Instructions

1. This question paper consists of SEVEN questions
2. Answer ALL questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Leave ONE line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. Show ALL formulae and substitutions in ALL calculations.
8. Round off your final numerical answers to TWO decimal places.
9. Give brief motivations, discussions, et cetera where required.
10. Write neatly and legibly.

Question 1

Multiple-choice questions: Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write down only the letter (A – D) next to the question number (1.1 – 1.4). (i.e. 1.5 E)

1.1 Peter-John travelled at an average velocity of 4 $m \cdot s^{-1}$. Which of the following is correct?

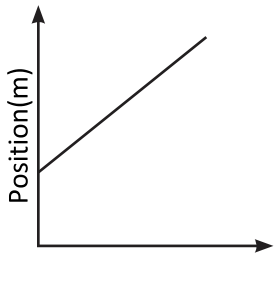
A His average speed must also be 4 $m \cdot s^{-1}$

B His average speed can be smaller or equal to 4 $m \cdot s^{-1}$ C His average speed can be greater or equal to 4 $m \cdot s^{-1}$

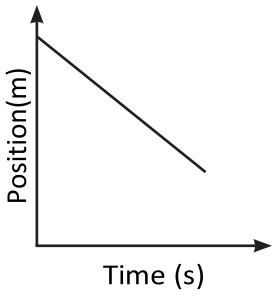
D His average speed can have any positive value (2)

1.2 Which of the following position–time graphs represent an object moving with a constant acceleration?

A



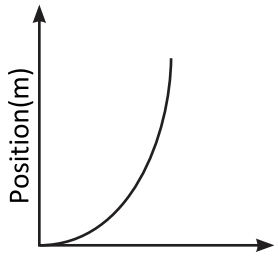
B



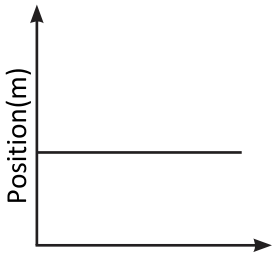
Pearson

Time: 40 minutes

C



D



(2)

1.3 When a metal conductor becomes hot, its resistance increases. This is because ...

A the atoms expand with heat; therefore, they are more in the way of the electrons.

B the forces between the atoms increase, making it difficult for electrons to pass.

C the atoms move further apart, so it is harder for electrons to move between them.

D the atoms vibrate more, so it is harder for electrons to move between them. (2)

1.4 Which one of the following statements regarding resistance is true? Resistance ...

A is a measure of the opposition to the flow of charge.

B is a measure of the rate of flow of charge.

C Is a measure of the amount of energy dissipated per charge unit in a resistor?

D increases with increasing thickness of a resistor. (2)

1.5 The bob on a pendulum reaches a maximum velocity of *v* after it is released from a height *h*. From what height does it have to be released to reach a maximum velocity of 2v?

A 1,5*h*

B √2*h*⁻

C *2h*

D 4*h* (2)

[10]

Question 2 SECTION B

A metal ball with a mass of 150 g is released on a track from a height of h_1. When it is a metre above the ground, its kinetic energy is 1,76 J.

2.1 Define kinetic energy. (2)

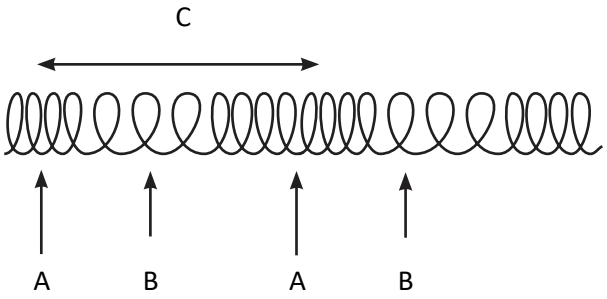
2.2 Ignore the influence of friction and calculate the height from which it was released. (5)

2.3 Calculate the velocity of the ball when it reaches the ground. (3)

[10]

Question 3

3.1 The diagram shows a longitudinal wave in a spring.



3.1.1 Give the appropriate labels for A, B and C on the diagram. (3)

3.1.2 A teacher produces longitudinal waves in a spring. The waves cover the 4 m length in 1,45 s. Exactly 2,5 waves are produced per second. Calculate the wavelength of the waves. (5)

3.2 You and a friend are given a drum and a stopwatch. You are asked to determine the speed of sound through the air. You can carry out the experiment on an open field, which is exactly 500 m long.

3.2.1 Explain how you will carry out the experiment. (2)

3.2.2 Calculate the speed of sound to the nearest metre, if the sound takes 1,49 seconds to travel 500 m. (3)

3.2.3 How will the speed of sound measured through water differ from the speed of sound measured through air? (1)

[14]

Question 4

A plant is left in a room. The only source of light is an orange light with a wavelength of 600 nm. An investigation showed that the plant utilises 30% of the energy from this light.

4.1 What is a photon? (2)

4.2 How many photons of this light will it take for the plant to store 475 kJ of energy in food? (4) [6]

Question 5

5.1 Two 1,5 V cells are connected in series. They are then connected in series to a 4 Ω bulb, a switch and a combination of two 4 Ω resistors in parallel. Draw a circuit diagram of this circuit. Also include a voltmeter which will measure the potential difference over the cells and an ammeter which will measure the current through one of the 4 Ω resistors. (6)

5.2.1 Define *emf*. (2)

5.2.2 Determine the *emf* of the battery in this circuit. (1)

5.3 Except for the temperature of a resistor, name two other factors that can influence the magnitude of the resistance of a resistor. (2)

5.4.1 Calculate the resistance of the two 4 Ω resistors in parallel. (2)

5.4.2 Calculate current flowing in the circuit. (

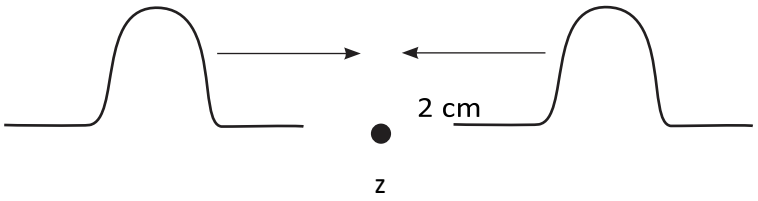
5.5 50 C of charge passes through a resistor in 10 s. The potential difference across the resistor is 2 V. Calculate the amount of energy that will be transferred by the current to

the resistor in 10 s. (3)

[20]

Question 6

6.1 Two pulses with equal amplitudes move towards each other and reach the same point Z in a medium.



6.1.1 Explain what will happen when the pulses meet at point **Z**. (2)

6.1.2 What is the phenomenon observed in question 6.1.1 called? (1)

6.1.3 Explain what will happen after the pulses meet. (2)

6.2 A wave is created in a wave tank in an industrial laboratory. A float on the side of the tank moves up and down on a scale that shows its minimum height as 0,5 m and the maximum as 2,1 m.

6.2.1 Define the frequency of a wave. (2)

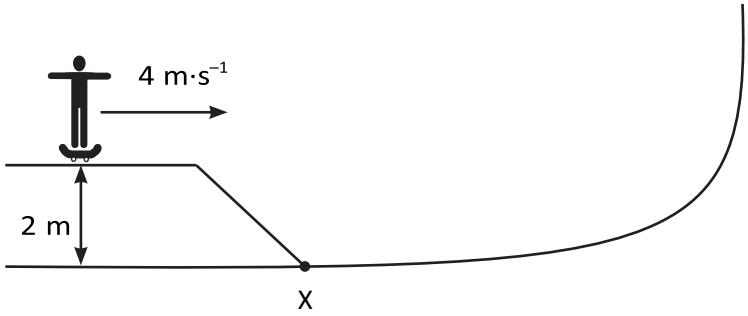
6.2.2 Explain why this is considered to be a transverse wave. (2)

6.2.3 Calculate the amplitude of the waves. (2)

[11]

Question 7

A boy with a mass of 70 kg is skateboarding. His path is represented in the diagram below. His velocity on the 2 m high platform is 4 $m \cdot s^{-1}$, as indicated.



7.1 State the law of conservation of energy. (2)

7.2 Calculate the boy's kinetic energy while on the platform. (3)

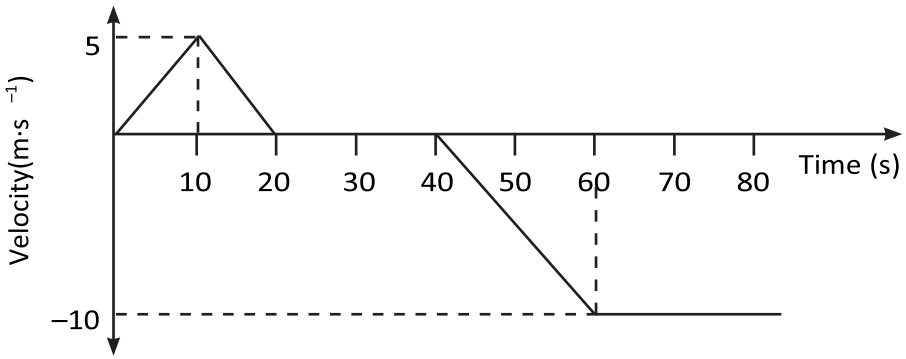
7.3 Calculate the boy's speed when he reaches point **X**. (4)

7.4 Calculate the maximum height the boy can reach on the opposite side. (4)

[13

Question 8

The velocity–time graph below represents the motion of a train moving on a straight track. It initially moves in a southerly direction.



8.1 Describe carefully the train's motion during the first 40 seconds. (5)

8.2 At what time does the train reach its furthest point south from the beginning of the motion? (1)

8.3 During what time interval is the train moving at a constant non-zero velocity? (1)

8.4 Without using equations of motion, calculate the magnitude and direction of the train's acceleration during the first 10 seconds. (4)

8.5 Without using equations of motion, calculate the magnitude of the train's displacement after 80 seconds. (5)

[16]

Total: [100]

END

PHYSICAL SCIENCES P2

GRADE 10 NOV EXAMS

TERM 4 2021

MARKS: 100

TIME: 2 hours

DATE: NOV2021

Name: **Surname:**

Instructions and information

1. This question paper consists of SEVEN questions
2. Answer ALL questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Leave ONE line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. Show ALL formulae and substitutions in ALL calculations.
8. Round off your final numerical answers to TWO decimal places.
9. Give brief motivations, discussions, et cetera where required.
10. Write neatly and legibly.

Question 1 SECTION A

Multiple-choice questions: Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write down only the letter (A – D) next to the question number (1.1 – 1.4). (i.e. 1.5 E)

1.1 Which one of the following is a physical change?

A The combustion of hydrogen

B The rusting of a piece of iron C The sublimation of $CO_2(s)$

D The decomposition of mercury oxide into its elements (2)

1.2 Why do halogens have high ionisation energies?

A They have many electrons

B They have full outer (valence) energy levels

C They have a high nuclear charge compared to their size

D They have large nuclei (2)

1.3 Which one of the following is not a property of metals?

A Good conductor of electricity

B Good conductor of heat

C Ductile

D Brittle (2)

1.4 Which of the following is NOT true for a chemical change?

A Mass is conserved

B Atoms are conserved

C Molecules are conserved

D There is a change in energy (2)

1.5 Which of the following substances is molecular?

A Lithium (Li)

B Oxygen (O_2)

C Silicate glass (SiO_2)

D Marble ($CaCO_3$) (2)

[10]

Question 2 SECTION B

2.1 Sulfur and iron filings are mixed. The mixture is heated and forms iron(II) sulfide.

2.1.1 What kind of mixture is the one mentioned above? (1)

2.1.2 Give a reason for your answer to question 2.1.1. (1)

2.1.3 Define a *compound*. (2)

2.1.4 Which of the substances mentioned above is a compound? (1)

2.1.5 Write down the formula of iron(II) sulfide. (2)

[7]

Question 3

3.1 The only stable isotope of phosphorus is phosphorus-31 (^{31}P).

3.1.1 Define *isotopes*. (2)

3.1.2 Draw the Aufbau diagram of the electron structure of phosphorus. (3)

3.1.3 Explain what is meant by the term *orbital*. (1)

3.1.4 What is the maximum number of electrons that can occupy an orbital? (1)

3.1.5 How many protons are there in a phosphorus-31 atom? (1)

3.1.6 Calculate the number of neutrons in a phosphorus-31 atom. (2)

3.1.7 Define *relative atomic mass*. (2)

3.2 Phosphorus combines with hydrogen to form phosphine (PH_3).

3.2.1 What type of bonding is found in phosphine? (1)

3.2.2 How does this kind of bonding form in phosphine? (3)

3.2.3 What kind of particles will phosphine be made of? (1)

3.2.4 Draw a Lewis diagram of phosphine (PH_3). (3)

[20]

Question 4

4.1 What is defined by 'number of moles per unit volume'? (1)

4.2 500 cm^3 of a 0,9 $mol.dm^{-3}$ copper nitrate ($Cu(NO_3)_2$) solution is prepared.

4.2.1 Calculate the molar mass of copper nitrate. (2)

4.2.2 Calculate the mass of copper nitrate that must be dissolved to make up this solution. (3)

4.3 The formula of hydrated copper sulphate is $CuSO_4.5H_2O$.

20 g of the water free $CuSO_4$ remains after the hydrated salt is heated to remove the water of crystallisation.

Calculate the mass of the hydrated salt that was heated. (4)

4.4 500 cm^3 of a 0,5 $mol \cdot dm^{-3}$ hydrochloric acid is neutralised by sodium hydroxide The balanced equation for the reaction is as follows:

$NaOH + HCl \rightarrow NaCl + H_2O$

Calculate the mass of dry sodium hydroxide needed to fully neutralize 500 cm^3 of the acid. (6)

[16]

Question 5

The periodic table is an orderly arrangement of elements according to their properties and structures.

5.1 Describe the trends in boiling points of substances in periods 2 and 3 of the periodic table from left to right. (3)

5.2 Identify the halogen in period 2 and then draw the Aufbau diagram of its electron structure. (3)

5.3 How is the ionisation energy of metals related to their reactivity? (2)

5.4 Both sodium and chlorine are found in the third period of the periodic table.

5.4.1 Which one of sodium or chlorine will have the highest electronegativity? (1)

5.4.2 Refer to the definition of electronegativity as well as the electron structure of the atoms and explain your answer to question 5.4.1. (3)

[12]

Question 6

When pollen that is suspended in water is viewed through a microscope, Brownian motion is observed.

6.1 Describe what you will observe. (2)

6.2 Use the kinetic molecular model of liquids to explain this motion. (3)

6.3 Why can Brownian motion not be observed in solids? (2)

[7]

Question 7

7.1 Write down the Law of constant composition. (2)

7.2 Hydrogen gas and nitrogen gas are used to make ammonia gas (NH_3)

7.2.1 Calculate the percentage composition of hydrogen in ammonia. (3)

7.2.2 Write down a balanced equation representing the reaction between hydrogen gas and nitrogen gas to form ammonia. (3)

7.2.3 Calculate the number of moles of ammonia in 20 g of ammonia gas. (3)

7.2.4 Calculate the volume that 20 g of ammonia gas would occupy at standard temperature and pressure (STP). (3)

7.3 Aluminium reacts with HCl gas to give aluminium chloride and hydrogen gas:

$$2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$$

If 20 g of aluminium reacts with an excess of HCl, calculate the theoretical yield (in g) of hydrogen gas that forms. (6)

7.4 A compound consists of 40% carbon, 6,65% of hydrogen and 53,35% oxygen.

Determine the empirical formula of the compound. (5)

7.5 By performing the necessary calculations, prove that mass is conserved in when the following reaction takes place:

$$2H_2O_2 \rightarrow 2H_2O + O_2$$ (3)

[28]

Total: [100]

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^{θ}	$1{,}013 \times 10^{5}$ Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	22,4 $dm^3 \cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^{θ}	273 K
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}$ C
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}$ mol^{-1}

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$

MOTION/*BEWEGING*

$v_f = v_i + a\,\Delta t$	$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$ or/*of* $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$
$v_f^{\,2} = v_i^{\,2} + 2a\Delta x$ or/*of* $v_f^{\,2} = v_i^{\,2} + 2a\Delta y$	$\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$ or/*of* $\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$

TABLE 3: THE PERIODIC TABLE OF ELEMENTS
TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE

KEY/*SLEUTEL*

Key	
Atomic number / *Atoomgetal*	29
Electronegativity / *Elektronegatiwiteit*	1,9
Symbol / *Simbool*	Cu
Approximate relative atomic mass / *Benaderde relatiewe atoommassa*	63,5

2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
																2 He 4
4 1,5 Be 9											5 2,0 B 11	6 2,5 C 12	7 3,0 N 14	8 3,5 O 16	9 4,0 F 19	10 Ne 20
12 1,2 Mg 24											13 1,5 Aℓ 27	14 1,8 Si 28	15 2,1 P 31	16 2,5 S 32	17 3,0 Cℓ 35,5	18 Ar 40
20 1,0 Ca 40	21 1,3 Sc 45	22 1,5 Ti 48	23 1,6 V 51	24 1,6 Cr 52	25 1,5 Mn 55	26 1,8 Fe 56	27 1,8 Co 59	28 1,8 Ni 59	29 1,9 Cu 63,5	30 1,6 Zn 65	31 1,6 Ga 70	32 1,8 Ge 73	33 2,0 As 75	34 2,4 Se 79	35 2,8 Br 80	36 Kr 84
38 1,0 Sr 88	39 1,2 Y 89	40 1,4 Zr 91	41 Nb 92	42 1,8 Mo 96	43 1,9 Tc	44 2,2 Ru 101	45 2,2 Rh 103	46 2,2 Pd 106	47 1,9 Ag 108	48 1,7 Cd 112	49 1,7 In 115	50 1,8 Sn 119	51 1,9 Sb 122	52 2,1 Te 128	53 2,5 I 127	54 Xe 131
56 0,9 Ba 137	57 La 139	72 1,6 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 1,8 Tℓ 204	82 1,8 Pb 207	83 1,9 Bi 209	84 2,0 Po	85 2,5 At	86 Rn
88 0,9 Ra 226	89 Ac															

58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175
90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Exemp

Time: 2 l

Final Year Examination Paper 1

MEMORANDUM

1.1 C✓✓ (2)

1.2 C✓✓ (2)

1.3 D✓✓ (2)

1.4 A✓✓ (2)

1.5 D✓✓ (2)

[10]

2.1 Kinetic energy is the energy an object possesses as a result of its motion. ✓✓ (2)

2.2 $E_{m\ 1\ metre} = mgh + \frac{1}{2}mv^2$✓

$= (0.15)(9,8)(1) + (1,76)$✓

$= 3,23$ J

$E_{m\ top} = mgh + \frac{1}{2}mv^2$

$3,23 = (0,15)(9,8)h + 0$✓

$h = 2,20$ m✓ (5)

2.3 $(mgh + \frac{1}{2}mv^2)_{bottom} = E_{m\ top}$ ✓

$0 + \frac{1}{2}(0,15)v^2 = 3,23$ ✓

$v = 6,56\ m \cdot s^{-1}$ ✓ (3)

[10]

3.1.1 A: compression ✓

B: rarefaction ✓

C: wavelength ✓ (3)

3.1.2 $v = \frac{\Delta x}{\Delta t}$

✓ ✓

$= \frac{4}{1,45}$ ✓

=

2,759 s

$v = f\lambda$ ✓

$2,759 = (2,5)\lambda$ ✓

$\lambda = 1,10$ m ✓ (5)

3.2.1 One beats the drum at one end of the field, while the other stands at the other end of the field ✓ and measures the time from when he sees the drumbeat until he hears it. ✓ (2)

3.2.2 Speed = $\frac{\text{distance}}{\text{time}}$ ✓

$= \frac{500}{1,49}$ ✓

$= 336\ m{\cdot}s^{-1}$ ✓ (3)

3.2.3 Sound travels at a higher speed through water than through air. ✓ (1)

[14]

4.1 A photon is a packet of light energy. ✓✓ (2)

4.2 $E = \frac{hc}{\lambda}$ ✓

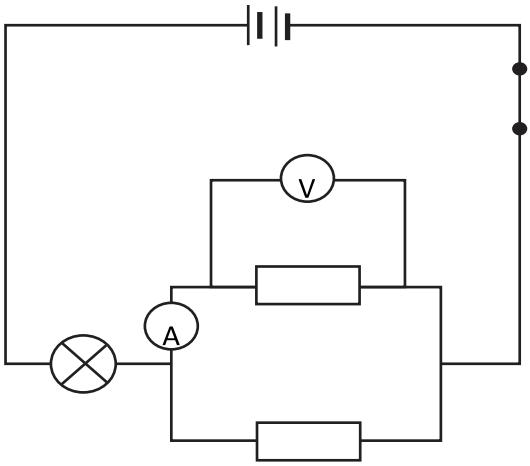
$= \frac{(6,63) \times 10^{-34})\ (3 \times 10^{8}}{600 \times 10_{-9}}$ ✓

$= 3,315 \times 10^{-19} \times 0,3 \times n = 475$ ✓

$n = 4,78 \times 10^{21}$ photons ✓ (4)

[6]

5.1



two cells in series ✓
light bulb ✓
resistors in parallel ✓
switch ✓
voltmeter ✓
ammeter ✓

(6)

5.2.1 emf is the potential difference across a cell or battery when no charge is flowing through it. ✓✓ (2)

5.2.1 3 V ✓ (1)

5.3 Type of material of which a resistor is made ✓

Thickness of the resistor ✓

Length of the resistor ✓ (Any two) (2)

5.4.1 $\frac{1}{R} = \frac{1}{4} + \frac{1}{4} = \frac{2}{4}$ ✓

R = $\frac{4}{2}$ = 2 Ω ✓ (2)

V 3 ✓

5.4.2 $I = R$ ✓ = (2 + 4) ✓ = 0,5 A ✓ (4)

5.5 $W = QV$✓

= 50 × 2✓

= 100 J ✓ (3)

[20]

6.1.1 The two displacements will create one big pulse ✓ and the amplitude will be the sum of the amplitudes of the initial two pulses. ✓ (2)

6.1.2 Constructive interference / superposition ✓ (1)

6.1.3 They will both continue in their original directions ✓ with their original amplitudes ✓ and speed. (2)

6.2.1 The number of complete waves passing a given point per second. ✓✓ (2)

6.2.2 The wave travels horizontally, ✓ while the float moves vertically. ✓

OR

The wave travels in a direction perpendicular to the direction that the particles of the water travel. (2)

6.2.3 $\frac{2,1 - 0,5}{2}$ ✓

= 0,8 m (Full marks if only answer is given) ✓ (2)

[11]

7.1 The total energy of an isolated system remains constant. ✓✓ (2) 7.2 $E_k = \frac{1}{2}mv^2$ ✓

$= \frac{1}{2}(70)(4)^2$ ✓

= 560 J ✓ (3)

7.3 $E_{m(start)} = E_{m(bottom)}$ ✓

(70)(9,8)(2) + 560 ✓ = 0 + $\frac{1}{2}v^2$ (70) ✓ (if 0 is omitted, the marl is still awarded.) v^2 = 55,2

v = 7,43 m·s^{-1} ✓ (4)

7.4 $E_{m(bottom)} = E_{m(top)}$ ✓

0 + $\frac{1}{2}$(70)(7,43)^2 = (70)(9,8)h – 0 ✓

h = 2,82 m ✓ (4)

[13]

8.1 The train moves from rest ✓in a southerly direction and accelerates uniformly ✓ for 10 , reaching a top speed of 5 $m \cdot s^{-1}$, before immediately slowing down steadily, ✓ coming to rest again after another 10 s ✓, and remaining at rest for a further 20 s. ✓ (5)

8.2 t = 20 s ✓ (1)

8.3 60 to 80 seconds ✓ (1)

8.4 Acceleration = gradient of the graph ✓

$$= \frac{5 - 0}{10 - 0} \checkmark$$

$= 0{,}5\ m \cdot s^{-2}$ ✓ south ✓ (4)

8.5 Displacement = area under graph ✓

$= \frac{1}{2}(20)$ ✓ $+ \frac{1}{2}(20)(-10)$ ✓ $+ (20)(-10)$ ✓

$= -250$

∴ 250 m ✓ (5)

[16]

Total: [100]

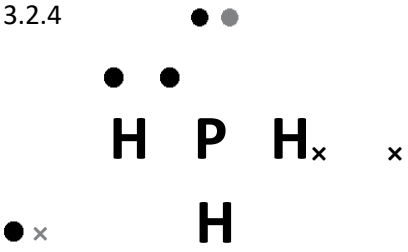
MARKING GUIDE PAPER T

3.2.1 Covalent ✓ (1)

3.2.2 An electron from a half-filled phosphorus orbital and one from a hydrogen atom ✓ is shared by the two atoms. ✓ The nuclei of both atoms attract the shared electrons. ✓ In the phosphine molecule there are three shared electron pairs between hydrogen and phosphorus. (any three) (3)

3.2.3 Molecules ✓ (1)

3.2.4



(3)

[20]

4.1 concentration ✓ (1)

4.2.1 $M(Cu(NO_3)_2)$= 63,5 + 2(14 + 16 x 3) ✓= 187,5 ✓ (2)

4.2.2 m = cMV ✓= 0,9 x 187,5 x 0,5 ✓= 84,38 g ✓ (3)

4.3 $M(CuSO_4)$ = 63,5 + 32 + 16 x 4 = 159,5 ✓

$M(CuSO_4.5H_2O)$ = 159,5 + 5(2 x 1 + 16) = 249,5 ✓

mass heated = $20 \times \frac{249,5}{159,5}$ ✓ = 31,29 g ✓ (4)

4.4 n(HCl) = c V = 0,5 x 0,5 ✓ = 0,25 mol. ✓

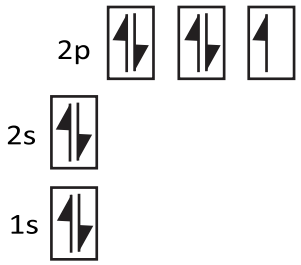
0,25 mol HCl is neutralized by 0,25 mol NaOH ✓

m(NaOH) = n.M ✓= 0,25 × 40 ✓ = 10 g ✓ (6)

[16]

5.1 The boiling points first increase ✓ as you go across period 2 and then decrease ✓ to neon. This repeats as you go across period 3. ✓ (3)

5.2 Fluorine (F) ✓



(3)

5.3 The smaller the ionisation energy, ✓ the more reactive they are. ✓ (2)

5.4.1 Chlorine ✓ (1)

5.4.2 Electronegativity is a measure of the attractive force that an atom might have on a shared electron pair. ✓ Since there are more protons in the nucleus of chlorine than of sodium, ✓ chlorine will have a stronger attractive force on the electrons in the same energy level ✓ than sodium. (3)

[12]

6.1 The pollen particles move randomly ✓ and change direction regularly. ✓ (2)

6.2 Water consists of invisible molecules ✓ which move constantly. ✓ They collide with the pollen, causing them to move. ✓ (3)

6.3 The molecules (particles) in solids do not move around enough ✓ and there will not be space for particles in the solid to move around visibly. ✓ (2)

[7]

7.1 The law of constant composition or constant proportions states that all samples of a given chemical compound have the same elemental composition. ✓✓ (2)

7.2.1 (3 × 1) ✓ / 17 ✓ × 100 = 17,65 %✓ (3)

7.2.2 $N_2 + 3H_2 \rightarrow 2\ NH_3$ ✓✓✓ (3)

7.2.3 n = m/M ✓= 20 /17 ✓= 1,18 mol. ✓ (3)

7.2.4 Volume = 1,18✓ × 22,4 ✓ = 26,43 dm^3✓ (3)

7.3 n = m/M = 20 / 27 ✓ = 0,74

mol. ✓ 2 mol Al yields 3

mol H_2 ✓ n H_2 = (0,74/2) ×

3 = 1,11 mol ✓

m = nM = 1,11 × 2 ✓= 2,22 g ✓ (6)

7.4 C: 40/12 =

3,333 ✓ H:

6,65 / 1 = 6,65✓

O: 53,35 / 16 = 3,334 ✓

D

C:H:O = 3,333/3,333 : 6,65/3,33 : 3,334/3,33 = 1:2:1 (*Divide by 3,33* ✓)

Empirical formula = C H_2 O ✓ (5)

7.5 Mass reactants: 2(34) = 68 g ✓ Mass products: 2(18) + 16 = 68 g ✓

Mass reactant = mass products ✓ ∴ mass is conserved. (3)

Total: [100]