

ACDB4011 CHEMISTRY QUIZ 1

NAME William Young DATE: Sept 29, 2022

- up 1. (6 points) Indicate whether each of the following statements is true or false:
- ☐ T ☒ F ✓ Chemical energy is stored in the nucleus .
- ☐ T ☒ F ✓ There are three d orbitals.
- ☒ T ☐ F Strontium ion used in pyrotechnics produces green light in fireworks.
- ☒ T ☐ F X-rays have a longer wavelength than ultraviolet.
- ☒ T ☐ F ✓ Isotopes of the same element always have the same number of protons.
- ☐ T ☒ F ✓ If the velocity of a moving object increased two times its kinetic energy increased two times as well

- 6p 2. (6 points) How many of each type of sub-atomic particles are contained in an atom ^{110}Cd ?

Protons: no 48 ✓

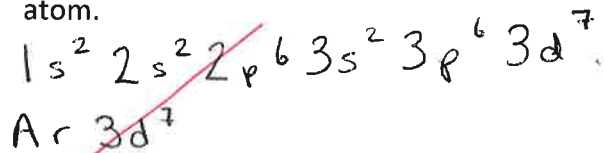
Neutrons: no 62 ✓ $\text{mass number} = 110$
 $110 - 48 = 62$

Electrons: no 48 ✓

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25
Mn

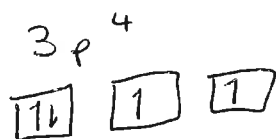
3. a) (6 points) Write the full and shorthand electronic configuration for manganese, Mn, atom.



- 3p
b) (3 points)
ground state?

How many unpaired electrons are there in a sulphur, S, atom in the

~~4~~ 2 unpaired electrons



- Op
4. (6 points) The radio station 92.1 FM broadcasts at a frequency of 9.21×10^7 Hz (92.1 MHz). Calculate the wavelength of the broadcast, and the energy of one photon.

Wavelength =

5. A 200 g mass is held at a height of 0.8 m above the ground.

a) (3 points) Calculate the gravitational potential energy stored in the mass before it is dropped.

2p

$$\begin{aligned} \text{Potential energy} &= mgh \quad \text{where } g = 10 \\ &= 200g \times 10 \times 0.8m \\ &= 0.2 \times 10 \times 0.8 \\ &= 4 \text{ J} \end{aligned}$$

0p b) (2 points) State the kinetic energy of the mass just before it hits the ground?

$$\begin{aligned} \text{Kinetic energy} &= \frac{1}{2} mv^2 \\ &= \frac{1}{2} 0.2v^2 \end{aligned}$$

$$\begin{aligned} v &= \frac{\sqrt{10}}{0.2} \\ v &= \sqrt{20} \end{aligned}$$

1p c) (3 points) Calculate the speed of the mass just before it hits the ground.

kinetic energy = $\frac{1}{2}mv^2$

$$\begin{aligned} v &= \frac{\sqrt{\frac{1}{2}mv^2}}{\frac{1}{2}m} \\ v &= \frac{\sqrt{0.5 \times 0.2^2}}{0.5} \\ &= \frac{0.2}{0.5} \\ &= 0.4 \text{ m/s} \end{aligned}$$

Assume kinetic energy = 10.

$$\begin{aligned} v &= \sqrt{\frac{\text{kinetic energy}}{\frac{1}{2}m}} \\ &= \sqrt{\frac{10}{0.5 \times 0.4}} \\ &= \sqrt{\frac{10}{0.2}} \\ v &= \sqrt{20} \\ v &\approx 4.5 \text{ m/s} \\ &\text{(no calculator)} \end{aligned}$$