GATE 2018 PH(14-26)

EE24BTECH11030 - J.KEDARANANDA

1) The elementary particle Ξ^0 is placed in the baryon decuplet, shown below, at

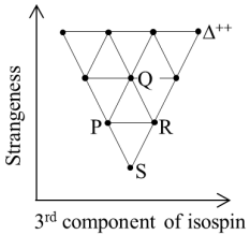


Fig. 1

a) P
b) Q
c) R
d) S

2) The intrinsic/permanent electric dipole moment in the ground state of hydrogen atom is (a_0 is the Bohr radius)

a) $-3ea_0$
b) zero
c) ea_0
d) $3ea_0$

3) The high temperature magnetic susceptibility of solids having ions with magnetic moments can be described by $\chi \propto \frac{1}{T+\theta}$ with T as absolute temperature and θ as constant. The three behaviors i.e. paramagnetic, ferromagnetic and anti-ferromagnetic are described, respectively, by

a) $\theta < 0,\ \theta > 0,\ \theta = 0$
b) $\theta > 0,\ \theta < 0,\ \theta = 0$
c) $\theta = 0,\ \theta < 0,\ \theta > 0$
d) $\theta = 0,\ \theta > 0,\ \theta < 0$

4) Which one of the following is an allowed electric dipole transition?

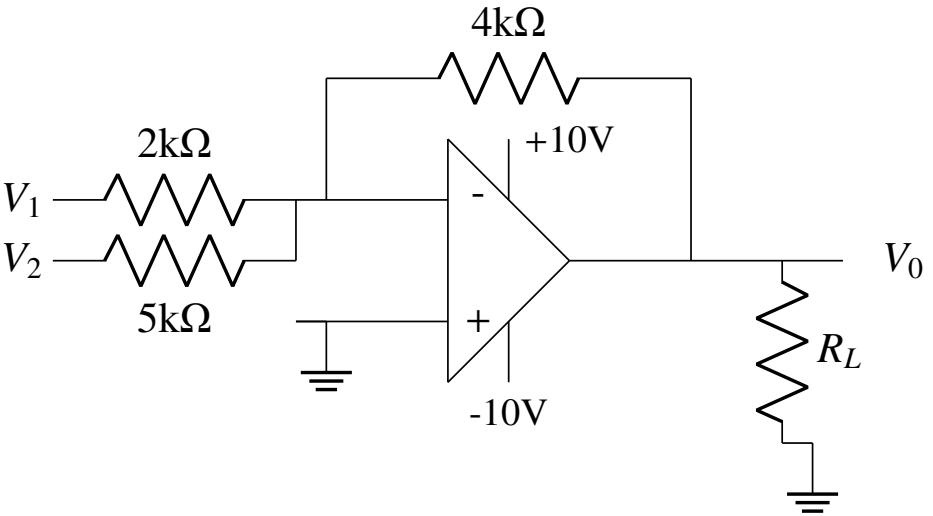
a) $^1S_0 \rightarrow {}^3S_1$
b) $^2P_{3/2} \rightarrow {}^2D_{5/2}$
c) $^2D_{5/2} \rightarrow {}^2P_{1/2}$
d) $^3P_0 \rightarrow {}^5D_0$

5) In the decay, $\mu^+ \rightarrow e^+ + \nu_e + X$, what is X?

a) γ
b) $\bar{\nu_e}$
c) ν_μ
d) $\bar{\nu_\mu}$

6) A spaceship is traveling with a velocity of $0.7c$ away from a space station. The spaceship ejects a probe with a velocity $0.59c$ opposite to its own velocity. A person in the space station would see the probe moving at a speed Xc, where the value of X is _____ (up to three decimal places).

7) For an operational amplifier (ideal) circuit shown below,



if $V_1 = 1\,\text{V}$ and $V_2 = 2\,\text{V}$, the value of V_0 is _____ V (up to one decimal place).

8) An infinitely long straight wire is carrying a steady current I. The ratio of magnetic energy density at distance r_1 to that at $r_2 (= 2\,r_1)$ from the wire is _____.

9) A light beam of intensity I_0 is falling normally on a surface. The surface absorbs 20% of the intensity and the rest is reflected. The radiation pressure on the surface is given by $X\frac{I_0}{c}$, where X is _____ (up to one decimal place). Here c is the speed of light.

10) The number of independent components of a general electromagnetic field tensor is _____.

11) If X is the dimensionality of a free electron gas, the energy (E) dependence of density of states is given by $E^{\frac{X}{2}-Y}$, where Y is _____.

12) For nucleus ^{164}Er, a $J^{\pi} = 2^{+}$ state is at 90 keV. Assuming ^{164}Er to be a rigid rotor, the energy of its 4^{+} state is _____ keV (up to one decimal place).

13) Given $\mathbf{V}_1 = \hat{i} - \hat{j}$ and $\mathbf{V}_2 = -2\hat{i} + 3\hat{j} + 2\hat{k}$, which one of the following $\mathbf{V}_3$ makes $(\mathbf{V}_1, \mathbf{V}_2, \mathbf{V}_3)$ a complete set for a three dimensional real linear vector space?

(A) $\mathbf{V}_3 = \hat{i} + \hat{j} + 4\hat{k}$
(B) $\mathbf{V}_3 = 2\hat{i} - \hat{j} + 2\hat{k}$
(C) $\mathbf{V}_3 = \hat{i} + 2\hat{j} + 6\hat{k}$
(D) $\mathbf{V}_3 = 2\hat{i} + \hat{j} + 4\hat{k}$