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### **PHYSICAL SCIENCES**

TIME: 2 hours

MARKS: 100

13 pages + 3 data sheets



## INSTRUCTIONS AND INFORMATION

- 1. Write your name in the appropriate space on the ANSWER BOOK.
- 2. This question paper consists of EIGHT questions. Answer ALL the questions.
- 3. **Start E**ACH question on a NEW page in the ANSWER BOOK.
- 4. Number the answers correctly according to the numbering system used in this question paper.
- 5. Write neatly and legibly.
- 6. You may use a non-programmable calculator.
- 7. You may use appropriate mathematical instruments. *Stanmorephysics.com*
- 8. USE the DATA SHEETS that are attached.
- 9. Show ALL formulae and substitutions in ALL calculations.
- 10. Round off your FINAL numerical answers to a minimum of TWO decimal places.



# **QUESTION 1: MULTIPLE-CHOICE QUESTIONS**

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A - D) next to the question numbers (1.1 - 1.10) in the ANSWER BOOK, e.g. 1.11 E.

1.1 For which one of the quantities given below is the CORRECT unit of measurement?

	QUANTITY	UNIT
А	Current	A·s <sup>-1</sup>
В	Energy	kW
С	Potential difference	V
D	Resistance	V·s

- 1.2 A battery is marked 12 V. Which ONE of the following is the correct meaning of 12 V?
  - A This means that 12 charges pass the battery.
  - B This means that 12 J of electrical work is done per coulomb of charge.
  - C This means that 12 coulomb of charges passes the battery each second.
  - D This means that 12 J of electrical energy is converted to light and heat.
- 1.3 In a small electrical appliance, a charge of 3 C flows through a light bulb with a resistance of 6  $\Omega$ , in 12 seconds. Which ONE of the following is the correct combination of the current through and potential difference applied across the bulb?

	Current (A)	Potential difference (V)
А	0,25	1,5
В	72	1,5
С	1,5	0,25
D	2	3

(2)

(2)

(2)

3

P.T.O.

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4

Consider the circuit diagram given below consisting of two resistors in parallel: 1.4





The effective resistance of the circuit is 1,2  $\Omega$ . Which ONE of the following correctly represents the resistance of unknown resistor Rx? Stanmorephysics.com

- 4Ω А
- 5Ω В
- С 1Ω
- D 3Ω

(2)

(2)

- 1.5 Salt crystals (such as NaCl) hold together so well because the anions are strongly attracted to ...
  - А protons in the neighbouring nucleus.
  - free electrons in the crystals. В
  - С neighbouring anions.
  - neighbouring cations. D
- 1.6 Which Lewis dot diagram represents an atom X with the highest electronegativity?



- ONE mole of ANY substance contains ... 1.7
  - $6,02 \times 10^{22}$  particles.  $6,02 \times 10^{23}$  particles.  $6,02 \times 10^{24}$  particles. А
  - В
  - С
  - 6,02 x 10<sup>25</sup> particles. D

(2)

5

1.8 The Aufbau diagram for an element is given below:





The number of valence electrons for the above element is ...

- А 3.
- В 7.
- С 2.
- D 5.

1.9 The minimum energy required to remove an electron from the outermost orbital of an atom in a gaseous state is ...

- А kinetic energy.
- В ionisation energy.
- С electron affinity.
- D potential energy.

1.10 The atomic structure of atoms Q, R, S and T are shown in the table below: 

Atom	Number of protons	Number of neutrons	Number of electrons
Q	6	7	6
R	7	7	
S	6	8	6
Т	8	8	8

Which TWO atoms are isotopes?

А	Q and S
В	Q and T
С	R and T
D	R and S

(2)[20]

(2)

(2)

# QUESTION 2

-

In our everyday lives we see mixtures all the time. A mixture of different foods such as meat and vegetables is called a stew; a mixture of water, salt and other substances can be found in seawater, and a mixture of gases such as carbon dioxide, oxygen and nitrogen is air.

STEW	SEAWATER	AIR
	Stanmorephysics.com	*

- 2.1 From the examples given, identify one homogeneous mixture.
- 2.2 Write the formulae of the following substances:

2.2.1	water	(1)
2.2.2	nitrogen	(1)

- 2.3 Classify the following substances as pure or impure:
  - 2.3.1 table salt (1)
    - 2.3.2 oxygen
- 2.4 Explain your answer to QUESTION 2.3.2.



(1)

(1)

(2) [**7**]



Matter exists in one of three states, namely X, Y and Z. Matter in state X has a fixed shape and volume. Matter in state Y takes on the shape of the container that it is in. Matter in state Z completely fills the container that it is in. Matter can change between these states by either adding heat or removing heat. This is known as a **change of state**.

- 3.1 Identify the state of matter **Y**.
- 3.2 Define the term *boiling point*.

The graph below represents the heating curve of a substance **A** that starts below its melting point.





- 3.4.3 100 °C
- 3.5 Draw the cooling curve of substance **B** using the information from the table below:

Substance	Boiling point (° C)	Melting point (° C)	
В	180	(3)	(3)
			[10]

(1)

(2)

7

(1)

GRADE 10



Consider the following substances given in the table below:

	KBr		NH <sub>3</sub>	Cu	HF	
4.1	Define	covale	ent bond.			(2)
4.2	From th	ne tab	le given above, write the	FORMULAE for the:		
	4.2.1	Subs	stance(s) that have a cov	alent bond.		(1)
	4.2.2	Subs	stance with metallic bondi	ng.		(1)
	4.2.3	lonic	compound.			(1)
4.3	Give a	reaso	n for the answer to QUES	n STION 4.2.3 above.		(1)
4.4	Define	ionic <i>l</i>	bonding.			(2)
4.5	Draw L	ewis c	dot structures for:			
	4.5.1	NH3				(2)
	4.5.2	KBr				(2) <b>[12]</b>



9



The image below shows an extract of Table 3 of the Periodic Table of Elements and focuses on the three magnetic elements.



5.1 Describe how to test and classify these elements as magnetic.

#### 5.2 Define the term:

5.4

5.5

5.6

- 5.2.1 *atomic number*.
- 5.2.2 isotopes.
- 5.3 Natural nickel consists of five stable isotopes as shown in the table below:

Isotopes	nickel-58	nickel-60	nickel-61	nickel-62	nickel-64	
Percentage	68,27	26,10	1,13	3,59	0,91	
abundance (%)						
						1
5.3.1 Give the term that represents the value 58 in nickel-58. (1)					(1)	
5.3.2 Calculate the relative atomic mass of nickel.				(3)		
Write the chemical formula of cobalt (II) chloride.					(1)	
Draw the Aufbau diagram (orbital box diagrams) of the chlorine atom.					(3)	
Determine the charge of iron after removing three electrons from the iron atom.					(1) <b>[14]</b>	

(2)

(1)

(2)

10



5 g of zinc granules are added to 400 cm<sup>3</sup> of hydrochloric acid. To investigate the chemical change of the reaction, the change in the mass of the flask containing the zinc and the acid is measured by placing the flask on a reading balance. The reading on the balance shows that there is a decrease in mass during the reaction.



The reaction which takes place is given by the following balanced equation:

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$$

- 6.1 Define one mole.
- 6.2 Calculate the:

6.2.1	Concentration of the hydrochloric acid that reacts completely with the 5 g of zinc granules.	(4)
6.2.2	Volume of the gas that is formed if the investigation is performed at STP.	(3)

6.2.3 Maximum decrease in the mass of the flask.



(2)

(2) [11]

11

(2)

(3)

(3)

(2) [10]

# QUESTION 7

In the circuit diagram below the reading on the voltmeter  $V_1$  is 12 V and the reading on the ammeter  $A_1$  is 2 A.



- 7.1 Define the term *resistance*.
- 7.2 Calculate the:
  - 7.2.1 Total resistance of the circuit.
  - 7.2.2 Amount of charge that flows through ammeter A<sub>1</sub> in 60 seconds.
- 7.3 The 3  $\Omega$  is removed from the circuit. How will this change affect the current through  $A_1$ ? Write down INCREASE, DECREASE or REMAIN THE SAME. Give a reason for the answer.



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### QUESTION 8

A group of learners carried out an investigation to determine the relationship between current and the number of cells added in series. Each cell carries a voltage 1,5 V. The diagram below shows the circuit diagram the learners used.



The results are represented in the graph below:

#### **GRAPH OF CURRENT VERSUS NUMBER OF CELLS**



- 8.1 Give a suitable investigation question for this investigation.
- 8.2 Define the term *emf*.

		GRADE 10	10
8.3	Identify the following variables:		
	8.3.1 Independent variable		(1)
	8.3.2 Dependent variable		(1)
8.4	Predict what will happen to the brightne added into the circuit.	ess of the light bulbs as more cells are	(2)
8.5	Use the information on the graph to calcan produce a current of 30 A.	culate the total voltage of the circuit that	(2)
8.6	An ammeter was connected in the circu Calculate the energy dissipated by the	it and gave a reading of 24 A, in 2 minutes. circuit.	(5)
8.7	Write the conclusion for the investigation Stanmorephysics.com	n.	(1) <b>[16]</b>
		TOTAL:	100



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GRADE 10



#### DATA FOR PHYSICAL SCIENCES GRADE 10 PAPER 1 (PHYSICS) GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10 VRAESTEL 1 (FISIKA)

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

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Acceleration due to gravity Swaartekragversnelling	g	9,8 m·s <sup>-2</sup>
Speed of light in a vacuum Spoed van lig in 'n vakuum	c	3,0 x 10 <sup>8</sup> m⋅s <sup>-1</sup>
Planck's constant Planck se konstante	h	6,63 x 10 <sup>-34</sup> J⋅s
Charge on electron Lading op elektron	e energy sics com	-1,6 x 10 <sup>-19</sup> C
Electron mass Elektronmassa	me	9,11 x 10 <sup>-31</sup> kg

#### TABLE 2: FORMULAE/TABEL 2: FORMULES

#### WAVES, SOUND AND LIGHT/GOLWE, KLANK EN LIG

$v = f \lambda$	$T = \frac{1}{f}$
$E = hf \text{ or/of } E = h \frac{c}{\lambda}$	

#### ELECTROSTATICS/ELEKTROSTATIKA

$n = \frac{Q}{e}$ or/of $n = \frac{Q}{q_e}$	$Q = \frac{Q_1 + Q_2}{2}$	
ELECTRIC CIRCUITS/ELE	KTRIESE STROOMBANE	
$Q = I \Delta t$	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$	
$R_s = R_1 + R_2 + \dots$	$V = \frac{W}{Q}$	

14

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

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Standard pressure Standaarddruk	Ρθ	1,013 x 10⁵ Pa
Molar gas volume at STP Molêre gasvolume by STD	Vm	22,4 dm <sup>3</sup> ·mol <sup>-1</sup>
Standard temperature Standaardtemperatuur	Τθ	273 K
Charge on electron Lading op elektron	е	-1,6 x 10 <sup>-19</sup> C
Avogadro's constant	NA	6,02 x 10 <sup>23</sup> mol <sup>-1</sup>

## TABLE 2: FORMULAE/TABEL 2: FORMULES

$n=\frac{m}{M}$		$n = \frac{N}{N_A}$
$c = \frac{n}{V}$	$OR c = \frac{m}{MV}$	$n = \frac{V}{V_m}$



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PHSICAL SCIENCES

**GRADE 10** 

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

	1		2		3		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	(I)		(II)													(III)	(IV)	(V)	(VI)	(VII)	(VIII)
2,1	1 H 1						I	KEY/SLE	UTEL	A	tomic nu Atoomg ↓	umber letal									2 He 4
1,0	3 Li 7	1,5	4 Be 9					Electr Elektro	onegativ negatiw	ity iteit →	29 ص Cu 63,5	Syn ← Sin	nbol nbool			5 0' B 11	2'2 2 0 0	7 0.℃ 14	8 9.0 16	4.0 F 9	10 Ne 20
6'0	11 Na 23	1,2	12 Mg 24						Approx Benade	kimate re erde rela	f elative at atiewe at	tomic ma	ass ssa			13 5. Al 27	14 8' Si 28	15 N P 31	16 9: S 32	17 Cl 35,5	18 Ar 40
0,8	19 K 39	1,0	20 Ca 40	1,3	21 Sc 45	1,5	22 Ti 48	23 9. V 51	24 9. Cr 52	25 بن Mn 55	26 <sup>00</sup> Fe 56	27 <sup>00</sup> 59	28 <sup>00</sup> Ni 59	29 5. Cu 63,5	9. Zn 65	31 9 Ga 70	32 © Ge 73	33 As 75	34 ▼ Se 79	35 80 80	36 Kr 84
0,8	37 Rb 86	1,0	38 Sr 88	1,2	39 Y 89	1,4	40 Zr 91	41 Nb 92	∞. 42 ™ Mo 96	43 ე. Tc	44 7 Ru 101	45 Rh 103	46 Pd 106	47 م: Ag 108	48 Cd 112	49 1- 115	<sup>50</sup> Sn 119	51 50 Sb 122	52 Te 128	53 57 I 127	54 Xe 131
0,7	55 Cs 133	0,9	56 Ba 137		57 La 139	1,6	72 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 ∞ Tℓ 204	82 ∞ Pb 207	83 5. Bi 209	84 0. Po	85 9. At	86 Rn
0,7	87 Fr	0,9	88 Ra 226		89 Ac			58	59	60	61	62	63	64	65	66	67	68	69	70	71
						-		Ce 140 90 Th	Pr 141 91 Pa	Nd 144 92	93 Np	Sm 150 94 Pu	Eu 152 95 Am	Gd 157 96 Cm	Tb 159 97 Bk	Dy 163 98 Cf	Ho 165 99 Fs	Er 167 100 Fm	Tm 169 101 Md	Yb 173 102 No	Lu 175 103 Lr
								232		238											

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# PROVINCIAL EXAMINATION JUNE 2024 Starmorep GRA DE 10 MARKING GUIDELINES

## **PHYSICAL SCIENCES**

7 pages



	Down	loaded f	MARKING GUIDELINES	GRADE 10
QUE	STION			
1.1	C	$\checkmark$		(2)
1.2	B	$\checkmark$		(2)
1.3	А	$\bigvee$		(2)
1.4	D	$\checkmark\checkmark$		(2)
1.5	D	$\checkmark\checkmark$		(2)
1.6	С	$\checkmark\checkmark$		(2)
1.7	В	$\checkmark\checkmark$		(2)
1.8	D	$\checkmark\checkmark$	Stanmorephysics.com	(2)
1.9	В	$\checkmark\checkmark$		(2)
1.10	A	$\checkmark\checkmark$		(2) <b>[20]</b>
QUE	STION	2		
2.1	Seaw	ater ✓ OR	air	(1)
2.2	2.2.1	H₂O ✓		(1)
	2.2.2	N₂ ✓		(1)
2.3	2.3.1	pure ✓		(1)
	2.3.2	pure 🗸		(1)
2.4	Oxyg physi	en is a subs cal methods	tance that cannot be separated into simpler components I $\cdot \checkmark \checkmark$	(2) [ <b>7</b> ]

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			MARKING GUIDELINES	GRAI	DE 10
QU	ESTION 3	7			
3.1	liquid •	R I			(1)
3.2	The ter pressu	mperature re. √√	of a liquid at which its vapour	pressure equals the external	(2)
3.3	90 °C •	<b>~</b>			(1)
3.4	3.4.1	solid √			(1)
	3.4.2	liquid ✓			(1)
	3.4.3	gas √	- Nor		(1)
3.5	Coolin	g curve	Stanmorephysics.com		
	(°C)	180	$\mathbf{i}$	✓ 180 °C	
	Temperature	-20		-√ 20 °C	
	(-1 ma	rk if the v-	Time (min)	✓ Shape starting at boiling point and horizontal during condensation and freezing	(3) [10]



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	MARKING GUIDELINES	GRADE 10							
QU	QUESTION 4								
4.1	Bond as the sharing of electrons between atoms to form molecules. $\checkmark\checkmark$	(2)							
4.2	4.2.1 NH₃ or HF ✓	(1)							
	4.2.2 Cu ✓	(1)							
	4.2.3 KBr ✓	(1)							
4.3	Potassium (K) is a metal and bromine (Br) is a non-metal, ionic bond formed the transfer of an electron from potassium to bromine. $\checkmark$	l by (1)							
4.4	Bond that involves the transfer of electrons to form cations and anions that attract each other to form a formula-unit.	(2)							
4.5	4.5.1 H: N:H Stanmorephysics.com	(2)							
	4.5.2 $[K]^+[:Br:]_{\sqrt{2}}$	(2) <b>[12]</b>							
QU	QUESTION 5								

5.1	Bring a If it is a	magnet close to the material (iron, cobalt or nickel). $\checkmark$ ttracted by the magnet, it is magnetic. If not, it is non-magnetic. $\checkmark$	(2)
5.2	5.2.1	The number of protons in an atom of an element. $\checkmark$	(1)
	5.2.2	Atoms of the same element having the same number of protons but different numbers of neutrons. $\checkmark\checkmark$	(2)
5.3	5.3.1	mass number ✓	(1)
	5.3.2	$A_{r}(Ni) = \frac{(58 \times 68,27) + (60 \times 26,10) + (61 \times 1,13) + (62 \times 3,59) + (64 \times 0,91)}{100}$	
		Ar(Ni) = 58,75 ✓	(3)
5.4	CoCl <sub>3</sub>		(1)



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6.2.3 
$$n = \frac{m}{M}$$
  
7,69 x 10<sup>-2</sup> =  $\frac{m}{2}$   $\checkmark$  ① substitution  
m = 0,15 g H<sub>2</sub> escaped  $\checkmark$  ② answer with unit (2)  
[11]

(2)

(3)

(3)

(2) [**10**]

#### **QUESTION 7**

7.2

- 7.1 Resistance is the ratio of potential difference to current/ measure of the position to current flow in an electric circuit.
  - 7.2.1  $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$   $\frac{1}{R_p} = \frac{1}{6} + \frac{1}{3}$   $R_p = 2 \Omega$   $R_T = R_1 + R_2$   $R_T = R_1 + R_2$   $R_T = 2 + 4$   $R_T = 6 \Omega \checkmark$ 7.2.2  $Q = I\Delta t \checkmark$  $Q = (2)(60) \checkmark$
- 7.3 Decreases. ✓

 $Q = 120 C \checkmark$ 

Total resistance increases in series as total current decreases/Resistance is inversely proportional to the current.  $\checkmark$ 

#### **QUESTION 8**

8.1	What series What	is the relation between current and adding more cells connected in ?/	
	series	? $\checkmark$	(2)
8.2	work o	done per unit charge by the source (battery). $\checkmark \checkmark$	(2)
8.3	8.3.1	Voltage ✓	(1)
	8.3.2	Current ✓	(1)

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- The brightness of the light bulbs will increase since voltage is directly 8.4 proportional to current. VV (2)1,5 x 10 = 15 V ✓✓ (2) 8.5 8.6  $Q = I\Delta t$  $Q = 24 \times 120 \checkmark$ Q = 2880 C $V = \frac{W}{Q} \checkmark$  $9 \checkmark = \frac{W}{2880} \checkmark$  $W = 25920 \text{ J} \checkmark$ (5) As more cells are added in series, the total voltage of the circuit increases thus 8.7 increasing the total current. (1) [16] Stanmorephysics.com
  - TOTAL: 100

