UNISA university of south africa

SMI181Q

October/November 2016

Science Mining I

STUDENT NUMBER / STUDENTENOMMER									

IDENTITY NUMBER / IDENTITEITSNOMMER												

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VIR GEBRUIK DEUR EKSAMENOPSIENER

Question No / Vraagnr	Marks / Punte					
	Examiners' / Eksaminatore					
	1		2		3	
Total / Totaal						

Subject / Vak

Number of paper / Vraestelnommer

Date of examination / Datum van eksamen

Examination centre / Eksamensentrum

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1 'n Kandidaat wat sonder magtiging enige boek dokument of voorwerp wat hom in die eksamen behulpsaam kan wees, in die eksamenlokaal inbring en nalaat om die ongemagtigde materiaal aan die opsiener te oorhandig voordat die eksamen amptelik 'n aanvang neem, sal skuldig wees aan oortreding van die Universiteit se eksamenregulasies en hom blootstel aan straf soos deur die Raad van die Universiteit bepaal mag word

2 Kladwerk mag slegs op die eksamenvraestel gedoen word en moet as sodanig aangedui word

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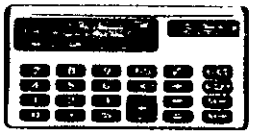
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

SMI181Q (481481) October/November 2016

SCIENCE MINING I

Duration 2 Hours 100 Marks

EXAMINERS
FIRST PROF BM MOTHUDI
SECOND DR SJ MOLOI

Use of a non-programmable pocket calculator is permissible

Closed book examination

- This examination paper consists of **thirteen (13) pages**
- The paper consists of two sections, **Section A (30%)** and **Section B (70%)**
- Answer **Section A (Multiple choice)** on the examination **mark reading sheet.**
- Answer **Section B (Written solutions)** in the examination answer book
- Show **all** steps in carrying out the calculations
- The mark allocation for each question is indicated in square brackets to the right
- The information given at the end of **Section B** may be used without proof

Section A: Multiple Choice Questions

1 An object is moving with constant velocity. Which of the following statements is true?

1) A constant force is being applied in the direction of motion
2) A constant force is being applied in the direction opposite of motion
3) There are no forces acting on the object
4) The net force on the object is zero
5) There is no frictional force acting on the object

(3)

2 A stone is thrown straight up. When it reaches its highest point,

1) both its velocity and its acceleration are zero
2) its velocity is zero and its acceleration is not zero
3) its velocity is not zero and its acceleration is zero
4) neither its velocity nor its acceleration is zero
5) neither velocity nor acceleration can be determined without additional information

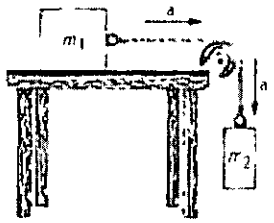
(3)

3 A constant net force acts on an object. Describe the motion of the object.

1) constant non-zero velocity
2) constant non-zero acceleration
3) increasing acceleration
4) decreasing acceleration
5) zero acceleration

(3)

4 Two masses, m_1 and m_2, are connected to each other as shown in figure below. Mass m_1 slides without friction on the table surface. Both masses have acceleration of magnitude a as shown. How does the tension in the string compare to the weight, $m_2 g$, of mass m_2?



1 The tension is equal to $m_2 g$
2 The tension is larger than $m_2 g$
3 The tension is smaller than $m_2 g$
4 It depends on m_1 being smaller than m_2
5 It depends on m_1 being larger than m_2

(3)

5 A simple pendulum, consisting of a mass m and a string of length L, swings upward, making an angle θ with the vertical The work done by the tension force is

1 zero
2 mgL
3 mgL cos θ
4 mgL sin θ
5 mgL tan θ

(3)

6 When an object experiences uniform circular motion, the direction of the acceleration is

1) in the same direction as the velocity vector
2) in the opposite direction of the velocity vector
3) is directed toward the center of the circular path
4) is directed away from the center of the circular path
5) depends on the speed of the object

(3)

7 What is the term for the property of a metal to be drawn into a wire?

1) alloy
2) ductile
3) malleable
4) tensile
5) none of the above

(3)

8 What is the general term for a substance dissolved in water?

1) aqueous salt
2) aqueous substance
3) aqueous solution
4) water solution
5) none of the above

(3)

9 After balancing the following redox reaction in *acidic* solution, what is the coefficient of H^{+}?

$$MnO_4^-(aq) + SO_3^{2-}(aq) \rightarrow Mn^{2+}(aq) + SO_4^{2-}(aq)$$

1 1
2 2
3 4
4 6
5 none of the above

(3)

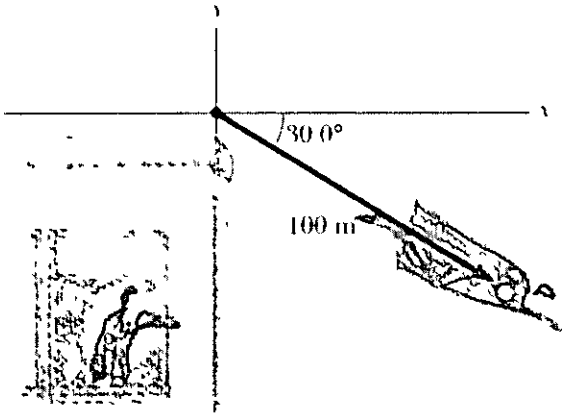
10 What is the term for the constant R in the equation $PV = nRT$?

1) combined gas constant
2) ideal gas constant
3) real gas constant
4) universal gas constant
5) none of the above

(3)

Section B: Written Solution

1 A superhero flies from the top of a tall building following the path shown in the figure



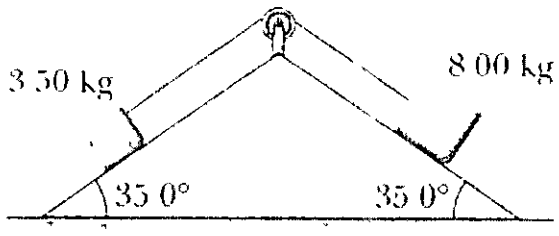
If he continues in a straight line for 100 m,

Determine horizontal and vertical components of the displacement **[4]**

2 A ball is thrown straight up with a speed of 36 m/s

a How long does it take the ball to reach the maximum height? (3)
b Determine the maximum height reached by the ball (2)
c How long does it take return to its starting point? (2)
[7]

3 Two blocks of m_1=3 50 kg and m2 = 8 00 kg are connected by a string of negligible mass that passes over a frictionless pulley as shown in the figure below The inclines are frictionless



a Draw the free body diagrams for each mass (4)
b Determine the magnitude of the acceleration (2)
c Calculate the tension on the string (3)
[9]

4 A car is moving with a speed of 32 0 m/s The driver sees an accident ahead and slams on the brakes, giving the car a deceleration of 3 50 m/s^2

How far does the car travel after the driver put on the brakes before it comes to a stop? **[4]**

5 A silver wire is 5 9 m long and 0 49 mm in diameter If the resistivity of the wire is $\rho = 1\ 59 \times 10^{-8} \Omega\ m$,

Determine the resistance of the wire **[4]**

6 Convert 180° to radians **[2]**

7 A compact disc rotates at 300 revolutions per minute
Determine its angular speed in rad/s **[4]**

8 2 67 g of Na_2CO_3 is dissolved in water and made up with water to a volume of 250 cm^3

a Calculate the molar mass of Na_2CO_3 (3)
b Deteremine the concentration (2)
[5]

9 A sample of argon gas at 520 mm Hg expands from 0 150 L to 0 300 L If the temperature remains constant, what is the final pressure in mm Hg?

Determine the pH of an aqueous solution if the $[H^+] = 0\ 000001 M$ **[4]**

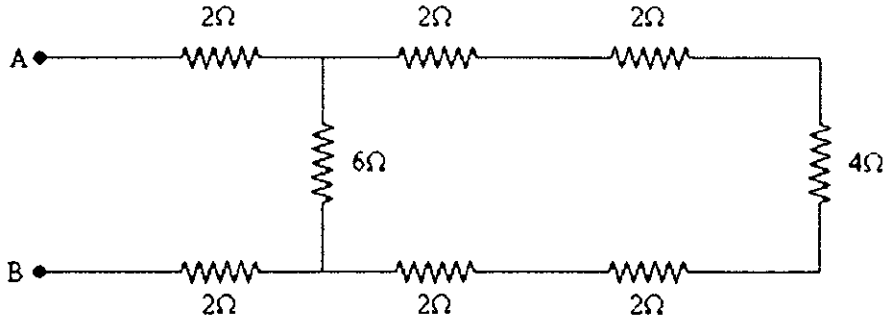
10 In the following reaction,

$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$

a Define a reducing agent? (2)
b Which metal is reduced? (2)
c Which metal is oxidised? (2)
[6]

11 What is the IUPAC name for $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_3$? **[2]**

12 A number of resistors are connected across points A and B as shown in the figure below



Determine the equivalent resistance between points A and B **[8]**

13 A small object is located 30 0 cm in front of a concave mirror with a radius of curvature of 40 0 cm

a Calculate the focal length (2)
b Determine the image position (3)
c Is the image upright or inverted? Explain (2)
[7]

14 Light enters a container of benzene at an angle of 43° to the normal, the refracted beam makes an angle of 27° with the normal

Calculate the refractive index of benzene **[4]**

Total **[100]**

Useful Information

Area of a circle of radius R	$A = \pi R^2$
Circumference of a circle	$C = 2\pi R$
Surface area of a sphere	$A = 4\pi R^2$
Volume of a sphere	$V = \frac{4}{3}\pi R^3$
Area of a triangle	$A = \frac{1}{2}bh$
Volume of a circular cylinder of length l	$V = \pi R^2 l$

Power	Prefix	Symbol
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f

Unit conversion factors and constants

1 in = 2.54 cm	1 cm = 10 mm	1 m = 100 cm
1 km = 10^3 m	1 h = 60 min	1 ft = 30.48 cm
1 mi = 5280 ft = 1.609 km	1 Å = 10^{-10} m = 0.1 nm	1 kg = 10^3 g
1 u = 1.661×10^{-27} kg	N = 0.2248 lb	1 J = 0.7376 ft lb
1 Btu = 1055 J	1 ft lb = 1.29×10^{-3} Btu = 3.24×10^{-4} kcal	1 kcal = 4.186 kJ
1 megaton = 4×10^{15} J	1 rad = 57.30°	360° = 2π rad
$v = 3.0 \times 10^8$ m/s	g = 9.8 m/s^2	1eV = 1.602×10^{-19} J
$\rho_{copper} = 1.7 \times 10^{-8}\ \Omega$ m	$n_{diamond} = 1.923$	$n_{lead} = 1.067$
$n_{air} = 1.00$	$n_{water} = 1.33$	$\mu_0 = 4\pi \times 10^{-7}$ T m/A
$k = 9.0 \times 10^9$ Nm^{2}C^{-2}		

[Turn Over]

A2 FORMULAE

MOMENTUM

force $F = \dfrac{\Delta(mv)}{\Delta t}$

impulse $F\Delta t = \Delta(mv)$

CIRCULAR MOTION

angular velocity $\omega = \dfrac{v}{r}$

$\omega = 2\pi f$

centripetal acceleration $a = \dfrac{v^2}{r} = \omega^2 r$

centripetal force $F = \dfrac{mv^2}{r} = m\omega^2 r$

OSCILLATIONS

acceleration $a = -(2\pi f)^2 x$

displacement $x = A\cos(2\pi f t)$

speed $v = \pm 2\pi f\sqrt{A^2 - x^2}$

maximum speed $v_{max} = 2\pi fA$

maximum acceleration $a_{max} = (2\pi f)^2 A$

for a mass-spring system $T = 2\pi\sqrt{\dfrac{m}{k}}$

for a simple pendulum $T = 2\pi\sqrt{\dfrac{l}{g}}$

electric potential $\Delta W = Q\Delta V$

$V = \dfrac{1}{4\pi\varepsilon_0}\dfrac{Q}{r}$

capacitance $C = \dfrac{Q}{V}$

decay of charge $Q = Q_0 e^{-t/RC}$

time constant RC

capacitor energy stored $E = \dfrac{1}{2}QV = \dfrac{1}{2}CV^2 = \dfrac{1}{2}\dfrac{Q^2}{C}$

MAGNETIC FIELDS

force on a current $F = BIl$

force on a moving charge $F = BQv$

magnetic flux $\Phi = BA$

magnetic flux linkage $N\Phi = BAN$

magnitude of induced emf $\varepsilon = N\dfrac{\Delta\Phi}{\Delta t}$

emf induced in a rotating coil $N\Phi = BAN\cos\theta$

$\varepsilon = BAN\omega\sin\omega t$

transformer equations $\dfrac{N_s}{N_p} = \dfrac{V_s}{V_p}$

efficiency $= \dfrac{I_s V_s}{I_p V_p}$

Formulae for Physics

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

$$v = u + at$$

$$\bar{F}_{net} = ma$$

$$\bar{f} = \mu \bar{F}_N$$

$$p = mv$$

$$\bar{F} = \frac{\Delta p}{\Delta t}$$

Impulse $= \bar{F}\Delta t = m\Delta v$

$$W = \bar{F}s$$

$$E_k = \frac{1}{2}mv^2$$

$$E_k = \frac{p^2}{2m}$$

$$E_p = mgh$$

$$P = \bar{F}v$$

$$a = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$$

$$\theta = \frac{s}{r} (\theta \text{ in rads})$$

$$v_T = r\omega$$

$$\omega = \frac{\theta}{t}$$

$$\omega_f^2 = \omega_i^2 + 2\alpha\Theta$$

$$\omega_f = \omega_i + 2\alpha t$$

$$\omega = 2\pi f$$

$$a_c = \frac{v^2}{r}$$

$$\tau = Fl$$

$$\tau\omega = P$$

$$\tau = NIAB \sin\theta$$

$$B = \mu_0 nI$$

$$B = \frac{\mu_o I}{2\pi\alpha}$$

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$f = \frac{R}{2}$$

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

$$M = \frac{h_i}{h_o} = -\frac{q}{p}$$

Formulae for Physics

$$I = \frac{q}{t}$$

$$V = IR$$

$$R = \frac{\rho L}{A}$$

$$P = IV = I^2R = \frac{V^2}{R}$$

$$V = \frac{W}{q}$$

$$\varepsilon = I\left(R + r\right)$$

$$R = R_1 + R_2 +$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \cdot$$

$$\overline{F} = k\frac{q_1 q_2}{r^2}$$

$$k = 9.0 \times 10^9 \frac{N.m^2}{C^2}$$

$$\overline{F} = q\overline{E}$$

Formulae for Chemistry

$$n = \frac{m}{M}$$

$$c = \frac{n}{V}$$

$$d = \frac{m}{V}$$

$$\frac{c_a V_a}{n_a} = \frac{c_b V_b}{n_b}$$

$$\mathrm{p}H = -\log[H_3O^+]$$

$$\mathrm{p}OH = -\log[OH^-]$$

$$pH + pOH = 14$$

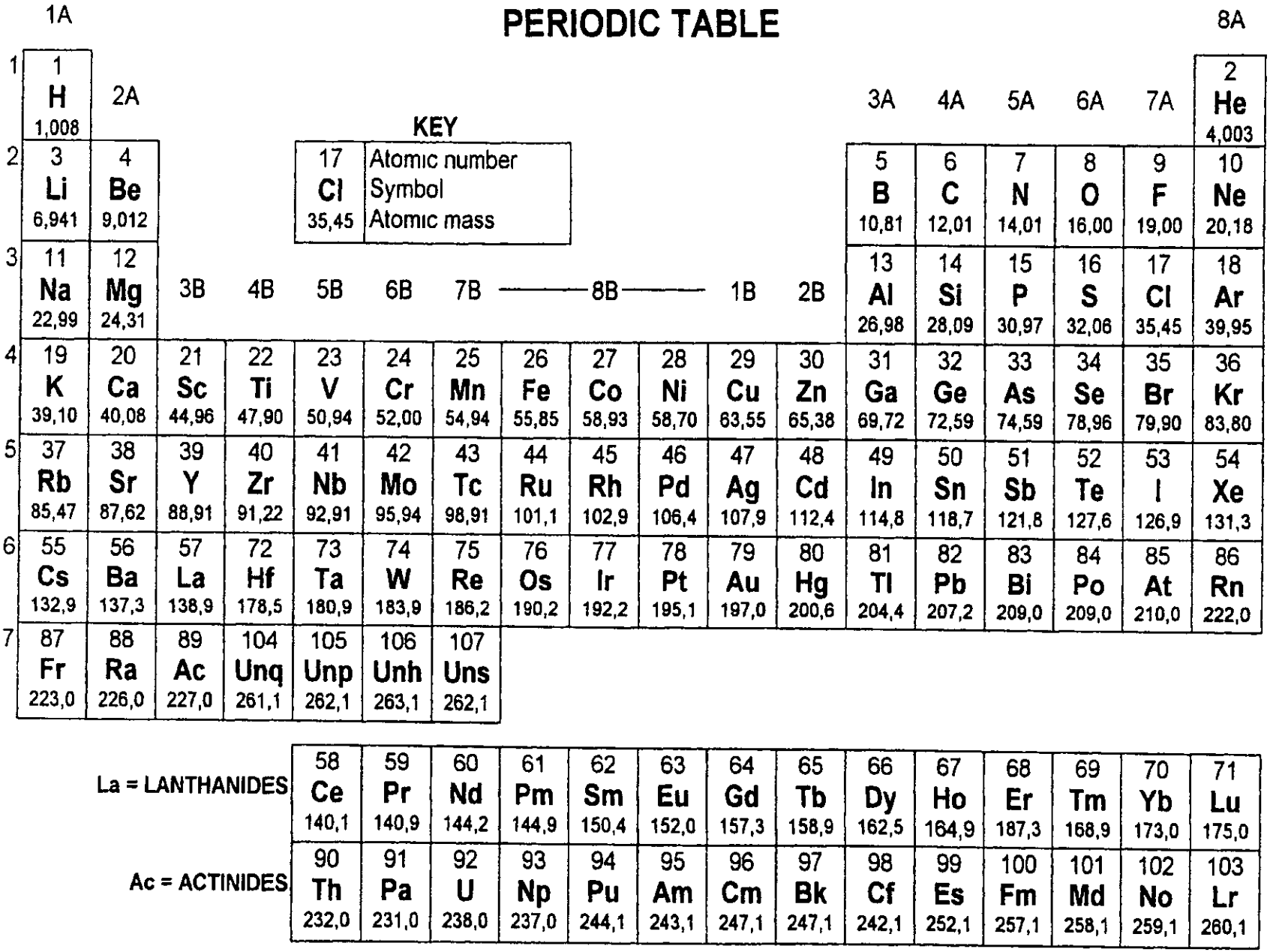
$$[OH^-][H_3O^+] = 1.0 \times 10^{-14}$$

$$PV = nRT$$

$$R = 8.31441 J\ K^{-1} mol^{-1}$$

$$\frac{n_{ice}}{l_{ice}} + \frac{n_{air}}{l_{air}} = 0$$

PERIODIC TABLE



[Turn Over]

Standard Reduction Potentials of various half-reactions at 25 °C.

Half-reaction:	Standard reduction potential:
$F_2(g) + 2e^- \Phi 2F^-(aq)$	$E^0_{red}(F_2/F^-) = +2.87\ V$
$PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \Phi PbSO_4(s) + 2H_2O$	$E^0_{red}(PbO_2/PbSO_4) = +1.69\ V$
$MnO_4^-(aq) + 8H^+(aq) + 5e^- \Phi Mn^{2+}(aq) + 4H_2O$	$E^0_{red}(MnO_4^-/Mn^{2+}) = +1.51\ V$
$PbO_2(s) + 4H^+(aq) + 2e^- \Phi Pb^{2+}(aq) + 2H_2O$	$E^0_{red}(PbO_2/Pb^{2+}) = +1.46\ V$
$BrO_3^-(aq) + 6H^+(aq) + 6e^- \Phi Br^- + 3H_2O$	$E^0_{red}(BrO_3^-/Br^-) = +1.44\ V$
$Au^{3+}(aq) + 3e^- \Phi Au(s)$	$E^0_{red}(Au^{3+}/Au) = +1.42\ V$
$Cl_2(g) + 2e^- \Phi 2Cl^-(aq)$	$E^0_{red}(Cl_2/Cl^-) = +1.36\ V$
$O_2(g) + 4H^+(aq) + 4e^- \Phi 2H_2O$	$E^0_{red}(O_2/H_2O) = +1.23\ V$
$Br_2(aq) + 2e^- \Phi 2Br^-(aq)$	$E^0_{red}(Br_2/Br^-) = +1.07\ V$
$NO_3^-(aq) + 4H^+(aq) + 3e^- \Phi NO(g) + 2H_2O$	$E^0_{red}(NO_3^-/NO) = +0.96\ V$
$Ag^+(aq) + e^- \Phi Ag(s)$	$E^0_{red}(Ag^+/Ag) = +0.80\ V$
$Fe^{3+}(aq) + e^- \Phi Fe^{2+}(aq)$	$E^0_{red}(Fe^{3+}/Fe^{2+}) = +0.77\ V$
$I_2(s) + 2e^- \Phi 2I^-(aq)$	$E^0_{red}(I_2/I^-) = +0.54\ V$
$O_2(g) + 2H_2O + 4e^- \Phi 4OH^-(aq)$	$E^0_{red}(O_2/OH^-) = +0.40\ V$
$Cu^{2+}(aq) + 2e^- \Phi Cu(s)$	$E^0_{red}(Cu^{2+}/Cu) = +0.34\ V$
$AgCl(s) + e^- \Phi Ag(s) + Cl^-(aq)$	$E^0_{red}(AgCl/Ag) = +0.22\ V$
$SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \Phi H_2SO_3(aq) + H_2O$	$E^0_{red}(SO_4^{2-}/H_2SO_3) = +0.17\ V$
$2H^+(aq) + 2e^- \Phi H_2(g)$	$E^0_{red}(H^+/H_2) = 0.00\ V$
$Pb^{2+}(aq) + 2e^- \Phi Pb(s)$	$E^0_{red}(Pb^{2+}/Pb) = -0.13\ V$
$Sn^{2+}(aq) + 2e^- \Phi Sn(s)$	$E^0_{red}(Sn^{2+}/Sn) = -0.14\ V$
$Ni^{2+}(aq) + 2e^- \Phi Ni(s)$	$E^0_{red}(Ni^{2+}/Ni) = -0.25\ V$
$Co^{2+}(aq) + 2e^- \Phi Co(s)$	$E^0_{red}(Co^{2+}/Co) = -0.28\ V$
$PbSO_4(s) + 2e^- \Phi Pb(s) + SO_4^{2-}(aq)$	$E^0_{red}(PbSO_4/Pb) = -0.36\ V$
$Cd^{2+}(aq) + 2e^- \Phi Cd(s)$	$E^0_{red}(Cd^{2+}/Cd) = -0.40\ V$
$Fe^{2+}(aq) + 2e^- \Phi Fe(s)$	$E^0_{red}(Fe^{2+}/Fe) = -0.44\ V$
$Cr^{3+}(aq) + 3e^- \Phi Cr(s)$	$E^0_{red}(Cr^{3+}/Cr) = -0.74\ V$
$Zn^{2+}(aq) + 2e^- \Phi Zn(s)$	$E^0_{red}(Zn^{2+}/Zn) = -0.76\ V$
$2H_2O(aq) + 2e^- \Phi H_2(g) + 2OH^-(aq)$	$E^0_{red}(H_2O/H_2) = -0.83\ V$
$Al^{3+}(aq) + 3e^- \Phi Al(s)$	$E^0_{red}(Al^{3+}/Al) = -1.66\ V$
$Mg^{2+}(aq) + 2e^- \Phi Mg(s)$	$E^0_{red}(Mg^{2+}/Mg) = -2.37\ V$
$Na^+(aq) + e^- \Phi Na(s)$	$E^0_{red}(Na^+/Na) = -2.71\ V$
$Ca^{2+}(aq) + 2e^- \Phi Ca(s)$	$E^0_{red}(Ca^{2+}/Ca) = -2.76\ V$
$K^+(aq) + e^- \Phi K(s)$	$E^0_{red}(K^+/K) = -2.92\ V$
$Li^+(aq) + e^- \Phi Li(s)$	$E^0_{red}(Li^+/Li) = -3.05\ V$

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EXAMINATION MARK READING SHEET EKSAMEN-MERKLEESBLAD

PART 1 (GENERAL/ALGEMEEN) DEEL 1

1 STUDY UNIT e.g. 'PSY100-X' / STUDIE EENHEID bv 'PSY100-X'

2 PAPER NUMBER / VRAESTELNOMMER

3 INITIALS AND SURNAME / VOORLETTERS EN VAN

4 DATE OF EXAMINATION / DATUM VAN EKSAMEN

5 EXAMINATION CENTRE (E.G. 'PRETORIA') / EKSAMENSENTRUM (BV. 'PRETORIA')

6 STUDENT NUMBER / STUDENTENOMMER

7 c0 c1 c2 c3 c4 c5 c6 c7 c8 c9

8 UNIQUE PAPER NO / UNIEKE VRAESTEL NR

9 c0 c1 c2 c3 c4 c5 c6 c7 c8 c9

For use by examination invigilator

Vir gebruik deur eksamenopsiener

IMPORTANT

1 USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
2 MARK LIKE THIS ●
3 CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
4 ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
5 CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY
6 CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY
7 CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED
8 DO NOT FOLD

BELANGRIK

1 GEBRUIK SLEGS 'N HB POTLOOD OM HIERDIE BLAD TE VOLTOOI
2 MERK AS VOLG ●
3 KONTROLEER DAT U VOORLETTERS EN VAN REG INGEVUL IS
4 VUL U STUDENTENOMMER VAN LINKS NA REGS IN
5 KONTROLEER DAT U DIE KORREKTE STUDENTENOMMER VERSTREK HET
6 KONTROLEER DAT DIE UNIEKE NOMMER REG INGEVUL IS
7 MAAK SEKER DAT NET EEN ALTERNATIEF PER VRAAG GEMERK IS
8 MOENIE VOU NIE

PART 2 (ANSWERS/ANTWOORDE) DEEL 2

10

1	c1 c2 c3 c4 c5	36	c1 c2 c3 c4 c5	71	c1 c2 c3 c4 c5	106	c1 c2 c3 c4 c5
2	c1 c2 c3 c4 c5	37	c1 c2 c3 c4 c5	72	c1 c2 c3 c4 c5	107	c1 c2 c3 c4 c5
3	c1 c2 c3 c4 c5	38	c1 c2 c3 c4 c5	73	c1 c2 c3 c4 c5	108	c1 c2 c3 c4 c5
4	c1 c2 c3 c4 c5	39	c1 c2 c3 c4 c5	74	c1 c2 c3 c4 c5	109	c1 c2 c3 c4 c5
5	c1 c2 c3 c4 c5	40	c1 c2 c3 c4 c5	75	c1 c2 c3 c4 c5	110	c1 c2 c3 c4 c5
6	c1 c2 c3 c4 c5	41	c1 c2 c3 c4 c5	76	c1 c2 c3 c4 c5	111	c1 c2 c3 c4 c5
7	c1 c2 c3 c4 c5	42	c1 c2 c3 c4 c5	77	c1 c2 c3 c4 c5	112	c1 c2 c3 c4 c5
8	c1 c2 c3 c4 c5	43	c1 c2 c3 c4 c5	78	c1 c2 c3 c4 c5	113	c1 c2 c3 c4 c5
9	c1 c2 c3 c4 c5	44	c1 c2 c3 c4 c5	79	c1 c2 c3 c4 c5	114	c1 c2 c3 c4 c5
10	c1 c2 c3 c4 c5	45	c1 c2 c3 c4 c5	80	c1 c2 c3 c4 c5	115	c1 c2 c3 c4 c5
11	c1 c2 c3 c4 c5	46	c1 c2 c3 c4 c5	81	c1 c2 c3 c4 c5	116	c1 c2 c3 c4 c5
12	c1 c2 c3 c4 c5	47	c1 c2 c3 c4 c5	82	c1 c2 c3 c4 c5	117	c1 c2 c3 c4 c5
13	c1 c2 c3 c4 c5	48	c1 c2 c3 c4 c5	83	c1 c2 c3 c4 c5	118	c1 c2 c3 c4 c5
14	c1 c2 c3 c4 c5	49	c1 c2 c3 c4 c5	84	c1 c2 c3 c4 c5	119	c1 c2 c3 c4 c5
15	c1 c2 c3 c4 c5	50	c1 c2 c3 c4 c5	85	c1 c2 c3 c4 c5	120	c1 c2 c3 c4 c5
16	c1 c2 c3 c4 c5	51	c1 c2 c3 c4 c5	86	c1 c2 c3 c4 c5	121	c1 c2 c3 c4 c5
17	c1 c2 c3 c4 c5	52	c1 c2 c3 c4 c5	87	c1 c2 c3 c4 c5	122	c1 c2 c3 c4 c5
18	c1 c2 c3 c4 c5	53	c1 c2 c3 c4 c5	88	c1 c2 c3 c4 c5	123	c1 c2 c3 c4 c5
19	c1 c2 c3 c4 c5	54	c1 c2 c3 c4 c5	89	c1 c2 c3 c4 c5	124	c1 c2 c3 c4 c5
20	c1 c2 c3 c4 c5	55	c1 c2 c3 c4 c5	90	c1 c2 c3 c4 c5	125	c1 c2 c3 c4 c5
21	c1 c2 c3 c4 c5	56	c1 c2 c3 c4 c5	91	c1 c2 c3 c4 c5	126	c1 c2 c3 c4 c5
22	c1 c2 c3 c4 c5	57	c1 c2 c3 c4 c5	92	c1 c2 c3 c4 c5	127	c1 c2 c3 c4 c5
23	c1 c2 c3 c4 c5	58	c1 c2 c3 c4 c5	93	c1 c2 c3 c4 c5	128	c1 c2 c3 c4 c5
24	c1 c2 c3 c4 c5	59	c1 c2 c3 c4 c5	94	c1 c2 c3 c4 c5	129	c1 c2 c3 c4 c5
25	c1 c2 c3 c4 c5	60	c1 c2 c3 c4 c5	95	c1 c2 c3 c4 c5	130	c1 c2 c3 c4 c5
26	c1 c2 c3 c4 c5	61	c1 c2 c3 c4 c5	96	c1 c2 c3 c4 c5	131	c1 c2 c3 c4 c5
27	c1 c2 c3 c4 c5	62	c1 c2 c3 c4 c5	97	c1 c2 c3 c4 c5	132	c1 c2 c3 c4 c5
28	c1 c2 c3 c4 c5	63	c1 c2 c3 c4 c5	98	c1 c2 c3 c4 c5	133	c1 c2 c3 c4 c5
29	c1 c2 c3 c4 c5	64	c1 c2 c3 c4 c5	99	c1 c2 c3 c4 c5	134	c1 c2 c3 c4 c5
30	c1 c2 c3 c4 c5	65	c1 c2 c3 c4 c5	100	c1 c2 c3 c4 c5	135	c1 c2 c3 c4 c5
31	c1 c2 c3 c4 c5	66	c1 c2 c3 c4 c5	101	c1 c2 c3 c4 c5	136	c1 c2 c3 c4 c5
32	c1 c2 c3 c4 c5	67	c1 c2 c3 c4 c5	102	c1 c2 c3 c4 c5	137	c1 c2 c3 c4 c5
33	c1 c2 c3 c4 c5	68	c1 c2 c3 c4 c5	103	c1 c2 c3 c4 c5	138	c1 c2 c3 c4 c5
34	c1 c2 c3 c4 c5	69	c1 c2 c3 c4 c5	104	c1 c2 c3 c4 c5	139	c1 c2 c3 c4 c5
35	c1 c2 c3 c4 c5	70	c1 c2 c3 c4 c5	105	c1 c2 c3 c4 c5	140	c1 c2 c3 c4 c5

MARK READING SHEET INSTRUCTIONS

Your mark reading sheet is marked by computer and should therefore be filled in thoroughly and correctly

USE ONLY AN HB PENCIL TO COMPLETE YOUR MARK READING SHEET

PLEASE DO NOT FOLD OR DAMAGE YOUR MARK READING SHEET

Consult the illustration of a mark reading sheet on the reverse of this page and follow the instructions step by step when working on your sheet

Instruction numbers ❶ to ❿ refer to spaces on your mark reading sheet which you should fill in as follows

❶ Write your paper code in these eight squares, for instance

P	S	Y	1	0	0	-	X

❷ The paper number pertains only to first-level courses consisting of two papers

WRITE | 0 | 1 | for the first paper and | 0 | 2 | for the second If only one paper, then leave blank

❸ Fill in your initials and surname

❹ Fill in the date of the examination

❺ Fill in the name of the examination centre

❻ WRITE the digits of your student number HORIZONTALLY (from left to right) Begin by filling in the first digit of your student number in the first square on the left, then fill in the other digits, each one in a separate square

❼ In each vertical column mark the digit that corresponds to the digit in your student number as follows [-]

❽ WRITE your unique paper number HORIZONTALLY

NB Your unique paper number appears at the top of your examination paper and consists only of digits (e g 403326)

❾ In each vertical column mark the digit that corresponds to the digit number in your unique paper number as follows [-]

❿ Question numbers 1 to 140 indicate corresponding question numbers in your examination paper The five spaces with digits 1 to 5 next to each question number indicate an alternative answer to each question The spaces of which the number correspond to the answer you have chosen for each question and should be marked as follows [-]

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