Science 10 **Name:** KEY

Chemistry – Outcome 3 Practice **Mark:** /

1. Calculate the molar mass for each of the following. (1 mark each)

methanol CH_3OH — 32.05 g/mol

copper (II) hydroxide $Cu(OH)_2$ — 97.57 g/mol

2. How many atoms or molecules are present in 5.2 mol of $Zn_{(s)}$ atoms? (1 mark)

\# of atoms = $N_A \times n$ = (5.2 mol) × (6.02×10^{23} atoms/mol)

\# of atoms = 3.1304×10^{24} = 3.1×10^{24} atoms

3. How many moles are present in each of the following? (2 marks each)

8.00 g of nitrogen gas molecules N_2

m: 8.00 g
n: ?
M: 28.02 g/mol

$m = nM$

8.00 g = n (28.02 g/mol)

n = 0.2855... mol

n = 0.286 mol

0.251 g $(NH_4)_3PO_4$

m: 0.251 g
M = 149.12 g/mol
n: ?

$m = nM$

0.251 g = n (149.12 g/mol)

n = 0.001683... mol

n = 0.00168 mol

1.68×10^{-3} mol

4. What is the mass of each of the following samples? (2 marks each)

2.00 mol of hydrogen sulfide molecules H_2S

m: ?
n: 2.00 mol
M: 34.09 g/mol

$m = nM$

m = (2.00 mol)(34.09 g/mol)

m = 68.18 g

m = 68.2 g

9.67 mol of silicon tetrachloride $SiCl_4$

m: ?
n: 9.67 mol
M: 28.09 g/mol

$m = nM$

m = (9.67 mol)(28.09 g/mol)

m = 271.63 g

m = 272 g

5. You want to heat water to make a bath. How much heat (in J) must be used to raise the temperature of 180 L (180 kg) of tap water (enough for one bath) from 15°C to 31°C (near the ideal bath tub temperature)? The specific heat is that of pure water, 4.19 J/g•°C (1 mark)

Q: ?
m: 180 kg = 180000 g
c = 4.19 J/g·°C
Δt: 16 °C

$Q = mc\Delta t$

Q = (180000 g)(4.19 J/g·°C)(16 °C)

Q = 12067200 J

$Q = 1.2 \times 10^8$ J

6. A 25.00 g sample of silver is heated up to 200.0 °C after it absorbs 984.5 J of heat. What will be the final temperature, given that specific heat capacity for silver is 0.235 J/g°C? (2 marks)

Q: 984.5 J

m: 25.00g

c: 0.235 J/g·°C

Δt: ?

$Q = mc\Delta t$

$984.5\ J = (25.00g)(0.235\ J/g\cdot°C)\ \Delta t$

$\Delta t =$

7. How much heat energy is released when 1.00 kg of liquid gold at it solidification point is turned to solid gold? The specific heat capacity of gold is 0.129 J/g °C, the heat of vaporization/condensation of gold is 334.4 kJ/mol and heat of fusion/solidification is 12.55 kJ/mol.. (2 marks)

Q: ??

n: ?

m: 1000g

H_{sol}: 12.55 kJ/mol

$m = nM$

$(1000g) = n\ (196.97g/mol)$

$n = 5.0769...\ mol$

$Q = n \times H_{sol}$

$Q = (5.0769...\ mol)(12.55\ kJ/mol)$

$Q = 63.715...\ kJ$

Q = 63.7 kJ