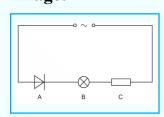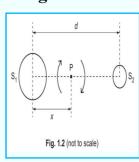**Image:**

Subject: EM

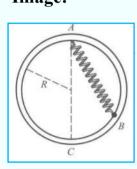**Level:** Middle

Vis: Essential

Question: The figure shows this power supply connected in a circuit. In each time period of the a.c., 1.5×10^{17} electrons pass through component A. The charge on an electron is $1.6 \times 10^{-19} C$. Calculate the average current in the circuit during one time period.

Image:

Fig. 1.2 (not to scale)

Subject: ACG
Level: High
Vis: Essential

Question: The stars S_1 and S_2 rotate with the same angular velocity ω about a point P, as illustrated in Fig. 1.2. Point P is at a distance x from the centre of star S_1. The period of rotation of the stars is 44.2 years. By considering the forces acting on the two stars, deduce an expression for the ratio of the masses of the stars.
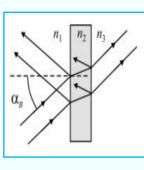

Image:

Subject: CM
Level: UG
Vis: Essential

Question: 一根原长 l_0 的弹簧，当下端悬挂质量为 m 的重物时，弹簧长 $l = 2l_0$。现将弹簧一端悬挂在竖直放置的圆环上端 A 点，设环的半径 $R = l_0$，把弹簧另一端所挂重物放在光滑圆环的 B 点，如图所示。已知 AB 长为 $1.6R$。当重物在 B 无初速地沿圆环滑动时，试求重物在B点的加速度。

Image:

Subject: OPT
Level: SUG
Vis: Essential

Question: Determine the energy transmission coefficient T of a glass plane-parallel plate with $n_2 = 1.5$ in air ($n_1 = n_3 = 1.0$) when linearly polarized light with polarization azimuth $\theta_0 = 30°$ is incident at the Brewster angle α_B.
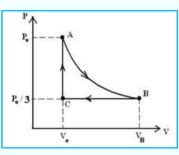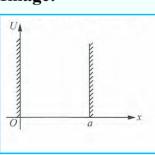

Image:

Subject: TSM

Level: BO

Vis: Essential

Question: A monatomic ideal gas undergoes the reversible cyclic process (ABCA) shown in the PV diagram. Process $A \rightarrow B$ is adiabatic. What is the efficiency of this engine?
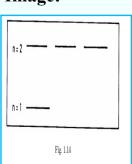

Image:

Subject: QMIT

Level: AO

Vis: Optional

Question: 势阱中的粒子不能到达 $x \leq 0, x \geq a$ 位置，粒子的势能为零，动能取为经典动能，质量记为 m，将氢原子中电子的能量取为经典动能与库仑势能之和，试求电子的基态（能量最低的定态）轨道半径和能量。
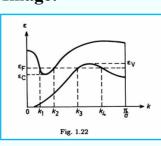

Image:

Fig. 1.14

Subject: AMONP

Level: MA

Vis: Optional

Question: Consider the ground state and $n = 2$ states of hydrogen atom. There are four corrections to the indicated level structure that must be considered to explain the various observed splitting of the levels. These corrections are: (a) Lamb shift, (b) fine structure, (c) hyperfine structure, (d) relativistic effects. Which of the above apply to the $n = 2$, $l = 1$ state? Answer in the name of the corrections.

Image:

Fig. 1.22

Subject: AMONP

Level: PhD

Vis: Essential

Question: Figure shows an energy versus wave vector diagram for electrons in a one-dimensional solid. If n is the number density for electrons and p is that for holes, what can be inferred about p/n?