

Entrance examination for Maritime Management
Novia University of Applied Sciences
April 2013

INSTRUCTIONS

The examination consists of three parts:

Part 1: Mathematics, Logical Deduction, Physics and Chemistry

Part 2: Interview in written

Part 3: English language (Applicable to those EU/EEA citizens who have not provided a proof of the English language skills by the set date within the application process.)

Part 1: Mathematics, Logical Deduction, Physics and Chemistry

The duration of **Part 1 and 2** is 3 hours.

You may not leave the examination room within the first 30 minutes.

You may only bring your writing material (pencil, sharpener, rubber, ruler, compasses and protractor) and your calculator to the examination. Formula books and dictionaries are not allowed.

Answer sheets and extra paper are distributed with the exam papers.

There are 10 problems to be solved; each worth 3 points. **Write your solutions on the provided answer sheets.**

Include calculation details whenever the solution requires calculations. Show your calculations clearly on the answer sheet, only giving the answer will not award full marks.

For problems 8, 9 and 10, you have to choose either A (Physics) or B (Chemistry). If you solve both, the one with the lower score will count.

Only solutions written on your answer sheets will be checked!

All papers must be returned.

Your mobile phone must be switched OFF!

Mathematics, Logical Deduction, Physics and Chemistry

Mathematics

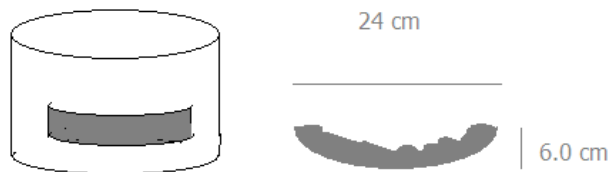
1. Solve the following equations. The details of the solutions and the exact answers are required.

a) $5 = 3(4x - 5) - 4(2x + 1)$

b) $-2 + \frac{2}{3}x = \frac{3}{2}x + \frac{1}{6}$

c) $0 = -\frac{5}{4}\left(-\frac{6}{5} + x\right)$

2. An *archaeological excavation* of an ancient Mediterranean seaport uncovered a potshard with measurements according to the picture. It was assumed that the original pot had a circular base. Calculate the cross-section of the original pot.



3. Simplify. The details of the simplifications are required.

a) $-(2x - 7) + 4(3x - 8)$

b) $\frac{4x^{-5} \cdot y^{-3} \cdot y^{-2} \cdot 3x^3}{y^3 \cdot 6x^{-5}}$

Evaluate the following expression

c) $b - [4 - b - (c - a)]$ use $a = 3, b = 1, c = 6$

4. In spring, the price of a mountain bike is set 30% higher than the original price. When the biking season is over, this 30% higher price is lowered by 28%. How many % higher or lower is this new price compared to the original one?

Logical Deduction

5. At the maritime school, the boys sit at desks numbered 1 – 5 and the girls sit opposite them at desks numbered 6 – 10.

- The girl sitting next to the girl opposite No. 1 is Fiona.
- Fiona is three desks away from Grace.
- Helen is opposite Christopher.
- David is opposite Grace.
- Edward is opposite the girl next to Helen.
- Helen is three desks away from June.
- If Christopher is not central then Adam is.
- The girl sitting next to the girl opposite Adam is June.
- Christopher is not at desk No. 5.
- June is not at desk No. 10.
- David is next to Bill.
- Bill is three desks away from Christopher.
- If Fiona is not central then Ivy is.

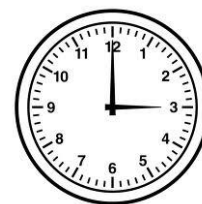
1	2	3	4	5
10	9	8	7	6

BOYS

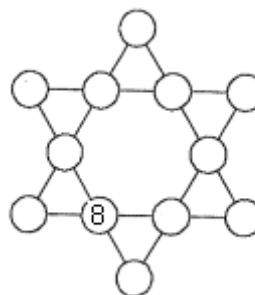
GIRLS

Can you work out the seating arrangement?

6. A clock on the wall falls to the floor and the face breaks into three pieces. The digits on each piece of clock add up to the same total. What are the digits on each piece?



7. Distribute the remaining numbers 1 to 12 around the nodes so that each of the six lines of four numbers add up to 26. Use this picture as a draft and put the final answer in the answer sheet.



Physics and Chemistry

Solve either problem 8.A or 8.B, not both. If you solve both, the one with the lower score will be chosen as your answer.

- 8.A** Two students start from opposite ends of an 8 km course walking towards each other. One student is walking at a rate of 4 km/h and the other is walking at a rate of 6 km/h. After how long will the students meet?

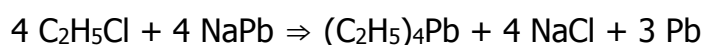
- 8.B** The analysis of a compound indicates a composition that is 26.57% K, 35.36% Cr, and 38.07% O. Derive the empirical formula of the compound.

Solve either problem 9.A or 9.B, not both. If you solve both, the one with the lower score will be chosen as your answer.

- 9.A** A 60-kg rectangular box, open at the top, has base dimensions 1.0 m by 0.80 m and depth 0.50 m.

- a) How deep will it sink in fresh water?
b) What weight of ballast will cause it to sink to a depth of 30 cm?

9.B Before the public became serious about pollution, it was common to improve the performance of gasoline by the addition of lead compounds. A 100-octane aviation gasoline used 1.00 cm^3 of tetraethyl lead $(\text{C}_2\text{H}_5)_4\text{Pb}$ of density 1.66 g/cm^3 , per liter of product. How many grams of ethyl chloride $\text{C}_2\text{H}_5\text{Cl}$ are needed to make enough tetraethyl lead for 1.00 liter gasoline? Tetraethyl lead production is described by



Solve either problem 10.A or 10.B, not both. If you solve both, the one with the lower score will be chosen as your answer.

10.A A thermos bottle contains 250 ml of coffee at 90°C . To this is added 20 ml of milk at 5°C . After equilibrium is established, what is the temperature of the liquid? The specific heat capacity of water, coffee and milk is $4.19 \text{ kJ}/(\text{kg}\cdot\text{K})$ and the density is 1000 kg/m^3 . Assume no heat loss to the thermos bottle.

10.B A sample of diborane gas (B_2H_6) , a substance that bursts into flames when exposed to air, has a pressure of 340 torr at a temperature of -16°C and a volume of 3.50 L. If conditions are changed so that the temperature is 38°C and the pressure is 470 torr, what will be the volume of the sample?

		Key																	
		11		8		7		6		5		4		3		2		1	
		Na		Fe		Mn		Cr		V		Ti		Sc		Be		H	
		Sodium 22.99		Iron 55.85		Manganese 54.94		Chromium 52.00		Vanadium 50.94		Titanium 47.87		Scandium 44.96		Beryllium 9.01		Hydrogen 1.01	
		Average atomic mass*		Average atomic mass*		Average atomic mass*		Average atomic mass*		Average atomic mass*		Average atomic mass*		Average atomic mass*		Average atomic mass*		Average atomic mass*	
18	8A	2	He	4.00	10	Ne	20.18	18	Ar	39.95	36	Kr	83.80	54	Xe	131.29	86	Rn	(222)
17	7A	9	F	19.00	8	O	16.00	16	S	32.07	34	Se	78.96	52	Te	127.60	84	Po	(209)
16	6A	7	N	14.01	15	P	30.97	14	Si	28.09	32	Ge	72.61	50	Sn	118.71	82	Pb	207.2
15	5A	6	C	12.01	14	C	12.01	13	B	10.81	31	Ga	69.72	49	In	114.82	81	Tl	204.38
14	4A	5	B	10.81	13	Al	26.98	12	Mg	24.31	20	Ca	40.08	38	Sr	87.62	88	Ra	(226)
13	3A	4	Be	9.01	12	Mg	24.31	11	Na	22.99	19	K	39.10	37	Rb	85.47	55	Cs	132.91
12	2B	30	Zn	65.39	29	Cu	63.55	28	Ni	58.69	27	Co	58.93	26	Fe	55.85	25	Mn	54.94
11	1B	48	Cd	112.41	47	Ag	107.87	46	Pd	106.42	45	Rh	102.91	44	Ru	101.07	43	Tc	(98)
10		80	Hg	200.59	79	Au	196.97	78	Pt	195.08	77	Ir	192.22	76	Os	190.23	75	Re	186.21
9		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
8		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
7		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
6		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
5		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
4		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
3		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
2		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
1		109	Mt	(268)	108	Hs	(269)	107	Bh	(264)	106	Sg	(266)	105	Db	(262)	104	Rf	(261)
71	Lu	70	Yb	174.97	69	Tm	168.93	68	Er	167.26	67	Ho	164.93	66	Dy	162.50	65	Tb	158.93
103	Lr	102	No	(289)	101	Md	(258)	100	Fm	(257)	99	Es	(252)	98	Cf	(251)	97	Bk	(247)
103	Lr	102	No	(289)	101	Md	(258)	100	Fm	(257)	99	Es	(252)	98	Cf	(251)	97	Bk	(247)
103	Lr	102	No	(289)	101	Md	(258)	100	Fm	(257)	99	Es	(252)	98	Cf	(251)	97	Bk	(247)

* If this number is in parentheses, then it refers to the atomic mass of the most stable isotope.

