higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS TECHNOLOGY
NQF LEVEL 4

(6050364)

27 February 2018 (Y-Paper)
13:00–16:00

Scientific calculators may be used.

This question paper consists of 5 pages and 1 periodic table.

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TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use 3,14 for the value of π
5. Start each section on a NEW page.
6. Write neatly and legibly.

FCAD

QUESTION 1

1.1 Name the TWO main components of an agitated film evaporator. (2)

1.2 1.2.1 Describe the main purpose of evaporation in the industry. (2)

1.2.2 How can evaporation of a solution be achieved? (2)

1.3 State FOUR advantages of using horizontal tubes in heat exchangers instead of coils. (4)

1.4 Name the FIVE components that a vapour bubble contact condenser consists of. (5)

1.5 Explain how vibration in condensers can cause materials to fail. (4)

1.6 Different types of column configurations are used in distillation.

Draw the diagram for each of the following column configurations:

1.6.1 Baffle

1.6.2 Single cross flow

1.6.3 Dual flow

(3 × 3) (9)

1.7 What is the name of the product called that is formed when ammonia reacts with water? (2)

[30]

QUESTION 2

2.1 Name FOUR properties of ceramics. (4)

2.2 Name TWO common uses of brass. (2)

2.3 Explain how the wire extrusion process is used in the metal shaping process. (2)

2.4 Name TWO types of metal fasteners that can be used to fasten wood pieces together. (2)

[10]

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QUESTION 3

3.1 Matter (mass) cannot be created nor destroyed; however, it can be changed from one form to another form.

What is the law called that states this phenomena? (3)

3.2 Two cubes, A and B, contain 10 particles each. The particles in cube A and in B has the same mass. The particles in cube A are spaced further apart while the particles in cube B are closer together. The volume of cube A is 1 m^3 and the volume of cube B is 0,5 m^3.

Answer the following questions:

3.2.1 Define the term *density* based on the above scenario. (4)

3.2.2 Calculate the density of both cube A and B. (5)

3.3 Define the following terms:

3.3.1 *Closed system* with reference to conservation of mass

3.3.2 *Weight*

3.3.3 *Volume concentration*

(3 × 2) (6)

3.4 Calculate the volume of a cone with a radius of 4 m and a height of 6,5 m. (5)

3.5 If the number of moles of calcium di-hydrogen phosphate [$Ca(H_2PO_4)_2$] is 8, calculate its mass. (7)

[30]

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QUESTION 4

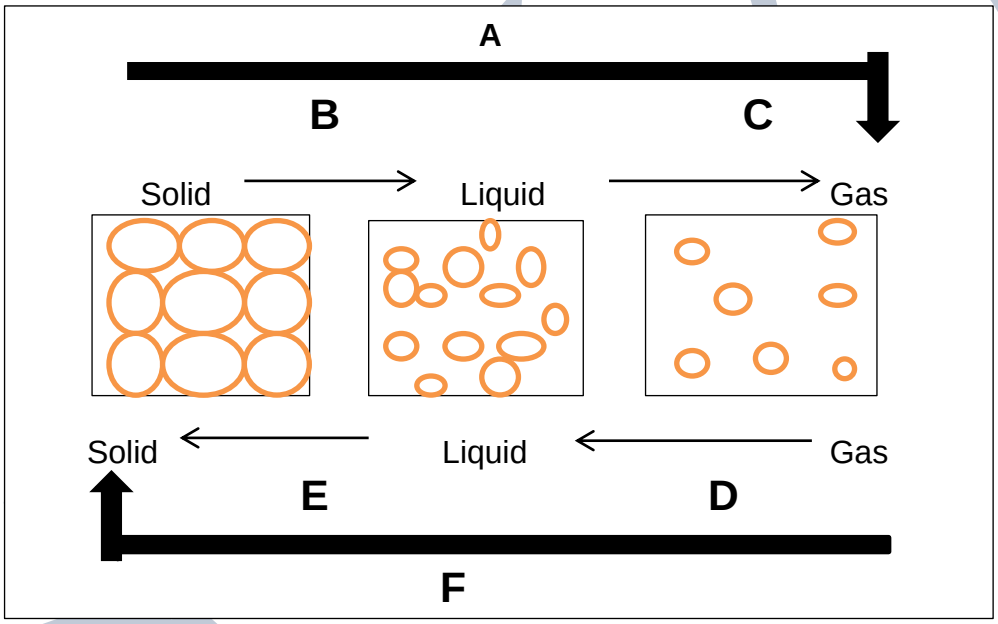
4.1 What is the energy called that exists due to the pull that other objects have on the object in question? (2)

4.2 Define the term *enthalpy.* (2)

4.3 Explain the difference between the *Celsius* and the *Fahrenheit* temperature scales. (4)

4.4 The diagram below shows the different phases and phase transitions of matter.

Identify the labelled phase transitions and write the answer next to the letter (A – F) in your ANSWER BOOK.



(6)

4.5 4.5.1 What does the term *specific heat* mean? (2)

4.5.2 In which unit is *specific heat* measured? (1)

4.6 Differentiate between the temperatures referred to as *melting point* and *fusion point*. (4)

4.7 A kettle with a diameter of 10 cm and a radius of 8 cm contains water at boiling point. The water has a density of 958 kg/m^3. The latent heat of vaporisation is L_v = 2 257 kJ/kg and the latent heat of fusion is L_f = 333,7 kJ/kg.

Calculate the heat that must be absorbed by the water to change into vapour. Express your final answer in MJ. (9) **[30]**

TOTAL : 100

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THE PERIODIC TABLE OF ELEMENTS
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 He 4
2,1 1 H 1																	
1,0 3 Li 7	1,5 4 Be 9											2,0 5 B 11	2,5 6 C 12	3,0 7 N 14	3,5 8 O 16	4,0 9 F 19	10 Ne 20
0,9 11 Na 23	1,2 12 Mg 24											1,5 13 Al 27	1,8 14 Si 28	2,1 15 P 31	2,5 16 S 32	3,0 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	1,6 23 V 51	1,6 24 Cr 52	1,5 25 Mn 55	1,8 26 Fe 56	1,8 27 Co 59	1,8 28 Ni 59	1,9 29 Cu 63,5	1,6 30 Zn 65	1,6 31 Ga 70	1,8 32 Ge 73	2,0 33 As 75	2,4 34 Se 79	2,8 35 Br 80	36 Kr 84
0,8 37 Rb 86	1,0 38 Sr 88	1,2 39 Y 89	1,4 40 Zr 91	1,6 41 Nb 92	1,8 42 Mo 96	1,9 43 Tc	2,2 44 Ru 101	2,2 45 Rh 103	2,2 46 Pd 106	1,9 47 Ag 108	1,7 48 Cd 112	1,7 49 In 115	1,8 50 Sn 119	1,9 51 Sb 122	2,1 52 Te 128	2,5 53 I 127	54 Xe 131
0,7 55 Cs 133	0,9 56 Ba 137	1,1 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	1,8 81 Tl 204	1,8 82 Pb 207	1,9 83 Bi 209	2,0 84 Po	2,5 85 At	86 Rn
0,7 87 Fr 223	0,9 88 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

KEY / *SLEUTEL*

Atomic number *Atoomgetal*

Electronegativity *Elektronegatiwiteit*

Symbol *Simbool*

Approximate relative atomic mass *Benaderde relatiewe atoommassa*

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