

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය , 2021 අගෝස්තු
 කல்විට් පොතුත් තරාතරප් පත්තිර(உயர் தர)ப் பரீட்சை, 2021 ஓகஸ்தர்
 General Certificate of Education (Adv. Level) Examination, August 2021

භෞතික විද්‍යාව I
 பௌதிகவியல் I
 Physics I

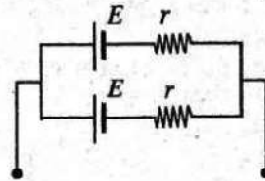
Advanced Level Physics
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PHT6210 2021Th 2021-05-07

Multiple Choice Questions

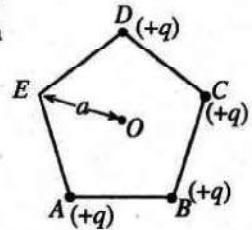
1. Two cells, each having e.m.f. E and internal resistance r , connected as shown in figure are equivalent to a single cell with

- (1) e.m.f. E and internal resistance r .
- (2) e.m.f. $2E$ and internal resistance $2r$.
- (3) e.m.f. $2E$ and internal resistance r .
- (4) e.m.f. E and internal resistance $\frac{r}{2}$.
- (5) e.m.f. E and internal resistance $2r$.



2. Four particles each having a charge of $+q$ are placed on four vertices of a regular pentagon as shown in figure. The distance from the centre O of the pentagon to a vertex is a . The electric field intensity at the centre of the pentagon is

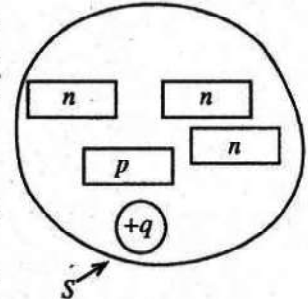
- (1) $\frac{q}{4\pi\epsilon_0 a^2}$ in the OE direction.
- (2) $\frac{q}{4\pi\epsilon_0 a^2}$ in the EO direction.
- (3) $\frac{q}{\pi\epsilon_0 a^2}$ in the OE direction.
- (4) $\frac{q}{\pi\epsilon_0 a^2}$ in the EO direction.
- (5) zero.



3. A Gaussian surface S encloses a metal sphere carrying a charge of $+q$, three n -type semiconductor pieces each having a number of free electrons corresponding to charge of $-q$, and one p -type semiconductor piece having a number of holes corresponding to charge of $+q$ as shown in figure.

Total electric flux through the surface can be made zero by

- (A) removing one n -type semiconductor piece.
- (B) adding one more p -type semiconductor piece with the same hole concentration.
- (C) bringing a metal sphere carrying a charge of $-q$ from outside into the enclosed volume.



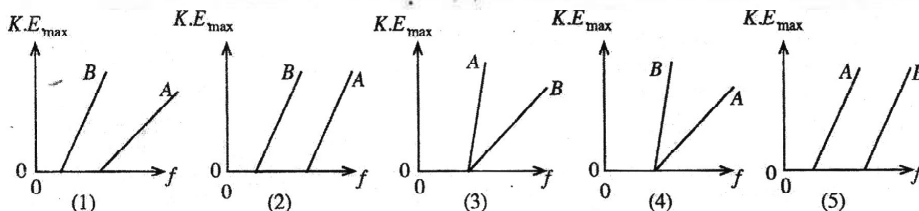
Of the above three methods

- (1) only A is true.
- (2) only C is true.
- (3) only A and B are true.
- (4) only B and C are true.
- (5) All A, B and C are true.

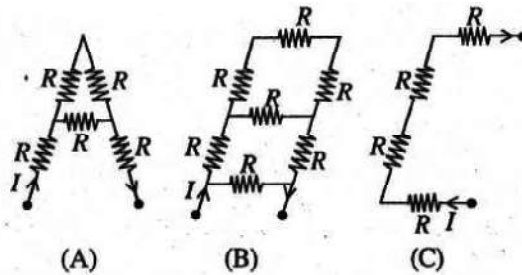
4. A radioactive material has a half life of 60 minutes. The percentage of the fraction of material that has decayed during a period of 3 hours is

- (1) 8.75%
- (2) 12.5%
- (3) 66.6%
- (4) 78.3%
- (5) 87.5%

5. The work functions corresponding to two metals A and B are W_1 and W_2 respectively, and $W_1 > W_2$. Two surfaces made of A and B are illuminated separately using a monochromatic beam of light of frequency f . Which of the following graphs correctly represents the variation of the maximum kinetic energy ($K.E_{max}$) of the emitted photoelectrons with the frequency (f) of the incident light beam, for the surfaces made of metals A and B ?



6.



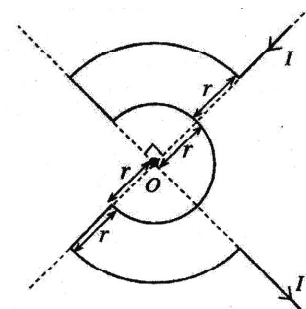
The same current I is sent through resistor networks A, B and C as shown in above figure. If all the resistors in the networks are of equal magnitude, the maximum power is consumed by

- (1) the network A. (2) the network B. (3) the network C.
 (4) the networks A and B equally. (5) the networks B and C equally.

7.

A piece of wire is bent into the form shown in figure and a current of I is passed in the direction shown. The magnitude of the magnetic flux density at the point O is

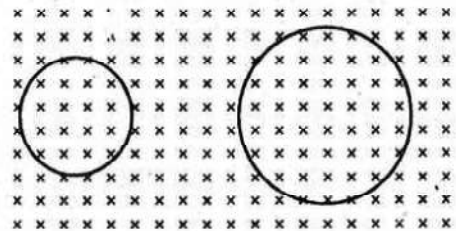
- (1) $\frac{\mu_0 I}{4r}$ (2) $\frac{\mu_0 I}{8r}$ (3) $\frac{3\mu_0 I}{2r}$
 (4) $\frac{\mu_0 I}{2r}$ (5) $\frac{3\mu_0 I}{8r}$



8.

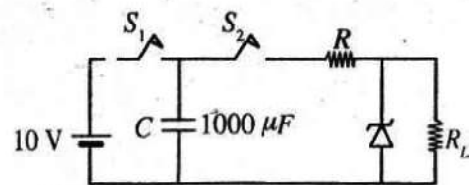
An electron and a proton travel with equal speeds around two circular paths shown in the diagram (drawn not to scale) under the influence of a uniform magnetic field. If the direction of magnetic field is perpendicular and into the plane of the paper,

- (1) the electron travels clockwise around the small circular path and the proton travels counter-clockwise around the large circular path.
 (2) the electron travels counter-clockwise around the small circular path and the proton travels clockwise around the large circular path.
 (3) the electron travels clockwise around the large circular path and the proton travels counter-clockwise around the small circular path.
 (4) the electron travels counter-clockwise around the large circular path and the proton travels clockwise around the small circular path.
 (5) the electron travels counter-clockwise around the small circular path and the proton travels counter-clockwise around the large circular path.



9.

Breakdown voltage of the zener diode in the circuit shown is 5 V. R_L is a suitable resistor. The capacitor C is first charged to 10 V by closing the switch S_1 and opening the switch S_2 . Subsequently, S_1 is opened and S_2 is closed. Consider the following statements made about the functioning of the circuit after S_2 is closed.



- (A) Voltage across R_L will be 5 V so long as the capacitor voltage is adequately above 5 V.
 (B) Time period through which the voltage across R_L remains constant does not depend on the value of the capacitance.
 (C) Potential drop across R gradually decreases with time.

Of the above statements,

- (1) only A is true. (2) only C is true.
 (3) only A and B are true. (4) only A and C are true.
 (5) All A, B and C are true.

10.

A cylindrical copper block of radius r and length $l = 2r$ radiates energy as a black body at temperature T . If this copper block is cut and separated into N identical disks having the same radius r , the rate of the emission of radiant energy at the above temperature will increase by a factor of

- (1) $\frac{(N+3)}{3}$ (2) $\frac{(N+2)}{3}$ (3) $\frac{(N+1)}{3}$ (4) $\frac{N}{3}$ (5) N