

# Hillcrest High School

Grade 10

## PHYSICAL SCIENCE

June 2025 P1 + P2 **memo**

**SECTION A** \_\_\_\_\_ (89)

**QUESTION 1** \_\_\_\_\_ (10)

1.1 A  $\checkmark\checkmark$

1.2 A  $\checkmark\checkmark$

1.3 D  $\checkmark\checkmark$

1.4 C  $\checkmark\checkmark$

1.5 C  $\checkmark\checkmark$

**QUESTION 2** \_\_\_\_\_ (11)

2.1 Atoms of the same element having the same number of protons  $\checkmark$  but different number of neutrons  $\checkmark$

$$2.2 \quad {}^{26}\text{X} = 100 - 78,99 - 10 \\ = 11,01 \checkmark$$

$$\text{R.A.M} = \frac{78,99 \times 24 + 10,00 \times 25 + 11,01 \times 26}{100} \checkmark \\ = 24,32 \text{ g.mol}^{-3} \checkmark$$

2.3.1 magnesium  $\checkmark$

2.3.2 26  $\checkmark$

2,3,3 12  $\checkmark$

2.3.4 12  $\checkmark$

2.3.5 2 ✓

2.3.6 14 ✓

**QUESTION 3** \_\_\_\_\_ **(10)**

3.1 How does the amount of time the pot is on the stove affect the temperature of the water? ✓

3.2.1 DE ✓

3.2.2 BC ✓

3.2.3 EF ✓

3.3 As the temperature increases ✓  
The average kinetic energy increases ✓

The intermolecular forces decrease ✓

3.4 Strong intermolecular forces ✓  
small spaces between particles ✓  
low kinetic energy / particles vibrate in places ✓

**QUESTION 4** \_\_\_\_\_ **(7)**

4.1 Alkali metals ✓

4.2 Reason ✓ + so what ✓

e.g. fluorine has a higher nuclear charge so it requires more energy to remove an electron

e.g. fluorine has a smaller atomic radius so the electrons are closer to the nucleus and require more energy to remove

4.3 silicon ✓

Additional energy level ✓

4.4 The energy released ✓ when an electron is attached to an atom or molecule to form a negative ion ✓

**QUESTION 5** \_\_\_\_\_ **(17)**

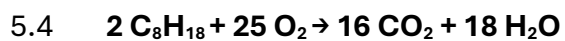
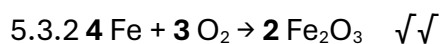
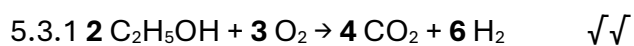
5.1.1  $\text{NH}_4\text{NO}_3$  ✓✓

5.1.2  $\text{Fe}_2\text{O}_3$  ✓✓

5.1.3  $\text{CF}_4$  ✓✓

5.2.1 copper (II) sulfide ✓✓

5.2.2 dinitrogen trisulfide  $\checkmark\checkmark$



LHS

$$2(12 \times 8 + 18) + 25(16 \times 2) = 1028 \text{ amu} \checkmark$$

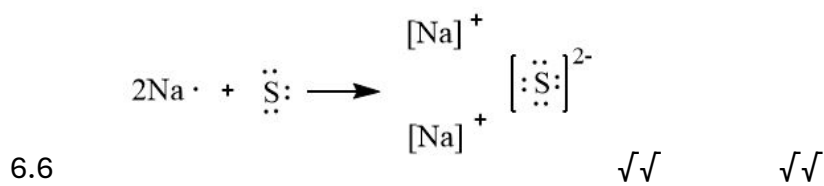
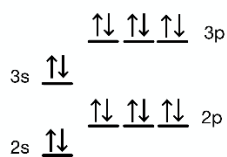
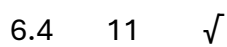
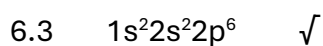
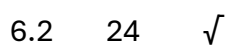
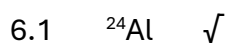
RHS

$$16(12 + 16 \times 2) + 18(2 \times 1 + 16) = 1028 \text{ amu} \checkmark$$

LHS = RHS

Mass of reactants = mass of products therefore conservation of mass has been upheld  $\checkmark$

**QUESTION 6** \_\_\_\_\_ **(10)**



**QUESTION 7** \_\_\_\_\_ **(6)**

7.1 a)  $H = H_{\text{products}} - H_{\text{reactants}}$

$$= 10 - 45$$

$$= -35 \text{ kJ} \quad \checkmark \checkmark$$

b)  $35 \text{ kJ} \checkmark$

7.2 Exothermic  $\checkmark$   $H < 0$  OR  $H_p$  less than  $H_r \checkmark$  (more energy released than absorbed)

7.3 Decrease  $\checkmark$

**QUESTION 8** \_\_\_\_\_ **(15)**

8.1  $n = \frac{m}{M} \checkmark$

$$= \frac{10,6}{106} \checkmark$$

$$= 0,1 \text{ mol} \checkmark$$

8.2  $n$  (MOLECULES)  $= n \times N_A \checkmark$

$$= 0,714 \times 6,02 \times 10^{23} \checkmark$$

$$= 4,2983 \times 10^{23} \text{ molecules}$$

$$n(\text{atoms}) = 4,2983 \times 10^{23} \times 5 \times \checkmark$$

$$= 2,15 \times 10^{24} \text{ atoms} \checkmark$$

8.3  $V = n \times V_m \checkmark$

$$= 0,42 \times 22,4 \checkmark$$

$$= 9,41 \text{ m}^3 \checkmark$$

8.4  $n = \frac{m}{M}$

$$= \frac{35}{342} \checkmark$$

$$= 0,1023 \text{ mol}$$

$$c = \frac{n}{v} \checkmark$$

$$= \frac{0,102}{0,33} \checkmark \checkmark$$

$$= 0,31 \text{ mol} \cdot \text{dm}^{-3} \checkmark$$

**QUESTION 9** \_\_\_\_\_ **(3)**

9.1 The temperature at which vapour pressure  $\sqrt{\quad}$  equals atmospheric pressure  $\sqrt{\quad}$

9.2 distillation  $\sqrt{\quad}$

**PART B** \_\_\_\_\_ **(36)**

**QUESTION 10** \_\_\_\_\_ **(10)**

10.1 C  $\sqrt{\quad}$

10.2 B  $\sqrt{\quad}$

10.3 C  $\sqrt{\quad}$

10.4 B  $\sqrt{\quad}$

10.5 A  $\sqrt{\quad}$

**QUESTION 11** \_\_\_\_\_ **(5)**

11.1 3 000 ml  $\sqrt{\quad}$

11.2 50cm<sup>2</sup>  $\sqrt{\quad}$

11.3 288 km.hr<sup>-1</sup>  $\sqrt{\quad}$

11.4 3 x 10<sup>14</sup> nHz  $\sqrt{\quad}$

11.5 200000 cm<sup>3</sup>  $\sqrt{\quad}$

**QUESTION 12** \_\_\_\_\_ **(16)**

12.1 X – compression

Y – rarefaction

12.2 Longitudinal  $\sqrt{\quad}$  wave

12.3 Distance between two successive points in  $\sqrt{\quad}$  in phase  $\sqrt{\quad}$

12.4 The particles of the medium vibrate at right angles  $\sqrt{\quad}$  to the direction of the wave  $\sqrt{\quad}$

12.5 Double  $\sqrt{\quad}$  (not just increase)

12.6 - removed because of mistake in Q

12.7) Cliff 1

$$\Delta x = v \cdot \Delta t$$

$$x = 320 \cdot \Delta t$$

(or)

$$x = 320 \cdot (t - 0,2)$$

(or)

Cliff 2

$$\Delta x = v \cdot \Delta t$$

$$200 - x = 320(t + 0,2)$$

$$200 - x = 320t$$

(6)

$$200 - x = 320(t - 0,2)$$

$$x = 320t$$

(or)

$$200 - x = 320t$$

$$x = 320(t + 0,2)$$

$$x = 68 \text{ m}$$

Or

To wall 2

$$\Delta x = v \cdot \Delta t$$

$$= 320(0,2)$$

$$= 64 \text{ m further to cliff 2}$$

$$\Delta x - \Delta x_{\text{further}}$$

$$200 - 64$$

$$= 136 \text{ m left between them}$$

(6)

$$\text{Cliff 1} = \frac{136}{2}$$

$$= 68 \text{ m to cliff 1}$$

$$\therefore \{ \text{cliff 2} = 64 + 68. \\ = 132 \text{ m}$$

Or

$$\begin{aligned}\Delta x &= v \cdot \Delta t \quad \checkmark \text{ Formula} \\ &= 320 (0,4) \quad \checkmark \\ &= 128 \text{ m}\end{aligned}$$

$$\begin{aligned}400 - 128 \quad \checkmark \\ = 272 \text{ m}\end{aligned}$$

$$\begin{aligned}\therefore \frac{272 \quad \checkmark \text{ m}}{2} \quad \text{(between them)} \quad \text{between their echoes} \\ = \frac{136 \text{ m}}{2} \quad \checkmark \quad \text{-2 again if echo used}\end{aligned}$$

Or

$$\begin{aligned}12.7] \\ \textcircled{1} \quad t_1 = \frac{\text{Total time}}{v} \quad \checkmark \text{ Formula} \\ = \frac{200}{320} \quad \checkmark\end{aligned}$$

$$\textcircled{2} \quad = 0,625 \text{ s}$$

$$\begin{aligned}\text{Time to} \quad \checkmark \\ = 0,625 - 0,2 \\ = 0,425 \text{ s}\end{aligned}$$

cliff  $\textcircled{3}$

$$\begin{aligned}\text{Then } \frac{0,425 \quad \checkmark \text{ m}}{2} \\ = 0,2125 \text{ s}\end{aligned}$$

$\therefore$

But to cliff 1

$$\begin{aligned}\Delta x &= v \cdot \Delta t \\ &= 320 (0,2125) \quad \checkmark \\ &= 68 \text{ m} \quad \checkmark \\ &\quad \longrightarrow\end{aligned}$$

Echo

Formula

$$\begin{aligned}\frac{400}{320} \quad \checkmark \\ = 1,25 \text{ s} \\ \therefore 1,25 - 0,4 \\ = 0,85 \quad \checkmark \\ \frac{0,85}{2} = 0,425 \text{ s} \quad \checkmark \\ \quad \quad \quad \div 2 \quad \checkmark\end{aligned}$$

Or

Cliff 1	Cliff 2
$\Delta x = v \cdot \Delta t$ $x = 320(t)$	$\Delta x = v \cdot \Delta t$ $400 - x = 320 \cdot (t + 0,4)$
	⊗
$x = 320(t - 0,4)$	$400 - x = 320t$
	⊗
$400 - x = 320t$	$x = 320(t + 0,4)$
$400 - x = 320(t - 0,4)$	$x = 320t$
$x = 68m$	

**QUESTION 13**

(5)

13.1 some aspects of the behaviour of electromagnetic radiation can best be explained using a wave model ✓ and some aspects can best be explained using a particle model ✓

13.2  $E = hf$  ✓

$$f = \frac{1,07 \times 10^{-22}}{6,63 \times 10^{-34}} \text{ ✓}$$

$f = 1,61 \times 10^{11}$  ✓