة، مفصولة بمسافة 20.0 cm، لهما شحنة كهربائية متساوية. **كم عدد الإلكترونات الزائدة التي يجب أن تكون موجودة في كل كرة** إذا كان حجم قوة التنافر بينها $3.33 \times 10^{-21} \text{ N}$?

Consider three point charges located at the corners of a right triangle as shown, where $q_1 = q_3 = 5.00 \mu\text{C}$, $q_2 = 2.00 \mu\text{C}$, and $a = 0.100 \text{ m}$. Find the resultant force exerted on q_3 .

ثلاث شحنات نقطية تقع في زوايا مثلث قائم الزاوية كما هو موضح ،

$q_1 = q_3 = 5.00 \mu\text{C}$, $q_2 = 2.00 \mu\text{C}$, and $a = 0.100 \text{ m}$.

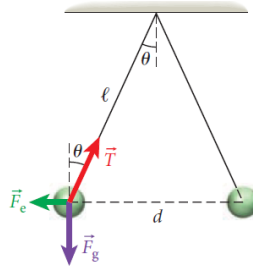
القوة المحصلة المؤثرة على q_3 .



A	$F = (1.04 \hat{x} + 7.94 \hat{y}) \text{ N}$
B	$F = (7.94 \hat{x} - 1.04 \hat{y}) \text{ N}$
C	$F = (-1.04 \hat{x} + 7.94 \hat{y}) \text{ N}$
D	$F = (-7.94 \hat{x} + 1.04 \hat{y}) \text{ N}$

Two balls have the same mass, 0.9680 kg , and the same charge, $29.59 \mu\text{C}$. They hang from the ceiling on strings of identical length, ℓ , as shown in the figure. If the angle of the strings with respect to the vertical is 29.79° , **what is the length of the strings?**

كرتان لهما الكتلة نفسها 0.9680 kg ، ونفس الشحنة ، $29.59 \mu\text{C}$
يتدليان من السقف على خيوط متطابقة الطول ، ℓ ، كما هو موضح في الشكل. إذا كانت زاوية الأوتار بالنسبة للعمودي 29.79° ، **فما طول الأوتار؟**



- A- 1.211 m .
- B- 2.511 m .
- C- 9.211 m .
- D- 0.012 m .

A - $2.3 \times 10^{-6} \text{ C}$ charge exerts a repulsive force of magnitude 0.35 N on an unknown charge 0.20 m away.

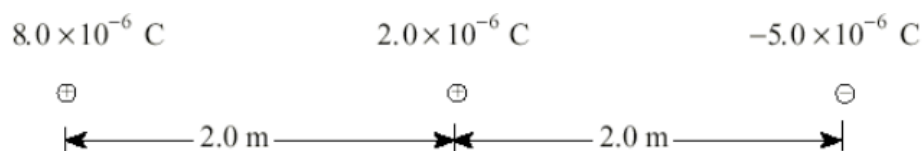
What are the magnitude and sign of the unknown charge?

شحنة $2.3 \times 10^{-6} \text{ C}$ - تؤثر بقوة تنافر مقدارها 0.35 N على شحنة غير معروفة على بعد 0.20 m **ما مقدار وإشارة الشحنة المجهولة؟**

	MAGNITUDE	POLARITY
a.	$6.8 \times 10^{-7} \text{ C}$	Negative
b.	$6.8 \times 10^{-7} \text{ C}$	Positive
c.	$1.2 \times 10^{-6} \text{ C}$	Negative
d.	$1.2 \times 10^{-6} \text{ C}$	Positive

Find the **net force** on the $2.0 \times 10^{-6} \text{ C}$ charge.

أوجد القوة الكلية المؤثرة على الشحنة $2.0 \times 10^{-6} \text{ C}$



a. $1.4 \times 10^{-2} \text{ N}$ towards the left

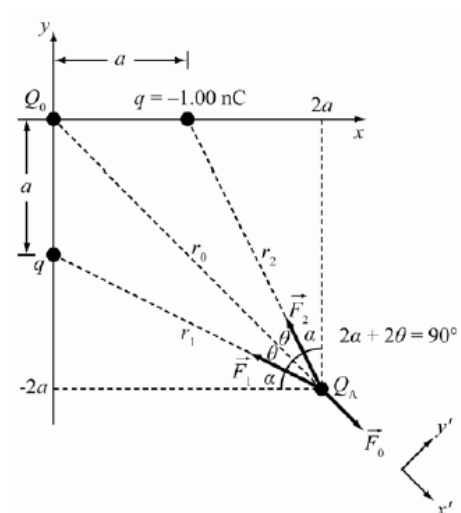
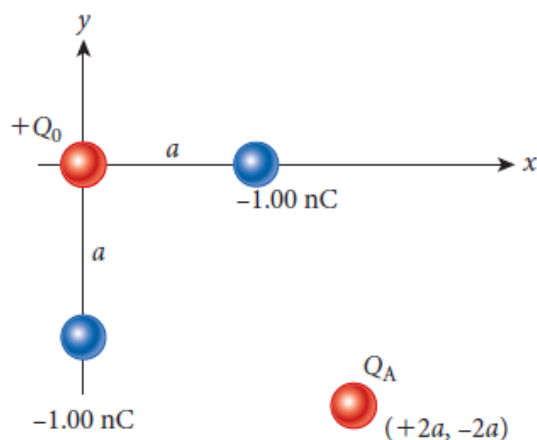
b. $1.4 \times 10^{-2} \text{ N}$ towards the right

c. $5.9 \times 10^{-2} \text{ N}$ towards the left

d. $5.9 \times 10^{-2} \text{ N}$ towards the right

Paper based

In the figure, the net electrostatic force on charge Q_A is zero. If $Q_A = +1.00 \text{ nC}$, determine the magnitude of Q_0 .



$$\theta + \alpha = 45^\circ \rightarrow \alpha = \tan^{-1}\left(\frac{a}{2a}\right) = 26.6^\circ \rightarrow \theta = 45 - 26.6 = 18.43^\circ$$

$$r_o = \sqrt{(2a)^2 + (2a)^2} = \sqrt{4a^2(1+1)} = 2a\sqrt{2} \quad \& \quad r_1 = r_2 = \sqrt{a^2 + (2a)^2} = \sqrt{a^2(1+4)} = a\sqrt{5}$$

$$F_{O \rightarrow A} = F_{1,A} + F_{2,A}$$

$$F_{O \rightarrow A} = F_{1,A} \cos \theta + F_{2,A} \cos \theta = F \times 2 \cos \theta$$

$$\frac{Q_o}{(r_o)^2} = \frac{q}{(r_1)^2} 2 \cos \theta$$

$$\frac{Q_o}{(2a\sqrt{2})^2} = \frac{q}{(a\sqrt{5})^2} \times 2 \cos \theta$$

$$\frac{Q_o}{2\sqrt{2}} = \frac{1 \times 10^{-9}}{\sqrt{5}} 2 \cos 18.43^\circ$$

$$Q_o = \frac{(2\sqrt{2})^2 \times 1 \times 10^{-9} \times 2 \cos 18.43^\circ}{(\sqrt{5})^2} = 3.03 \times 10^{-9} \text{ C}$$

General Charge Distributions

$$\left. \begin{aligned} dq &= \lambda dx \\ dq &= \sigma dA \\ dq &= \rho dV \end{aligned} \right\} \text{for a charge distribution} \left\{ \begin{aligned} &\text{along a line;} \\ &\text{over a surface;} \\ &\text{throughout a volume.} \end{aligned} \right.$$

Name	Symbol	SI Unit
Linear charge density	λ	C/m
Surface charge density	σ	C/m ²
Volume charge density	ρ	C/m ³

The electric force affecting a charge above infinite conducting sheet can be found by the following formula

$$F = q \frac{X}{\epsilon_0}$$

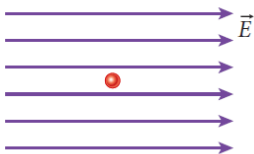
The unit of **X** is

- A. C/m
- B. C/m²
- C. C/m³
- D. C.m

Apply the relationship between the electric field E and the electric force F and the charge q

Concept Check 22.5

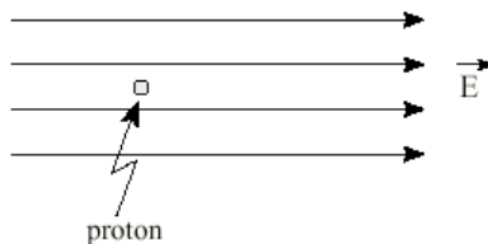
A small positively charged object is placed at rest in a uniform electric field as shown in the figure. When the object is released, it will



- not move.
- begin to move with a constant speed.
- begin to move with a constant acceleration.
- begin to move with an increasing acceleration.
- move back and forth in simple harmonic motion.

What is **the acceleration of a proton** in a uniform $2.5 \times 10^5 \text{ N/C}$ electric field as shown below?

ما **عجلة البروتون** في المجال الكهربائي المنتظم $2.5 \times 10^5 \text{ N/C}$ كما هو موضح أدناه؟

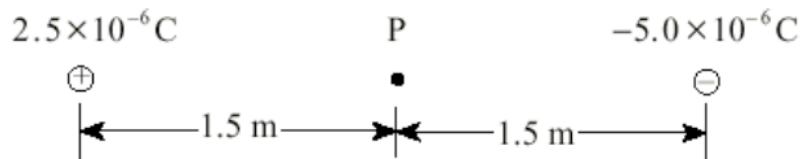


	MAGNITUDE OF ACCELERATION	DIRECTION OF ACCELERATION
a.	$2.4 \times 10^{13} \text{ m/s}^2$	Right
b.	$2.4 \times 10^{13} \text{ m/s}^2$	Left
c.	$1.5 \times 10^{32} \text{ m/s}^2$	Right
d.	$1.5 \times 10^{32} \text{ m/s}^2$	Left

Two point charges, $2.5 \times 10^{-6} \text{ C}$ and $-5.0 \times 10^{-6} \text{ C}$, are placed 3.0 m apart

What is the magnitude of the electric field at point P, midway between the two charges?

ما مقدار المجال الكهربائي عند النقطة P في منتصف المسافة بين الشحنتين؟



a. 0 N/C

b. $1.0 \times 10^4 \text{ N/C}$

c. $2.0 \times 10^4 \text{ N/C}$

d. $3.0 \times 10^4 \text{ N/C}$

Which vector best represents the direction of **the electric field at point P**, which is equidistant from both charges?

ما المتجه الأفضل الذي يمثل اتجاه المجال الكهربائي عند النقطة P ، والتي تقع على مسافة متساوية من كلتا الشحنتين؟

P

$\oplus$
Q

$\oplus$
2Q

a.



c.



b.



d.

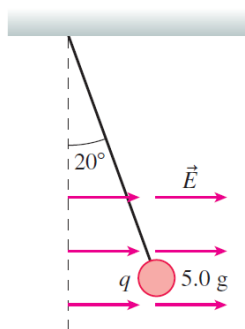


The electric field 2.0 m from a point charge has a magnitude of $8.0 \times 10^4 \text{ N/C}$. **What is the strength of the electric field at a distance of 4.0 m?**

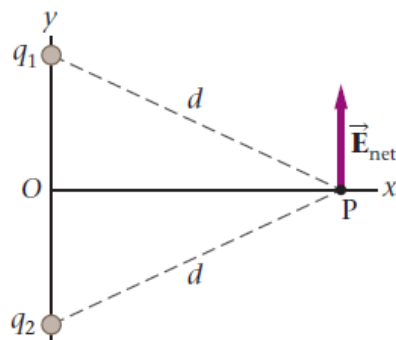
المجال الكهربائي على بعد 2.0 م من شحنة نقطية له مقدار $8.0 \times 10^4 \text{ N/C}$ ما هي قيمة المجال الكهربائي عند المسافة 4.0 م؟

- a. $2.0 \times 10^4 \text{ N/C}$
- b. $4.0 \times 10^4 \text{ N/C}$
- c. $1.6 \times 10^5 \text{ N/C}$
- d. $3.2 \times 10^5 \text{ N/C}$

|||| An electric field $\vec{E} = (100,000 \text{ N/C, right})$ causes the 5.0 g ball in Figure P20.71 to hang at a 20° angle. What is the charge on the ball?

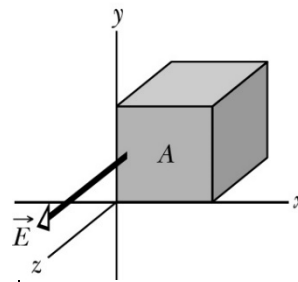


Two charges, q_1 and q_2 , have equal magnitudes q and are placed as shown in the accompanying sketch. The net electric field at point P is directed vertically upward. Can we conclude that q_1 is positive and q_2 is negative, q_1 is negative and q_2 is positive, or q_1 and q_2 have the same sign?



Apply the relationship between the charge density and the electric field magnitude E and also specify the direction of the field for points near a flat thin, infinite or large, nonconducting/conducting surface with a uniform charge density

Gaussian cube of face area A is immersed in a uniform electric field E that has positive direction along z axis In terms of E and A , **what is the flux through Front surface** and **Right surface**



ما التدفق خلال السطح الأمامي
و اليمين

	Front surface	السطح الأمامي	Right surface	السطح اليمين
A	- EA		+ EA	
B	+ EA		$EA \cos 90$	
C	0		- EA	
D	$EA \cos 90$		- 0	

What is the electric flux through each of the surfaces A to E in **FIGURE Q24.6**? Give each answer as a multiple of q/ϵ_0 .

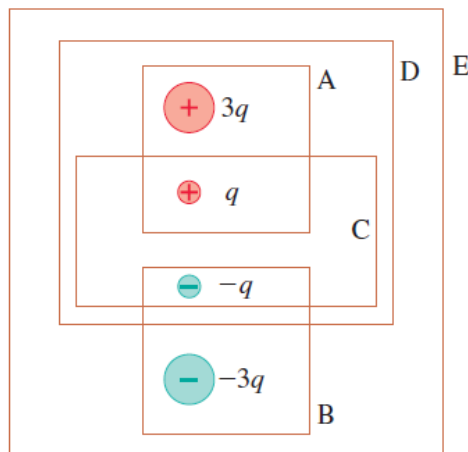
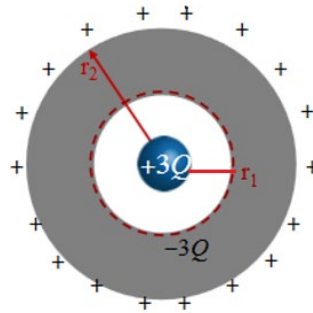


FIGURE Q24.6

If a hollow conducting sphere is gives a charge of $-Q$ and we put a charge of $+3Q$ in its center **What is the electric field at the following points**

إذا أعطيت كرة موصلية مجوفة شحنة $-Q$ ووضعنا شحنة $+3Q$ في مركزها
ما هو المجال الكهربائي في النقاط التالية



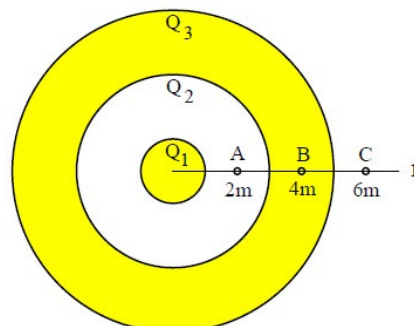
	At $r < r_1$	At $r > r_2$
A	Zero	$\frac{K 2Q}{r^2}$
B	$\frac{K 2Q}{r^2}$	$\frac{K 3Q}{r^2}$
C	$\frac{K 3Q}{r^2}$	$\frac{K Q}{r^2}$
D	$\frac{K 3Q}{r^2}$	$\frac{K 2Q}{r^2}$

Consider a conducting sphere of radius $r_1 = 1\text{m}$ and a conducting spherical shell of inner radius $r_2 = 3\text{m}$ and outer radius $r_3 = 5\text{m}$. The charge on the inner sphere is $Q_1 = -0.6\mu\text{C}$. The net charge on the shell is zero.

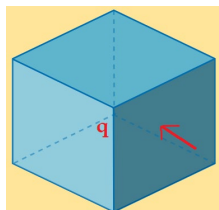
- Find the charge Q_2 on the inner surface and the charge Q_3 on the outer surface of the shell.
- Find magnitude and direction of the electric field at point A between the sphere and the shell.
- Find magnitude and direction of the electric field at point B inside the shell.
- Find magnitude and direction of the electric field at point C outside the shell.

Solution:

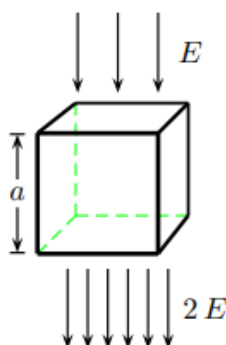
- Gauss's law implies that $Q_2 = -Q_1 = +0.6\mu\text{C}$.
Given that $Q_2 + Q_3 = 0$ we infer $Q_3 = -0.6\mu\text{C}$.
- $E_A = k \frac{0.6\mu\text{C}}{(2\text{m})^2} = 1349\text{N/C}$ (inward).
- $E_B = 0$ inside conductor.
- $E_C = k \frac{0.6\mu\text{C}}{(6\text{m})^2} = 150\text{N/C}$ (inward).



A single point charge is placed at the center of an imaginary cube that has **20-cm**-long edges. The electric flux of one of the cube's sides is **$-1.50 \text{ kN}\cdot\text{m}^2/\text{C}$** . **How much charge is at the center?**



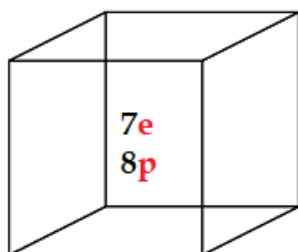
A cubic box of side a , oriented as shown, contains an unknown charge. The vertically directed electric field has a uniform magnitude E at the top surface and $2E$ at the bottom surface.



How much charge Q is inside the box?

- A. $Q_{\text{encl}} = \epsilon_0 E a^2$
- B. $Q_{\text{encl}} = 3 \epsilon_0 E a^2$
- C. $Q_{\text{encl}} = 2 \epsilon_0 E a^2$
- D. $Q_{\text{encl}} = 0$

Assume the cube shown in the figure contains seven electrons, eight neutrons, and a number of protons, if the electric flux through the cube is $3.62 \times 10^{-8} \text{ Nm}^2/\text{C}$ **How many protons** in the cube?



The charged conducting spherical shell has a 2m inner radius and a 4m outer radius. The charge on the outer surface is $Q_{\text{ext}} = 8\text{nC}$. There is a point charge $Q_p = 3\text{nC}$ at the center.

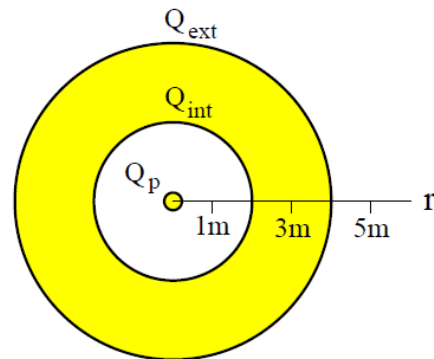
- Find the charge Q_{int} on the inner surface of the shell.
- Find the surface charge density σ_{ext} on the outer surface of the shell.
- Find the electric flux Φ_E through a Gaussian sphere of radius $r = 5\text{m}$.

Solution:

$$(a) \quad Q_{\text{int}} = -Q_p = -3\text{nC}.$$

$$(b) \quad \sigma_{\text{ext}} = \frac{Q_{\text{ext}}}{4\pi(4\text{m})^2} = 3.98 \times 10^{-11} \text{C/m}^2.$$

$$(c) \quad \Phi_E = \frac{Q_{\text{ext}}}{\epsilon_0} = 904 \text{Nm}^2/\text{C}.$$



Consider two very large uniformly charged parallel sheets as shown. The charge densities are $\sigma_A = +7 \times 10^{-12} \text{C/m}^2$ and $\sigma_B = -4 \times 10^{-12} \text{C/m}^2$, respectively. Find magnitude and direction (left/right) of the electric fields E_1 , E_2 and E_3

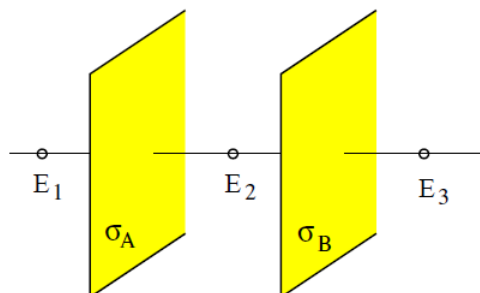
لوحين متوازيين من مادة عازلة مشحونة بشكل موحد كما هو موضح. كثافة الشحنة السطحية.

$$\sigma_A = +7 \times 10^{-12} \text{C/m}^2$$

$$\sigma_B = -4 \times 10^{-12} \text{C/m}^2$$

. اوجد مقدار واتجاه المجالات الكهربائية

E_1 , E_2 and E_3



	E_1	E_2	E_3
A	0.43 N/C ←	0.12 N/C →	0.43 N/C →
B	0.17 N/C ←	0.63 N/C →	0.17 N/C →
C	0.63 N/C ←	0.17 N/C →	0.63 N/C →
D	0.63 N/C →	0.17 N/C ←	0.63 N/C →

Relate the component of the electric field along a certain direction E_s to the change in the electric potential along that direction ($E_s = -dV/ds$)

The electric potential at a point in space is given by the relation $V = 23x - 27y + 11y^2 + 72$.

What is the magnitude of the electric field (in V/m) at the point $r = (3.0, 2.0, 1.0)$?

- a. 5
- b. 23
- c. 29
- d. 59
- e. 131

الجهود الكهربائي عند نقطة ما في الفضاء مُعطى بالعلاقة

$$V = 23x - 27y + 11y^2 + 72.$$

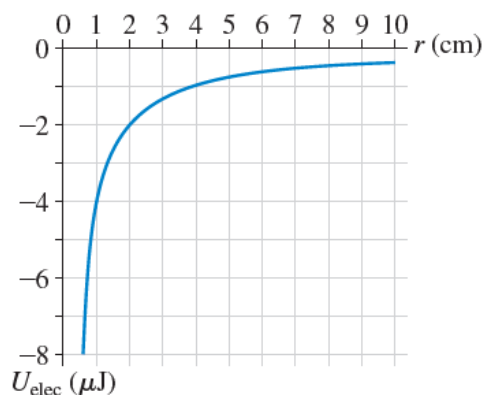
ما مقدار المجال الكهربائي (V / m) عند النقطة $r = (3.0, 2.0, 1.0)$ ؟

- a. 5
- b. 23
- c. 29
- d. 59
- e. 131

Calculate the potential energy of a system of pair of charged particles

The graph in Figure shows the electric potential energy as a function of separation for two point charges. If one charge is $+0.44 \text{ nC}$, what is the other charge?

يوضح الرسم البياني في الشكل طاقة الوضع الكهربائي كدالة لفصل شحنتين نقطيتين. إذا كانت إحدى الشحنة $+0.44 \text{ nC}$ ، فما الشحنة الأخرى؟

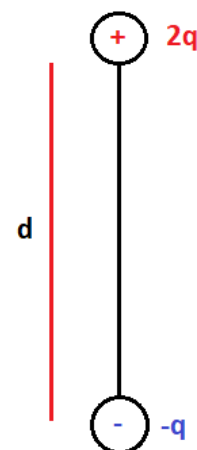


What is the net electric potential **in the midway** between

The two charges

ما مقدار محصله الجهد الكهربائي في **منتصف المسافة** بين الشحنتين

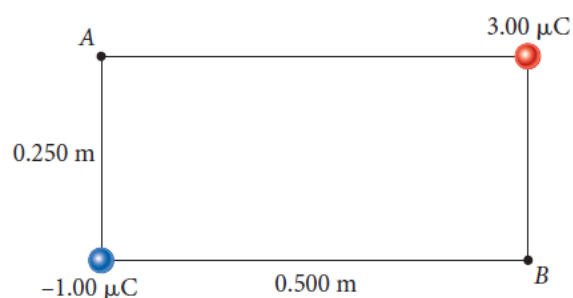
$\frac{2kq}{d}$	$\frac{-2kq}{d}$
$\frac{kq}{2d}$	$\frac{4kq}{d}$



What the **potential energy** of the system

And $V_B - V_A$

ما طاقة الوضع الكهربائية للنظام التالي من الشحنتات وفرق الجهد $V_B - V_A$



	Electric potential energy	$V_B - V_A$
A	- 0.48 J	$7.19 \times 10^4 \text{ V}$
B	- 0.28 J	$- 5.12 \times 10^4 \text{ V}$
C	- 0.48 J	$- 7.19 \times 10^4 \text{ V}$
D	- 0.28 J	$5.12 \times 10^4 \text{ V}$

apply the law of conservation of energy to relate different energies (or energy differences) existing in the system like change in KE, change in Electric potential energy, and work done by a force

When a charge is accelerated through a potential difference of 500 V, its kinetic energy increases from $2.0 \times 10^{-5} \text{ J}$ to $6.0 \times 10^{-5} \text{ J}$. **What is the magnitude of the charge?**

عندما يتم تسريع الشحنة من خلال فرق جهد قدره 500 فولت ، تزداد طاقتها الحركية من $2.0 \times 10^{-5} \text{ J}$ إلى $6.0 \times 10^{-5} \text{ J}$ **ما مقدار الشحنة؟**

a. $4.0 \times 10^{-8} \text{ C}$

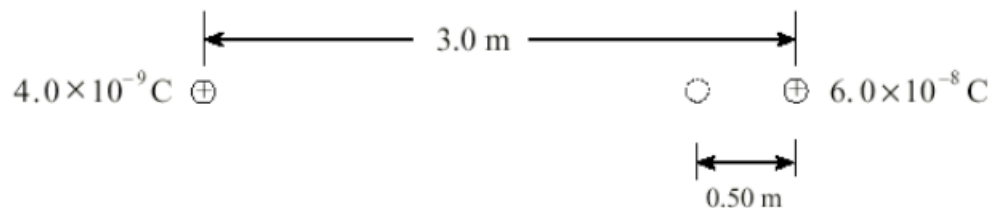
b. $8.0 \times 10^{-8} \text{ C}$

c. $1.2 \times 10^{-7} \text{ C}$

d. $1.6 \times 10^{-7} \text{ C}$

A $4.0 \times 10^{-9} \text{ C}$ charge is initially located 3.0 m from a stationary $6.0 \times 10^{-8} \text{ C}$ charge.
How much work is required to move the $4.0 \times 10^{-9} \text{ C}$ charge to a point 0.50 m from the stationary charge?

تقع شحنة $4.0 \times 10^{-9} \text{ C}$ على مسافة 3.0 m من شحنة ثابتة مقدارها $6.0 \times 10^{-8} \text{ C}$ **ما مقدار الشغل المطلوب لنقل الشحنة $4.0 \times 10^{-9} \text{ C}$ إلى النقطة 0.50 m من الشحنة الثابتة؟**



a. $6.0 \times 10^{-7} \text{ J}$

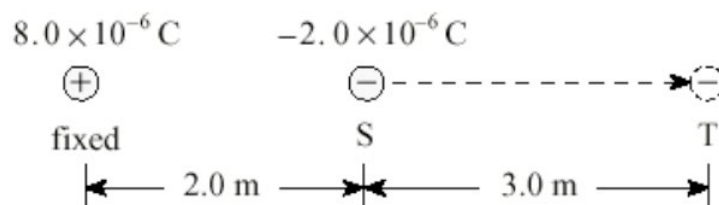
b. $8.6 \times 10^{-7} \text{ J}$

c. $3.6 \times 10^{-6} \text{ J}$

d. $4.3 \times 10^{-6} \text{ J}$

How much work is needed to move a $-2.0 \times 10^{-6} \text{ C}$ charge from position S to position T as shown below?

ما مقدار الشغل المطلوب لتحريك شحنة $-2.0 \times 10^{-6} \text{ C}$ من الموضع S إلى الموضع T كما هو موضح أدناه؟



a. $4.3 \times 10^{-2} \text{ J}$

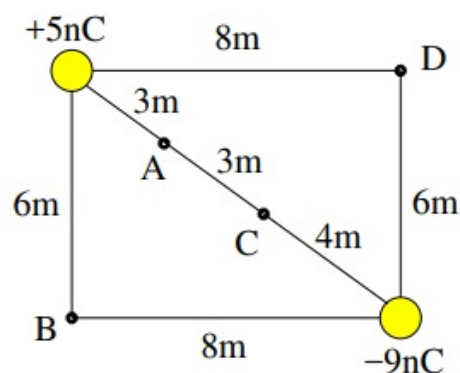
b. $4.8 \times 10^{-2} \text{ J}$

c. $9.1 \times 10^{-2} \text{ J}$

d. $1.1 \times 10^{-1} \text{ J}$

Consider two point charges positioned as shown.

- Find the magnitude of the electric field at point A.
- Find the electric potential at point B.
- Find the magnitude of the electric field at point C.
- Find the electric potential at point D.

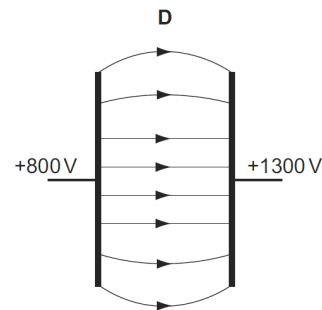
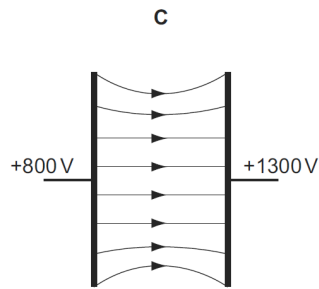
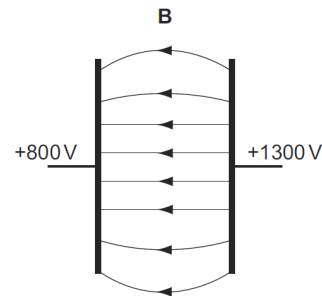
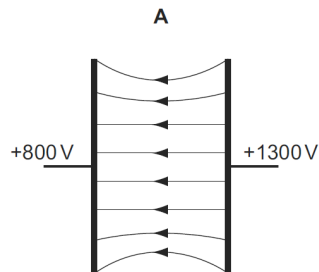


Solution:

- $E_A = k \frac{|5\text{nC}|}{(3\text{m})^2} + k \frac{|-9\text{nC}|}{(7\text{m})^2} = 5.00\text{V/m} + 1.65\text{V/m} = 6.65\text{V/m}.$
- $V_B = k \frac{(+5\text{nC})}{6\text{m}} + k \frac{(-9\text{nC})}{8\text{m}} = 7.50\text{V} - 10.13\text{V} = -2.63\text{V}.$
- $E_C = k \frac{|5\text{nC}|}{(6\text{m})^2} + k \frac{|-9\text{nC}|}{(4\text{m})^2} = 1.25\text{V/m} + 5.06\text{V/m} = 6.31\text{V/m}.$
- $V_D = k \frac{(+5\text{nC})}{8\text{m}} + k \frac{(-9\text{nC})}{6\text{m}} = 5.63\text{V} - 13.5\text{V} = -7.87\text{V}.$

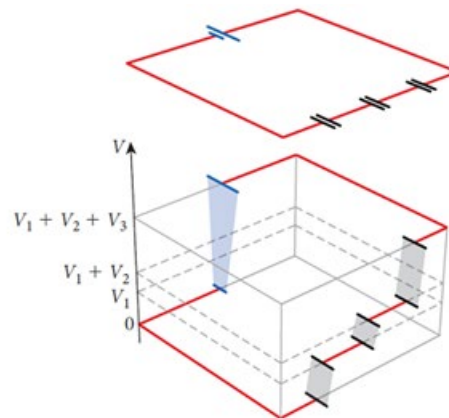
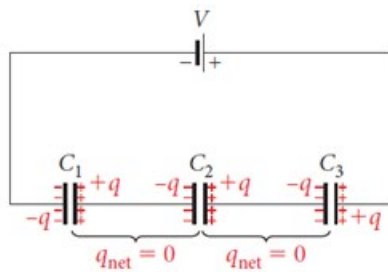
Two parallel metal plates are at potentials of +800V and +1300V. **Which diagram best shows the electric field between the metal plates?**

صفيحتان معدنيتان متوازيتان بجهد +800V و +1300V ما هو الرسم التخطيطي الذي يوضح المجال الكهربائي بين الألواح المعدنية بشكل أفضل؟



What is the correct order of increasing values of capacitances of the following circuit

ما هو الترتيب الصحيح لزيادة قيم سعات الدائرة التالية



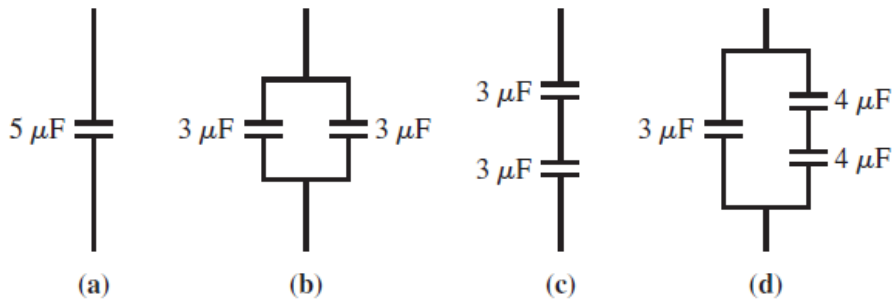
A. $C_1 = C_2 = C_3$

B. $C_1 > C_2 > C_3$

C. $C_1 < C_2 < C_3$

D. $C_3 < C_1 < C_2$

Rank in order, from largest to smallest, the equivalent capacitance $(C_{eq})_a$ to $(C_{eq})_d$ of circuits a to d.

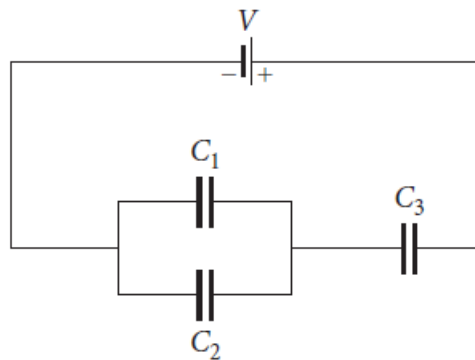


رتب السعة المكافئة تنازليا للأشكال السابقة

Three capacitors are connected to a battery as shown in the figure. If $C_1 = C_2 = C_3 = 10.0 \mu F$ and $V = 10.0 V$,

what is the charge on capacitor C_3 and C_2 ?

ثلاثة مكثفات متصلة بالبطارية كما هو موضح في الشكل. إذا كان $C_1 = C_2 = C_3 = 10.0 \mu F$ و $V = 10.0 V$,
ما مقدار الشحنة المخزنة على كلا من C_3 , C_2



	Charge on C_2	Charge on C_3
A	$133.4 \mu C$	$66.7 \mu C$
B	$66.7 \mu C$	$150 \mu C$
C	$33.35 \mu C$	$66.7 \mu C$
D	$66.7 \mu C$	$150 \mu C$

A parallel plate capacitor has a capacitance equal to C . What would be its capacitance if the area of each of the two plates doubled and their separation distance quadrupled?

- a. $C/4$
- b. $C/2$
- c. $2C$
- d. $4C$

مكثف لوحي متوازي له سعة تساوي C . ما سعته إذا تضاعفت مساحة كل من الصفيحتين وتضاعفت المسافة الفاصلة بينهما أربع مرات؟

- a. $C/4$
- b. $C/2$
- c. $2C$
- d. $4C$

Initially, a capacitor C_1 is connected to a battery of potential difference V . Then a second capacitor C_2 ($C_2 > C_1$) is added in series. What is true for C_1 now

- A) q_1 decreases, V_1 decreases
- B) q_1 remains constant, V_1 remains constant
- C) q_1 increases, V_1 increases
- D) q_1 increases, V_1 decreases

في البداية ، يتم توصيل مكثف C_1 ببطارية ذات فرق جهد V . ثم يضاف المكثف الثاني ($C_2 > C_1$) على التوالي. ما هو صحيح بالنسبة لـ C_1 الآن

- أ) q_1 ينقص ، V_1 ينقص
- ب) q_1 يظل ثابتاً ، V_1 يظل ثابتاً
- ج) q_1 يزيد ، V_1 يزيد
- د) q_1 يزيد ، V_1 ينخفض

	Wire		Galvanometer
	Capacitor		Voltmeter
	Resistor		Ammeter
	Inductor		Battery
	Switch		AC source

Paper based

schematic representations to compare the equipotential surfaces due to a point charge, two identical charges, and two different charges

