

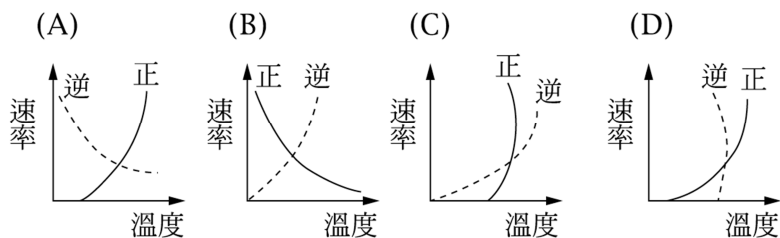
國立臺中教育大學 101 學年度研究所碩士在職專班
及國民小學教師在職進修教學碩士學位班招生考試

自然科學概論試題

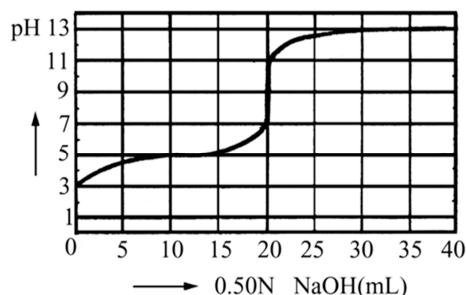
適用學系：科學應用與推廣學系科學教育碩士在職專班 A 組

一、選擇題：(每題 3%，共 24%)

- 下列因素何者無法使蛋白質變性？ (A)加熱 (B)加入硫酸 (C)加入酒精 (D)輻射 (E)以上皆可。
- NH_4NO_2 中後一個氮原子的氧化數與下列哪一個氮原子的氧化數相同？ (A)NO (B) NO_2 (C) N_2O (D) N_2O_3 。
- 燃燒煤、石油可能導致全球溫度改變的主要原因為何？
(A) SO_2 增加，大量吸收太陽輻射。
(B) CO_2 增加，大量吸收地球輻射。
(C) O_3 增加，大量吸收太陽輻射。
(D) N_2 增加，大量吸收地球輻射。
- $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g}), \Delta H = -3.1 \text{Kcal/mol}$ ，則溫度升高，正逆反應速率的變化以下列何圖表示最佳？



- 有一反應 $\text{A}(\text{aq}) \rightarrow \text{B}(\text{aq}) + \text{C}(\text{aq})$ 的正反應活化能為 20kJ/mol ，該反應的莫耳反應熱為 -45kJ/mol ，則該反應的逆反應活化能為： (A)25 (B)-25 (C)65 (D)-65 kJ/mol 。
- 某一元弱酸 ($K_a = 10^{-7} \sim 10^{-3}$) 之溶液 100 毫升，以 0.50N 氫氧化鈉溶液滴定後得滴定曲線如下圖所示：



該弱酸在滴定前的濃度是 (A)0.05M (B)0.10M (C)0.15M
(D)0.20M (E)0.50M。

- 7、承上題，該弱酸的電離常數(或解離常數)是 (A) 10^{-3} (B) 10^{-4} (C) 10^{-5}
(D) 10^{-6} (E) 10^{-7} 。
- 8、承上題，滴定前該弱酸溶液中 $[\text{OH}^-]$ 離子濃度應為 (A) 10^{-3} M (B) 10^{-5} M
(C) 10^{-7} M (D) 10^{-9} M (E) 10^{-11} M。

二、問答題(共 76%)

- 1、(1)何謂辛烷值？(2)汽油中為何加四乙基鉛？(3)無鉛汽油中添加何物？(6%)
- 2、請說明太陽黑子對地球可能產生的影響。(10%)
- 3、近年科學家觀察到許多地方的冰川、冰層、或冰山都出現大量溶化的現象，且大部分由其底部開始發生。請說明前述現象中大型的冰體皆由底部開始溶化的原因。(10%)
- 4、請舉例說明何謂虹吸現象。(10%)
- 5、請舉出三種常用不同的電池種類，並分別說明其產生電能的方式。(10%)
- 6、請說明光合作用三階段。(15%)
- 7、所有的生態系皆會競爭有限資源，競爭可以是種間或種內的。請解釋生物可能使用的競爭形式。(15%)

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科學教育概論試題

適用學系：科學應用與推廣學系科學教育碩士在職專班 B 組

一、名詞解釋 (20%)

1. Constructivism
2. Inquiry teaching
3. Schema
4. Authentic assessment

二、何謂鷹架理論(scaffolding theory)? 在課室教學中，您如何提供鷹架，幫助學生學習，試以科學教學為例說明之。(20%)

三、請就如何教育學生了解「地球的夏天、冬天與地球距離太陽的遠近無關，而是太陽直射或斜射的因素」構想一個教學程序，以協助學生理解。(20%)

四、我國中小學九年一貫課程，在「自然與生活科技」學習領域課程基本理念強調「自然與生活科技之學習應以學習者的活動為主題，重視開放架構和專題本位的方法」，試申論其義。(20%)

五、目前人類面對「能源枯竭」及劇烈「氣候變遷」，請問在中小學教育中應如何納入有關「節能減碳教育」之內涵，請略述其教育目標及實施方法。(20%)

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專業語文試題

適用學系:科學應用與推廣學系科學教育碩士在職專班 A、B 組

一、請寫出以下短文主要希望表達的訊息以及加以摘要(30%)

The results from a 20-year survey of science knowledge and attitudes toward science among undergraduates are presented. Nearly 10, 000 students taking astronomy as part of a general education requirement answered a set of questions that overlap a science literacy instrument administered to the general public by the National Science Foundation. The research questions addressed are: What is the level of science literacy among undergraduates, and what variables or attributes predict science literacy? Their attitudes toward science and pseudo-science were probed by a set of 22 statements coded on a Likert scale. On the knowledge items, freshmen perform only marginally higher than the general public, with the exception of large positive differences in their knowledge of evolution and the Big Bang. Gains on any particular item through the time that students graduate are only 10%-15%, despite the fact that they have taken two or three science courses. Belief in pseudoscience runs high, and the fact that the level of pseudoscience belief does not correlate well with the level of science knowledge is particularly noteworthy. In addition, no variable in the analysis is predictive of science literacy. Over the interval 1988-2008, there's no detectable improvement in undergraduate scientific literacy.

二、請針對下列文章擬定一項標題，並說明文章大意 (30%)

Social constructivism views each learner as a unique individual with unique needs and backgrounds. The learner is also seen as complex and multidimensional. Social constructivism not only acknowledges the uniqueness and complexity of the learner, but actually encourages, utilizes and rewards it as an integral part of the learning process (Wertsch 1997).

Social constructivism or socioculturalism encourages the learner to arrive at his or her version of the truth, influenced by his or her background, culture or embedded worldview. Historical developments and symbol systems, such as language, logic, and mathematical systems, are inherited by the learner as a member of a particular culture

and these are learned throughout the learner's life. This also stresses the importance of the nature of the learner's social interaction with knowledgeable members of the society. Without the social interaction with other more knowledgeable people, it is impossible to acquire social meaning of important symbol systems and learn how to utilize them. Young children develop their thinking abilities by interacting with other children, adults and the physical world. From the social constructivist viewpoint, it is thus important to take into account the background and culture of the learner throughout the learning process, as this background also helps to shape the knowledge and truth that the learner creates, discovers and attains in the learning process (Wertsch 1997).

三、請逐句將下段英文短文翻譯成中文。(20%)

Children arrive in school classroom with a range of speaking and listening skills learned by social interaction. They have a unique vocabulary and understanding of words in use in different contexts developed through their experiences. As well as this variation in vocabulary, each child brings an individual conception of the world around them to school science. For teachers, the challenge is to find out what children think and to organize ways of helping them to question their own ideas and those of others, extending and clarifying use of words at the same time.

(引自 IJSE, 26, 6, p. 677)

四、在 2011 年，台灣曾發生過流感，醫界建議民眾施打 H1N1 疫苗以做預防。

請你為衛生署試寫一篇一百字左右的短文來宣導此項措施。(20%)