Gr 10 Physical Science November 2020 Memo

1.1 C
1.2 A
1.3 A
1.4 D
1.5 B
1.6 D
1.7 B
1.8 C
1.9 C
1.10 A

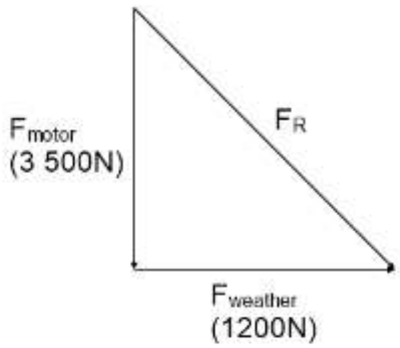
2.1 A vector is a physical quantity with both magnitude and direction. ✓✓

2.2 $F_{weather} = F_{current} + F_{wind}$

$= 350 + 850$ ✓

$= 1\,200$ N east ✓ (only correct answer ✓✓)

2.3.1



One mark per vector

2.3.2 $F_R^2 = 3\,500^2 + 1200^2$

$F_R = 3\,700$ N ✓

$\tan\theta = \frac{1200}{3700}$

$\theta = 17{,}969\ldots$ ✓

Bearing = 180°- θ

= 162,03° ✓

2.4 Do not sail due south, but more SE. ✓ or Adjust his direction 32,03° to the east etc.

3.1 The rate of change of position. ✓✓

3.2 270 $km.h^{-1}$ ✓

3.3 $V_f = V_i + a \Delta t$ ✓

$10 = 75 + a.\ 20$ ✓

$a = -3,25\ m.s^{-2}$ East ✓

or

$a = 3,25\ m.s^{-2}$ West

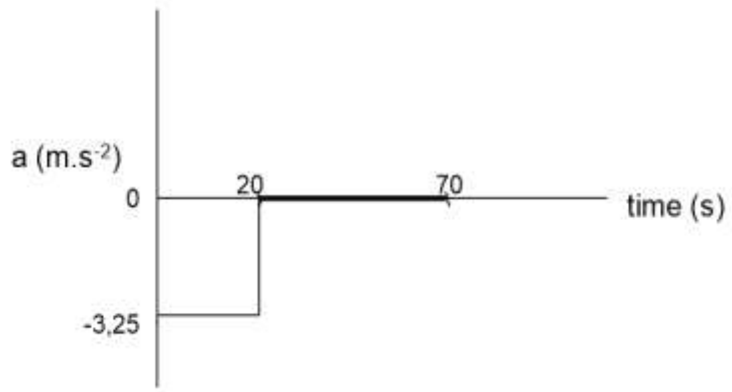
3.4 $v = \frac{\Delta x}{\Delta t}$ ✓

$10 = \frac{500}{\Delta t}$ ✓

$\Delta t = 50\ s$ ✓

Total time = 50 + 20 = 70 s ✓

3.5



Axis labelled and units indicated ✓

Shape of graph correct ✓

Initial acceleration correct ✓

Acceleration changes to 0 $m.s^{-1}$ at 20 s. ✓

End time indicated. ✓

3.6 The velocity of the aeroplane. ✓

4.1 $E_p = mgh$ ✓

$E_p = 0,150(9,8)(2,25)\text{P} = 3,31\ \text{J}$✓

4.2 $E_k = \frac{1}{2}mv^2$ ✓

$E_k = \frac{1}{2}(0,150)(5)^2$ ✓

$E_k = 1,88\ J$ ✓

4.3 $E_{M(A)} = E_{M(B)}$ ✓

$3,31 + 1,88 = 0 + \frac{1}{2}(0,15)v^2$ ✓

$v^2 = 69,2 \therefore v = 8,32 m \cdot s^{-1}$ ✓

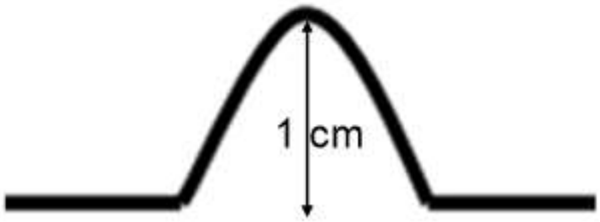
5.1.1 C ✓

5.1.2 F ✓

5.1.3 Any combination except A and E or B and F ✓

5.2.1 (partial) destructive interference ✓

5.2.2



Shape ✓

Amplitude ✓

5.3 $f = \frac{15}{60}$ ✓ $= 0,25\ Hz$ ✓

5.4 distance = speed x time ✓

Halve times ✓

Cliff 1: 340 x 1 = 340 m ✓ Cliff 2: 340 x 2 = 680 m ✓

340 + 680 = 1020 m ✓

6.1 The net charge of an isolated system remains constant during any physical process. ✓✓

6.2 $Q = \frac{Q_A + QB}{2}$

$Q = \frac{6-3}{2} P = 1,5\ C$ ✓

6.3 $n = \frac{Q}{q_e}$ ✓

$n = \frac{4,5}{1,6 \times 10^{-19}} P = 2,81\ \times 10^{19} e^{-}$ ✓

7.1 $\frac{1}{R_p} = \frac{1}{3} + \frac{1}{3}\ P = \frac{2}{3} P \therefore R_p = \frac{3}{2}$

$R = \frac{3}{2} + 2 = 3,9 \Omega$ ✓

7.2 V = I R ✓

$10 = I.3{,}5$ ✓

$I = 2{,}86\ A$ ✓

7.3 V = I R ✓

$V = 2{,}86(2)P = 5{,}71\ V\ P$

7.4 $Q = It$ ✓

$Q = 2{,}86(60) = 171{,}6C$ ✓

$V = \frac{W}{Q}$ ✓

$5{,}71 = \frac{W}{171{,}6}$ ✓

$W = 979{,}84$ J ✓

CHEMISTRY

8.1.1 11 protons (p^+)✓ 11 electrons (e^-)✓ 12 Neutrons (n^o)✓

8.1.2 charges✓ *all correct or 0*

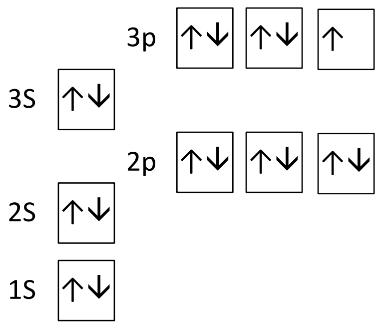
8.2 $(0.7 \times 35) + (0.3 \times 37) = 35.6$ ✓✓✓

8.3.1 Ionisation energy (IE) = minimum energy to remove an electron✓ from a mole of atoms✓.

8.3.2 IE for Li > IE for Na✓✓

8.3.3 As the alkali metal gets bigger it requires less energy✓ (easier) to remove an electron as it is further from the nucleus✓ and (it's shielded more by the lower energy level electrons).

9.1.1



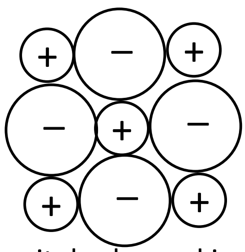
Orbital labels ✓ blocks✓ ✓electrons

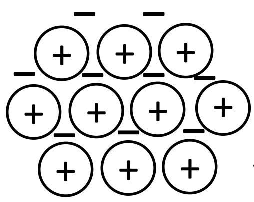
9.1.2 ✓ ✓ ✓ ✓

9.1.3 ionic

9.1.4 metallic

9.1.5

 ✓

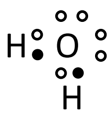
 ✓

a) oppositely charged ions ✓

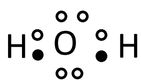
b) sea of delocalised electrons around positive kernels (ions)✓

9.1.6 a) brittle, dissolves in water ✓✓ b) malleable, ductile, conductor ✓✓

9.2



✓ *(or linear)*



10.1.1 $(NH_4^+)_2CO_3^=$ ✓*correct ions* & ✓*correct ratio*

10.1.2 $Mg(NO_3^-)_2$ ✓✓ " "

10.1.3 H_2S ✓✓ " "

10.2 Iron (III) sulphate ✓✓

10.3.1 $N_2 + 3H_2 \rightarrow 2NH_3$ ✓✓ (*right or wrong, ie. 2 or 0)*

10.3.2 $Cu + 4HNO_3 \rightarrow 2H_2O + 2NO_2 + Cu(NO_3)_2$ ✓✓

10.4 $2NaOH + H_2SO_4 \rightarrow 2H_2O + Na_2SO_4$ *reagents*✓*products*✓*balanced*✓

11.1 The amount of substance with the same number of particles✓ as there are atoms in 12g of pure ^{12}C ✓ (isotope).

11.2.1 Hydrochloric acid✓

11.2.2 $2HCl_{(aq)} + Mg \rightarrow H_{2(g)} + MgCl_{2(aq)}$

mole ratio: 2 : **1 → 1 : 1**

Mg: $n = \frac{m}{M} = \frac{13}{24} = 0.542\ mol \cong 0.54mol$✓

$MgCl_2$: M = 24 + 2(35.5) = 95 g.mol^{-1} ✓

$n = 0.54mol = \frac{m}{M} = \frac{m}{95} \quad \therefore m = n \cdot M = 0.54 \times 95\surd = 51.3\ g\surd$

11.2.3 $H_2 : n = 0.54mol = \frac{v}{V_m}\surd = \frac{v}{22.4} \quad \therefore v = n \cdot V_m = 0.54 \times 22.4\surd = 12.096 \cong 12.1dm^3\surd$

11.2.4a) STP= Std Temp & Press✓

11.2.4b) because a change in temp and/or pressure affects the volume✓

11.3 $\%Mg = \frac{24}{95} \times \frac{100}{1}\surd\surd = 0.2526 \times 100 = 25.26 \cong 25.3\%\ \surd\ (accept\ 1\ decimal)$