

# Classroom Response System Questions

## Chapter 21 Electric Charge

**Halliday/Resnick/Walker**  
**Fundamentals of Physics**

21.3.7. Silicon is an example of what type of material?

- a) metal
- b) insulator
- c) semiconductor
- d) superconductor
- e) perfect conductor

21.6.2. When an electron (charge  $-1.60 \times 10^{-19}$  C) and a positron (charge  $+1.60 \times 10^{-19}$  C) come together, they annihilate one another. Two particles of light (photons) are emitted from the annihilation. This is an example of what type of physical phenomena?

- a) charge quantization
- b) charge separation
- c) Coulomb force
- d) charge density wave
- e) charge conservation

21.4.1. Two objects separated by a distance  $r$  are each carrying a charge  $-q$ . The magnitude of the force exerted on the second object by the first is  $F$ . If the first object is removed and replaced with an identical object that carries a charge  $+4q$ , what is the magnitude of the electric force on the second object?

a)  $4F$

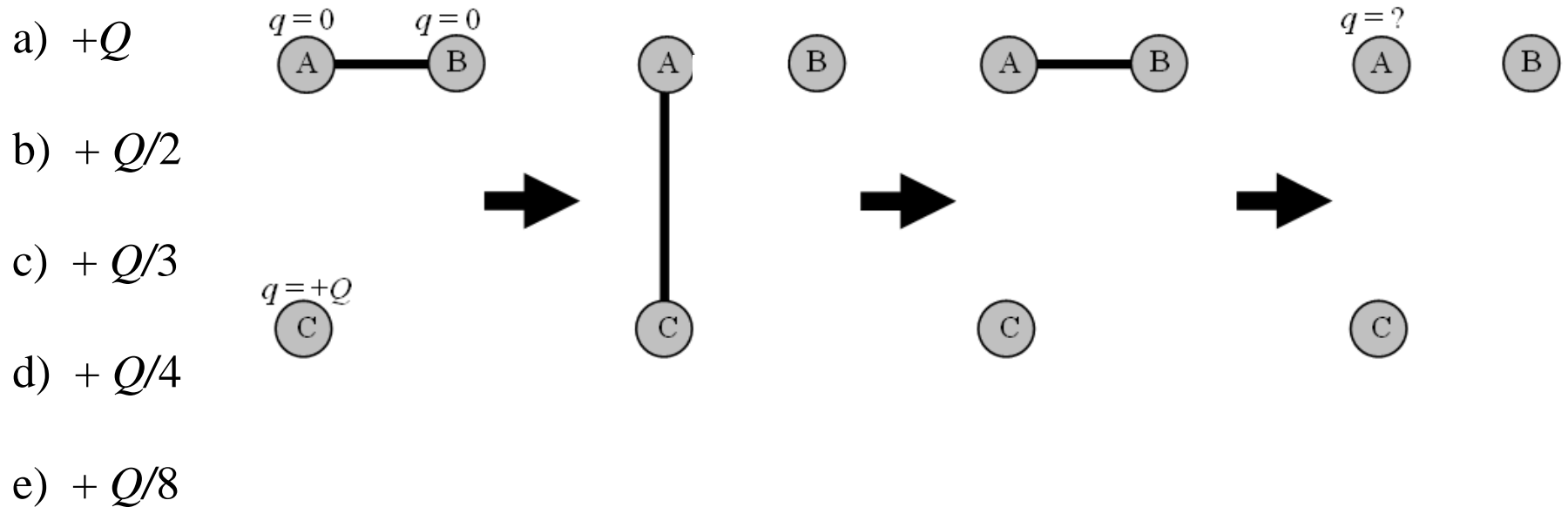
b)  $2F$

c)  $F$

d)  $F/2$

e)  $F/4$

21.3.6. Consider the conducting spheres labeled A, B, and C shown in the drawing. The spheres are initially charged as shown on the left, then wires are connected and disconnected in a sequence shown moving toward the right. What is the final charge on sphere A at the end of the sequence?



21.6.1. The smallest charge on a single particle has been measured to be  $1.60 \times 10^{-19}$  C. What can we conclude from the fact that no smaller charges have been measured?

- a) Charge is quantized.
- b) Electrons are conserved.
- c) Charge is conserved.
- d) Electrons have the smallest unit of charge.
- e) Charge is the same as mass.

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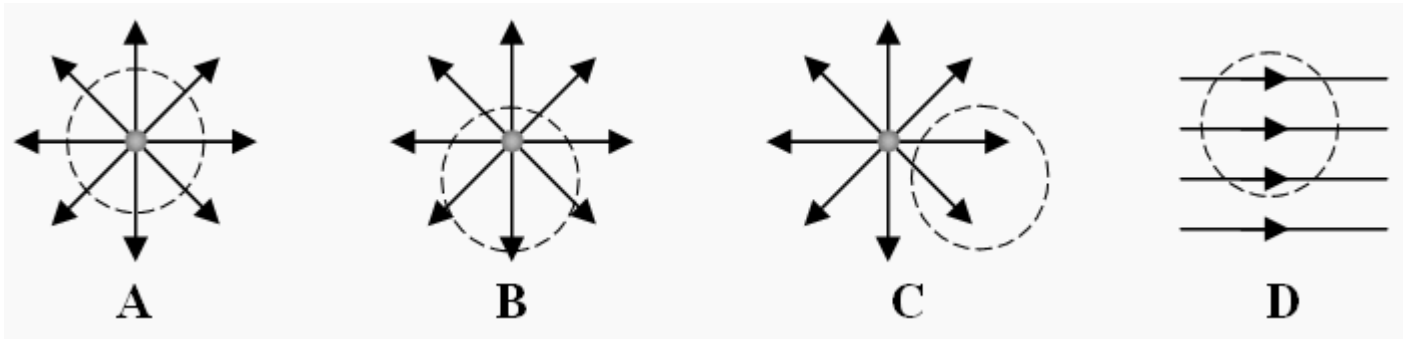
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Classroom Response System Questions

Chapter 23 Gauss' Law

**Reading Quiz Questions**

23.3.1. In each of the four cases below a Gaussian circle is represented by the dashed line circle and the arrows represent electric field lines. In which of the four cases is the flux through the Gaussian circle not equal to zero?



- a) A and B only
- b) C and D only
- c) A only
- d) D only
- e) A, B, C, and D



23.6.3. Why must the electric field at the surface of a conductor be perpendicular to the surface?

- a) Excess charge in a conductor always moves to the surface of the conductor.
- b) Flux is always perpendicular to the surface.
- c) If it was not perpendicular, then charges on the surface would be moving.
- d) The electric field lines from a single charge extend radially outward or inward.
- e) None of the above choices are correct.

23.6.5. A spherical conductor has a radius  $R$  and a tiny spherical cavity at its center that has a radius  $R/10$ . The conductor is otherwise solid. Inside the cavity is a positive charge  $Q$ . What is the electric field at a distance  $R/2$  from the center?

a) zero N/C

b)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{R^2}$

c)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{\left(\frac{1}{2}R\right)^2}$

d)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{\left(\frac{1}{10}R\right)^2}$

e)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{\left(\frac{1}{2}R\right)}$

23.7.1. What is the best choice for the shape of a Gaussian surface?

- a) spherical
- b) cylindrical
- c) cubic
- d) It should be one that encloses the smallest volume.
- e) It should be one that matches the symmetry of the charge distribution.

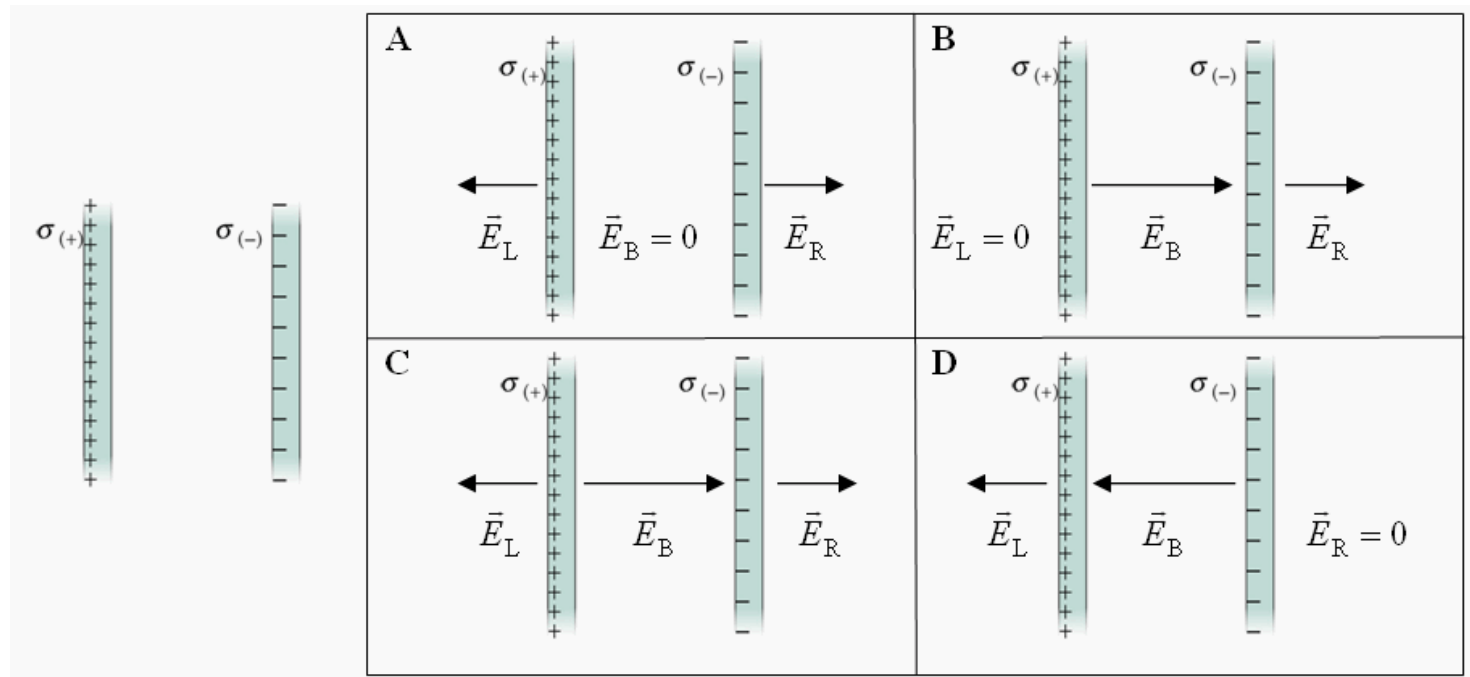
23.8.1. Consider the situation shown to the left below. There are two parallel non-conducting plates. The plate on the left is positively charged with  $(3/2)$  the surface charge density to that of the right plate, which is negatively charged. Which one of the drawings shows the correct net electric field that results from this situation?

a) A

b) B

c) C

d) D



e) None of these drawings is correct.

23.9.1. A spherical conductor has a radius  $R$  and a tiny spherical cavity at its center that has a radius  $R/10$ . The conductor is otherwise solid. Inside the cavity is a positive charge  $Q$ . What is the electric field at a distance  $2R$  from the center?

a) zero N/C

b)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{R^2}$

c)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{\left(\frac{1}{2}R\right)^2}$

d)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{\left(\frac{1}{10}R\right)^2}$

e)  $E = \frac{1}{4\pi\epsilon_0} \frac{Q}{(2R)^2}$

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Chapter 24 Electric Potential

**Interactive Lecture Questions**

**1. The electric potential energy for two positive charges of magnitude  $q$  and separated by a distance  $r$  is  $U_1$ . What will the electric potential energy be if one of the charges is completely removed and replaced by a negative charge of the same magnitude?**

**a)  $U_2 = 2U_1$**

**b)  $U_2 = U_1$**

**c)  $U_2 = -U_1$**

**d)  $U_2 = -2 U_1$**

**e) There is no way to determine this without knowing the value of  $q$ .**

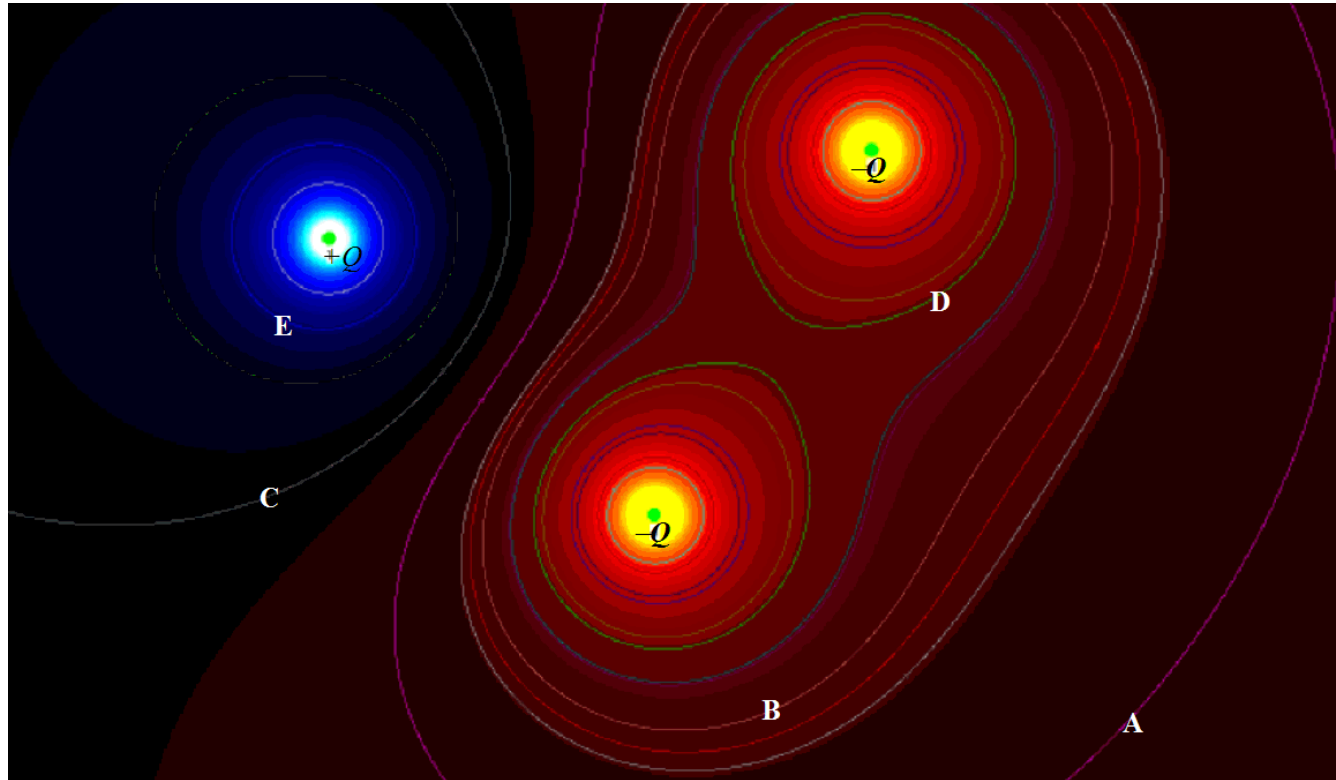
**2. Why is an electrostatic force considered a conservative force?**

- a) Charged particles do not experience friction, which is a non-conservative force.**
- b) The energy required to move a charged particle around a closed path is equal to zero joules.**
- c) The work required to move a charged particle from one point to another does not depend upon the path taken.**
- d) Answers (a) and (b) are both correct.**
- e) Answers (b) and (c) are both correct.**



3. The drawing shows three point charges of equal magnitude, but one is positive (shown in blue) and two are negative (shown in yellow). Some of the equipotential lines surrounding these charges are shown and five are labeled using letters A, B, C, D, and E. At which of the labeled points will an electron have the greatest electric potential energy?

- a) A
- b) B
- c) C
- d) D
- e) E



**4. Consider the equipotential lines shown in the box. The labeled cases indicate electric field line drawings. Which of these cases best matches the equipotential lines shown?**

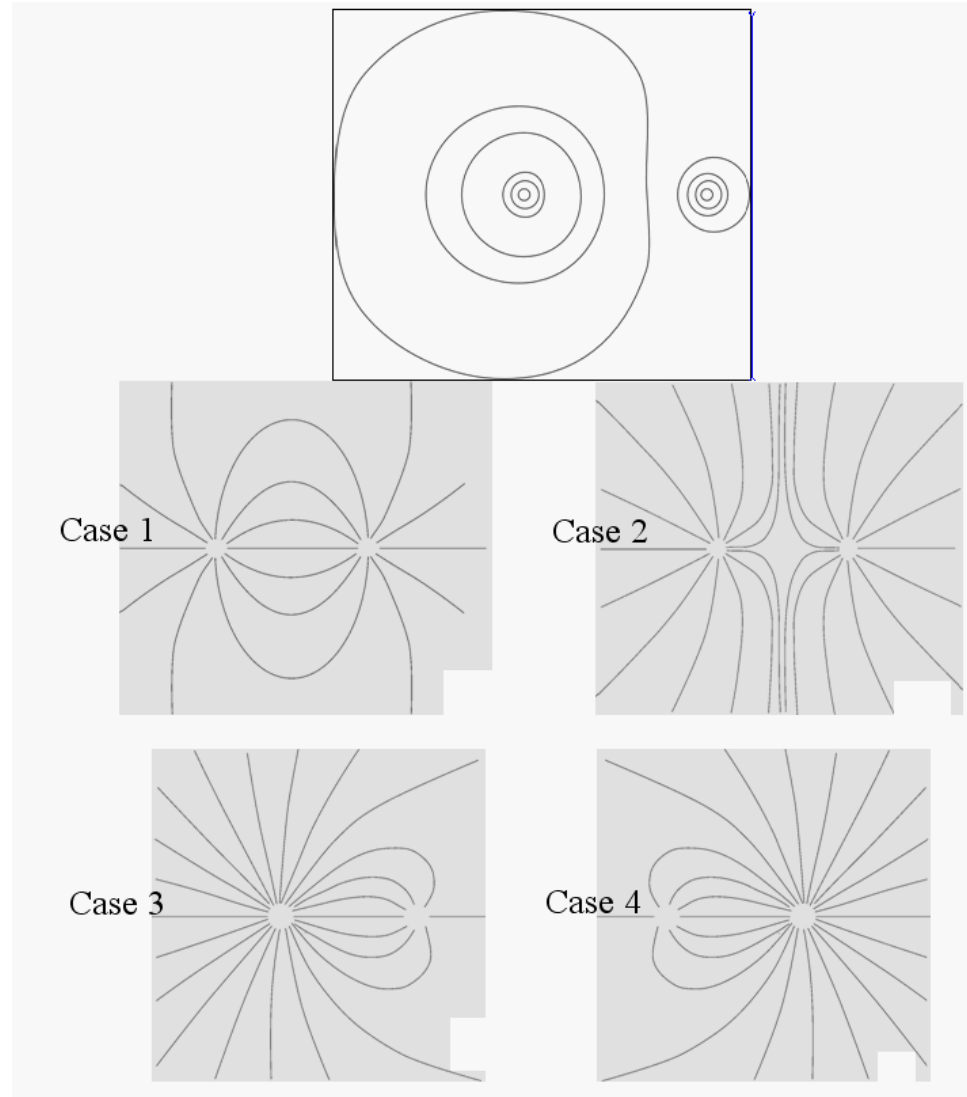
**a) 1**

**b) 2**

**c) 3**

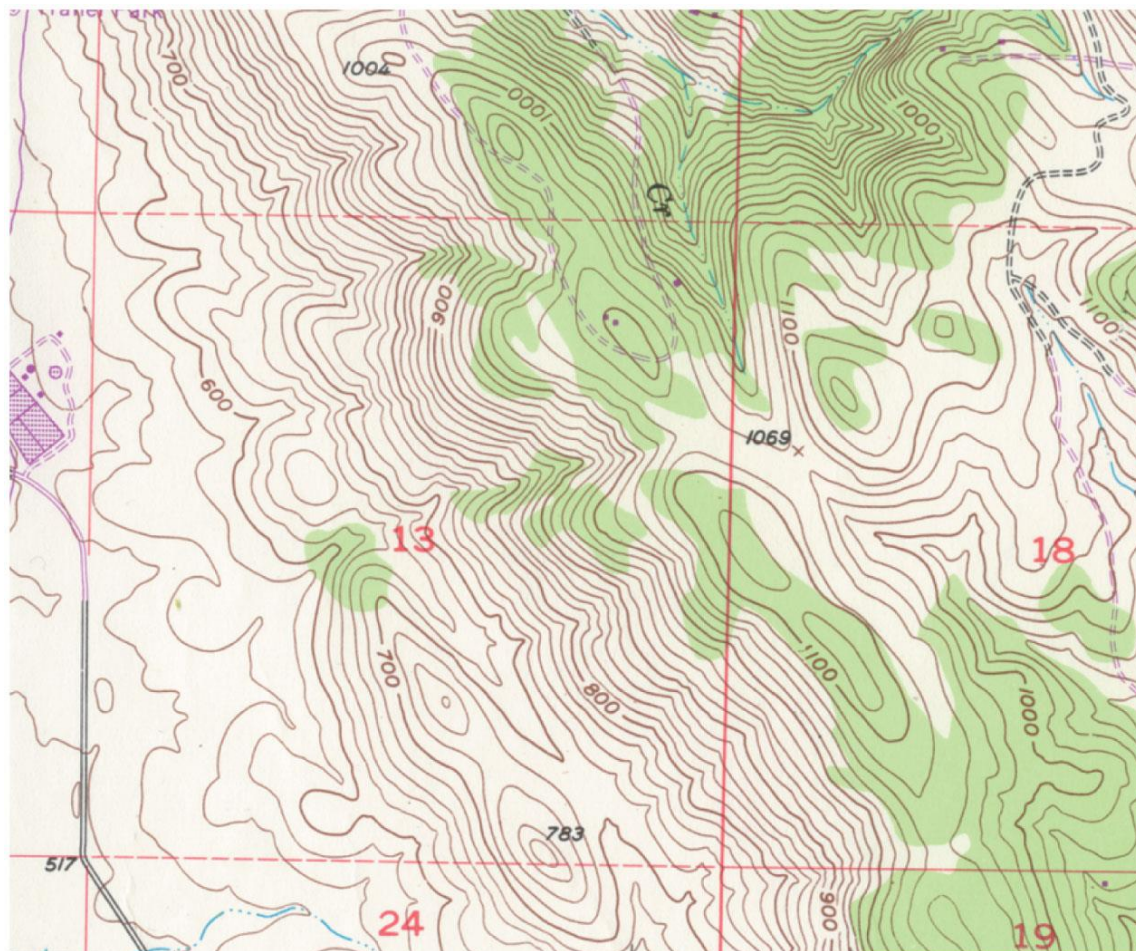
**d) 4**

**e) None of these cases match the equipotential lines shown.**



5 根據第二章和第四章的討論，  
電場有哪兩個單位？

## 6. 以下圖形中的曲線可以代表哪 些類型的曲線？



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Classroom Response System Questions

Chapter 25 Capacitance

**Interactive Lecture Questions**

1 請問National Ignition Facility是在進行何種實驗？

2 請問Hyperbaric Chamber  
為什麼會失火？

3 請問在糖廠或麵粉廠內，如何降低粉塵爆炸的風險？



4 請問電容式/動圈式麥克風  
何者是主動式，何者是被動式  
麥克風？

5 請問ITO 氧化銦錫的主要應用是甚麼？

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Classroom Response System Questions

Chapter 25 Current and Resistance

**Interactive Lecture Questions**

1. 請問打雷的時候，到落點相同距離的牛和人，誰的風險比較大？

2. 請問在  $\rho = \frac{m}{e^2 n \tau}$  式中，何者與溫度有關？

3. 請問興登堡飛船與其他飛船最大的不同點是甚麼？

4. 請問 BCS Theory 是針對何者所建立的？

5. 半導體的 I-V curves 迥異於導體；請問半導體的 I-V curves 有哪兩個主要特點？

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Classroom Response System Questions

Chapter 26 Circuits

**Interactive Lecture Questions**

1. 請簡述克希荷夫迴路定理  
Kirchhoff loop rule。
2. 請列舉三種可保護電路過載的裝置。
3. 請問歐姆( $\Omega$ ) x 法拉(F)的單位是甚麼？
4. 請問電鰻在電擊獵物時，何以自身不受影響？
5. 請問右圖是在測量甚麼？



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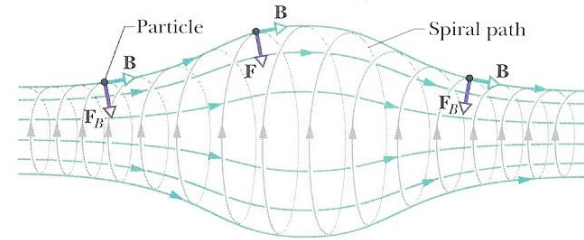
Classroom Response System Questions

Chapter 26 Circuits

**Interactive Lecture Questions**

1. 請問下式(左)是在說明哪個量子效應？

$$G = \frac{I_{\text{channel}}}{V_{\text{Hall}}} = \nu \frac{e^2}{h}$$

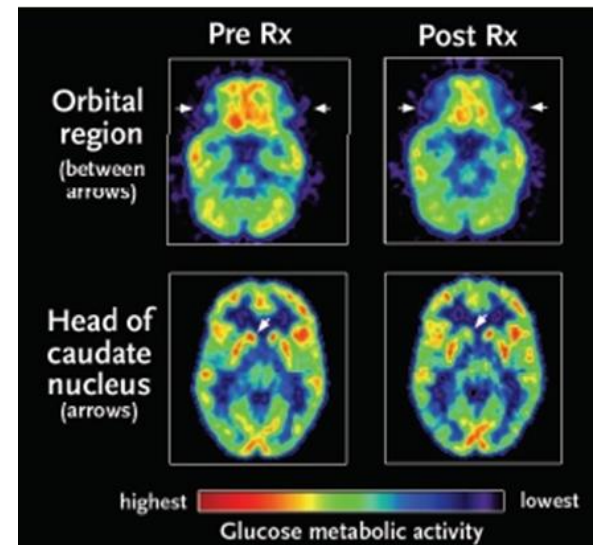


2. 請問上圖(右)的磁場可用何種方式產生？

3. 請列舉三種可分離同位素的方法。

4. 請問Cyclotron 和 Synchrotron 最大的差別是甚麼？

5. 請問右圖可用於何種疾病的診斷？





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Classroom Response System Questions

Chapter 26 Circuits

**Interactive Lecture Questions**

1. 請問關於磁場的toroidal field 和 poloidal field 有何區別？
2. 請問Solenoid和Toroid的磁場有何區別？
3. 請解釋 JET 和 ITER。
4. 請問  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$  的單位是甚麼？
5. 請解釋下面兩個積分有何區別？

$$\oint \vec{B} \cdot d\vec{s} = \mu_0 i_{enc}$$

$$\oint \vec{E} \cdot d\vec{A} = \frac{q_{enc}}{\epsilon_0}$$

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Classroom Response System Questions

Chapter 26 Circuits

**Interactive Lecture Questions**

1. 請問電吉他和木吉他有何區別？
2. 本章所述的Two Symmetric Situations指的是哪兩種現象？
3. 請舉出另一對Symmetric Situations。
4. 請問generator和alternator有何區別？
5. 木衛一艾歐的火山噴發，其能量何來？

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Classroom Response System Questions

Chapter 31 AC Circuits

**Interactive Lecture Questions**

1. 請說明力學和電磁震盪系統有何對應關係？
2. 請說明力學和電磁震盪系統在加上阻滯之後，振幅和頻率有何變化？
3. 請說明在串聯RLC電路中，各元件電流之間的相位關係。
4. 請問DRIVEN RLC電路的共振條件是甚麼？
5. 還有哪些共振的例子？

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Classroom Response System Questions

Chapter 32 *Magnetism of Matter*

*Maxwell's Equations*

Interactive Lecture Questions

1. 請問磁性如何應用於考古？
2. 還有哪些物理現象能應用於考古？
3. 請舉例說明哪些物質具有順磁性、逆磁性和鐵磁性。
4. 請說明有哪些方法可產生磁場，這些方法有何共同點？
5. 解釋Maxwells Equations 。



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Classroom Response System Questions

Chapter 33 *Electromagnetic Waves*

**Interactive Lecture Questions**

1. 請說明甚麼是橫波、甚麼是縱波？  
請舉例說明。
2. 請問電磁波是橫波和縱波？Why?
3. (a)請舉一個電磁波的例子；  
(b)說明它在電磁光譜上的哪一段；  
(c)它有何應用？
4. 請解釋甚麼是total internal reflection?
5. 請解釋甚麼是Brewster's law？

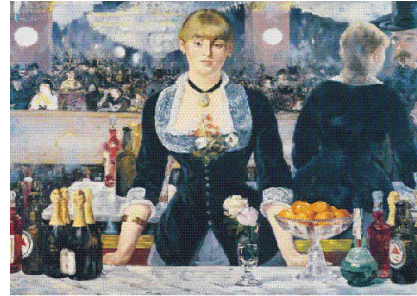
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Classroom Response System Questions

Chapter 34 **Images – Geometrical Optics**

**Interactive Lecture Questions**

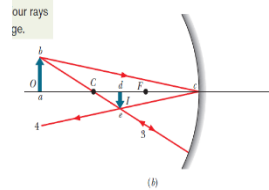
1. 請說明馬內的名畫 "女神遊樂場的吧檯" 有甚麼特別之處？



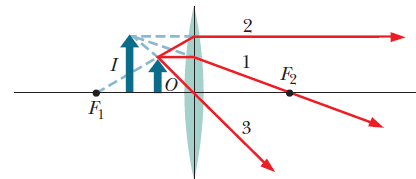
2. 請問四眼魚的眼睛跟我們有何不同？

3. 請問有哪些常見(或不常見)的現象是跟光學直接相關的？

4. 球面鏡成像。



5. 薄透鏡成像。



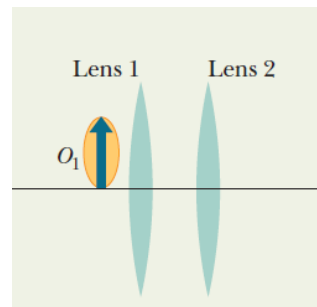
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Classroom Response System Questions

Chapter 35 **Optical Instruments**

**Interactive Lecture Questions**

1. 請問Simple Magnifiers、Compound Microscope、Refracting Telescope這三者有何共同點？
2. 請比較一下複式顯微鏡和折射式天文望遠鏡的設計有何差異。
3. 請比較一下反射式和折射式天文望遠鏡的優缺點。
4. 請問複式顯微鏡的放大率是否有限制。
5. 透鏡組成像。



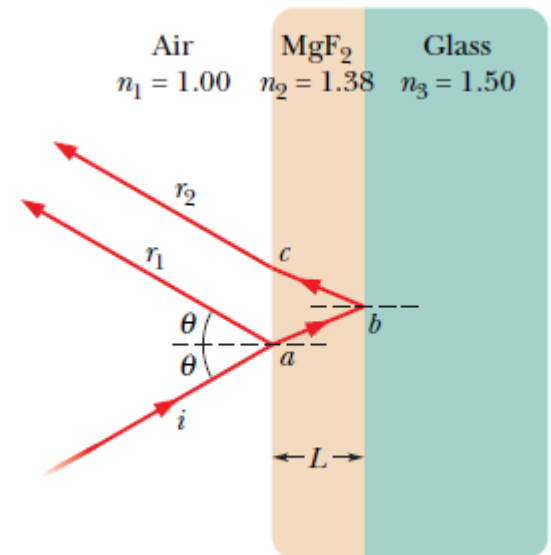
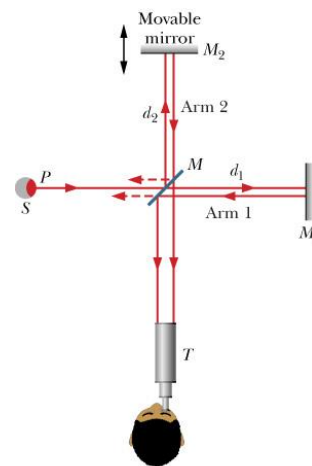
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Classroom Response System Questions

Chapter 36 *Interference*

**Interactive Lecture Questions**

1. 請問干涉有甚麼應用？
2. 請說明惠更斯原理。
3. 請問當光由空氣進入介質之後，何者改變、何者不變？
4. 請說明當 $r_1$ 和 $r_2$ 兩道光產生建設性干涉時，光程差 $abc$ 應滿足何種條件？
5. Michelson Interferometer。





謝謝收看