

Name.....ID.....

**Prince of Songkla University**  
**Faculty of Engineering**

**Final Examination : Semester II****Academies Year : 2005****Date : February 22, 2006.****Time : 09.00-12.00****Subject :226-318 Industrial Ceramics****Room : R300**

.....

ทูลจรลทในการสอบ โทษขันด่ำปรลบกในรายวلمانันแลลพัทการเรยน 1 ภาคการศึกษา

**Instruction:**

1. *Do all 21 .*
2. *The score appears at the end of question.*
3. *Total score is 100.*
4. *Write your name and ID no. on pages 1 -3.*
5. *Your choices for problem no. 1-18 are shown on pages 6-11 . For the answer you have to put 4 letters which is corresponding to the choice into*

--	--	--	--
6. *The answers must be done on pages 2 and 3.*
7. *Book, notes and calculator are allowed.*

*Asst. Prof.Sane Thanthadalugsana*



1. **How could the refractoriness under load of a ceramic body be found? (4)**
2. **What is spalling resistance? (4)**
3. **What is thermal shock? (4)**
4. **There are 2 ceramic bodies (A and B). The true porosity of A is less than B. Tell me about thermal conductivity and strength. (4)**
5. **How do you produce an insulating firebrick? (4)**
6. **How do you produce air-setting refractory mortar? (4)**
7. **What is aluminosilicate firebrick? (4)**
8. **How many types of carborundum product? What are they? (4)**
9. **How many types of industrial kiln ? What are they? (4)**
10. **Why is the temperature difference between work piece and heating element in normal electric furnace smaller than in vacuum furnace? (4)**
11. **How is reducing atmosphere produced in gas-fired kiln ? (4)**
12. **Why does eclectic kiln consume less energy than gas-fired kiln? (4)**
13. **Why don't ceramic factories use large electric-kilns to produce stoneware products? (4)**
14. **Why should you do bisque firing before glazing? (4)**
15. **How do you measure the temperature of a ceramic kiln during high firing? (4)**
16. **What is earthenware glaze? (4)**
17. **What is the difference between under glaze and over glaze colorant? (4)**
18. **Why should periodic kiln be lined with ceramic fiber? (4)**
19. **Given LPG of 11,000 kcal./kg., 600 lbs of silica chamotte, 15% of total efficiency and 1200-1300°C with in 2 hours.**
  - (a) **Find Qx in Kcal (6)**
  - (b) **How many kgs/hr of LPG should be? (5)**



20. Given formula of a glaze as follows:

0.25 PbO

0.04 MgO    0.07 Al<sub>2</sub>O<sub>3</sub>    0.72 SiO<sub>2</sub>

0.07 CaO    0.14 B<sub>2</sub>O<sub>3</sub>

Then the molecular formula from the above one is as below:

0.7 PbO

a MgO    b Al<sub>2</sub>O<sub>3</sub>    x SiO<sub>2</sub>

0.2 CaO    d B<sub>2</sub>O<sub>3</sub>

Find a , b, d and x .....(10)

21.

Raw Mat.	Moles	M.W.	Batch weight
CaCO <sub>3</sub>	0.7572	100	75.72
MgCO <sub>3</sub>	0.1135	84	Y
B-Feldspar	X	596	76.94
Kaolin	A	258	59.13
Silica flour	B	60	93.44
		Total	314.76

Find X and Y .....(7)



A	B	C	D
---	---	---	---

Thermal conductivity of A should be higher but the strength is lower.

B	A	C	D
---	---	---	---

Thermal conductivity of A should be lower but the strength is higher.

C	B	A	D
---	---	---	---

Thermal conductivity and the strength of A should be higher.

D	C	B	A
---	---	---	---

Thermal conductivity and the strength of B should be higher.

B	D	E	F
---	---	---	---

The firebrick whose raw material is mainly clay.

D	B	E	F
---	---	---	---

The firebrick whose raw materials are mainly clay and silica.

E	D	B	F
---	---	---	---

The firebrick whose raw materials are silica and alumina.

F	D	E	B
---	---	---	---

The firebrick whose raw materials are fireclay and silica flour.

C	E	F	G
---	---	---	---

To let the cylindrical specimen be pressed under  $2 \text{ kgs/cm}^2$  at high temperature until the deformation occurs.

E	C	G	F
---	---	---	---

To press the specimen at  $1300^\circ\text{C}$  and the pressure of  $2 \text{ kgs/cm}^2$

F	G	C	E
---	---	---	---

To provide the pressure of  $2 \text{ kgs/cm}^2$  over the specimen and record the high temperature at which the deformation occurs.

G	F	E	C
---	---	---	---

To fire the specimen under  $2 \text{ kgs/cm}^2$  pressure and record the temperature at which the crack begins.

E	F	R	T
---	---	---	---

The property of the body which could repeatedly resist high temperature changes.

F	E	T	R
---	---	---	---

The property of the body which could resist abrasion at high temperature.

T	F	E	R
---	---	---	---

The property of the body which could resist thermal shock.

E	T	R	F
---	---	---	---

The property of the body which could repeatedly resist cracking at high temperature.

A	G	K	L
---	---	---	---

The power of normal one is larger.

G	A	K	L
---	---	---	---

The power of normal one is smaller.

L	A	G	K
---	---	---	---

The normal one provides heat transfer through radiation and conduction but the vacuum one doesn't.

G	L	K	A
---	---	---	---

The normal one provides heat transfer through radiation but the vacuum doesn't.

E	K	J	D
---	---	---	---

The occurrence of large temperature change is immediately done.

K	E	D	J
---	---	---	---

The large change of heating is suddenly done.

J	K	D	E
---	---	---	---

The large change of pressure is immediately done.

E	J	K	D
---	---	---	---

The large changes of temperature and pressure are immediately done.

C	A	Q	D
---	---	---	---

To fire the mixture of calcinated-clay, clay and sodium silicate.

A	Q	D	C
---	---	---	---

To fire the mixture of clay and calcinated-clay.

Q	D	C	A
---	---	---	---

To mix calcinated-clay, clay and sodium silicate.

D	A	Q	C
---	---	---	---

To fire the body of clay calcinated-clay and combustible material.

A	P	K	D
---	---	---	---

Because of higher investment and power.

P	A	D	K
---	---	---	---

Because of lower efficiency production.

D	P	K	A
---	---	---	---

Because of higher investment and production rate.

K	A	P	D
---	---	---	---

Because of higher investment.

J	K	P	Q
---	---	---	---

Lower production cost and higher production rate.

K	J	Q	P
---	---	---	---

Lower energy consumption and production rate.

P	K	J	Q
---	---	---	---

Higher product quality and lower cost.

Q	P	K	J
---	---	---	---

The lifetime of the kiln is longer.

A	B	P	Q
---	---	---	---

2. Electric and gas fired.

B	A	Q	P
---	---	---	---

3. Electric, gas fired and charcoal fired.

Q	B	A	P
---	---	---	---

2. Fiber lined and insulating firebrick lined.

P	Q	A	B
---	---	---	---

2. Periodic and continuous ones.

J	K	F	D
---	---	---	---

2. Chamotte and mortar.

K	J	D	F
---	---	---	---

3. Chamotte, mortar and silicon carbide.

D	K	J	F
---	---	---	---

2. Carborundum and carbon products.

F	D	K	J
---	---	---	---

2. Refrax and carbofrax.

U	V	S	T
---	---	---	---

To let small amount of air get into the kiln.

V	U	S	T
---	---	---	---

To control amount of air.

S	V	U	T
---	---	---	---

To control amount of gas.

T	S	U	V
---	---	---	---

To let large amount of gas get into the kiln.

T	S	X	Y
---	---	---	---

In electric kiln, the work piece need less energy.

S	T	Y	X
---	---	---	---

In electric kiln, heat loss is lower.

Y	X	T	S
---	---	---	---

Gas-fired kiln provides lower efficiency.

X	Y	S	T
---	---	---	---

Heat loss through chimney of gas-fired kiln is essential but electric kiln isn't.

P	Q	X	Y
---	---	---	---

 To use pyrometric cone.

Q	P	X	Y
---	---	---	---

 To use thermometer.

Y	Q	P	X
---	---	---	---

 To use pyrometric cone or thermocouple and temperature indicator.

P	X	Y	Q
---	---	---	---

 To use optical pyrometer.

J	Q	R	T
---	---	---	---

 To lessen defects of products.

Q	S	T	R
---	---	---	---

 To get the good ones.

R	Q	S	T
---	---	---	---

 To reduce the defects from bubbles.

T	R	J	Q
---	---	---	---

 To decrease production cost.

A	D	R	T
---	---	---	---

 The glaze is matured around 650 – 1050 °C

D	A	R	T
---	---	---	---

 The glaze is matured around 700 – 1000 °C

R	D	A	T
---	---	---	---

 The glaze is matured around 650 – 1100 °C

T	R	D	A
---	---	---	---

 The glaze is matured around 800 – 1200 °C






X	T	V	R
---	---	---	---

The colorant of underglaze is used before bisque firing but the other is not.

V	X	T	R
---	---	---	---

The colorant of underglaze is used before glost firing but the other is not.

R	V	X	T
---	---	---	---

The colorant of underglaze is used before glazing and the other is painted after glost firing.

T	R	V	X
---	---	---	---

The colorant of underglaze is painted after glost firing and the other is used before glost firing.

