※注意：作答時，請於答案卷上標明作答之大題及其題號，並依序作答。

Read the text and answer the following questions.

I. Swelling powers of starches

The swelling powers (SP) of ten kinds of starches from cereal, roots, tubers, and pea have been determined at 55°C to 95°C. SP increased with temperature for all the starches tested. When the temperature was reaching the peak temperature (T_p) from differential scanning calorimetric thermogram, there existed an increase in SP. Potato, tapioca, and waxy corn starch yielded high SP and exhibited a maximum value near 80 °C. Low swelling starch, such as corn and rice starch, yielded greater peak storage modulus (G'_{max}) in dynamic mechanical analysis. The corresponding loss tangent (tan $\delta_{G'max}$) correlated fairly (r^2=0.8) with SP measured at 75 °C. Granule size, amylose content, or heat of gelatinization alone did not significantly correlate with the SP for all the data obtained. An equation consisting of temperature effect and tan $\delta_{G'max}$ was developed to explicate the relationships between thermal, rheological characteristics and SP.
(Cited from Li & Yeh, 2001. J. Food Eng. 50(3):141-148.)

單選題：(每題 2 分)

( ) 1. Which one is not a cereal starch? (1) potato starch (2) rice starch (3) corn starch (4) wheat starch.
( ) 2. The peak temperature (T_p) from differential scanning calorimetric thermogram for a starch generally indicates a temperature for (1) glass transition (2) freezing (3) gelatinization (4) drying.
( ) 3. Which one has the lowest swelling power? (1) potato starch (2) tapioca starch (3) waxy corn starch (4) corn starch.
( ) 4. Which one consists of almost zero amylose? (1) potato starch (2) tapioca starch (3) waxy corn starch (4) corn starch.
( ) 5. The swelling power generally indicates the capability of starch absorbing (1) ethanol (2) methanol (3) ether (4) water.
( ) 6. Which one is significantly related to the swelling power? (1) heat of gelatinization (2) granule size (3) loss tangent (4) amylose content.
( ) 7. In dynamic mechanical analysis, the storage modulus accounts for (1) viscous (2) elastic (3) adhesive (4) viscoelastic property of starch paste.
( ) 8. Which word is a synonym of "explicate"? (1) expound (2) translate (3) comprehend (4) decapitation.
( ) 9. Amylose is a biopolymer and is formed by (1) glucose and galactose (2) glucose (3) glucose and amino acid (4) glucose and fructose.
( ) 10. Which starch has the smallest granule? (1) tapioca (2) rice (3) potato (4) waxy corn.

接背面

II. Genistein

We investigated the potential of genistein, the primary isoflavone of soy, to protect against breast and prostate cancers in animal models. For mammary cancer studies, Sprague-Dawley rats were fed AIN-76A diet ± 250 mg genistein/kg diet. Dimethylbenz[a]anthracene was administered by gavage at d 50 postpartum to induce mammary tumors. Mammary cancer chemoprevention was demonstrated after prepubertal and combined prepubertal and adult genistein treatments but not after prenatal- or adult-only treatments, demonstrating that timing of exposure to genistein is important for mammary cancer chemoprevention. The cellular mechanism of action was found to be mammary gland and cell differentiation, as shown by whole-mount analysis and β-casein expression. As imprinting effect was shown for epidermal growth factor receptor expression in mammary terminal end buds. For prostate cancer studies, we used two models. The first model was a chemically (N-methylnitrosourea) induced prostate cacer rat model. Genistein in the diet inhibited the development of invasive adenocarcinomas in a dose-dependent manner. The second model was a transgenic mouse model that resulted in spontaneously developing adenocarcinoma tumor of the prostate. Genistein in the diet reduced the incidence of poorly differentiated prostatic adenocarcinomas in a dose-dependent manner and down-regulated androgen receptor, estrogen receptor-α, progesterone receptor, epidermal growth factor receptor, insulin-like growth factor-1, and extracellular signal-regulated kinase-1 but not estrogen receptor-β and transforming growth factor-α mRNA expressions. We conclude that dietary genistein protects against mammary and prostate cancers by regulating specific sex steroid receptors and growth factor signaling pathways.
(J. Nutr. 132: 552S-558S, 2002)

是（O）或非（X），每題 2 分，答錯倒扣 1 分。

( ) 1. Timing of exposure to genistein is important for prostate cacer chemoprevention.

( ) 2. In this paper they used cell models to evaluate the potential of genistein against breast and prostate cancers.

( ) 3. Dimethylbenz[a]anthracene was used to induce mammary cacer in Sprague-Dawley rats.

( ) 4. This paper used three models for prostate cancer studies,.

( ) 5. Genistein inhibited the development of invasive adenocarcinomas in a dose-independent manner.

( ) 6. A transgenic mouse model resulted in spontaneously developing adenocarcinoma tumor of the prostate.

( ) 7. This paper conclude that dietary genistein protects against mammary and prostate cancers by regulating specific sex steroid receptors and growth factor signaling pathways.

( ) 8. Dimethylbenz[a]anthracene was administered by gavage at d 50 postpartum to induce prostate tumor in rats.

( ) 9. The cellular mechanism of mammary cacer chemoprevention was found to be mammary gland and cell differentiation, as shown by whole-mount analysis and β-casein expression.

( ) 10. Genistein in the diet up-regulated androgen receptor but not estrogen receptor-β.

接次頁

III. Bifidobacteria and spray drying

[Paragraphs adopted and modified from Lien et al., International Journal of Food Microbiology, 74 (2002), 79-86]

Bifidobacteria are gram-positive, non-motile bacteria that naturally inhabit the guts of warm blooded animals and man (Scardovi, 1986). Since their first discovery in 1898 by Tisser, extensive research on the properties and applications of these organisms has been conducted. It has been reported that these organisms are able to exert beneficial effects including improvement of intestinal microflora by preventing colonization of pathogens, amelioration of diarrhea or constipation, activation of the immune system and increasing protein digestion (Ishibashi, 1993). Owing to these properties, bifodobacteria are now frequently used to prepare probiotic dietary adjuncts. Incorporation of bifidobacteria in food products such as cheese yoghurt, and other milk products has become an increasingly popular trend (Dinakar, 1994). In addition, various health products and pharmaceutical preparations containing dried cells of bifidobacteria are used in the treatment of gastrointestinal disturbances.

Spray drying which has high production rate and low operation cost, is a well-known technology in the food industry. It is one of the common methods used to prepare food adjuncts which are dry, stable and occupy small volume (Potter, 1980). In addition, spray drying is used for the preservation and concentration of microorganisms (Fu, 1995). Furthermore, the use of spray drying has been reported by various investigators to prepare starter cultures which are used to prepare lactic fermented products or used as adjuncts to enhance the flavor of cheese (Johnson et al.,1993).

Lien et al. (2002) performed a study to investigate the survival of bifidobacteria after spray drying with different carrier media including 10 % (w/w) gelatin, gum arabic, skim milk and soluble starch. Results revealed that survival of bifidobacteria after spray drying varies with strains and is highly dependent on the kinds of carrier, as well as outlet-air temperatures employed during spray drying. Among the test organisms, *B. longum* B6 was the least susceptible to spray drying under the test conditions. Survival was the lowest with soluble starch as the carrier for drying. Increasing the outlet-air temperature resulted in reduced survival of bifidobacteria, while the magnitude of reduced survival varied with the carriers used. Generally, elevation of outlet-air temperature caused the largest reduction in the survival of bifidobacteria after spray drying with soluble starch while the magnitude of survival reduction caused by this temperature effect was the least when spray drying with skim milk.

(是非題，每題兩分，答錯倒扣一分)

( )1. After Gram staining, bifidobacteria will appear purple in color.

( )2. Probiotic dietary adjuncts are commonly employed to improve the flavor of food products.

( )3. "Johnson et al. (1993)" cited in the article implies that there are at least two authors involved.

( )4. In " *Bifidobacterium lognum* B6", "*Bifidobacterium*" refers to the family name, while "*longum* B6" refers to species name of the microorganism.

( )5. Among the microorganisms tested, *B. longum* B6 survived best during spray drying and exhibited the lowest viable population.

( )6. Spray drying can provide food product with a better keeping quality.

( )7. Bifidobacteria may exhibit therapeutic value.

( )8. Based on the article, it is reasonable to expect that a higher viable count of test organism in product spray-dried at an outlet air temperature of 60℃ than at 50℃.

( )9. Bifodobacteria possess no flagella

( )10.Survival of *B. longum* B6 was higher in product spray-dried with gelatin than soluble starch as a carrier.

接背面

IV. *Ginkgo biloba*

A study in the August 21 issue of the *Journal of the American Medical Association* found that ginkgo biloba(1) had no beneficial effect on memory and related mental functions of healthy older adults when taken following manufacturer's instructions.

The study, conducted by researchers at Williams College, Williamstown, Mass., and The Memory Clinic, Bennington, Vt.(2), identified 230 volunteers over the age of 60 who were physically and mentally healthy. Researchers gave the volunteers 14 tests of learning, memory, and attention and concentration(3), and had them and their companions rate the participants' mental functions(4). There were no significant differences(5) between those taking ginkgo and those taking placebo(6) on any of the objective or subjective(7) measures.

In response to the study, press(8) releases(9) from the American Herbal Products Association, the National Nutritional Foods Association, and the Council for Responsible Nutrition urged consumers to put this new study in context with the total body of positive research(10) on this botanical. (cited from *Food Technology* 56(11): 10).

單選題：(每題 2 分)

( ) 1. "Ginkgo biloba" is a species of (1) tree (2) grass (3) fungus.

( ) 2. "Vt." is a (1) nation (2) province (3) state.

( ) 3. "Concentration" here means (1) the quantity (2) to focus the attention (3) the intention for teamwork.

( ) 4. Who are the participants? (1) The volunteers only (2) The researchers only (3) The volunteers and the researchers.

( ) 5. How to tell "significant" differences from "insignificant" ones among research data? (1) Through an opinion poll (2) By the judgment of the leader in the research group (3) Through statistical analysis.

( ) 6. The placebo (1) looks like the ginkgo preparation (2) has more therapeutic effect than ginkgo (3) is a health food.

( ) 7. To judge through interview is usually (1) more of an objective measure than a subjective measure (2) more of a subjective measure than an objective measure (3) neither a subjective measure nor an objective measure.

( ) 8. A synonym for "press" here is (1) "article" (2) "newspaper" (3) "news".

( ) 9. If we substitute the word "releases" with "released" here, the sentence will be (1) better in grammar (2) incorrect in grammar (3) having ambiguous meaning.

( ) 10. What does "positive research" mean here? (1) A research project that is executed successfully (2) Researches that come to positive results for whatever assumed (3) A research project that supports the health effect of ginkgo.

接次頁

V. Lycopene in tomato

Lycopene is a carotenoid found in fruits and vegetables and is responsible for the redness in tomato (Lycopersicon esculentum Mill), red pepper, and red grapefruit. The function of lycopene is to harvest light and protect the plant from photooxidative damage. During normal aerobic cellular metabolism, highly reactive oxygen species are produced and lycopene can act as an antioxidant in reacting with these species which can otherwise cause cell damage. Lycopene has eleven conjugated double bonds which withstand attack from peroxy radicals, forming inactive products resulting in cell stabilization. Singlet oxygen is quenched by lycopene at a rate of almost twice that of β-carotene.

Heating or cooking tomatoes or tomato products may increase the bioavailability of lycopene. It has been reported that the consumption of unheated tomato juice did not increase serum lycopene concentration. During processing, the thermally induced rupture of cell walls and the release of lycopene contributes to the increased lycopene content in processed tomato products. Water loss during processing also contributes to higher concentrations of lycopene in processed tomato products.

The quantity of lycopene in tomatoes has been reported to be dependent upon the ripeness of the fruit at the time of harvesting. As tomatoes develop from immature green to ripe, the increase in carotenoid content is seen by the change in pigmentation. The change in pigment is caused by the increase in lycopene content within the plastids. The lycopene contents for immature green (surface color is completely green and no jelly-like material is present in any of the locules), mature green (surface color is completely green and jelly-like matrix in all locules), breaker (not more than 10 % of surface color is pink or red), firm red (more than 90 % of surface color shows red), and overripe tomatoes (rotting) are reported as followings: 25, 10, 370, 4600, and 7050 μg/100 g, respectively.

In addition to the confirmation that lycopene content changes during tomato development and maturation, this study compares the lycopene content of various cultivars, as well as lycopene content of stewed tomatoes prepared from raw tomato of the various cultivars. (cited from Journal of Food Science 2000 (65): 791)

是（O）或非（X），每題 2 分，答錯倒扣 1 分。

( ) 1. Lycopene in fruits is to protect cells by reacting with reactive oxygen species.
( ) 2. Thermal treatment of red pepper increases the absorption of lycopene.
( ) 3. Heated tomato juice contains less bioavailable lycopene than raw tomato juices due to the thermal rupture of cell walls and destruction of pigment during processing.
( ) 4. Contents of lycopene in tomato is constant during the ripening process.
( ) 5. Overripe tomatoes are reported to contain about 4600 μg lycopene/100 g.
( ) 6. Compared to the lycopene in raw tomato, lycopene in cooked one is more bioavailable.
( ) 7. Lycopene acts as an antioxidant in fruits by its eleven conjugated double bonds.
( ) 8. Singlet oxygen reacts with β-carotene at a faster rate than with lycopene.
( ) 9. Released amount of lycopene from cells is dependent upon the processing condition.
( )10. Increase in carotenoid content during the ripeness of tomato decreases the lycopene level.