PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination : Semester 2 Academic Year : 2004

Date : March 4, 2005 Time : 09.00-12.00

Subject : 226-318 INDUSTRIAL CERAMICS Room : R300

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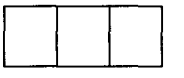
ทุจริตในการสอบโทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Instruction :

1. Do all of 21 problems.
2. The score appears at the end of each problem.
3. Total score is 102.
4. Notes, books and calculator are allowed.
5. Your choices are on page 4-7.
6. Write the answers on page 8.
7. Each answer of the problem no.1-18 must be in the form of  and the rest has to be done on page 8.

ผศ.เสน่ห์ ธัญธาดาลักษณ์

ผู้ออกข้อสอบ

1. How could the refractoriness of ceramics be found?.....(4)
2. What is chamotte?.....(4)
3. What do you know about spalling resistance?.....(4)
4. Tell me 2 ceramic materials of high thermal shock resistance?.....(4)
5. There are 2 fire bricks (A and B). The bulk density of A is more than B. They are made of same material. What are the differences of thermal conductivity and strength?.....(4)
6. How do you make an insulating firebrick ? .....(4)
7. How do you make air setting-refractory mortar?.....(4)
8. What is refrax?.....(4)
9. What do you know about tunnel kiln?.....(4)
10. What is the important difference between metal and ceramics in case of heating element?.....(4)
11. Why is the temperature difference of work piece and heating element in normal electric furnace less than in vacumm furnace?.....(4)
12. Why should gas burner be used instead of oil burner to produce stoneware glaze?.....(4)
13. How many types of atmosphere does occur during glost firing?.....(4)
14. What colors could glaze formula which comprises CuO as one of counstituents be after glost firing? .....(4)
15. Why have we to build chimney for gas-fired kiln?.....(4)
16. How many kinds of the furniture material could be used in the kiln? What are they?.....(4)
17. How do you measure the kiln temperature during high firing?.....(4)
18. How do you produce earthenware glaze?.....(4)
19. Given LPG of 11000 kcal./kg., 200 lbs of silica chamotte, 15% of net efficiency and 1200-1300^{o}C within one hour.
    (a) Find energy consumption in Kcal.....(10)
    (b) How many kgs/hr of LPG should be?.....(5)

20. Given the molecular formula of glaze as follow:

0.2 Mgo

0.2 Cao 0.4 Al_2O_3 3.5 $Si\ O_2$

0.3 BaO 0.5 B_2O_3

AK_2O

Find A.....(5)

21.

Raw Material	Molecular Eqerivalent	Molecular Weight	Batch Wight
$CaCO_3$	X	Y	Z
$MgCO_3$	.1135	84	9.53
B-Feldspar	.1291	596	76.94
Kaolin	.1615	258	59.13
Flint	1.076	60	93.44

The total batch weight is 314.76 . M.W. of $CaCO_3$ is 100.

Find X.....(10)

The metal is serviced at higher temperature.	=	O	N	E
The metal is serviced at lower temperature.	=	N	O	E
The metal is serviced for longer time.	=	E	O	N
The metal is serviced for shorter time.	=	O	E	N

Green and red.	=	4	X	Y
Blue, green and red.	=	X	4	Y
White and blue.	=	Y	4	X
Yellow, blue and red.	=	X	Y	4

Oil burner is more efficient.	=	2	K	W
Gas burner is more efficient.	=	K	W	2
Gas burner provides better quality of product.	=	K	2	W
Gas burner is cheaper.	=	W	K	2

The chimney provides better quality of fired product.	=	5	X	O
The chimney provides better firing.	=	O	X	5
Gas fired kiln provides burned gases which must be exhausted.	=	X	5	O

Refractory clay and carbofax	=	6	M	K
Refractory clay and refrax.	=	K	M	6
High alumina clay and mortar.	=	K	6	M
Pure oxide and refrax.	=	M	6	K

Using thermocouple and cone.	=	7	X	Y
Using temperature controller.	=	X	Y	7
Using infared thermometer.	=	X	7	Y
Using thermocouple and pyrometric cone.	=	Y	X	7

Fired-clay body.	=	2	A	B
Fired-SiC body.	=	A	B	2
Fired-brick.	=	B	2	A
Fired-Glaze.	=	2	B	A

C and SiO_2 .	=	4	B	C
Clay and diamond.	=	B	C	4
SiC and Si_3N_4 .	=	C	B	4
Clay and talc.	=	B	4	C

Thermal conductivity of A is lower but the strength is higher than B.	=	5	C	D
Thermal conductivity of A is higher but the strength is lower than B.	=	C	D	5
Both properties of A is lower.	=	C	5	D
Both properties of A is higher.	=	D	C	5

High firing of refractory clay and SiO_2.	=	7	A	B
High firing of clay and burned $MgCO_3$.	=	A	7	B
Mixing refractory clay and burned ceramics.	=	B	7	A
Mixing sodium silicate and calcinated-refractory clay.	=	A	B	7

The kiln is continuously run ceramicwares production.	=	9	A	G
The kiln is periodically run ceramicwares production.	=	A	G	9
The longly straight kiln is continuously run ceramicwares production.	=	G	9	A
The longly straight kiln is periodically run ceramicwares production.	=	G	A	9

High carbon product.	=	8	D	E
Clay-graphite product.	=	D	E	8
Carborundum product of 95% SiC or higher.	=	8	E	D
One of carborundum products.	=	D	8	E

The vacuum furnace is more efficient.	=	H	B	1
The heating element of the normal one is lower efficient.	=	B	H	1
The heating element of the vacuum one is operated at very high temperature.	=	1	B	H
The heat transfer of the normal one is higher.	=	B	1	H

To fire the specimen reaching the temperature at which the moment of sagging occurs and the apex falls down the level of the base.	=	1	G	D
To fire the specimen reaching the temperature at which the moment of melting occurs.	=	G	1	D
To fire the specimen reaching the temperature at which the sintering occurs.	=	D	G	1
To fire the specimen reaching the temperature at which the failure occurs.	=	G	D	1

The ability of a refractory material to resist repeated temperature variation without being destroyed.	=	3	K	F
The ability of a refractory material to resist thermal shock without being destroyed.	=	K	3	F
The ability of a refractory material to resist very high temperature for long time without melting.	=	F	K	3
The ability of a refractory material to resist the temperature at which is higher than 1000^{o}C.	=	3	F	K

Firing refractory clay at 1400^{o}C.	=	6	B	J
Firing the mixture of fireclay, calcinated refractory clay and combustible additives at 1400^{o}C.	=	B	6	J
Firing the mixture of fireclay and combustible additives at 1400^{o}C.	=	J	B	6
Firing the mixture of fireclay and calcinated refractory clay at 1400^{o}C.	=	6	J	B

3	=	3	D	B
2	=	D	3	B
1	=	D	B	3
0	=	B	D	3

Firing the mixture of high lead compound and stoneware glaze batch at 1200°C or lower.	=	8	Y	X
Firing the mixture of high lead and boron compounds with stoneware glaze batch at 1100°C or lower.	=	8	X	Y
Firing the mixture of high boron compound and stoneware glaze batch at 1000°C or lower.	=	X	8	Y
Firing the mixture of the mixture of high lead compound and stoneware glaze batch at 900°C or lower.	=	Y	X	8