

28p

ACDB4011 CHEMISTRY QUIZ 1

NAME John Gourlay DATE: Sept 29, 2022

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

- | T | F | |
|---------------|---------------|---|
| <u> </u> | <u>✓</u> | ✓ Chemical energy is stored in the nucleus . |
| <u> </u> | <u>✓</u> | ✓ There are three d orbitals. |
| <u> </u> | <u>✓</u> | ✓ Strontium ion used in pyrotechnics produces green light in fireworks. |
| <u> </u> | <u>✓</u> | ✓ X-rays have a longer wavelength than ultraviolet. |
| <u>✓</u> | <u> </u> | ✓ Isotopes of the same element always have the same number of protons. |
| <u>✓</u> | <u> </u> | ✗ If the velocity of a moving object increased two times its kinetic energy increased two times as well |

$$E_k = \frac{1}{2} m v^2$$

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

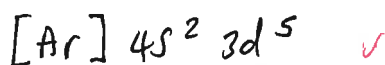
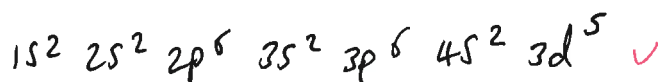
Protons: 48 ✓

Neutrons: 62 ✓

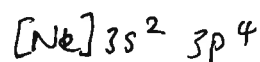
Electrons: 48 ✓

11

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 electrons ✓



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.

$\cancel{\nu = \frac{c}{\lambda}} \quad \cancel{\nu = \frac{3.0 \times 10^8}{6.6 \times 10^{-34}}}$

$\cancel{\lambda = 4.54 \times 10^4 \text{ m}}$

$E = \lambda \nu$

$\cancel{E = h \nu}$

$E = c \cdot h \cdot \nu$

E

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.

$$E_p = mgh$$

$$E_p = 0.2 \times 9.81 \times 0.8$$

$$E_p = 1.57 \text{ J to 2 d.p.} \quad \checkmark$$

2p

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

$$\Delta \quad E_k = \frac{1}{2} m v^2$$

$$E_p = E_k$$

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

3p

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

$$E_k = \frac{1}{2} m v^2$$

$$1.57 = \frac{1}{2} \times 0.2 \times v^2$$

$$v^2 = 15.696 \text{ ms}^{-1}$$

$$v = \sqrt{15.696}$$

$$v = 3.96 \text{ ms}^{-1} \text{ to 2 d.p.} \quad \checkmark$$