education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

TECHNICAL SCIENCES P2
NOVEMBER 2024

MARKS: 75

TIME: 1½ hour

This paper consists of 8 pages and 2 data sheets.

INSTRUCTIONS AND INFORMATION

1. This paper consists of FIVE questions. Answer ALL the questions in the ANSWER BOOK.
2. Start EACH question on a NEW page in the ANSWER BOOK.
3. Number the answers correctly according to the numbering system that is used in this question paper.
4. Leave ONE line between two sub questions e.g. between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEETS.
8. Round off your FINAL numerical answers to a minimum of TWO decimal places.
9. Give brief motivations, discussions etc. where required.
10. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1 to 1.5) in the ANSWER BOOK, e.g. 1.6 D.

1.1 The SI-unit for specific heat capacity of an object is …

A Joules.

B Joules per Kelvin.

C Joules per kilogram.

D Joules per kilogram per Kelvin. (2)

1.2 A car engine is an example of a/an …

A open system.

B simple system.

C closed system.

D isolated system. (2)

1.3 The cooling of a fridge takes place when …

A the heat is absorbed from the hot reservoir and given to the cold reservoir.

B the heat is absorbed from the cold reservoir and given to the hot reservoir.

C an increase in pressure of the gas goes along with a decrease in temperature.

D a decrease in pressure of the gas goes along with an increase in temperature. (2)

1.4 Which ONE of the following statements is TRUE for the reaction:

$$Mg + O_2 \rightarrow 2MgO$$

A Mg is the oxidizing agent and gets reduced.

B Mg gains electrons.

C O_2 is the oxidizing agent and gets reduced.

D O_2 is the reducing agent and loses electrons. (2)

1.5 During electrolysis the substance at the …

A cathode loses electrons.

B anode increase in mass.

C cathode decrease in mass.

D anode loses electrons. (2)

[10]

QUESTION 2 (Start on a new page.)

Thermodynamics is a fundamental unit in physics that studies the relationship between heat, energy and work. It plays an integral role in our understanding of how energy is transformed and transferred in physical and chemical processes.

2.1 State the *Law of Conservation of Heat* in words. (2)

2.2 Name THREE factors that must be considered when a substance is heated or cooled. (3)

2.3 A piece of copper has a mass of 1,1 kg. It requires 16,8 KJ energy to raise its temperature from 20 °C to 59 °C.

2.3.1 Define s*pecific heat capacity*. (2)

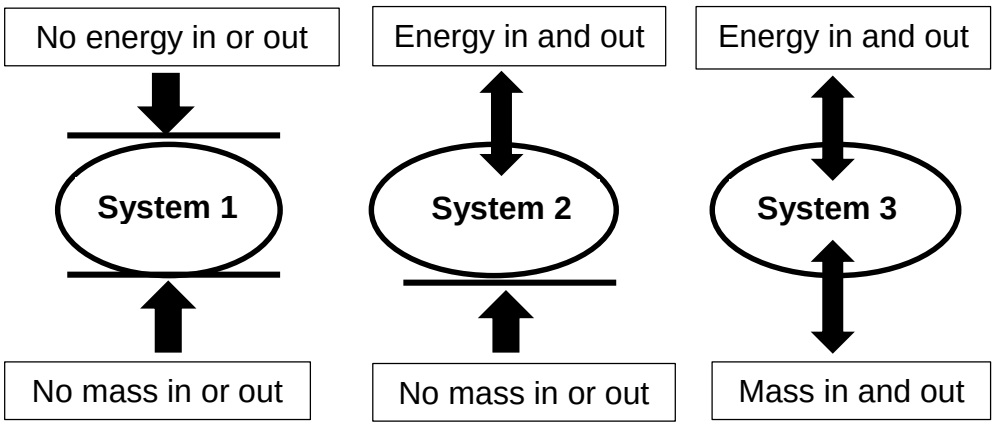
2.3.2 Calculate the specific heat capacity of copper. (4)

2.3.3 How will the amount of energy require change if 1,1 kg water instead of copper is heated?

Write only INCREASE, DECREASE or REMAIN THE SAME. (2)
[13]

QUESTION 3 (Start on a new page.)

The figures below show THREE different thermodynamic systems.



3.1 Define the term *internal energy of a thermodynamic system*. (2)

3.2 Name each of the THREE systems that are illustrated in the figures above. (3)

3.3 State the *First Law of Thermodynamics* in words. (2)

3.4 The gas in a cylinder absorbs 1 200 J heat and performs 600 J work while 700 J heat is released in the process.

3.4.1 Determine the nett heat that is taken up by the system. (3)

3.4.2 Calculate the change in the internal energy of the system. (3)

3.4.3 Describe ONE method how the change in energy of the system can be decreased. (1)

3.5 Define the term w*orking substance*. (2)

3.6 Give TWO examples of working substances. (2)
[18]

QUESTION 4 (Start on a new page.)

Chemical change deals with a variety of chemical reactions, including electrochemistry, which is a branch that deals with energy conversion because of chemical reactions.

4.1 Distinguish between *oxidation* and *reduction*. (4)

4.2 Identify the CATHION in the following compounds:

4.2.1 $CuCl_2$ (1)

4.2.2 Na_2S (1)

4.3 Define the term o*xidation number*. (2)

4.4 Calculate the oxidation numbers of the underlined elements in the following compounds:

4.4.1 $\underline{Cr}_2O_7^{2-}$ (1)

4.4.2 $Mg\underline{S}O_4$ (1)

4.4.3 $H\underline{N}O_3$ (1)

4.4.4 $K\underline{Mn}O_4$ (1)

4.5 Study the balanced chemical reaction below and identify the:

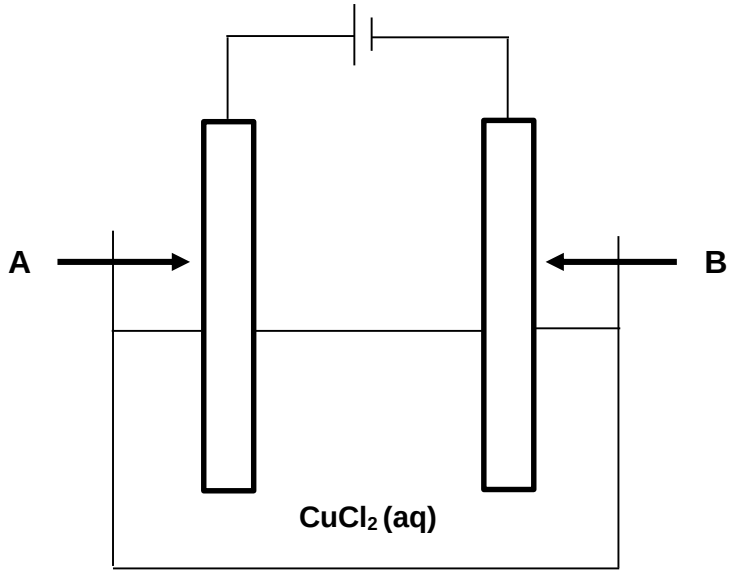
$$2HCl \rightarrow H_2 + Cl_2$$

4.5.1 Reducing agent (2)

4.5.2 Oxidizing agent (2)
[16]

QUESTION 5 (Start on a new page.)

The diagram below represents an electrolytical cell that is used in an investigation of the decomposition of a copper(II)chloride solution.



5.1 Define the term e*lectrolyte.* (2)

5.2 Explain a *non-spontaneous reaction.* (2)

5.3 Carbon electrodes are used in this investigation. Give TWO reasons why carbon is suitable to use as electrodes for this investigation? (2)

5.4 Which electrode, **A** or **B**, represents the:

5.4.1 anode ? (1)

5.4.2 cathode? (1)

5.5 Describe the observations that will take place at electrode:

5.5.1 A (2)

5.5.2 B (2)

5.6 Write down the:

5.6.1 Reduction half reaction (2)

5.6.2 Oxidation half reaction (2)

5.7 Name TWO uses of this chemical reaction in technology. (2)
[18]

TOTAL: 75

DATA FOR TECHNICAL SCIENCES GRADE 11
PAPER 2

GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 11
VRAESTEL 2

TABLE 1: SPECIFIC HEAT CAPACITIES/*TABEL 1: SPESIFIEKE HITTEKAPASITEITE*

Name/*Naam*	**Values/*Waardes* ($J.kg^{-1}.K^{-1}$)**
Water	4 200
Aluminium	900
Glass / *Glas*	700
Ethyl alcohol / *Etielalkohol*	2 460
Iron / *Yster*	460
Zinc / *Sink*	380
Lead / *Lood*	130
Ice / *Ys*	2 100
Brass	380
Mercury / *Kwik*	140
Methylated spirits / *Brandspiritus*	2 400

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

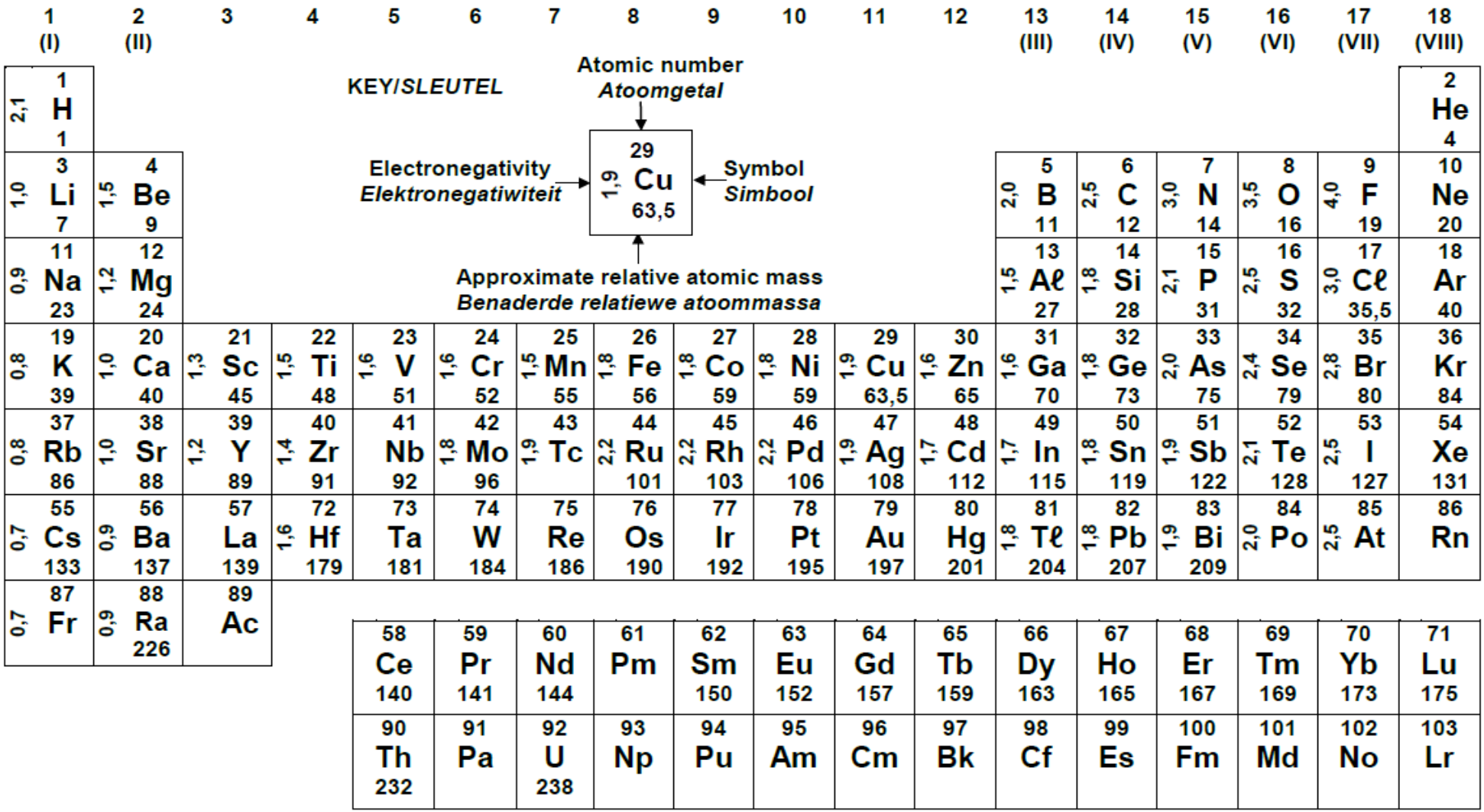
HEAT AND THERMODYNAMICS/*HITTE EN TERMODINAMIKA*

$C = c\ m$	$Q = c\ m\ \Delta T$	$\Delta Q = \Delta U + \Delta W$

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

$f = \frac{1}{T}$	$\Delta v = \frac{\Delta x}{\Delta t}$
$T = \frac{1}{f}$	$v = f \lambda$

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



1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
2,1 H 1																	2 He 4
1,0 Li 7	1,5 Be 9											2,0 B 11	2,5 C 12	3,0 N 14	3,5 O 16	4,0 F 19	10 Ne 20
0,9 Na 23	1,2 Mg 24											1,5 Aℓ 27	1,8 Si 28	2,1 P 31	2,5 S 32	3,0 Cℓ 35,5	18 Ar 40
0,8 K 39	1,0 Ca 40	1,3 Sc 45	1,5 Ti 48	1,6 V 51	1,6 Cr 52	1,5 Mn 55	1,8 Fe 56	1,8 Co 59	1,8 Ni 59	1,9 Cu 63,5	1,6 Zn 65	1,6 Ga 70	1,8 Ge 73	2,0 As 75	2,4 Se 79	2,8 Br 80	36 Kr 84
0,8 Rb 86	1,0 Sr 88	1,2 Y 89	1,4 Zr 91	41 Nb 92	1,8 Mo 96	1,9 Tc	2,2 Ru 101	2,2 Rh 103	2,2 Pd 106	1,9 Ag 108	1,7 Cd 112	1,7 In 115	1,8 Sn 119	1,9 Sb 122	2,1 Te 128	2,5 I 127	54 Xe 131
0,7 Cs 133	0,9 Ba 137	57 La 139	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	1,8 Tℓ 204	1,8 Pb 207	1,9 Bi 209	2,0 Po	2,5 At	86 Rn
0,7 Fr 87	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