AL Physics MC Answers

Year:1981

Question Number: 6, 15,21,23,24,

1981MC(6)

The gas expands isothermally → the temperature does not change

PV= nRT

P = nrT/V

Work done = $\int_{V_1}^{V_2} PdV$

$= \int_{V_1}^{V_2} \frac{nRT}{V} dV$

$= nRT \int_{V_1}^{V_2} \frac{1}{V} dV$

$= nRT \ln V \Big|_{V_1}^{V_2}$

$= nRT(\ln V_2 - \ln V_1)$

1981MC (15)

Magnetic force on a current F = BIL

Earth's field is unchanged, so F is doubled when I is doubled.

Magnetic force per unit length between two parallel current $\frac{\mu_o I_1 I_2}{2\pi r}$

Both I_1 and I_2 are doubled, so the force is 4 times larger.

The magnetic forces are vectors, so the sum is a vector sum.

1981 MC (21)

Magnetic field inside a long solenoid B = $\frac{\mu_o NI}{l}$.

As an inductor, an emf will be induced across its ends when the current I changes with time

$\varepsilon = -\frac{d\Phi}{dt} = -\frac{d}{dt}(\frac{\mu_o N^2 AI}{l}) = -\frac{\mu_o N^2 A}{l}\frac{dI}{dt}$

Compared with $\varepsilon = -L\frac{dI}{dt}$, the inductance of a long solenoid is identified to be

$$L = \frac{\mu_o N^2 A}{l} \quad \text{..........................(1)}$$

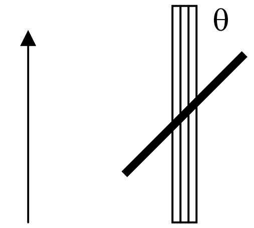
When a current passing through an inductor, the magnetic energy stored in it is

$$E = \frac{1}{2} L I^2 \quad \text{...............................(2)}$$

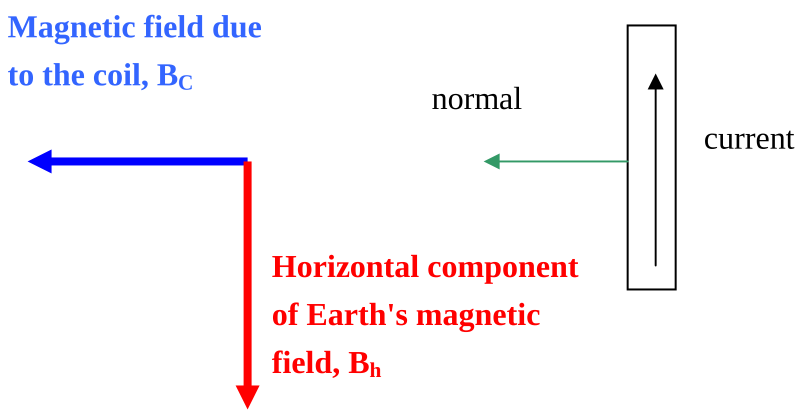
Plug (1) into (2), we get

$$E = \frac{\mu_o N^2 A I^2}{2l}$$

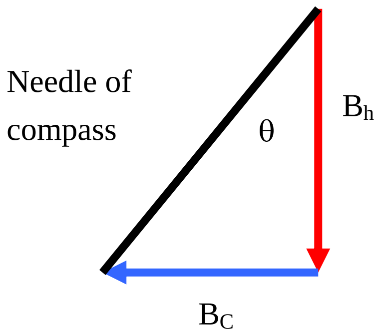
1981MC (23)



1. Magnetic North pole = geographic South pole
2. earth's magnetic field runs from geographic S to geographic N
3. In the above diagram, Earth's b field points downwards.
4. The coil and the resultant magnetic field are



5. Needle of the compass will align with the resultant magnetic field



6. The magnitude of the magnetic field at the center of a flat coil $B_C = \frac{\mu_0 NI}{2r}$, where r is the radius of the coil. Referring to the above diagram,

$$\tan\theta = \frac{B_C}{B_h} = \frac{\mu_0 NI}{2rB_h}$$

1981MC (24)

The E-field between the plate is uniform and equal to V/s.

Electric force acting on an electron = eE = eV/s

Acceleration of the electron = F/m = eV/m

$$s = \frac{1}{2}at^2, \text{ so } t = \sqrt{\frac{2s}{a}} = \sqrt{\frac{2s}{(\frac{eV}{ms})}} = \sqrt{\frac{2ms^2}{eV}}$$
