EEE207 Quick Quiz

1) In a semiconductor, $\boldsymbol{np = n_i^2}$ is always true. *True*

2) At T = 0K, all levels above the Fermi level (E_F) are **empty**. *True*

3) A n-type semiconductor has a net **negative** charge. *False*

4) At *very* high temperatures, a n-type semiconductor *can* become **intrinsic**. *True*

5) If E_g = 8eV, the material is an ***insulator***. *True*

6) In a metal-semiconductor junction, if $\Phi_S > \Phi_M$, we get a ***Schottky*** contact. *False*

7) For a p-n junction in equilibrium, the Fermi level, (E_F), is continuous. *True*

8) Schottky diodes generally have a ***higher*** operating speed than p-n junction diodes. *True*

9) **All** metal-semiconductor junctions can rectify. *False*

10) The built-in voltage in a p-n junction opposes further diffusion of majority carriers. *True*

11) At very low temperatures, a n-doped semiconductor can become ***intrinsic***. *True*

12) The expression $P(E) = \{1+\exp[(E-E_F)/kT]\}^{-1}$ is called the Fermi-Boltzmann function. *False*

13) For conduction in a semiconductor, you ***must*** have ***some*** electrons in the conduction band. *False*

14) The Fermi level is close to the *valence band* in a p-doped semiconductor. *True*

15) Learning about semiconductors is **very interesting**. *True*

16) A **group III** impurity will act as an **acceptor** in Silicon. *True*

17) At room temperature in a p-type semiconductor, $\boldsymbol{N_A \approx p}$. *True*

18) The quantised energy spacing for the levels $n = 1,2,3\ldots$in a quantum well varies as $\boldsymbol{n^2}$. *True*

19) To obtain an n-type semiconductor at room temperature, the acceptor level must be > 25meV from the conduction band edge. *False*

20) Ionised donor atoms are **positively** charged. *True*

21) Compensation doping occurs when a semiconductor is doped with ***both*** acceptors ***and*** donors. *True*

22) It is easy to use *compensation doping* to create ***intrinsic*** semiconductors. *False*

23) In ideally compensated material, ***both*** N_A and N_D disappear. *False*

24) The statement, *'No current can flow across a p-n junction if no external voltage is applied'*, is **always** true. *False*

25) The **minimum** thickness of the gate oxide in a metal oxide silicon transistor (MOST) is determined by the deposition uniformity. *False*

26) Light emitting diodes (LEDs) rely on the **stimulated** emission of photons. *False*

27) Electrons and holes can recombine in a **direct band-gap** semiconductor *only* with a change in momentum. *False*

28) The band-gap, $\mathbf{E_g}$, is defined as the separation between the conduction band and the valence band only at $\boldsymbol{p}$ (or $\boldsymbol{k}$) =0. *False*

29) Generally in a semiconductor, electrons and holes have the **same** effective mass, $\boldsymbol{m^*}$. *False*

30) According to **Heisenberg**, we cannot determine the *exact position* of a particle. *False*