Gerund and infinitive

8.1 Gerund

The –ing form of a verb can be used in different ways: as part of a verb, as an adjective, or as a noun.

When the –ing form is used as a noun, it is called a gerund. Look at the sentences below.

- Mike’s running to catch a bus! (as a verb in the present continuous tense)
- Most homes in Hong Kong have running water. (as an adjective describing the motion of water)
- Running can be dangerous! (as a noun or gerund treating running as a kind of sports)

Uses of gerund

1. Gerund is a verbal noun—a form of the verb used as a noun.
   e.g. Eating too much makes you fat. (Eating is the subject)
   
   e.g. I don’t like reading. (reading is the object)

2. Gerunds can also have their own objects.
   e.g. Eating fried food makes you fat. (fried food is the object)
   
   e.g. I don’t like reading history books. (history books is the object)

3. Gerunds are used after prepositions
   a) after verb + preposition.
   e.g. I apologize for making such a mistake.
       I always dream of being a princess
       She insists on taking taxi.

   Some of these verb + preposition patterns include:

   | apologize for | deal with | object to |
   | approve of    | dream of / about | rely on |
   | believe in    | feel like       | succeed in |
   | complain of / about | insist on | think about |
   | count on     | * look forward to |

* In these expressions, look forward to and object to, to is a preposition instead of an infinitive form. Therefore, it can be followed by a gerund.
I look forward to seeing you soon. (✓)
The manager objects to increasing our salary. (✓)
I look forward to see you soon. (X)
The manager objects to increase our salary. (X)

b) After adjective + preposition

e.g. Mrs. To is good at cooking.
I am fond of swimming.

Some of these adjective + preposition patterns include:

<table>
<thead>
<tr>
<th>Afraid of</th>
<th>Fond of</th>
<th>Satisfied with</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angry at</td>
<td>Good at</td>
<td>Sick of</td>
</tr>
<tr>
<td>Ashamed of</td>
<td>Happy about</td>
<td>Sorry for/about</td>
</tr>
<tr>
<td>Aware of</td>
<td>Keen on</td>
<td>Sure of</td>
</tr>
<tr>
<td>Bad at</td>
<td>Interested in</td>
<td>Tired of</td>
</tr>
<tr>
<td>Capable of</td>
<td>Ready for</td>
<td>Weak in</td>
</tr>
<tr>
<td>Famous for</td>
<td>Responsible for</td>
<td>Worried about</td>
</tr>
</tbody>
</table>

4. by + -ing form: talking about method

You can say how something is done (the method) by using the preposition by + -ing.
e.g. The man became strong by lifting weights.

You can see several -ing forms together:
e.g. You can improve your English by studying your lessons, listening to English on the radio and TV, reading English books and newspapers, and speaking English with your friends and family.

5. for + -ing form: talking about purpose

Sometimes we want to say why we use a thing (its purpose). There are several ways to do this.

a) use for + ing when you are talking about things in general
e.g. Pen is used for writing.
A ruler is used for drawing straight lines and measuring things.

b) a tool / device / instrument, etc. + for + -ing. Dictionaries often use phrases like this for definitions:
e.g. A saw is a tool for cutting wood.
A fax is a device for sending written messages.
A thermometer is an instrument for measuring temperature.
6. Verbs followed by the gerund
   a) Many verbs are followed by gerund. The most common of these are:

<table>
<thead>
<tr>
<th>admit</th>
<th>describe</th>
<th>imagine</th>
<th>resist</th>
</tr>
</thead>
<tbody>
<tr>
<td>adore</td>
<td>detest</td>
<td>involve</td>
<td>risk</td>
</tr>
<tr>
<td>avoid</td>
<td>dislike</td>
<td>keep (on)</td>
<td>spend money/ time</td>
</tr>
<tr>
<td>can’t help</td>
<td>enjoy</td>
<td>mention</td>
<td>suggest</td>
</tr>
<tr>
<td>can’t stand</td>
<td>excuse</td>
<td>mind</td>
<td>understand</td>
</tr>
<tr>
<td>carry on</td>
<td>fancy</td>
<td>miss</td>
<td></td>
</tr>
<tr>
<td>consider</td>
<td>feel like</td>
<td>postpone</td>
<td></td>
</tr>
<tr>
<td>delay</td>
<td>finish</td>
<td>practise</td>
<td></td>
</tr>
<tr>
<td>deny</td>
<td>go</td>
<td>recall</td>
<td></td>
</tr>
</tbody>
</table>

e.g. She admitted cheating in the exam.

   Have you finished tidying your room?

   I can’t stand eating on the street.

A passive form (being + a past participle) can also be used.

   e.g. I dislike being shouted at.

   Some people mind being called by nick names.

7. Some expressions are followed by gerund.  
   a) It’s no good …-ing  
   b) It’s / there’s no use …-ing  
   c) There’s no point in …-ing  
   d) It’s worth / not worth …-ing

Exercise 1
Finish the following sentences:

1. It’s no good _________________________________________________________

2. There’s no use _______________________________________________________

3. There’s no point in _________________________________________________

4. It’s worth __________________________________________________________

5. I am good at _________________________________________________________
8.2 Infinitive

1. Some verbs are followed by the infinitive, not by the gerund. Common ones are:

<table>
<thead>
<tr>
<th>afford</th>
<th>agree</th>
<th>appear</th>
<th>arrange</th>
</tr>
</thead>
<tbody>
<tr>
<td>attempt</td>
<td>decide</td>
<td>fail</td>
<td>forget</td>
</tr>
<tr>
<td>hope</td>
<td>learn (how)</td>
<td>manage</td>
<td>offer</td>
</tr>
<tr>
<td>plan</td>
<td>pretend</td>
<td>promise</td>
<td>refuse</td>
</tr>
<tr>
<td>seem</td>
<td>tend</td>
<td>threaten</td>
<td>hesitate</td>
</tr>
</tbody>
</table>

e.g. They have agreed to get married next year.
Don’t pretend to be something that you are not.
May promised to keep the secret for me.

A negative form not to is used with some of these verbs.
e.g. When we see each other, she always pretends not to know me.
I promise not to say anything about it. It’s our secret.

2. Verbs followed by a question word + the infinitive

Some verbs can be used with a question word like what, where, who, and how + the infinitive. Sometimes an object word is used before the infinitive.

* ask decide explain forget imagine know
* remember *remind *show *teach *tell understand

e.g. I have forgotten what to say.
Don’t ask me where to go. I’m a stranger here myself.
I don’t know which station to get off at.
* these words can also have an object and an infinitive

3. Verbs followed by an object + an infinitive

a) Some verbs are always followed by an object + to infinitive.

<table>
<thead>
<tr>
<th>enable</th>
<th>force</th>
<th>get (= persuade)</th>
</tr>
</thead>
<tbody>
<tr>
<td>invite</td>
<td>order</td>
<td>persuade</td>
</tr>
<tr>
<td>remind</td>
<td>teach (how)</td>
<td>tell</td>
</tr>
</tbody>
</table>

e.g. Last week, my teacher invited me to go to his house.
I should remind everyone to bring their textbook to class tomorrow.
b) Some verbs are **sometimes** followed by an object + to infinitive.

<table>
<thead>
<tr>
<th>ask</th>
<th>choose</th>
<th>expect</th>
<th>help</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>want</td>
<td>would like</td>
<td>would prefer</td>
</tr>
</tbody>
</table>

e.g. He **expects** to fail.

He **expects the examiner** to fail him.

I don’t **expect** to pass.

I don’t expect **you** to pass.

**Exercise 1**

*Complete the sentences below using the correct form of the verbs in the word box.*

<table>
<thead>
<tr>
<th>steal</th>
<th>speak</th>
<th>carry</th>
<th>write</th>
</tr>
</thead>
<tbody>
<tr>
<td>get</td>
<td>work</td>
<td>come</td>
<td>help</td>
</tr>
<tr>
<td>tidy</td>
<td>paint</td>
<td>close</td>
<td></td>
</tr>
<tr>
<td>have</td>
<td>be</td>
<td>meet</td>
<td></td>
</tr>
<tr>
<td>take</td>
<td>go</td>
<td>ask</td>
<td></td>
</tr>
</tbody>
</table>

1. I think you should invite Mr. Chan __________ for dinner.
2. Have you finished __________ the walls yet?
3. I feel a bit cold. Do you mind __________ the window?
4. The teacher suggested __________ a test next Monday but the whole class disagreed.
5. No one can force you __________ hard unless you want to.
6. She insists on __________ addressed as Miss Wong instead of Mrs. Chan.
7. This case is too heavy. Will you help me __________ it?
8. The thief admitted __________ the jewellery.
9. I can’t remember how __________ Putonghua anymore.
10. She hates __________ up early in the morning, so she is often late for work.
11. I can help you with the letter but you have to tell me what __________ next.
12. I feel like __________ another cup of coffee. It’s too cold here.
13. The students look forward to ____________ their new teacher.

14. I have to decide whether ____________ History or Geography next term.

15. Those two boys are responsible for ____________ up the room.

16. I would like ____________ you a question.

17. The customers are complaining about ____________ served rudely.

18. These kids are capable of ____________ care of themselves.

19. If I have a choice, I would prefer ____________ to Japan this year.

20. I’m afraid I must ask you ____________ me.

Exercise 2

Read this page from the minutes of the English Club meeting. Complete each sentence using a gerund or a ‘to’-infinitive formed from the verb in brackets.

Minutes of the English Club Meeting

End of Term Gathering

Eric said that we should begin (1) _________________(plan) the End of Term Gathering of the English Club as he had promised (2) _________________(give) the details to Mrs. Chan by next week. Mark suggested (3) _________________(book) a room at the Golden Dragon Restaurant. However, Susan felt that most members couldn’t afford (4) _________________(pay) for an expensive dinner. Ellen offered (5) _________________(let) us use her parents’ home in Kowloon Tong on Saturday afternoon. She said that she liked (6) _________________(have) big parties and she didn’t mind (7) _________________(organize) it by herself. However, Donald he hated (8)
(make) one person do all the work. He wanted (9) (get) more members involved.

Simon considered (10) (hold) the gathering at the Beachside Café in Sai Kung. He thought most members would enjoy (11) (go) to Sai Kung. Maggie said a lot of members would hesitate (12) (travel) all the way to Sai Kung because of the distance.

The members continues (13) (discuss) the suggestions for some time but no decision was reached.

Exercise 3

Fill in the blanks with gerunds or infinitive.

1. He is sorry for __________________________(lie) about his absence to his teacher.

2. Do you still remember ____________________(take) the ferry ride with me on the evening of the Mid-Autumn Festival last year? What a wonderful time we had together!

3. I'm sorry I forgot _____________________(call) you last night, Rose. Some friends of mine paid me an unexpected visit and we had a chat until late into the night.

4. We all look forward to _____________________(hear) from you in the near future.

5. She is not used to ______________________ (work) in a factory.

6. I hope he will remember ______________________ (bring) his camera this time.

7. It was impossible ______________________(predict) what life would be like after 1997.

8. She used ______________________ (go) to school on foot when she lived there.
9. We spent the whole evening __________ (try) __________ (work) out the solution to that problem.

10. The secretary is busy ________________ (sort) out the letters at the moment.

8.3 Bare infinitive

Bare infinitive is the infinitive form without ‘to’. You do not change the verbs after verbs with bare infinitives, e.g. ‘let’, ‘make’.

Examples:

Will your mother let you go on the camping trip?

The teacher made William clean the blackboard.

With the verb ‘help’, you can use either the to-infinitive or the bare infinitive after the indirect object. Using the to-infinitive is more formal.

Examples:

My uncle helps me (to) build the model.

Sally helped Mrs. Li (to) carry some books.
8.4 Gerund or infinitive?

The basic difference is that the gerund refers to something that is more general whereas the infinitive suggests a special occasion or a specific instance.

LIKE

I like playing football. (a habit)
I’d like to play football. (on a particular occasion)

PREFER

We prefer traveling by air. (a general choice)
We would prefer to travel by air. (a choice on a particular journey)

HATE

I hate listening to folk songs. (a dislike in general)
I’d hate to listen to folk songs. (a dislike on a particular occasion.)

REMEMBER, FORGET, REGRET

With these three verbs, the infinitive refers to an action which takes place after the remembering, forgetting, or regretting (a future action). The gerund refers to an action which took place before the act of remembering, forgetting or regretting (a past action).

FORGET

Infinitive: “fail to remember”

   e.g. I am afraid he will forget to write to me.

Gerund: “lose the memory of”

   e.g. I shall never forget seeing Mary for the first time.

REMEMBER

Infinitive: future action, “not forget”

   e.g. Please remember to bring your book tomorrow.

Gerund: past event, “call to mind”

   e.g. I remember seeing her last week.
REGRET

Infinitive: an action which one is supposed to do/ supposed to have done

e.g. We regret to say that you have failed in the examination.

Gerund: a past action

e.g. We regret telling him about the result of his examination.

STOP

He stopped to eat. (=He ceased doing something else in order to eat.)
He stopped eating. (=He discontinued eating.)

NEED

With the verb ‘need’, the gerund has a passive meaning,
e.g. My pen needs filling. (=My pen needs to be filled.)

LEARN

The infinitive suggests a certain degree of success, while the gerund means no more than “study”.
e.g. She has learnt to cook. (=now she know how to cook)
    She has been learning cooking. (=she is still learning how to cook)

TRY

Infinitive: “to make an attempt”
Gerund: “to make an experiment or trial”
e.g. He tried to run as fast as possible. (He made an attempt to run quickly.)
    He tried running as fast as possible. (He ran as fast as possible to see if this would help.)
    You must try to understand what I say. (attempt)
    Try adding water to your drink. (an experiment)
Verbs of perception (hear, see, feel, notice, watch, etc.)

Either the bare infinitive or the –ing form can be use.

e.g. I heard him come in last night.
   I heard him coming in last night.
I saw him work in the garden yesterday.
I saw him working in the garden yesterday.

Infinitive: more interested in the fact of the completion of the action.
“\[I\ heard\ him\ come\ in\ …\ so\ I\ know\ that\ he\ did\ come\ in.\]”
gerund: more interested in the continuity or the performing of the action.
“\[I\ saw\ him\ working\ in\ the\ garden\ …\ and\ noticed\ how\ interested\ he\ was\ in\ it.\]”

Exercise 1

Fill in the following blanks with either a noun ending in –ing or an infinitive.

1. He tried ______________ (reach) the top but in vain.
2. I prefer ______________ (swim) to ______________ (picnic).
3. He hates ______________ (wait) for late comers and very often looks down on them.
4. Don’t forget ______________ (bring) the book.
5. I regret ______________ (inform) you that your application was unsuccessful.
6. Mrs. Chan said that she would not allow her husband ______________ (smoke).
7. The doctor advised him ______________ (give up) ______________ (smoking).
8. Your house needs ______________ (clean); would you like me ______________ (do) it for you?
9. she likes ______________ (watch) films and goes to the cinema once a week.
11. It wasn’t worth ______________ (worry) about.
12. He will never forget ______________ (take) this examination.
13. I know my hair needs ______________ (cut) but I don’t have time to go to the barber’s.
14. Why do you keep _____________ (look) back? Are you afraid of _____________ (be) followed?

15. I would prefer _____________ (go) to the beach today.

**Exercise 2**

*Supply a gerund or an infinitive in the place of the verb in brackets according to the meaning of the sentence:*

*e.g.* I want *(go out)* this evening.
= I want to go out this evening.

She doesn’t remember *(see)* him in the street yesterday.
= She doesn’t remember seeing him in the street yesterday.

1. Do you remember *(meet)* her at my house last year?

2. Please remember *(wipe)* your feet before coming in.

3. I completely forgot *(lock)* the front door last night.

4. Don’t forget *(bring)* your bathing suit with you.

5. That was a memorable occasion. I shall never forget *(meet)* the Prime Minister at your house.

6. These stockings need *(mend)*.

7. Do you really need *(buy)* all that stuff?

8. Do you remember *(meet)* John in my office last year?
9. She has already forgotten (lend) him the money, since she has offered him some more.

10. Does your car need (wash)? I certainly need (wash) mine.

11. I’m afraid you will regret (have lent) her the money.

12. What’s he doing? He’s just trying (open) the tin.

13. I have been learning (skate) for three years and I still fall down all the time.

14. Although he is only five, he learnt (write) very quickly.

15. The results are very disappointing, I regret (say).

Exercise 3

Tick the appropriate choice in each of the following questions.

1. You must practise ............ the piano if you want to succeed.
   (A) to play        (B) playing          (C) having played

2. I wonder why Mary avoids ............ us.
   (A) see            (B) to see           (C) seeing

3. Mary has gone to a commercial school ............ shorthand and typing.
   (A) to learn       (B) for learning     (C) to be learnt

4. I’m sorry I made a mistake but I’m not used ............ dresses.
   (A) to make        (B) making           (C) to making

5. When Mr. Smith speaks too quickly, we listen to him without ............ what he is saying.
   (A) absorb         (B) to absorb       (C) absorbing

6. Mr. Chan has no intention ............ us.
   (A) of helping     (B) to help          (C) helps
7. Mr. Cheung does not intend .......... them.
   (A) to help         (B) helped         (C) helps

8. You ought to change your way .......... and try to be more courteous.
   (A) to speak       (B) of speaking   (C) to speech

9. Friendship and respect are things which are best obtained by .......... them to other
    people.
   (A) given         (B) giving        (C) gave

10. Most businessmen in Hong Kong do not mind borrowing money and .......... reasonable
     interest on it.
    (A) pay           (B) to pay        (C) paying

Exercise 4

1. I don’t allow .......... in my sitting-room.
   (A) to smoke       (B) smoke         (C) smoking     (D) smoked

2. You should stop .......... so many sweets.
   (A) to eat         (B) eat           (C) being eat   (D) eating

3. He decided to disguise himself by .......... as a beggar.
   (A) dressing      (B) having dressed (C) dressed     (D) dress

4. I am looking forward to .......... you soon.
   (A) see            (B) having seen   (C) seeing      (D) being see

   (A) to have put it (B) putting it    (C) to put it    (D) put it

6. This particular job is worth .......... properly.
   (A) do             (B) to do         (C) done        (D) doing

7. He planned to go for a picnic, but the rain prevented him from .......... so.
   (A) to do          (B) having done   (C) being done  (D) doing

8. The teacher advised him .......... harder.
   (A) to work        (B) working       (C) works       (D) work

9. There is nothing .......... 
   (A) fearing       (B) be feared     (C) fear        (D) to fear

10. I am sure that he said so = I am sure .......... 
    (A) his having say so (B) his having said so
       (C) of his having said so (D) he has done so

11. They praised John because he had won the prize = They praised John .......... 
    (A) to win the prize (B) to have won the prize
       (C) winning the prize  (D) for having won the prize
12. I was not aware that he was idle = I was not aware .............
   (A) his being idle               (B) of his being idle.
   (C) of being idle               (D) his idle

13. These young seedlings require ............
   (A) to look after               (B) to being look after
   (C) look after                  (D) looking after

14. it is impossible to tell what may happen = ............. what may happen.
   (A) it is impossible telling    (B) We can’t be told
   (C) There is no telling         (D) It is not to tell

15. He seemed ............. ill.
   (A) to be                      (B) to being
   (C) to have                   (D) have been

16. ............. with you, he is not a man to be entirely trusted.
   (A) Frank                      (B) Be frank
   (C) To be frank               (D) Frankly
Write about 300 words for the following topic.

What is your favourite time of the day?
Chapter 19 Biodiversity

The diagrams below show a variety of organisms: (The diagrams are not drawn to scale.)

(a) All the organisms shown except organism C can be classified into group X.
   (i) How is organism C different from the other organisms? (2 marks)

(ii) Name another organism that belongs to group X. (1 mark)

(b) Two of the five organisms shown in the above diagrams belong to the same group as the grass.
   (i) What are these two organisms? (2 marks)

(ii) State the feature on which the classification in (b)(i) is based on. (1 mark)
Chapter 19 Biodiversity

(c) Using the criteria given below, construct a dichotomous key for identifying the organisms shown in the diagrams. (4 marks)

- With seeds or not
- Flowering or non-flowering plant
- Presence or absence of stem and leaves
- Monocotyledonous or dicotyledonous

(d) According to the classification system proposed by Carl Woese, organisms can be divided into six kingdoms. Classify organisms A, B, C, D and E into different kingdoms. (2 marks)

(Total: 12 marks)
Class: _________________________  (        )
Name: _________________________

**Worksheet 10.3**

**Remainder Theorem**

*(Refer to Book 5 Chapter 10, pp.11 – 17.)*

Using the remainder theorem, find the remainder for each of the following divisions of polynomials (1 – 6).

1. \((6x^2 + 14x - 5) \div (2x - 3)\)

2. \((4x^2 - 8x - 17) \div (-2x + 1)\)

3. \((-6x^2 + 7x - 5) \div (-3x - 1)\)

4. \((6x^3 + x^2 - 8x + 13) \div (2x - 1)\)

5. \((4x^4 + 6x^3 - 4x + 15) \div (x + 2)\)

6. \((9x^3 + 3x^2 - 5x + 11) \div (3x + 2)\)
7. Find the value of \( k \) such that when \( 6x^2 + kx - 6 \) is divided by \( 3x - 2 \), the remainder is 4.

8. Find the value of \( k \) such that when \( 2kx^3 + 7x^2 - 5x - 3k \) is divided by \( 2x + 3 \), the remainder is –6.

9. When \( (p + 1)x^2 + qx + 2p \) is divided by \( x - 2 \), the remainder is –16. When it is divided by \( x - 3 \), the remainder is –13. Find the values of \( p \) and \( q \).

10. When \( px^3 + qx^2 - 8x \) is divided by \( x + 3 \), the remainder is 15. When it is divided by \( x - 2 \), the remainder is 0. Find the values of \( p \) and \( q \).
Factor Theorem

(Refer to Book 5 Chapter 10, pp.17 – 20.)

In each of the following questions, determine whether the linear polynomial in brackets is a factor of the polynomial \( P(x) \) (1 – 5).

1. \( P(x) = -2x^3 + 4x^2 - 32 \) \( [x + 2] \)

2. \( P(x) = x^3 - 5x^2 - 7x + 49 \) \( [x + 3] \)

3. \( P(x) = 2x^3 + 5x^2 - 7x + 2 \) \( [2x - 1] \)
4. \[ P(x) = 6x^3 - 5x^2 - 9x + 18 \] [2x + 3]

5. \[ P(x) = 9x^3 - 12x^2 - 6x + 5 \] [3x - 2]

6. Let \( P(x) = 12x^3 - 4x^2 - 17x - 6 \).

Using the factor theorem, determine whether each of the following linear polynomials is a factor of \( P(x) \).

(a) \( 2x + 1 \)

(b) \( 2x + 3 \)

(c) \( 3x + 2 \)
7. Let \( P(x) = 4x^3 - 11x^2 + 10x - 3 \).

(a) Using the factor theorem, determine whether each of the following linear polynomials is a factor of \( P(x) \).

(i) \( x - 1 \)  
(ii) \( x + 2 \)

(b) Hence factorize \( P(x) \) completely.

8. Let \( P(x) = 2x^3 - kx^2 + 11x + 6 \).

(a) If \( x + 2 \) is a factor of \( P(x) \), find the value of \( k \).

(b) Hence factorize \( P(x) \) completely.
工作紙 10.3

班別：_________________________ （ ）
姓名：_________________________

餘式定理

（參閱第5冊第十章，頁11－17。）

利用餘式定理，求下列（第1－6題）各多項式除法的餘數。

1. \((6x^2 + 14x - 5) \div (2x - 3)\)  
2. \((4x^2 - 8x - 17) \div (-2x + 1)\)

3. \((-6x^2 + 7x - 5) \div (-3x - 1)\)  
4. \((6x^3 + x^2 - 8x + 13) \div (2x - 1)\)

5. \((4x^4 + 6x^3 - 4x + 15) \div (x + 2)\)  
6. \((9x^3 + 3x^2 - 5x + 11) \div (3x + 2)\)
7. 當多項式 $6x^2 + kx - 6$ 除以 $3x - 2$ 時，所得的餘數為 4，求 $k$ 的值。

8. 當多項式 $2kx^3 + 7x^2 - 5x - 3k$ 除以 $2x + 3$ 時，所得的餘數為 −6，求 $k$ 的值。

9. 當多項式 $(p + 1)x^2 + qx + 2p$ 除以 $x - 2$ 及 $x - 3$ 時，所得的餘數分別為 −16 及 −13。求 $p$ 及 $q$ 的值。

10. 當多項式 $px^3 + qx^2 - 8x$ 除以 $x + 3$ 及 $x - 2$ 時，所得的餘數分別為 15 及 0。求 $p$ 及 $q$ 的值。
班別：_________________________ (        )
姓名：_________________________

因式定理

(參閱第5冊第十章，頁17~20。)

在下列 (第 1 – 5 項) 項中，判別括號內的一次多項式是否多項式 P(x) 的因式。

1. \( P(x) = -2x^3 + 4x^2 - 32 \) \[x + 2\]

2. \( P(x) = x^3 - 5x^2 - 7x + 49 \) \[x + 3\]

3. \( P(x) = 2x^3 + 5x^2 - 7x + 2 \) \[2x - 1\]
4. \[ P(x) = 6x^3 - 5x^2 - 9x + 18 \] [2x + 3]

5. \[ P(x) = 9x^3 - 12x^2 - 6x + 5 \] [3x - 2]

6. 設 \( P(x) = 12x^3 - 4x^2 - 17x - 6 \)。
   利用因式定理，判別下列何者為 \( P(x) \) 的因式。
   (a) \( 2x + 1 \)  
   (b) \( 2x + 3 \)
   (c) \( 3x + 2 \)
7. 設 \( P(x) = 4x^3 - 11x^2 + 10x - 3 \)。

(a) 利用因式定理，判別下列何者為 \( P(x) \) 的因式。

(i) \( x - 1 \)  
(ii) \( x + 2 \)

(b) 由此，因式分解 \( P(x) \)。

8. 設 \( P(x) = 2x^3 - kx^2 + 11x + 6 \)。

(a) 若 \( x + 2 \) 為 \( P(x) \) 的因式，求 \( k \) 的值。

(b) 由此，因式分解 \( P(x) \)。
中五 -- 生物科工作紙

鄧肇堅維多利亞官立中學
生物科

第十九課 生物多樣性

姓名：_________________________ (   )  日期：_________________________
班別：

姓名 _______________   斑別 _______ (   )

甲部  選擇題

1. 細菌與古細菌屬於不同的「界」，因為
   (1) 古細菌體形較細菌細小。
   (2) 很多古細菌都在極端的環境生活，而細菌卻不是。
   (3) 細菌的細胞壁由肽聚糖組成，而古細菌的細胞壁則沒有肽聚糖。
   A. 只有 (2)
   B. 只有 (3)
   C. 只有 (1) 和 (2)
   D. (1)、(2) 和 (3)

指引：參考下表，解答 2 和 3 兩題。下表顯示三四種蘇格蘭的鳥。

<table>
<thead>
<tr>
<th>俗名</th>
<th>學名</th>
</tr>
</thead>
<tbody>
<tr>
<td>柳雷鳥</td>
<td>Lagopus lagopus</td>
</tr>
<tr>
<td>岩雷鳥</td>
<td>Lagopus mutus</td>
</tr>
<tr>
<td>黑琴雞</td>
<td>Lyrurus tetrix</td>
</tr>
</tbody>
</table>

2. 下列哪項敘述是正確的？
   A. 柳雷鳥和岩雷鳥屬於同一「屬」。
   B. 柳雷鳥和黑琴雞屬於同一「屬」。
   C. 岩雷鳥和黑琴雞屬於同一「屬」。
   D. 三種鳥都屬於同一「屬」。

3. 下列哪項（些）敘述是正確的？
   (1) 學名在不同的地方會有所不同。
   (2) 每種鳥所屬的「種」都有別於另外兩者。
   (3) 科學家用世界通用的俗名來溝通，避免引起誤會。
   A. 只有 (1)
   B. 只有 (2)
   C. 只有 (1) 和 (3)
   D. (1)、(2) 和 (3)

4. 下圖顯示的松樹
   (1) 是維管植物。
   (2) 透過種子繁殖。
   (3) 是單子葉植物。
   A. 只有 (1) 和 (2)
   B. 只有 (1) 和 (3)
   C. 只有 (2) 和 (3)
   D. (1)、(2) 和 (3)

5. 蟾蜍是兩棲動物，因為
   (1) 牠能在水中游泳，又能在陸地爬行。
   (2) 牠的皮膚表面濕潤，而且沒有鱗片。
   (3) 牠的幼體生活在水中，用鰓呼吸。
   A. 只有 (1) 和 (2)
   B. 只有 (1) 和 (3)
   C. 只有 (2) 和 (3)
   D. (1)、(2) 和 (3)

6. 不把病毒視為生物的原因是
   (1) 病毒沒有細胞核。
   (2) 病毒的遺傳物質是 DNA 或 RNA。
   (3) 病毒並非由細胞組成。
   A. 只有 (1)
   B. 只有 (3)
   C. 只有 (1) 和 (2)
   D. (1)、(2) 和 (3)
乙部 結構題

1. 下圖是依照電子顯微照片繪畫的細菌。

(a) 畫出 W、X、Y 和 Z 的名稱。  

W __________________________   X __________________________  
Y __________________________   Z __________________________

(b) 畫出這細菌所屬的「界」的名稱。從圖中舉出三項特徵以支持你的答案。  

_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________

(c) 細菌曾經歸入植物界，但現在已歸入另一「界」。舉出兩個原因以否定細菌是植物。  

_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________  
_________________________________________________________________
2. 下圖顯示的生物會長出絲狀的構造，並以枯木上已死的有機物質作為食物。

(a) 下圖顯示這生物的生活史。在有利的環境下，這生物會進行無性生殖。當環境變得惡劣，這生物便會進行有性生殖。在圖中以「X」做標記，指出減數分裂在哪裏發生。 (1 分)

(b) 寫出這生物所屬的「界」的名稱。 (1 分)

(c) 這生物常被人誤會為植物，舉出三個原因解釋為甚麼這生物不是植物。 (3 分)
3. 一個現代的分類系統能反映生物之間的演化關係。

(a) 解釋現代分類系統內的分類階梯如何反映生物之間的演化關係。 (3 分)

(b) 為甚麼兩個屬於同一科的物種不可能屬於不同的綱？ (1 分)
1. Fill in the following table:

<table>
<thead>
<tr>
<th>Formula</th>
<th>Shape</th>
<th>Spatial arrangement of the bonds (use ‘arrow’ to indicate the dipole moment of individual bond)</th>
<th>Polar or non-polar?</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H₂O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NH₃</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO₂</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BF₃</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH₄</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Draw the electron diagrams for the above molecules.

3. Prepare the test for chapter 24 and 25.
例題 1
球以 1 m s^{-1} 的速度沿水平方向投擲。繪畫球在投擲後首兩秒的軌道。考慮球每隔 0.4 s 時距的位置。取向上為正。

提示：
考慮球於每隔 0.4 s 時距的水平位移 s_x 和垂直位移 s_y。
取 u = 0 及 a = g = -10 m s^{-2}，利用運動方程 s = ut + \frac{1}{2} at^2 找出 s_y。

<table>
<thead>
<tr>
<th>t / s</th>
<th>0</th>
<th>0.4</th>
<th>0.8</th>
<th>1.2</th>
<th>1.6</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>s_x / m</td>
<td>0</td>
<td>0.4</td>
<td>0.8</td>
<td>1.2</td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td>s_y / m</td>
<td>0</td>
<td>-0.8</td>
<td>-3.2</td>
<td>-7.2</td>
<td>-12.8</td>
<td>-20.0</td>
</tr>
</tbody>
</table>

![圖 a]
例題 2  
例題 2  
圖 6a 中，上面的路軌與下面的路軌相距 30 cm。在 \( t = t_1 \) 時，兩個球以相同的水平速度 (1.6 m s\(^{-1}\)) 移動。試找出兩個球相撞時，上面的球的 
(a) 水平距離 
(b) 速率 
空氣阻力可忽略不計。

提示：獨立考慮水平和垂直運動，利用不同的運動方程計算兩個運動。

(a) 考慮垂直方向（取向下為正）：

考慮水平方向（取向右為正）：

球移動的水平距離是____________。

(b)

球的速率是____________。

例題 3  
飛鏢對準鏢板上方的邊緣，兩者的水平距離是 3 m。鏢板的直徑是 0.46 m（圖 a）。飛鏢最小要以甚麼速率水平擲出，才能擊中鏢板？空氣阻力可忽略不計。

提示：
飛鏢擊中鏢板所需的最多時間 = 飛鏢下移 0.46 m 所需的時間
取向下為正。考慮飛鏢下移 0.46 m 所需的時間。

最小速率 =
6.2 一般拋體運動

例題 4
球以 25°的投射角擲出，始速度是 5 m s\(^{-1}\)。試找出球的射程。

根據 \( s_x = \frac{u^2 \sin 2\theta}{g} \)。

球的射程是 _______。

例題 5
試在例題 4 中，找出另一個會出現相同射程的投射角。

提示：兩個產生相同射程的投射角會有甚麼關係？

\( \theta = \)______。

另一個會出現相同射程的投射角是______。
例題 6

球從地面以 45° 投射角擲出。球的始速度是 8 m s⁻¹。求

(a) 球的最大高度（距離地面的高度）。

(b) 球的飛行時間。

(c) 球的射程。

(a) 最大高度

\[ h = \frac{u^2 \sin^2 \theta}{2g} \]

(b) 根據，

\[ s_y = (u \sin \theta) t - \frac{1}{2} gt^2 \]

球的飛行時間是__________。

(c)

球的射程是__________。

進度評估 3 (p.294)