E is wrong; other elements beside titanium have $A = 60$ (eg. $^{60}_{27}Co$, an unstable isotope of Cobalt), but the different number of protons (the Z number) leads to a different potential energy function and different energy levels.
F is wrong; all titanium isotopes have the same number of protons in the nucleus.
G is wrong; see answer to C; $l = 3$ corresponds to an f state and these are not occupied in the ground state.

Q15 The correct options are D and E

The first ionisation energy is the energy required to remove the least tightly bound electron. The electron configuration of rubidium is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s$ ($Z = 37$, and 5s shell fills before 4d shell; see Table 8 and Figure 20 of Unit 15). The electron in the 5s state is the least tightly bound.

Q16 A and F are correct

These particles are bosons. If particles contain an *odd* number of fermions, they are therefore themselves fermions, and obey the generalised exclusion principle. If particles contain an *even* number of fermions, they are bosons and do *not* obey the generalised exclusion principle.
CO is a boson, since it contains an even number of fermions (14 protons + 14 electrons + 14 neutrons)

$^{3}_{2}He$ is a fermion (2 protons + 2 electrons + 1 neutron)
NO is a fermion (15 protons + 15 electrons + 15 neutrons)

$^{9}_{4}Be$ is a fermion (4 protons + 4 electrons + 5 neutrons)

$^{14}_{7}N$ is a fermion (7 protons + 7 electrons + 7 neutrons)

$^{7}_{3}Li$ is a boson (3 protons + 3 electrons + 4 neutrons)
BeO is a fermion (12 protons + 12 electrons + 13 neutrons)

Q17 The correct response is F

A is irrelevant because the photons in laser light are bosons, so they do not obey an exclusion principle.

B is also not relevant; ^4He atoms are bosons, thus having the positive tendency to share the same quantum state.
C is not the correct response; although tunnelling is a purely quantum mechanical effect, it has no *direct* relation to the Pauli exclusion principle which is the concern of this question.
D is irrelevant because the wave-like properties that lead to diffraction are a consequence of de Broglie's equation which applies whether the particles involved are bosons or fermions.
E is also irrelevant; the quantum mechanical phenomenon of tunnelling is not directly relevant here.
F is correct; it is the Pauli pressure created by the electrons (fermions) which resists the collapse of the core of a red giant, thus forming a stable entity called a white dwarf.
G is irrelevant because these instabilities are thought to be due to a sudden transfer of angular momentum between the surface and a superfluid region inside the neutron star.

Q18 The correct answer is E

According to Unit 16,

$$E_{\max} = \frac{h^2 (N/V)^{2/3}}{8m_e}$$

so $$\frac{N}{V} = \left(\frac{E_{\max} \times 8m_e}{h^2}\right)^{3/2} = \left(\frac{8.0\times10^{-11}\ \mathrm{J}\times 8\times 9.11\times10^{-31}\ \mathrm{kg}}{\left(6.63\times10^{-34}\ \mathrm{J\ s}\right)^2}\right)^{3/2}$$

$$= 4.83 \times 10^{40}\ \mathrm{m^{-3}}$$

Hence $$P = \frac{2}{3}\frac{N}{V}\times\frac{3}{5}E_{\max} = \frac{2}{5}\frac{N}{V}E_{\max}$$

$$= \frac{2}{5}\times 4.83\times10^{40}\ \mathrm{m^{-3}}\times 8.0\times10^{-11}\ \mathrm{J} = 1.5\times10^{30}\ \mathrm{N\ m^{-2}}$$

(Note that $1\ \mathrm{J\ m^{-3}} = 1\ \mathrm{N\ m^{-2}}$ because $1\ \mathrm{J} = 1\ \mathrm{N\ m}$).