

10p

ACDB4011 CHEMISTRY QUIZ 1

NAME CRAIG MACLELLAN DATE: Sept 29, 2022

3p

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

~~T~~ F
~~T~~ _____

Chemical energy is stored in the nucleus .

_____ F ✓

There are three d orbitals.

_____ F ✓

Strontium ion used in pyrotechnics produces green light in fireworks.

~~T~~ _____

X-rays have a longer wavelength than ultraviolet.

~~T~~ _____ ✓

Isotopes of the same element always have the same number of protons.

~~T~~ _____

If the velocity of a moving object increased two times its kinetic energy increased two times as well

2p

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

Protons: 48 ✓

Neutrons: ~~48~~ _____

Electrons: 48 ✓

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

²⁵
Mn

~~[Ar] 5d~~

~~1s² 2s² 2p⁶ 3s²~~

- b) (3 points) ground state?

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

¹⁶
S

~~[Ne]~~

$\frac{1}{2}$

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.

$$v = f\lambda$$

$$\lambda = \frac{v}{f}$$

$$\lambda = \frac{340}{9.21 \times 10^7}$$

$$\lambda = 3.69 \times 10^{-6} \text{ m}$$

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.

3p

$$\begin{aligned}
 E_g &= mgh \\
 &= 0.2 \times 9.8 \times 0.8 \\
 &= \underline{1.57 \text{ J}} \quad \checkmark
 \end{aligned}$$

1p

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

$$\begin{aligned}
 E_k &= \frac{1}{2} mv^2 \quad (1p) \\
 &= \frac{1}{2} \times 0.2 \times \cancel{9.8^2} \\
 &= \underline{9.6 \text{ J}}
 \end{aligned}$$

0p

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

$$\begin{aligned}
 & \quad \quad \quad \underline{9.8 \text{ ms}^{-2}} \\
 E_k &= \frac{1}{2} mv^2 & \Delta E &= \frac{dE}{dt} & t &= \frac{d}{s} \\
 & & & & &= 0.8 \\
 & & & & &= \\
 \text{or } \frac{E_k}{0.5} &= mv^2 & S &= \frac{d}{t} & & \\
 & & &= \underline{0.8} & & \text{v is not} \\
 & & & & & \\
 & & & & & u = \\
 & & & & & a = \frac{v-u}{t} \\
 & & & & & t \times a = v-u \\
 & & & & & t = \frac{v-u}{a}
 \end{aligned}$$

~~$t = \frac{0.8 - 0}{9.8}$~~

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