

ACDB4011 CHEMISTRY QUIZ 1

NAME ZOE CUMMINS DATE: Sept 29, 2022

5p 1. (6 points) Indicate whether each of the following statements is true or false:

 ^T ^F F ✓ Chemical energy is stored in the nucleus. F ✓ There are three d orbitals. F ✓ Strontium ion used in pyrotechnics produces green light in fireworks. F ✓ X-rays have a longer wavelength than ultraviolet.T ✓ 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

$$KE = \frac{1}{2}mv^2$$

$$(10)^2 = 1000$$

$$(20)^2 = 2000$$

$$4000$$

6p 2. (6 points) How many of each type of sub-atomic particles are contained in an atom ^{110}Cd ?Protons: 48 ✓Neutrons: 62 ✓Electrons: 48 ✓Gamma
M

XRay

UV

Vis

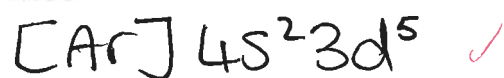
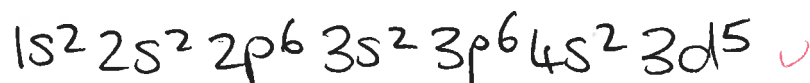
IR

Micro Radio

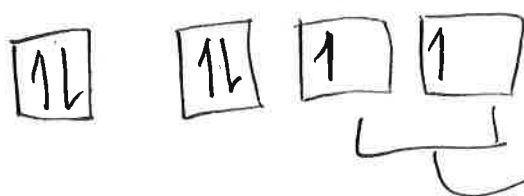
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3. a) (6 points) Write the full and shorthand electronic configuration for manganese, Mn, atom.



- b) (3 points) How many unpaired electrons are there in a sulphur, S, atom in the ground state?



2 unpaired.

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

$$c = \lambda f$$

$$f/\nu = 9.21 \times 10^7$$

$$\Delta E = h\nu$$

$$3 \times 10^8 = \lambda \times 9.21 \times 10^7$$

$$\lambda = 3.26 \text{ m} \quad \checkmark$$

$$\Delta E = 6.6 \times 10^{-34} \times 9.21 \times 10^7$$

$$\Delta E = 6.08 \times 10^{-26} \text{ J} \quad \checkmark$$

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

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

$$E_p = mgh$$

$$g = 9.8 \text{ ms}^{-2}$$

$$E_p = 0.2 \times 9.8 \times 0.8$$

$$E_p = 1.568$$

$$E_p = 1.57 \text{ J} \quad \checkmark$$

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

$$K_E = \frac{1}{2}mv^2$$

$$mgh = \frac{1}{2}mv^2$$

Transferred from  $E_p$  to  $E_k$

It's the same as  $E_p$

$$0.2 \times 9.8 \times 0.8 = \frac{1}{2} \times 0.2 \times v^2$$

$$v^2 = 15.68$$

$$v = 3.96 \text{ ms}^{-1}$$

$$K_E = \frac{1}{2} \times 0.2 \times (3.96)^2$$

$$K_E = 6.27 \text{ J}$$

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

$$K_E = \frac{1}{2}mv^2 \quad mgh = \frac{1}{2}mv^2$$

$$0.2 \times 9.8 \times 0.8 = \frac{1}{2} \times 0.2 \times v^2$$

$$v^2 = 15.68$$

$$v = 3.96 \text{ ms}^{-1} \quad \checkmark$$