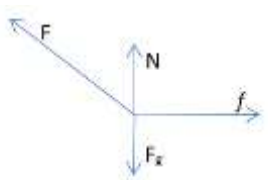
Grade 11 Science Nov 2020 Exam MEMO

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

2.1 A physical quantity with magnitude and direction. ✓✓

2.2.1



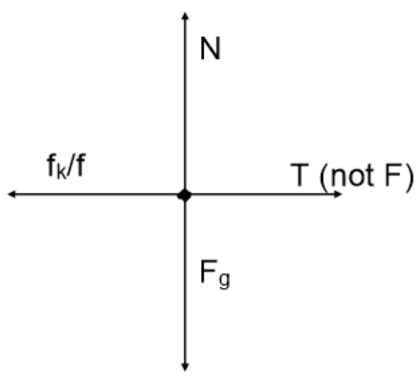
2.2.2 $F_{res} = F_x - f = 50\cos 25° - 8{,}5$ ✓ $= 36{,}82\ N$ ✓ left ✓

3.1 A body will remain in its state of rest or uniform motion unless a non-zero resultant/net force acts on it. ✓✓

3.2 Because of inertia/Newton's First Law ✓, the mask will keep moving forward (at a constant velocity) ✓ when the car stops/slows down. ✓

4.1 When a resultant/net force acts on an object, the object will accelerate in the direction of the force at an acceleration that is directly proportional to the force and inversely proportional to the mass of the object. ✓✓

4.2 1 mark per vector ✓✓✓✓



4.3 $F = ma$ ✓

$T - f_k = ma$

$T = 5a + 14,7$ .... 1 ✓

$F_g - T = ma$

$T = 196 - 20a$ ✓

$5a + 14.7 = 196 - 20a$

$a = 7,25\ m.s^{-2}$ ✓

$f_k = \mu_k N$ ✓

$= 0,3(5)(9.8)$ ✓

$= 14,7N$

5.1 (Each particle in the universe attracts every other particle with a gravitational) force that is directly proportional to the product of their masses ✓ and inversely proportional to the square of the distance between their centres. ✓ (2)

5.2 $F = \frac{Gm_1m_2}{r^2}$ ✓

$F = \frac{(6{,}67 \times 10^{-11})(7{,}35 \times 10^{22})(2{,}84 \times 10^{17})\ ✓}{(386\ 000 \times 10^3)^2\ ✓}$

$F = 9{,}34 \times 10^{12}\ N$ ✓ (3)

5.3 High tide. ✓ (1)

5.4 LESS THAN. ✓

The distance between the moon and the Indian Ocean has increased. ✓ (2)

[8]

6.1 The (magnitude of the electrostatic) force (exerted by two point charges on each other) is directly proportional to the product of the magnitudes of the charges ✓ and inversely proportional to the square of the distance between them. ✓ (2)

6.2.1 $F_{net} = F_Y -^{✓} F_X$

$F_{net} = \frac{kQ_YQ_{e^-}}{r_Y^2} - \frac{kQ_XQ_{e^-}}{r_X^2}$ ✓ formula $F = \frac{kQ_1Q_2}{r^2}$

$F_{net} = \frac{(9 \times 10^9)(2 \times 10^{-6})(1{,}6 \times 10^{-19})}{(2{,}5 \times 10^{-3})^2}$ ✓ $- \frac{(9 \times 10^9)(8 \times 10^{-6})(1{,}6 \times 10^{-19})}{(12{,}5 \times 10^{-3})^2}$ ✓

$F_{net} = 3{,}87 \times 10^{-13}\ N$ right ✓ (5)

6.2.2 $F_Y = F_X$ ✓ (mark for ANY indication that the learner knows $F_Y = F_X$ if $F_{net} = 0$)

Charge X is **4 times** charge Y, ∴ distance from X should be **2 times** the distance from Y. (*There are other, more mathematical ways to do this*).

∴ 10 mm (to the right of X) ✓ (2)

[9]

7.1 The magnitude of the induced emf across the ends of a conductor is directly proportional to the rate of change in the magnetic flux linkage with the conductor. ✓✓ (2)

7.2.1 - Increase the strength of the magnetic field. ✓
- Increase the size of the area of the coil of wire. ✓ (2)

7.2.2 - Increase the speed of rotation of the loop of wire. ✓
- Increase the number of coils. ✓ (2)

[6]

8.1 Rate at which energy is transferred ✓ ✓ (or amount of energy transferred per unit time)

8.2 P $= I_{10\Omega}^2 \times R$ ✓ $I_A = 0,212... \times \frac{12}{18}$ ✓ = 0,14 A ✓

0,45 $= I_{10\Omega}^2 \times 10$ ✓

$I_{10\Omega} = 0,212...$ (A)

8.3 $Q = It = 0,21 \times 100$ ✓ = 21 C✓

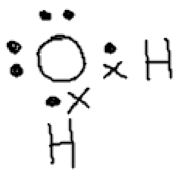
8.4 $V_{10\Omega} = IR$ ✓ = 0,21 ✓x 10 ✓= 2,1 V OR $V_{tot} = I \times R_{tot}$✓

$V_p = IR =$ 0,21✓ x $\left(\frac{12x6}{12+6}\right)$ ✓= 0,21 x 4 = 0,84 V = 0,21✓ x (10 ✓ + $\frac{12x6}{12+6}$ ✓✓)

V_{tot} = 2,1 +✓ 0,84 = 2,94 V ✓ = 2,94 V ✓

8.5 Decrease

9.1.1 Bonding pairs ✓ Lone pairs ✓



9.1.2 Single bonding pair ✓

Triple bond ✓

9.2.1 A pair of electrons that is shared between two atoms in a covalent bond. ✓✓

9.2.2 2 (two) ✓

9.3 H-O: △EN = 3,5 – 2,5 = 1,4

C-H: △EN = 2,5 – 2,1 = 0,4

H-O more polar ✓, △EN is bigger. ✓

9.4 linear ✓

9.5 Polar ✓, it has an asymmetrical electron cloud/distribution ✓

10.1.1 induced dipole-induced dipole / London ✓

10.1.2 dipole-induced dipole ✓

10.1.3 dipole-dipole ✓

10.2 NH_3 polar ✓ BF_3 non-polar ✓ I_2 non-polar ✓

I_2 dissolves in BF_3, ✓ like dissolves like. ✓

10.3 H_2O hydrogen bond ✓ H_2S dipole-dipole

More energy required to break stronger hydrogen bond. ✓

H_2O has higher boiling point. ✓

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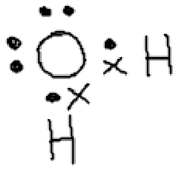

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11.1 The reactants that is used up first✓✓

11.2 $N_2 (g) + 3H_2 (g) \rightarrow 2NH_3 (g)$

$n(N_2) = \frac{V}{V_m}\surd = \frac{200}{50}\surd = 4\ mol$

$n(H_2) = \frac{m}{M} = \frac{60}{2(1)}\surd = 30\ mol$

$n(H_2)$ needed = 4 x 3✓

= 12 mol

(∴ N_2 is limiting)

(∴ H_2 is in excess)

$n(H_2)$ left over = 30-12✓

= 18 mol

V (H_2) left over = 18x50✓

= 900 dm^3

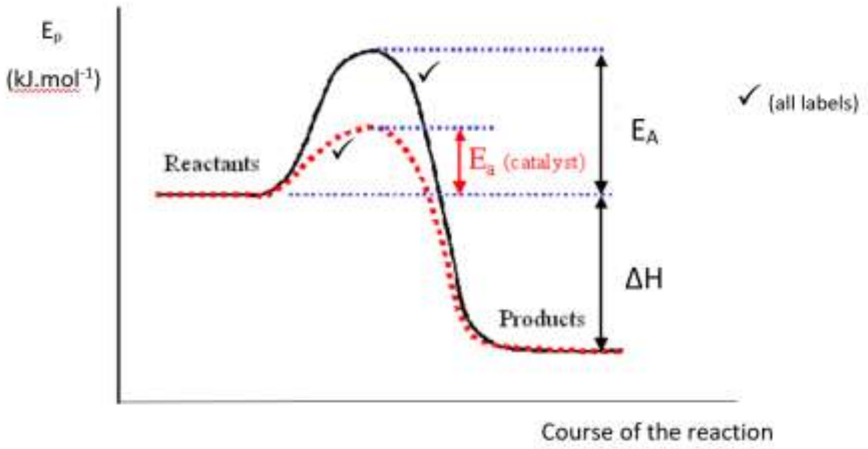
$V(NH_3)$ = 2x200✓ = 400dm^3

TOTAL volume gases = 900 + 400 = 1300 dm^3✓

11.3 % yield = $\frac{140}{400}\surd$ x $100 = 35\%$✓

11.4 A substance that gets added to a reaction to increase the rate of the reaction by lowering the activation energy. ✓✓ (The catalyst itself does not undergo any permanent change.)

11.5



11.6 ΔH = Energy in – energy out = 90 – 130✓ = – 40 kJ ✓ (not .mol^{-1})

12.1 Forms hydroxide ions when dissolved in water. ✓✓

12.2 $Zn(NO_3)_2$ ✓

12.3 ZnO and H_2O or HNO_3 and $Zn(NO_3)_2$ ✓✓ (2 or 0)

12.4 neutralization reaction

12.5 Produces only one hydronium ion in water.

Or ✓✓

Donates only one hydrogen ion.

12.6 dative covalent ✓

12.7 red ✓

12.8 yellow ✓

13.1 Oxidation is the loss of electrons. ✓✓

13.2 Reaction 1 ✓
There is and decrease in the oxidation number of S, therefore it got reduced. ✓

13.3 Reduced ✓
There was a decrease in the oxidation number or it gained electrons. ✓

13.4 Red: $SO_2 + 4H^+ + 4e^- \rightarrow S + 2H_2O$ ✓

Oxi: $2H_2S \rightarrow 2S + 4H^+ + 4e^-$ ✓ x2 ✓

$SO_2 + 2H_2S \rightarrow 3S + 2H_2O$ ✓

13.5 Mn ✓