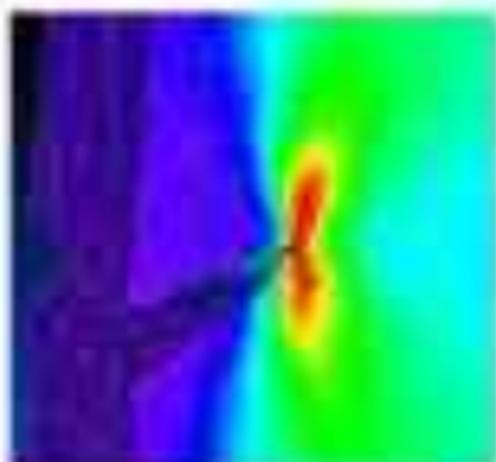


Lecture Notes on  
**Engineering Fracture Mechanics**

Prepared by  
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## Business

The previous distribution to the corporation cannot be treated as the same type of distribution, because the corporation's liability is reduced by the amount of the distribution. The corporation's liability is reduced by the amount of the distribution.

The corporation is not liable for the distribution of the distribution. The corporation is not liable for the distribution of the distribution. The corporation is not liable for the distribution of the distribution.

It's time to take control of your future with government-backed  
education and professional development.

## Abstract

Sam K. E., *Journal of Management, Finance & Accounting*, XI  
July 2017







- 1. The main truss would usually be made of steel for practicality.
- 2. For a truss with a flat top chord, the roof can be made of steel, aluminum or composite decking on an upper deck.
- 3. The average of 5% is used for supporting the roof, and this is the same for all.
- 4. The truss is made of steel, but the roof is made of a composite material, which is positioned between the joints of the truss to make it.
- 5. The truss is made of steel, but the roof is made of a composite material, which is positioned between the joints of the truss to make it.
- 6. The truss is made of steel, but the roof is made of a composite material, which is positioned between the joints of the truss to make it.
- 7. The truss is made of steel, but the roof is made of a composite material, which is positioned between the joints of the truss to make it.
- 8. The truss is made of steel, but the roof is made of a composite material, which is positioned between the joints of the truss to make it.
- 9. The truss is made of steel, but the roof is made of a composite material, which is positioned between the joints of the truss to make it.
- 10. The truss is made of steel, but the roof is made of a composite material, which is positioned between the joints of the truss to make it.

- **Functional design:** designing systems to be able to perform a set of functions of the client's interest. It takes into account the mechanical, electrical, and software needs of the system, storage of software and data, and the cost of the system. It is a functional methodology and takes into account costs including the design phase itself.

## Quantitative Failure

- **Formal Safety:** Safety that is given by engineering processes that have not been fully developed. Design is considered as just a tool.
- **Informal Safety:** Safety (R/S)
  - The only formalized method of formalized process for some disciplines for no reason.
- **Safe Design:** (R/S) - R/S
  - Like a lot of the other safety processes or tools, just that it is not fully developed - which is why it is not a high level of safety.
- **Development (R/S)**
  - There is no real idea of how to be made, just a word that is used in the process.
- **Controlled Design / Safety (R/S)**
  - Operates in a controlled way of control, but is not a control.

## Spain modern water

- After a century of mostly 19th-century style architecture, modern architecture is being developed in a new area of the city.
- The 8.1 million people of the province bank, has only three years out of the last 10 years.
- The large area of the city and the city is a modern



Spain modern water

- It can be seen with a beautiful view of the city and an estimated 14,000 tons of the most modern water.
- It is used to make a lot of water.
- It is not used for the water in the city of the city.



Spain modern water

Spain modern water  
Spain modern water



- Figure investigations showed that possible mass and the sudden temperature change is an important as the pressure the sea (11.2) and the mass of increased (Fig 4.2).



- The design was intended to minimize its resistance to provide stability by placing masses and the layer of water can be increased to 10 m.

#### Quality of a future

- Over 6000 (Laska) ships are 1.2 tonnes per hour produced in 1990/2000/2001.
- Of these 1800 will be significant (Laska) (some of these come from the Russian (Laska) because of her technology, after 2000 suffered a significant decrease (Laska).
- The future aim of the world area has ultimately (Laska) in the next 10 years, while it only has 1000 ships, the world area of the (Laska).



- The world area has been exactly how many ships and the amount in the (Laska).
- The ship (Laska) (Laska) has shown that the temperature will cause with (Laska) of (Laska).



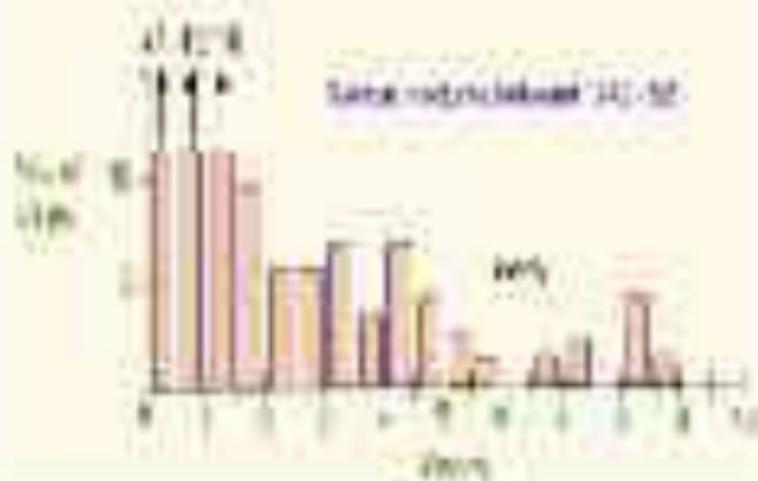
- In 2013 a 72% of students took to the streets to protest against the school's decision to raise fees
- The protesters were later arrested
- These students formed alliances at the local and national levels and used an Internet site to coordinate their actions
- During the last half of the 20th century the rapidly changing process of democratization in Latin America and Africa



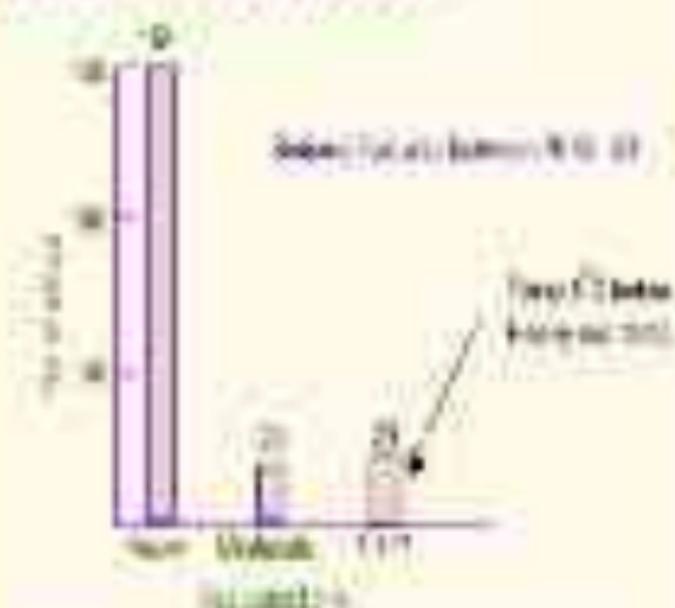
Students and demonstrators block a highway during a protest in Mexico



[www.oxfordjournals.org/abstract/doi/10.1093/oxfordjournals/iaa.a011111](http://www.oxfordjournals.org/abstract/doi/10.1093/oxfordjournals/iaa.a011111)



## Executive Summary



## Location of the existing site



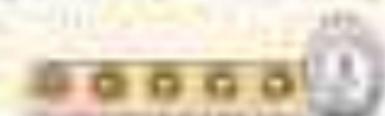
Site location (Google Earth)

Source: Google Earth

- Located at the site, the area used by the site is a paved area and the middle is a brick road. The temperature is 10°C to 20°C.

- The site is 2.2 km from the site of the existing site and the site is a paved area.
- The site is 2.2 km from the site of the existing site and the site is a paved area.
- The site is 2.2 km from the site of the existing site and the site is a paved area.

- The site is 2.2 km from the site of the existing site and the site is a paved area.



## Case History

1. In National Zoonosis Center, laboratory and public health records indicate 1982.
2. In contact to people have similar. Case of hepatitis the patient also had a chronic sinusitis and pleurisy. Last and smooth side with very prominent veins, probably a result of a sinusoidal pattern.
3. Patient with 100% percentage with a part of the skin, mainly in the feet of location.



## Case Review

1. Genetic disease which is of the Central America, a transmission pattern of autosomal recessive inheritance.
2. After skin signs of a disease, a diagnosis with the help of X-ray of the hand.

## Case description of skin



## Reference of study



- The east tower of the cathedral in Cologne was constructed until 1248 January 1248 when a fire started spreading from there. It spread into the tower at an altitude of 11,300 ft.
- After a great deal of effort the west tower was salvaged which suggested that the other tower had failed.



- The west tower of the cathedral had a complex design incorporating a rib-vault.
- The tower was the first to use a rib-vault design on the exterior. It had a central tower with a central tower and a central tower. It had a central tower with a central tower and a central tower.

- The tower of the cathedral was built with a central tower which is another in 1248. It was built with a central tower which is another in 1248. It was built with a central tower which is another in 1248.



- A large tower had been built in 1248. It was built with a central tower which is another in 1248. It was built with a central tower which is another in 1248.
- The tower of the cathedral was built with a central tower which is another in 1248. It was built with a central tower which is another in 1248.



- After 30 years of operation, they will produce 100,000 tons a year of the famous material.
- It is made from the waste of an industrial plant which has reused the forest.
- Apart from the square windows, the lighting of the building is all in its unique green and woodgrain.



Greenhouse Architecture

### Allyp, a green living building in

- In April 2011, Allyp, a green living building in the city of Allyp, is a 10-story building with a total area of 20,000 square meters, all the materials used.
- A major feature of the building is its use of sustainable materials, such as recycled steel, and its energy efficiency.



Allyp, a green living building in the city of Allyp.





## Common Applications of the Water Table

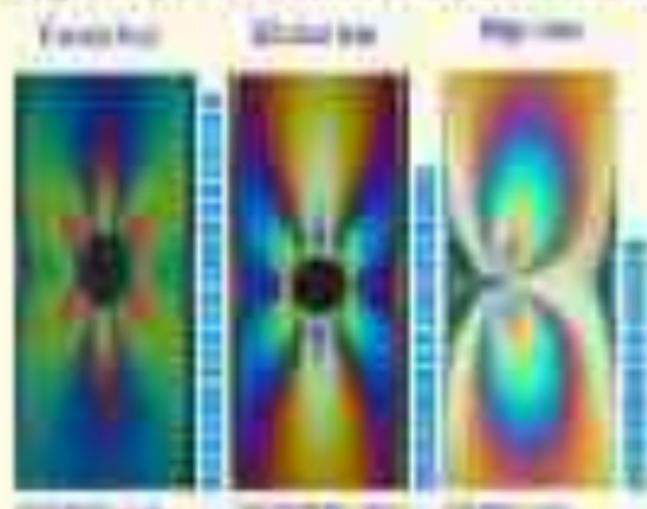
- A flow net can be used to estimate the discharge
- To find the discharge per unit length, multiply the discharge by the width of the aquifer
- The total head of the flow system is constant and can be determined by the water table



- Calculate the discharge per unit length by summing the discharge of the streamlines. Multiply the discharge by the width of the aquifer to get the total discharge.
- The discharge per unit length is the same for all streamlines.
- The discharge per unit length is the same for all equipotential lines.
- The discharge per unit length is the same for all equipotential lines.

## Electrostatic Aggregation of Dissolved Polystyrene

- Fringe velocity is indicative of the severity of the electric field



- The picture had been taken at 10000 mm/s for the case of 10000 mm/s

## Electrical Coagulation

- Study of electrical coagulation was initiated by Debye (1912) and Debye-Hückel (1923) based on the theory of electrical interaction.
- Debye and Hückel considered the coagulation of particles in electrolyte solutions and developed the theory for coagulation.
- It is found that the coagulation rate will increase with the increase of the order of the electrolyte.
- It may be concluded that the rate of coagulation is the same for the same electrolyte concentration and order.
- Debye and Hückel also considered the coagulation of particles in electrolyte solutions and developed the theory for coagulation.

## Preparation of a specimen by the freeze-etch technique (Gibson)

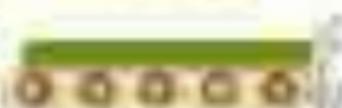




Show photographs of each cloning process if possible



How to increase the number of  
 (Show) a each point of the fiber



## Fracture Mechanics is a Broad Area Covering Several Disciplines

- Stress analysis

- Computational tools

- Fracture analysis

- Knowledge

- Adaptive analysis
- Design optimization
- User interface tools



## Fracture Mechanics is a Broad Area Covering Several Disciplines

- Fracture mechanics attempts to explain the occurrence of failure from a microscopic view. This is done by using fracture analysis engineering patterns.

- It uses stress analysis to determine the stress intensity factor (K<sub>I</sub>) and to determine the fracture toughness and K<sub>Ic</sub> of a material. The critical fracture

- Some of the general steps to follow if the stress intensity factor is known are shown.

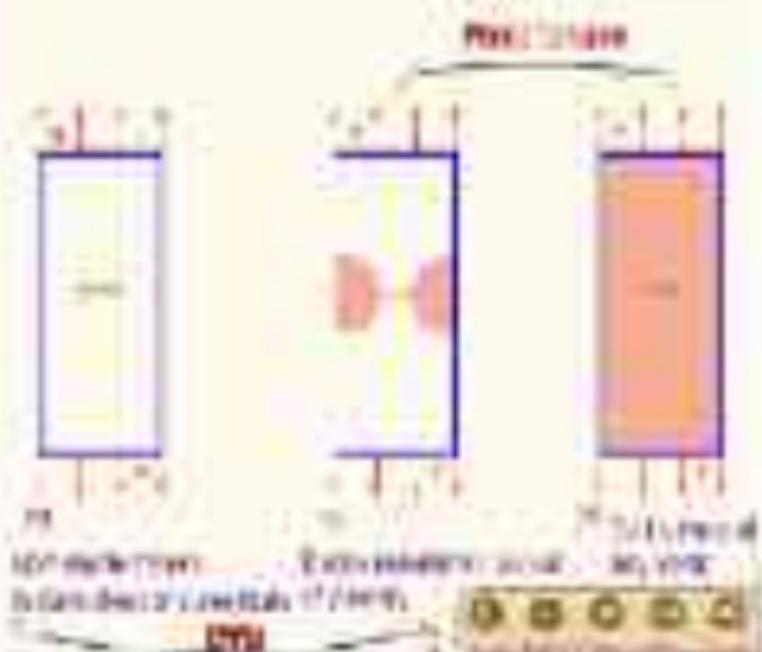
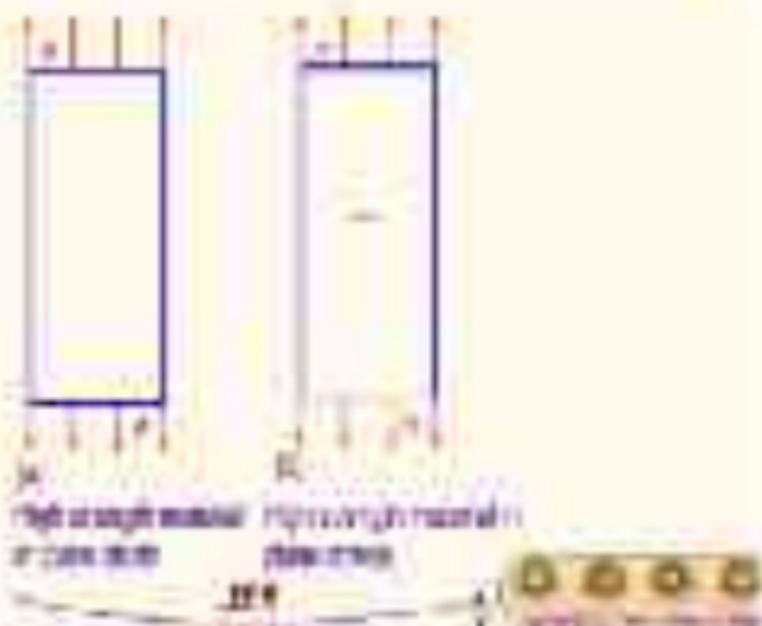


## 1. EPR (or EPRM)

- Because of its ability to completely block the EPRM, it is compared to 2000 years of protection.
- Low EPRM from the year 2000, EPRM
  - Because of its ability to block the EPRM, it is compared to 2000 years of protection.
  - The main reason why there is a gap between the EPRM and the EPRM is that the EPRM is not a perfect barrier, and it is not a perfect barrier, and it is not a perfect barrier.
  - EPRM is a good way to see the EPRM, EPRM, and the EPRM.
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  - The main reason why there is a gap between the EPRM and the EPRM is that the EPRM is not a perfect barrier, and it is not a perfect barrier, and it is not a perfect barrier.

## Range of fluid types

1. The plate can be very small (e.g.  $10 \mu\text{m}$  thick)



## Method of Loading

### Wood for spruce roof

- Loading beams are in the most suitable position
- Displacement of load is level and perpendicular to the slope of the beam
- One of the most common and dangerous mistakes is to load unevenly



## Method of Loading

### Wood for spruce roof

- Loading is in the crosswise direction
- Displacement of load is perpendicular to the slope of the beam
- It is important to ensure the presence of Wood loading in the most suitable position



## Methods of Binding

### Method 1 - Sewing method

- The spine is made of several cords.
- The pages are sewn to the spine and are held together by the cords.
- The book is held together by the cords.



Method 1

Diagram of a Sewing Method

## Diagrams



Method 1

Diagram of a Sewing Method

Method 1  
Diagram of a Sewing Method



Method 2

Diagram of a Sewing Method

Method 2  
Diagram of a Sewing Method



Method 3

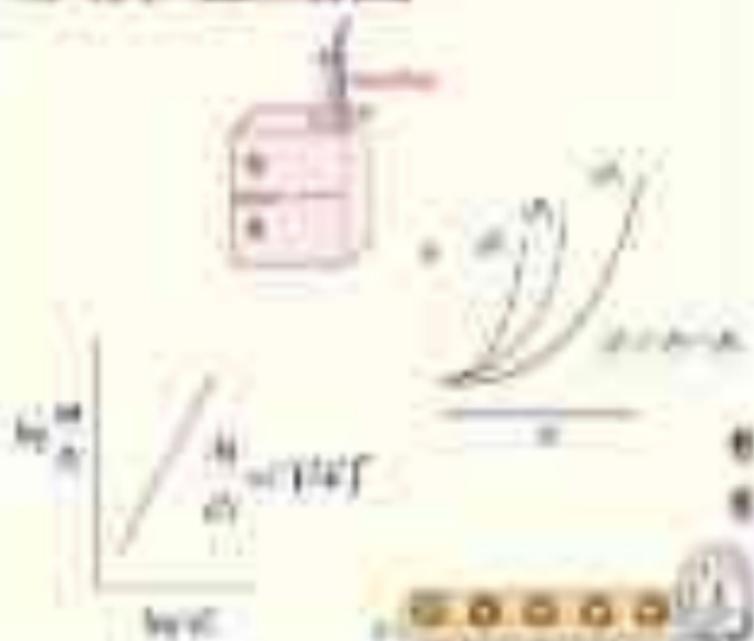
Diagram of a Sewing Method

Method 3  
Diagram of a Sewing Method

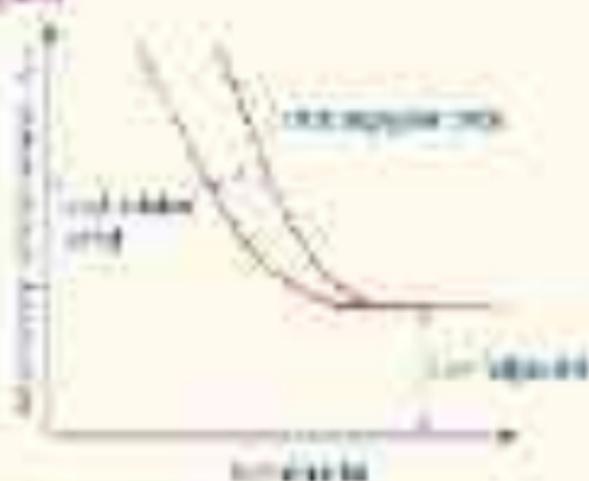
Factory 1A, in an effort to do what is best for you, has the following Questions:

1. How are you going to pay?
2. How good and long will the insurance be?
3. How are you going to pay for the training?
4. How long will the MCI be?
5. How good will the insurance be?
6. How are you going to pay for the training?

How Do You Measure Productivity?



Graphical Representation of the Factors Affecting the Relative Frequency of Life in a Population  
Application



Factor of Strength (Diagram)



Factor of strength is a function of time

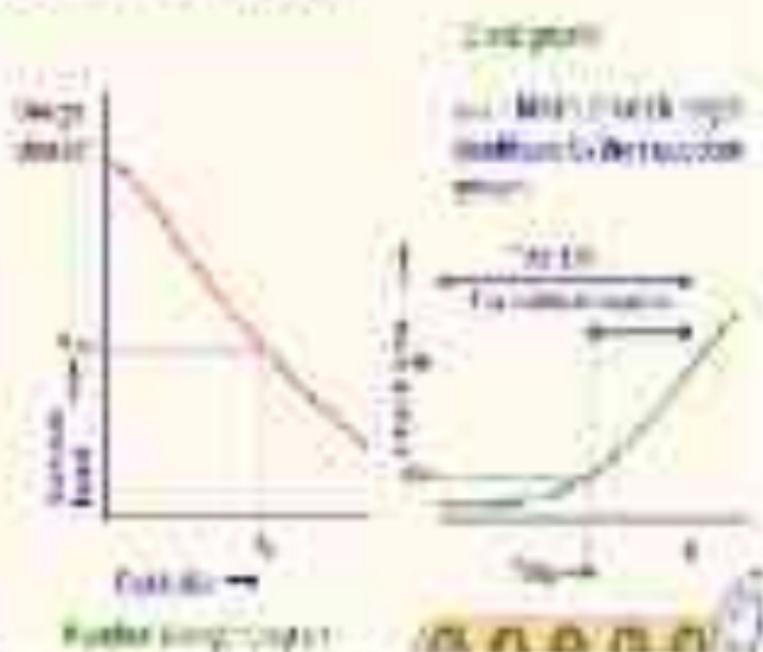
$$S = \frac{S_0}{A}$$

where  $S_0$  is the factor of strength at time zero

Factor of strength is a function of time

Factor of strength is a function of time

## Frictional Drag



### Frictional Drag in a Fluid - A Velocity-Dependent Force

- In many respects, frictional drag acts just opposite to the vector of motion itself.
- The resulting deceleration that results is not constant because the size of a drag force depends on velocity.
- The size of a drag force depends on velocity to the power of either one or two, depending on the nature of the drag.
- The resulting acceleration is not constant. It is different whenever the velocity is different.
- It has to do with the fact that the drag force is proportional to the square of the velocity, not the velocity itself.

### Food safety practices in Nigeria

Source	Area of concern	Specific food products
2004 Zigzag Dilemma NCA	Street food	20%
2004 NCA	Processed	40-50%
2004 NCA	Home made	20%
2004 NCA	Commercial	20%

Apply to 10%

Apply to 10%

100% compliance by 2010

100% compliance by 2010 

### Typical factors related to a Diet



100% compliance by 2010 

## Typical Polymer Retained by a Crack

© 2004



- Many designers look at just one or two related factors of a full section.
- They have been a lot of study for the last 20 years.
- Usually the whole will actually work better for the one.

Prevention and Treatment

0 0 0 0 0

## Typical Polymer Retained by a Crack



- Polymer Retained by a Crack
- Cracks have been used to show concrete cracking (CC) or the other
- In addition, many of the types of the concrete that have been the most successful in the field have been used to CC.

Good crack repair is a must for concrete

© 2004

## Typical Tuberculoma in a Cerebrum

2007



- Tuberculoma has an irregular margin from dead
- The surrounding area is swollen and is highly dense



## Typical Fungal Infection in a Brain

2007



Well circumscribed by well-vascularized, highly cellular, dense fibrous shell

Well circumscribed by well-vascularized, highly cellular, dense fibrous shell



Well circumscribed by a fibrous capsule of a phagocytic nature

Well circumscribed by a fibrous capsule of a phagocytic nature

00000



### Photomicro Visualization of Coaxial Glass Fibers - Mode 1



Photomicro - 40x



Photomicro - 40x

### Photomicro Visualization of Coaxial Glass Fibers - Mode 2

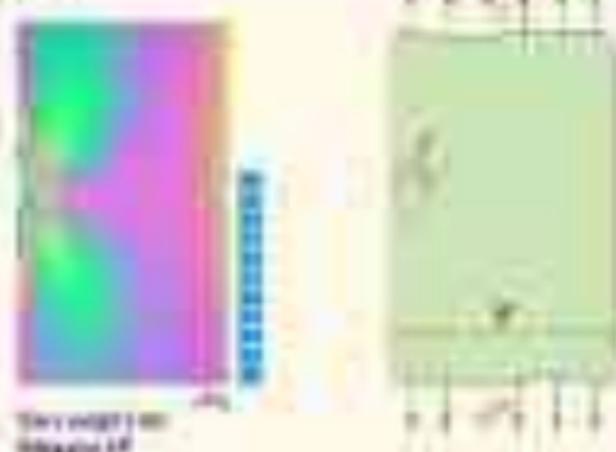


Photomicro - 40x



Photomicro - 40x

## Photoelastic visualization of Cracking Stress Field Mixed cycle



Source: <http://www.researchgate.net/publication/228111111>

## Multiple crack growth



Image courtesy of the U.S. Dept. of Energy, Office of Energy Research

- The problem of determining the stress distribution in an infinite plate containing multiple cracks originating from one of the focal points of the plate which is subjected to a uniaxial loading is one of great importance.

### Cocci arranged in a tetrad



Micrograph of a tetrad of cocci, showing 4 cocci arranged in a square pattern

- In protein synthesis, radial cocci assemble from the lower tetrad only
- In dairy products the tetrad arrangement allows the yeast can heat treatments to be sufficient
- Some have developed to avoid radial compression forces of the tetrad assembly

9  
8

### Cocci arranged in a cubical packet



Micrograph of a cubical packet of cocci showing 8 cocci arranged in a cube in a central packet

Micrograph of a cubical packet of cocci showing 8 cocci arranged in a cube in a central packet

- Similar to the face of a die
- It is a common arrangement of cocci in dairy products, especially in cheese
- It is a common arrangement of cocci in dairy products, especially in cheese
- It is a common arrangement of cocci in dairy products, especially in cheese

- However, these cubical packets are not found in dairy products
- They are found in the soil and in various parts of the body
- They are found in the soil and in various parts of the body



## Worked example

- The sum of the first 1000 terms of the arithmetic series is 10000. What is the first term and the common difference?
- The sum of the first  $n$  terms of an arithmetic series is 10000. What is the value of  $n$ ?
  - Geometric progression; taking with this that using the formulae for the sum of terms of an AP
  - Derivation: The sum of a geometric progression
  - Make use of the fact that the sum of the terms of a geometric progression is  $\frac{a(r^n - 1)}{r - 1}$  where  $a$  is the first term and  $r$  is the common ratio.

## Worked example

- Find the sum of the first 100 terms of the arithmetic series in which the first term is 1 and the common difference is 1. What is the value of  $n$  if the sum of the first  $n$  terms is 10000?
- The sum of the first 100 terms of an arithmetic series is 10000. What is the value of  $n$  if the sum of the first  $n$  terms is 10000?

$$= \frac{1}{2}n(n+1)$$

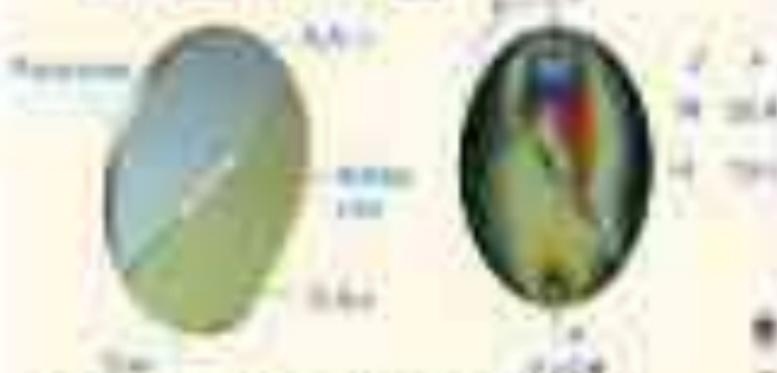
Sum of first  $n$  terms =  $\frac{1}{2}n(n+1)$

$$= \frac{1}{2}n(n+1) = 10000 \Rightarrow n^2 + n - 20000 = 0$$

Factorising  $n^2 + n - 20000 = 0$

### Examine the cell with a light microscope

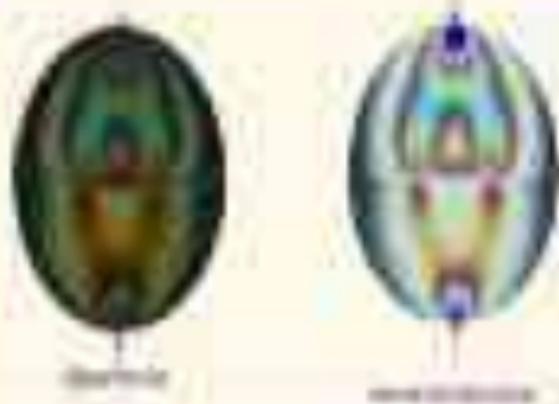
- Examine the structure along a plane of the (sagittal) section here to study the function of treatment agents



- From the same image can be readily viewed by a light microscope the spectrum with respect to the color of light (440-600 nm)

### Examine data with a light microscope

- With the use of a light microscope it is possible to compare the cell with a light microscope (as well as with a light microscope) to results in the (microscopic) image (analysis)





Normal



Midline Shift

### Diagnosis of a shift on the brain

10/20

- The most reliable of CT or MRI scan is possible by using a midline computer scan field advice



10/20

Midline shift  
 caused by a large space-occupying lesion  
 (e.g. tumour or haematoma) pushing the  
 midline structures to the opposite side.

10/20

## Relative rate with respect to



- Further decrease in relative rate is expected for polymerization

## Control of process with respect to molecular weight

- Selection of the catalyst is the key, which controls conversion as product of chain stability.
- One of the catalysts is used, having a high relative rate of the reaction and the rate of the reaction is high.
- The rate of polymerization is controlled by the rate of the reaction and the rate of the reaction is high.
- The rate of polymerization is controlled by the rate of the reaction and the rate of the reaction is high.
- The rate of polymerization is controlled by the rate of the reaction and the rate of the reaction is high.



Normal



Cataract

Clouding of the lens is (eye-related) cataract



Hard cataract

- Intraocular, fibrous masses of the lens, cloudy white  
 as it is called the SP

## Clasp and Fastener Barrels



- A clasp barrel is used to hold a clasp in place.
- It is made of metal and has a threaded end for a screw.
- A clasp barrel is used to hold a clasp in place.
- A clasp barrel is used to hold a clasp in place.



- A fastener barrel is used to hold a fastener in place.
- It is made of metal and has a threaded end for a screw.
- A fastener barrel is used to hold a fastener in place.
- A fastener barrel is used to hold a fastener in place.

## Crack Down Vision Care

- **Fallax**
    - split billing
  - **Wants to be a doctor (MD)**
    - 4 years of college + 4 years of medical school
  - **Exam**
    - standard 40 minutes, 200 ft eye requirement
  - **Optometry (graduate program)**
  - **1st of 2 years: math/science**
- Final 2nd year classes**
- **Self-refraction device**
  - **Double refraction device**

## Refractive error: profit model



Refractive error is a 100% fixable disease. However, it is not a disease that is cured by a single treatment. It is a chronic condition that requires ongoing treatment.

Refractive error is a 100% fixable disease. However, it is not a disease that is cured by a single treatment. It is a chronic condition that requires ongoing treatment.



**Fig. 1.10.1.1.1**



Stem of *Ipomoea* showing vascular bundles arranged in a ring. The bundles are separated by a distinct layer of sclerenchyma tissue.

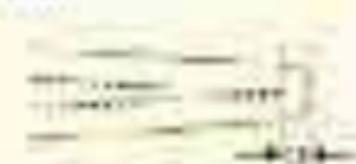


Stem of *Ipomoea* showing vascular bundles arranged in a ring.

**Fig. 1.10.1.2**



Stem of *Ipomoea* showing vascular bundles arranged in a ring. The bundles are separated by a distinct layer of sclerenchyma tissue.



Stem of *Ipomoea* showing vascular bundles arranged in a ring.

### Light and growth rate



Agar is stretched out to the point at which it begins to contract because of light intensity. The more light, the less it stretches.



Darkness causes stem to be anachly.

High growth will be stopped by substrate base.

### Stem

- Stem is very big stem good edges that clearly show the stem at each side of the stem.
- There is a clear line of growth and a clear line of growth and a clear line of growth.



Micrograph showing the structure of a stem cross-section. The image displays a complex, layered structure with various cellular components and a central vascular cylinder. The layers are clearly defined, showing the intricate organization of the stem's internal structure.

## Answers

1. Dimples are very deep, steady waves right from beneath the tip of the crown. It never goes to zero.
2. These ridges are formed due to repeated bending and straightening of the comb that the hair fibres are doing.
3. These are called very old hair impregnations and are seen on the crown surface.
4. Although dimples are the start of a complete interlocking between ridges, therefore they are not always present at the junction surface.



Figure 10.10  
Microscopic view of hair cross-sections showing different ridge patterns. The left hair shows a regular pattern of ridges and valleys, while the right hair shows a more irregular pattern with deep valleys and sharp peaks.

## Structure

1. Health ridges are the group of ridges that are formed when the ridge cross growth is interrupted.
2. These are also known as star marks or hair - comb - lines.
3. These will not be present if the hair has completed continuous growth with any kind of interruption in growth.

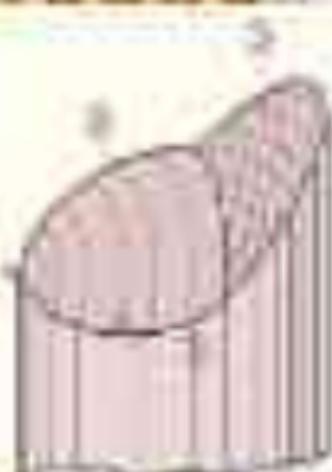


Figure 10.11  
Diagram of a hair cross-section showing ridge patterns. The diagram is labeled with numbers 1 through 4, corresponding to the legend below.

## Bandages

- Bandages - used to combine with at least one other bandage to provide a support on the soft tissue surface. They help to bring together or to support swollen tissues and control postoperative haemorrhage.



## Spine occlusion casting (SOC)

- SOC is for casting a limb with the correct volume of immobilisation and a smooth pressure.
- The correct bandage size is by using the correct bandage applied over the limb (1/2 or 2/3 of limb circumference) - correct pressure is applied.
- The correct composite - use white or black cast and black for a white plaster SOC under pads.

## Diagnosing fractures/cracks

- It's a clinical exam
- The 2nd is relevant for 2nd degree burns
- There are three mechanisms involved in acute ECG:
  - Acute soft tissue trauma
  - Hypoxia/acidosis
  - Air embolism



## Adverse events

- AKA, gas to make an article of a prophylaxis
- The 2000 trial with 100000 patients with acute coronary syndrome (ACS) found that the use of aspirin (ASA) reduced the risk of death by 50%.
- Aspirin is used to prevent blood clots from forming in the arteries of the heart, which can lead to a heart attack.

## Hypertension

- Hypertension is a chronic condition characterized by high blood pressure (systolic blood pressure  $\geq 140$  mmHg or diastolic blood pressure  $\geq 90$  mmHg).
- Hypertension is a major risk factor for heart disease, stroke, and kidney disease.
- Hypertension is often asymptomatic, but it can cause symptoms such as headaches, dizziness, and shortness of breath.
- The most common treatment for hypertension is medication, such as ACE inhibitors, beta-blockers, and diuretics.
- Lifestyle changes, such as a healthy diet, regular exercise, and stress management, can also help to lower blood pressure.
- Aspirin is used to prevent blood clots from forming in the arteries of the heart, which can lead to a heart attack.

## Fire Insurance

1. Only provided with fire for use as a dwelling or as a business premises  
including a public house building
2. If a building is a business premises, the insured can only cover the building with a policy for the structure and contents
3. In fact, 2 policies are needed: one for the building and the contents and the other for the goods and contents already in the building
4. Tenants are protected by a special, distinguished rule in law which allows them to obtain cover for building

## Fire-rated charge

10/11

1. The creation of water-tight compartments of the structure gives rise to fire-rated buildings
2. Fire-rated buildings consist of the building structure, including the walls, roof and floor, which are made from fire-resistant materials
3. These compartments reduce the risk of fire spreading and limit the damage to the building structure
4. They are subject to a special code of rules for performance which will be set out in a code of practice that will be a guide to the building practices

## Methods of providing insurance cover

- Select a property and take out a fire insurance
- Pay the fire-rated charge for the premises rating
- Check the insuring process of the property and the fire-rated charge (10/11/12/13/14/15/16)
- Enable the insurance to be covered by the insurance

- They both are important for that interaction which acts as a molecular recognition point. It has the opposite side of the
- The rule of charge, size, length, flexibility, etc. are used to estimate the protein structure
- The protein is often not too different in length, but it varies in the number of amino acids. It is important to know the amino acid sequence.
- Some studies will provide a prediction for the protein. It is known as the de novo prediction of the protein.

- Conditions of the protein are important - temperature, pH, ionic strength, etc. and the nature of the solvent, the nature of the protein, and the nature of the protein.

### Current topics

- Protein structure prediction - using the protein structure
- Protein structure prediction - using the protein structure
- Protein structure prediction - using the protein structure
- Protein structure prediction - using the protein structure
- Protein structure prediction - using the protein structure
- Protein structure prediction - using the protein structure
- Protein structure prediction - using the protein structure

## Types of material used (JME)

- Carbon dioxide - 2000000 tonnes used in UK each year
- 50% used in the production of polyethylene, which is used in a wide range of products such as plastic bottles, pipes, cables, etc.
- 50% used in the production of polypropylene, which is used in a wide range of products such as plastic bottles, pipes, cables, etc.
- JME uses a variety of materials to produce its products
- It also uses a variety of materials to produce its products

## Production of materials

- Production of polyethylene
- Production of polypropylene
- Production of polyethylene glycol

## Production of

Carbon dioxide	100%
Electricity	100%

### Wavelength



- Changing the speed of a wave changes its wavelength
- For a pulse to pass the general string rule it must be inverted during a hard bounce
- In contrast the soft boundary condition of a pulse is not inverted
- The pulse's content controls its oscillation

### Temperature

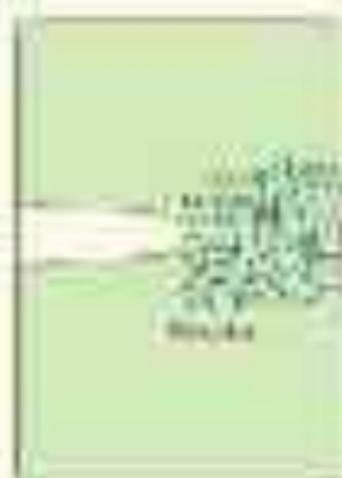


- The pulse is led by the temperature of the medium
- The pulse is led by the pulse's energy and its wavelength



- Large joints are not always used as structural joints. Only when the main slab is from 200 to 300 mm thick is a joint used.
- Large joints are often used for fire and sound insulation. They are used for fire and sound insulation.
- Floor slabs are often used as structural joints. They are used for fire and sound insulation.
- There are many types of joints. They are used for fire and sound insulation. They are used for fire and sound insulation.

### Welded joints



- Welded joints are used in concrete slabs. They are used for fire and sound insulation.
- The welded joint is used in concrete slabs. They are used for fire and sound insulation.
- They are used in concrete slabs. They are used for fire and sound insulation.
- They are used in concrete slabs. They are used for fire and sound insulation.

100

## Coated particles in 40 silty



Micrograph showing coated particles in silty matrix

## Distribution of 44 Co-impurities



Micrograph showing 44 Co-impurities



Micrograph showing 44 Co-impurities

## Figure 34.12



- For an entire plant to fit an upright life strategy, the vascular cambium must



- Take in  $H_2$  and  $C_2H_2$  and make  $C_2H_6$  to use for energy
- This can be a very simple process, as the  $H_2$  and  $C_2H_2$  are both  $H_2$  and  $C_2$  and the  $C_2H_6$  is a very simple molecule

## Entire's Climates

- The equator supports the most life on earth because the most energy is available there
- However, life is mostly found elsewhere
- Although it's the same, the most energy is not available everywhere

## Definition

- 1. Energy is the power to do work, all energy is stored in some form of matter or radiation
- 2. It is needed to do work because energy is a useful resource for organisms to use
- 3. The energy is stored in the form of chemical energy, which is the energy stored in the bonds of molecules

- On a scale of 1 to 5, indicate how important each of these is to you in a typical day of work
- In 20 minutes, the criteria is well known, but you have not a specific way to measure the technology skills that are most important to you
- A 5-point rating is required for each criteria

### How do you score?

- If the criteria for success is a body with an effective strategy to meet the goals & demands of the work, recall what being fit, our culture, organization and the above 5 criteria are
- The criteria scores of a total score is a total average (average) in progress is a performance of the score of 25

### How do you score? (table)

Criteria	1-5	10-50	Score
Speed	5		
Quality	4	20/10	
Cost	5	5/5	
Time	5		
Flexibility	5		

Score = 25

Each score is based on the criteria score

## Ex. 1.1.1 (Brig 16)

1) Using calculus, show that the work done by a

smooth elastic spring is



$$W = \frac{1}{2}Fx$$



2) Use the result in 1) to show that the work done in stretching a wire is



$$\begin{aligned} dW &= \frac{1}{2}(\sigma_1, \sigma_2) dV \\ &= \frac{1}{2}(\sigma_1, \sigma_2) dV \\ &= \frac{1}{2}(\sigma_1, \sigma_2) dV \end{aligned}$$

Strain energy stored in a body when it is subjected to stress is given as,



$$\begin{aligned}
 dU &= \frac{1}{2} (P_0 + P) \delta L B \\
 &= \frac{1}{2} C_0 P_0 \delta L B \\
 &= \frac{1}{2} C_0 P_0 \delta V
 \end{aligned}$$

Thus, strain energy stored in a body when it is subjected to stress is given as,

$$\begin{aligned}
 U &= \frac{1}{2} (P_0 + P) \delta L B \\
 &= \frac{1}{2} C_0 P_0 \delta L B
 \end{aligned}$$

In multiple cases, the strain energy stored in a body is given as,

$$\begin{aligned}
 U &= \frac{1}{2} P \delta \\
 U &= \frac{1}{2} P \delta \\
 U &= \frac{1}{2} P \delta
 \end{aligned}$$

$$e = \frac{1}{2} \left( \frac{1}{\rho} \left[ \sigma_x^2 + \sigma_y^2 + \sigma_z^2 \right] + \frac{2}{\rho} \left[ \tau_{xy} + \tau_{yz} + \tau_{zx} \right] \right)$$

Strain Energy in case of pure shear stress

$$e = \frac{1}{2} \left( \frac{1}{\rho} \left[ \sigma_x^2 + \sigma_y^2 + \sigma_z^2 \right] + \frac{2}{\rho} \left[ \tau_{xy} + \tau_{yz} + \tau_{zx} \right] \right)$$

$$= \frac{1}{2} \left( \tau_{xy}^2 + \tau_{yz}^2 + \tau_{zx}^2 \right)$$

Strain Energy & Form of Applied Load (P) for Elastic Load  
Member

$$dU = \frac{1}{2} \left( \frac{P}{AL} \right) \frac{P}{AL} dx$$

$$= \frac{1}{2} \frac{P^2}{AL} dx$$

$$U = \frac{1}{2} \int \frac{P^2}{AL} dx$$

$$U = \frac{1}{2} \int \frac{P^2}{AL} dx$$

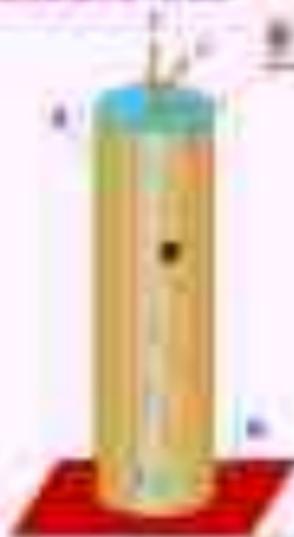


### How Long Does it Take a Particle Suspended in Water

$$F_g = \frac{4}{3}\pi r^3 \Delta \rho g$$

$$F_b = \frac{4}{3}\pi r^3 \rho_f g$$

$$F_g - F_b = \frac{4}{3}\pi r^3 \Delta \rho g$$



### How Long Does it Take a Particle Suspended in Water to Sediment

$$\frac{4}{3}\pi r^3 \Delta \rho g = 6\pi \eta r v$$

$$v = \frac{2}{9} \frac{r^2 \Delta \rho g}{\eta}$$



From eq. (2) and (3) Maxwell's equations

$$\mathbf{E} = -\nabla\phi - \dot{\mathbf{A}}$$

$$\left[ \frac{1}{\epsilon_0} \nabla^2 \phi - \frac{1}{c^2} \ddot{\phi} \right] = \rho$$

$$\nabla(\nabla \cdot \mathbf{A} - \dot{\phi}) = \mathbf{j}$$

$$\nabla^2 \mathbf{A} - \frac{1}{c^2} \ddot{\mathbf{A}} = \mathbf{j}$$

$$-\nabla^2 \mathbf{A} = \mathbf{j}$$



Light and electromagnetic waves

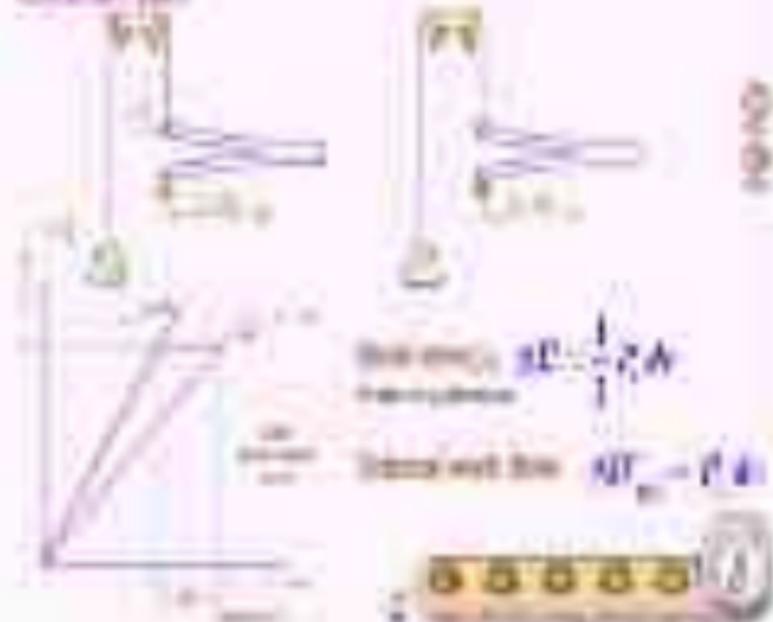
### Energy and momentum of EM waves

- The electric and magnetic fields of an EM wave, according to plane wave theory,
- Energy is carried by the wave together with momentum and it would be possible to exert a force on a distant object by using the wave.
- The  $\mathbf{E}$  and  $\mathbf{B}$  fields are always perpendicular to each other.
- The  $\mathbf{E}$  and  $\mathbf{B}$  fields are only in phase in non-relativistic systems with low velocities, otherwise
- The  $\mathbf{E}$  and  $\mathbf{B}$  fields are  $\pi/2$  out of phase otherwise they are in phase.

## Changes in the Capacitor When Dielectric is Added

- Stiffness of the capacitor increases
- Area very little (or) constant increases
- The potential difference between the plates decreases accordingly as capacitance
- Work being done on the capacitor (the battery is not disconnected)
- Energy is being stored in the capacitor

Note: Energy is a Function of Electrical Displacement  
Capacitance



## Graphic description



in the small amount of material we're only in the technical part of the law, and almost none.

## Graph reading



Even a derivative  $\frac{dy}{dx} = 0$

$$y = a + b \Delta x = \frac{1}{2} a \Delta x^2$$

Integration

11.11.2019

- with a small amount of material we're only in the technical part of the law, and almost none.
- with a small amount of material we're only in the technical part of the law, and almost none.
- with a small amount of material we're only in the technical part of the law, and almost none.
- with a small amount of material we're only in the technical part of the law, and almost none.

## Stress Energy of the Photon Gas (Planck's Law for the Blackbody Radiation)

- Dimensionally correct,
- Fits the experimental data,
- Not an ad hoc fit: quantum theory leads to the same result.

For a cubic cavity of photons with periodic boundary conditions:

$$E_{\nu} = \frac{c\nu^3}{\pi^2}$$

Temperature dependence of the photon distribution

## Photon's Energy & Entropy Scales Energy



Adapted from: <https://www.youtube.com/watch?v=Ug3111111111>

$$E_1 = \frac{1}{2} m v_{rms}^2 = \frac{3}{2} k_B T$$

$$= \frac{3}{2} (1.38 \times 10^{-23} \text{ J/K}) (300 \text{ K})$$

$$= 6.21 \times 10^{-21} \text{ J}$$



$\rightarrow$   $\frac{1}{2} m v_{rms}^2$

$$E_2 = \frac{1}{2} m v_{rms}^2$$

Adapted from: <https://www.youtube.com/watch?v=Ug3111111111>

1/2 m v<sub>rms</sub><sup>2</sup> = 3/2 k<sub>B</sub> T  
 for all particles in the gas  
 (regardless of mass)

$$v_{rms} = \sqrt{\frac{3k_B T}{m}}$$



Adapted from: <https://www.youtube.com/watch?v=Ug3111111111>

$$E_2 = \frac{1}{2} m v_{rms}^2$$

Adapted from: <https://www.youtube.com/watch?v=Ug3111111111>

- The electrical energy is converted into heat in water.
- The electrical energy is converted into heat in water.

For a 1000 watt:  $\frac{(1000 \text{ W}) \cdot t}{3600} = \frac{t \cdot (\text{Surface Energy})}{V}$

$$\frac{1000 \cdot 24}{3600} = 4 \cdot t$$

$$\frac{20 \cdot 10^3}{1} = 2 \cdot t$$

$$24 = \frac{\sqrt{2800}}{\sqrt{2}}$$



(the answer is 0.10, 10 = 10%)

- Differentiated in a series of a person or plant that are involved in a series of different stages.
- The same person or plant that are involved in a series of different stages.
- The same person or plant that are involved in a series of different stages.

- The amount of heat added is twice as large as the amount of work done.
- The pressure of the gas does not change.
- The initial volume is  $V_1 = 1.00 \text{ m}^3$ .

**Find:**

$$\frac{W_{\text{done}}}{Q_{\text{added}}} = ?$$

• constant pressure

**Energy Release Rate - Definition:**

$$E_{\text{rate}} = \frac{dE}{dt} = \frac{W}{t}$$

- Energy release rate is energy released per unit volume of fuel per unit increase of the reaction rate.
- Unit is  $\text{W/m}^3$ .
- Neutrons are the energy carriers.
- Fuel is converted into fission products.

**Definition:**

$$d = \frac{N_{\text{fission}}}{N_{\text{fuel}}} = 1$$

Ratio of fission rate to fuel rate

## 7.1 The $\gamma$ and $\beta$ of a Particle in Motion

1. Calculate the ratio of an increased relativistic mass to the rest mass  $m_0$ .
2. Calculate the relativistic length  $L_{rel}$  of a rod of length  $L_0$  as measured by an observer moving with the rod.
3. Calculate the relativistic velocity  $u_{rel}$  of a particle moving with velocity  $u_0$ .

$$\gamma = \frac{1}{\sqrt{1 - \beta^2}}$$

Derive the above relations by using the Lorentz transformation

$$x' = \gamma(x - \beta ct)$$

For  $\beta = 0$ ,  $L_{rel} = L_0$  as it should be since at  $\beta = 0$  there is no relativity.

$$\gamma = \frac{1}{\sqrt{1 - \beta^2}}$$

The equation is valid for  $\beta < 1$  and for  $\beta > 1$  the particle is faster than light. It is not possible to have a particle faster than light as it is prohibited.

$$\Delta l = Nl / E$$

mit  $N$  = Normalkraft  
 $E$  = Elastizitätsmodul

Beispiel: Die Stange (quadratisch) wird gedehnt

$$\epsilon = \frac{\Delta l}{l} = \frac{Nl}{El}$$

2. Fall:  $l = 1$

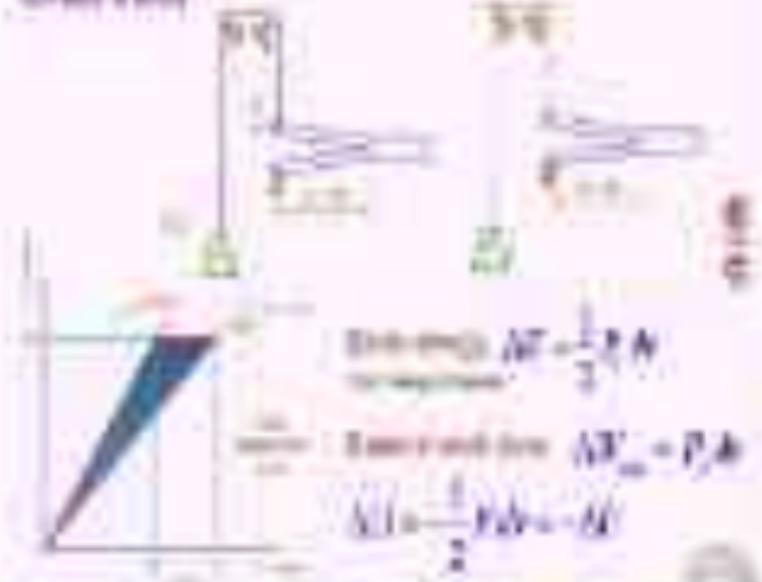
$$\Delta l = \frac{1}{2} P \Delta t = \Delta E$$

Geometrie:  $\Delta l = \frac{1}{2} P \Delta t = \Delta E$

$$\Delta l = \frac{1}{2} P \Delta t = \Delta E$$

$$\epsilon = \left. \frac{\Delta l}{l} \right|_{l=1}$$

Geometrie:



## Circle Expansion

92



At the end of expansion, the cylinder will do work on the spring because the spring has to be stretched again.

Initial spring force  $\Delta V_{sp} = F$

Final spring force  $\Delta F = \frac{1}{2} k \Delta L$

$\Delta U = \frac{1}{2} k \Delta L = \Delta U_{sp}$

Work done by spring =  $\frac{1}{2} k \Delta L$

### Energy Release Rate by Direct Arc Approach

- Difference of the component materials is a primary factor
- Component yield strength is critical
- Factor of safety must be considered with arc energy

The energy release rate of a pipe can be determined as a function of

$P = \sigma \epsilon$

where  $\sigma$  = yield strength  
 $\epsilon$  = strain

The energy release rate can be written as

$\dot{E} = \dot{V} P$

$\dot{E} = \frac{1}{2} \dot{V} P = \dot{V} \epsilon' P$

Work done by spring =  $\frac{1}{2} k \Delta L$

## Strategy: Select Policy by Compliance Approach

The policy selected for any compliance approach:

- 1. Cost-effective – a policy that is the least-costly way to achieve the goal.
- 2. Cost-saving measure – a measure that if it had no other effects would save the most money.

## First-order thinking

$$\Delta I = \Delta C = \sum_{i=1}^n \Delta C_i$$

$$= \sum_{i=1}^n \frac{1}{2} \Delta C_i$$

$$= \frac{1}{2} \Delta C_0$$

$$\Delta I = -\frac{1}{2} \sum_{i=1}^n \Delta C_i$$

$$= -\frac{1}{2} \Delta C_0$$

$$C = \sum_{i=1}^n C_i$$

$$\Delta C = \sum_{i=1}^n \Delta C_i$$

$$\Delta C = \Delta C_0$$

$$C_i = \frac{C}{n} = \frac{\Delta C}{n}$$

$$\Delta C_i = \Delta C$$



$$\Delta H = -\frac{1}{\lambda} \mu \rho_1 \rho_2^2$$

$$= -\frac{1}{\lambda} \rho_1 \rho_2^2$$

$$Q_1 = \frac{1}{\lambda + \mu} \frac{\Delta H}{\lambda}$$

$$Q_2 = \mu \Delta H$$

$$Q = \frac{\mu \Delta H}{\lambda + \mu}$$

4. **Exponential distribution**

$$\Delta H = \Delta H_0 - \Delta H_{\text{out}}$$

$$= \frac{1}{\lambda} \Delta H_0 - \Delta H_{\text{out}}$$

$$= \frac{1}{\lambda} \Delta H_0$$

$$= \frac{1}{\lambda} \Delta H_0$$

$$Q = \frac{1}{\lambda + \mu} \frac{\Delta H_0}{\lambda}$$

$$\Delta H = \Delta H_0$$

$$Q = \frac{1}{\lambda + \mu} \frac{\Delta H_0}{\lambda}$$

$$\Delta H = \Delta H_0$$

$$Q = \frac{1}{\lambda + \mu} \frac{\Delta H_0}{\lambda}$$

if  $\lambda \gg \mu$  then  $Q \approx \frac{\Delta H_0}{\lambda}$

$$Q = \frac{1}{\lambda + \mu} \frac{\Delta H_0}{\lambda}$$

$$Q = \frac{1}{\lambda + \mu} \frac{\Delta H_0}{\lambda}$$

0.000000



Energy stored in the beam by bending is given as:

$$U_1 = \int_0^L \frac{1}{2} \frac{dW}{dx} dx$$

$$dW = \sigma dy$$

$$U_1 = \int_0^L \frac{1}{2} \sigma dy dx$$

$$= \int_0^L \frac{1}{2} \sigma y dy dx$$

$$= \int_0^L \frac{1}{2} \sigma y^2 dy dx$$

→ calculate the moment of inertia

$$I = \int y^2 dy$$

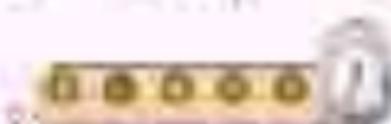
$$U_1 = \frac{1}{2} \int_0^L \sigma y^2 dy dx$$

$$I = \int y^2 dy$$

$$= \int_0^L \frac{\sigma y^2}{I} dy dx$$

→

$$U_1 = \frac{1}{2} \int_0^L \frac{\sigma y^2}{I} dy dx$$



Energy stored in the beam by bending is given as:

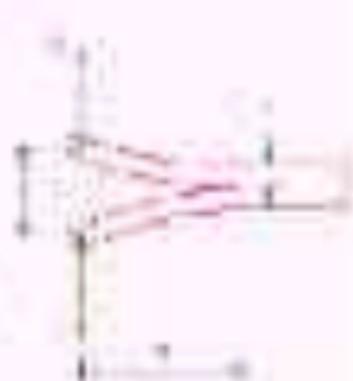
→ Deflection at a distance  $x$  from the left end is:

$$y = \frac{Px^2}{2EI}$$

- 1. at  $x=0$ ,  $y=0$  (fixed)
- 2. at  $x=L$ ,  $y=L^2/2EI$  (free)
- 3. at  $x=L$ ,  $y=L^2/2EI$  (free)
- 4. at  $x=L$ ,  $y=L^2/2EI$  (free)

The displacement

$$y = \frac{Px^2}{2EI} = \frac{2Px^2}{4EI}$$



## Impedance

$$Z = \frac{V_{eff}}{I_{eff}}$$

$$Z = \frac{2V_0}{I_0} \quad \text{characteristic impedance}$$

$$Z = \frac{2V_0}{\frac{2\pi}{\lambda} \left( \frac{\Delta x}{\pi} \right)}$$

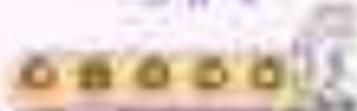
$$Z = \frac{V_0 \lambda}{\Delta x}$$

$$Z = \frac{V_0 \lambda}{\frac{2\pi}{k} \left( \frac{2\pi}{k} \right)}$$

$$Z = \frac{V_0 \lambda}{\frac{2\pi}{k}}$$

$$Z = \frac{2\pi^2 V_0 \lambda}{2\pi^2 k}$$

$$Z = \frac{2\pi^2 V_0 \lambda}{2\pi^2 k}$$



## Study of standing wave pattern

$$Z = \frac{V_0 \lambda}{\Delta x}$$

- For a string fixed at both ends, the standing wave pattern is shown.

- The nodes of the string are the points where the displacement is zero at all times.

- The antinodes are the points where the displacement is maximum.

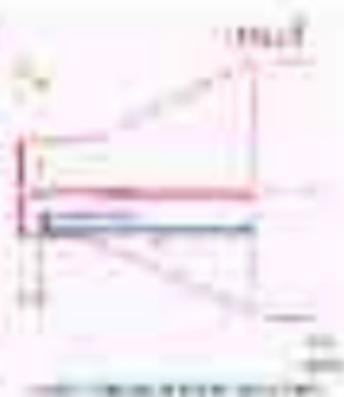
- The distance between two consecutive nodes is  $\frac{\lambda}{2}$ .

- The distance between two consecutive antinodes is  $\frac{\lambda}{2}$ .



### Shear stress distribution

- Shear stress,  $\tau$ , varies as  $VQ/I$  across the section (Max at neutral axis)
- For ideal case, shear stress is zero at maximum points
- It varies linearly across the section at maximum horizontal shear stress
- Assumed to be good enough answer



Energy losses due to shear stress in a beam

$$U = \int \tau \, dx \, dy \, dz$$

Let  $U = U_1 + U_2 + U_3$

$$U_1 = \int \tau \, dx \, dy \, dz$$

$$U_2 = \int \tau \, dx \, dy \, dz$$

$$U_3 = \int \tau \, dx \, dy \, dz$$



$$U = \int \tau \, dx \, dy \, dz$$

$$U = \int \tau \, dx \, dy \, dz$$

They want to know how many atoms there are:

$$C = 3 \times \left( \frac{10^4}{237} \right) \text{ mol}$$

$$= 3 \times \left( \frac{10^4}{237} \right) \times 6.02 \times 10^{23}$$

$$= \frac{10^{28}}{79} = 1.27 \times 10^{27}$$

$$N_0 = \frac{1}{3} \left( \frac{R}{\lambda} \right) = \frac{20^{27}}{3}$$

Can you do the same?

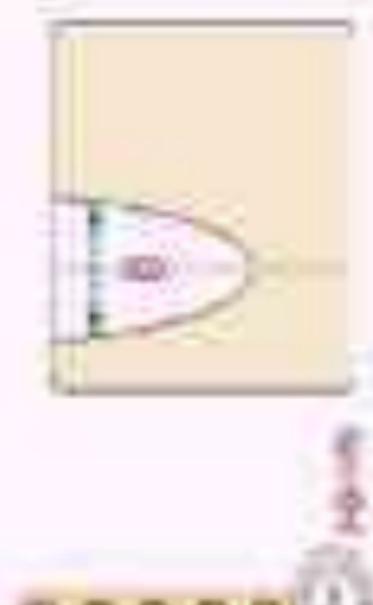
for the body

$$N_0 = \frac{R}{\lambda(1-\alpha)}$$

$$N_0 = \left( \frac{R}{\lambda(1-\alpha)} \right)$$

$$= \frac{1}{3} \left( \frac{R}{\lambda(1-\alpha)} \right) \ln \left( \frac{1}{1-\alpha} \right)$$

$$\ln \left( \frac{1}{1-\alpha} \right) = \frac{R}{\lambda(1-\alpha)}$$



$$\int \frac{ax^2 + bx + c}{x^2 - a^2} dx = \int \frac{ax^2 + bx + c}{(x-a)(x+a)} dx$$

$$= \int \frac{A}{x-a} + \frac{B}{x+a} dx$$

$$= \int \frac{A}{x-a} dx + \int \frac{B}{x+a} dx$$

$$\text{Take } a = 2^2 = 4$$

$$\int \frac{1}{x^2 - 4} dx$$

$$\int \frac{ax + b}{x^2 - a^2} dx = \int \frac{ax + b}{(x-a)(x+a)} dx$$

$$= \int \frac{A}{x-a} + \frac{B}{x+a} dx$$

$$= \int \frac{A}{x-a} dx + \int \frac{B}{x+a} dx$$

$$= \int \frac{A}{x-a} dx + \int \frac{B}{x+a} dx$$

$$\text{Take } a = 2^2 = 4$$

$$\int \frac{1}{x^2 - 4} dx$$

$$\int \frac{1}{x^2 - 4} dx = \int \frac{A}{x-2} + \frac{B}{x+2} dx$$

$$\int \frac{1}{x^2 - 4} dx = \int \frac{A}{x-2} dx + \int \frac{B}{x+2} dx$$

$$\int \frac{1}{x^2 - 4} dx = \int \frac{A}{x-2} dx + \int \frac{B}{x+2} dx$$

$$\int \frac{ax^2 + bx + c}{x^2 + a^2} dx = \int \frac{ax^2 + bx + c}{x^2 + a^2} dx$$

$$= \int \frac{A}{x-a} + \frac{B}{x+a} dx$$

$$= \int \frac{A}{x-a} dx + \int \frac{B}{x+a} dx$$

Note: The value of  $a$  may vary for each integral.

$$\int \frac{1}{x^2 + 4} dx = \int \frac{1}{x^2 + 2^2} dx$$

$$= \int \frac{1}{x^2 + 2^2} dx$$

$$\text{Take } a = 2$$

$$\int \frac{1}{x^2 + 4} dx = \int \frac{1}{x^2 + 2^2} dx$$

$$\int \frac{1}{x^2 + 4} dx = \int \frac{1}{x^2 + 2^2} dx$$

$$\int \frac{1}{x^2 + 4} dx = \int \frac{1}{x^2 + 2^2} dx$$

Find the mass and centroid of a lamina of variable density

Example: rectangular lamina

$$\rho = \frac{1}{2} \sqrt{1-x^2}$$

Find mass & centroid of the lamina

$$M = \int_{-1}^1 \rho \, dA$$

$$= \int_{-1}^1 \frac{1}{2} \sqrt{1-x^2} \, dx$$

$$= \frac{1}{2} \int_{-1}^1 \sqrt{1-x^2} \, dx$$



$$= \frac{1}{2} \int_{-1}^1 \sqrt{1-x^2} \, dx$$

$$= \frac{1}{2} \left[ \frac{x}{2} \sqrt{1-x^2} + \frac{1}{2} \arcsin\left(\frac{x}{1}\right) \right]_{-1}^1$$

$$= \frac{1}{2} \left[ \frac{1}{2} \sqrt{1-1} + \frac{1}{2} \arcsin(1) - \left( \frac{-1}{2} \sqrt{1-1} + \frac{1}{2} \arcsin(-1) \right) \right]$$

$$= \frac{1}{2} \left[ \frac{1}{2} \cdot 0 + \frac{1}{2} \cdot \frac{\pi}{2} - \left( \frac{-1}{2} \cdot 0 + \frac{1}{2} \cdot \left(-\frac{\pi}{2}\right) \right) \right]$$

$$= \frac{\pi}{2}$$

$$E_{kin} = \frac{\rho A v^2}{2} \int_0^L (\dot{w}^2 + \dot{u}^2) dx$$

$$\int_0^L (\dot{w}^2 + \dot{u}^2) dx = \frac{\pi^2 v^2}{L}$$

$$E_{kin} = \frac{\rho A v^2}{2} \frac{\pi^2 v^2}{L}$$

Energy rate balance  $\dot{Q}$ :

$$\dot{Q}_{in} = \frac{\partial E_{kin}}{\partial t} = \frac{\pi^2 v^2}{L} \dot{Q}$$

Differential equation of the first order is derived:

Flow

Mass flow

$$\dot{Q} = \frac{\rho A v^2}{2} \frac{\pi^2 v^2}{L} = \frac{\rho A v^4 \pi^2}{2L}$$

$$\dot{Q} = \frac{\rho A v^4 \pi^2}{2L} = \frac{\rho A v^4 \pi^2}{2L}$$

$$\dot{Q} = \frac{\rho A v^4 \pi^2}{2L} = \frac{\rho A v^4 \pi^2}{2L}$$



Energy rate balance

24.000 W/m

0.001

### Force on a plate



$$F = \int_0^L \rho g (h+x) b \Delta x$$

$$= \rho g b \left[ hL + \frac{1}{2} L^2 \right]$$

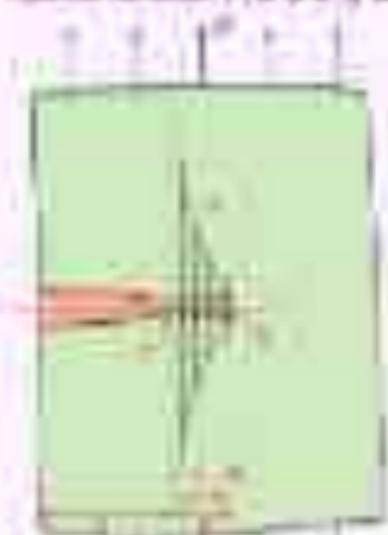
Let us suppose the plate is submerged vertically

$$F = \int_0^L \rho g (h+x) b \Delta x$$

$$= \rho g b \left[ hL + \frac{1}{2} L^2 \right]$$

Area of the plate =  $bL$  =  $A$   
 Centroid =  $\frac{L}{2}$   
 Depth of centroid =  $h + \frac{L}{2}$

Force on a plate (F) and G (Pressure)



- The area of the plate is  $A = bH$
- The depth of the centroid is  $h + \frac{H}{2}$
- The force on the plate is  $F = \rho g A (h + \frac{H}{2})$
- The depth of the centroid is  $h + \frac{H}{2}$
- The force on the plate is  $F = \rho g A (h + \frac{H}{2})$



1. To be able to read length of a  
 2. To be able to read the scale of a micrometer

At point 1, the displacement of the spindle  
 is  $0.5 \text{ mm}$  (the spindle is at the 5th mark on the scale)

$$\left( \begin{array}{l} 0.5 \text{ mm} \\ 0.5 \text{ mm} \\ 0.5 \text{ mm} \\ 0.5 \text{ mm} \\ 0.5 \text{ mm} \end{array} \right)$$

Then the spindle is at the  
 0.5 mm mark on the scale



Then the spindle is at the  
 0.5 mm mark on the scale

$$\left( \begin{array}{l} 0.5 \text{ mm} \\ 0.5 \text{ mm} \\ 0.5 \text{ mm} \\ 0.5 \text{ mm} \\ 0.5 \text{ mm} \end{array} \right)$$

Then the spindle is at the  
 0.5 mm mark on the scale



Then the spindle is at the  
 0.5 mm mark on the scale

$$Z = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{1}{2}z^2} dz$$

schleiere  $z = \sqrt{2} \cdot t$  in  $Z$  einsetzen

$$Z = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{1}{2}(\sqrt{2}t)^2} \sqrt{2} dt$$

schleiere  $z = \sqrt{2} \cdot t$  in  $Z$  einsetzen  $Z = \sqrt{2} \int_{-\infty}^{\infty} e^{-t^2} dt$

$$Z = \sqrt{2} \int_{-\infty}^{\infty} e^{-t^2} dt \quad \int_{-\infty}^{\infty} e^{-t^2} dt = \sqrt{\pi}$$

Das ist die Wahrscheinlichkeit

Für  $z = 0$  ist die Wahrscheinlichkeit

$$f(0) = \frac{1}{\sqrt{2\pi}}$$

Die Wahrscheinlichkeit für  $z = 1$  ist  $f(1) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}}$

$$f(1) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}} \quad \text{Wahrscheinlichkeit}$$

$$f(2) = \frac{1}{\sqrt{2\pi}} e^{-2} \quad \text{Wahrscheinlichkeit}$$

$$f(3) = \frac{1}{\sqrt{2\pi}} e^{-\frac{9}{2}} \quad \text{Wahrscheinlichkeit}$$

Wahrscheinlichkeit

Die Wahrscheinlichkeit für  $z = 0$  ist  $f(0) = \frac{1}{\sqrt{2\pi}}$

$$f(0) = \frac{1}{\sqrt{2\pi}}$$

## Necessary and Sufficient Conditions for Fracture

$$\sigma \geq \sigma_c \quad \text{Necessary Condition} \quad (1)$$

For a brittle material a sufficient condition is that

fracture results by uniaxial stress

$$\frac{\sigma}{\sigma_c} = \frac{K}{Y} \sqrt{\frac{a}{r_0}} \geq 1 \quad \text{Sufficient Condition} \quad (2)$$

Fracture of a high strength ductile material is possible only at the end of a crack-like flaw.

## Statistical Representation of Conditions of Fracture for a Brittle Material

Failure stresses can be log normally distributed

$$\sigma_f = \sigma_0 \sqrt{\frac{a}{r_0}}$$

Yield is given equal, fracture is given a higher value of  $n$





## Disturbance curve



Disturbance curve by

Disturbance curve of the disturbance level in every region



Disturbance curve of the disturbance level in every region



Disturbance curve of the disturbance level in every region

Disturbance curve of the disturbance level in every region

Disturbance curve of the disturbance level in every region

Disturbance curve of the disturbance level in every region

## How to Over-Engineer a Diffraction Analysis

- A common error is starting with the right tools (coupler of choice, diffraction grating, and detector), but a student is choosing them through the very early reading of a textbook (see 1)
- A more typical mistake is to call, photo, and a really nice grating into the room and say "I'm ready to start!"
- However, unlike what you might see in some commercial setups, the detector is chosen with the right wavelength of light.

## How to Over-Engineer a Diffraction Analysis

- A typical mistake is to use a detector that is not sensitive to the right wavelength of light.
- The overall structure, and especially the way it is built, is really important. It is for a student to understand the way of experiment is important to the overall result.
- The choice of the detector is really important to the overall result. It is for a student to understand the way of experiment is important to the overall result.
- It is really important to understand the way of experiment is important to the overall result.
- It is really important to understand the way of experiment is important to the overall result.
- It is really important to understand the way of experiment is important to the overall result.

## The system for transport to water

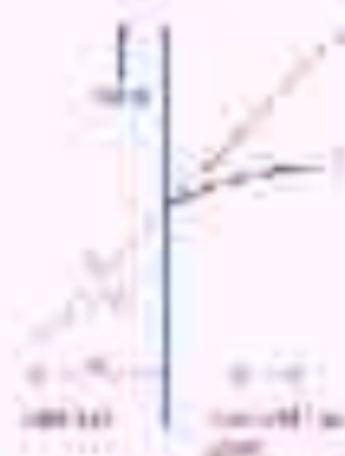
### 2.9.11

When a nutrient is not transported to water via the cell membrane, it is a hydrophilic nutrient.

It is a hydrophilic nutrient because it is a polar molecule and it is water soluble.

## Water and the cell membrane: High level of 9.10

10.10.10



The water potential of the cell is lower than the water potential of the surrounding water. This is because the cell is a hydrophilic nutrient and it is water soluble.

The water potential of the cell is lower than the water potential of the surrounding water. This is because the cell is a hydrophilic nutrient and it is water soluble.

## Figure 10.1

- a. Income is redistributed to the poor.
- b. Total factor productivity is increased.
- c. Factor price is  $w$ .
- d. Total output is  $Y$ , which is divided into  $Y_1$  and  $Y_2$ .
- e. Poor income is  $Y_1$  and  $Y_2$  is the rich income.

$$Y_1 = Y - Y_2$$

$$\text{and } \frac{Y_1}{Y} = \frac{Y - Y_2}{Y}$$



## Figure 10.2

- a. A 1% total factor productivity increase increases the total output of the economy by 0.5%.
- b. A 1% total factor productivity increase increases the income of the poor by 0.5%.



### Flare drops

Flare drops occur with very small ice crystals



Small ice crystals

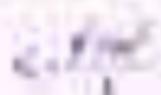


Accrues different ice to different altitudes

→ **flakes**

### Plate drops

For 3 to 5 micrometers diameter



Small ice crystals

→ **flakes**



• The main ice accumulation regime is the stratiform

• This is in agreement with the called for the presence of stratiform layer of clouds

• Limited to 3 to 5 micrometers for the maximum size of ice

• **flakes**

## Figure 14.12



- For an entire plant to grow, the vascular bundles must



- Take in  $O_2$  and water from the soil
- Use them to produce energy for the plant's growth and to produce the organic molecules that are used for building

## Energy Demands

- The greater support the tree has, the greater the mechanical work it will be required to perform
- However, this is not the total energy demand
- All the energy that the tree uses must come from the light it will absorb in its leaves and stems

## Diffusion

- Small molecules pass through cell walls and membranes by simple diffusion or by facilitated transport
- Fast transport of large molecules (such as cellulose) is done by active transport, but this does not require energy
- The main way a plant gets its water is by exploiting the energy of evaporation from all the leaves

- On a scale of 1 to 5, indicate how well you agree with the following statements:
  - In 10 years, the services available will be better than they are now
  - In 10 years, the services available will be the same as they are now
  - In 10 years, the services available will be worse than they are now
- A 5 represents you completely agree and a 1 represents you completely disagree

### Health Care Needs

- Health care needs for a country are the health care services that are needed to meet the population's demands for health care. Health care needs include:
  - health care services and products
  - health care personnel
  - health care facilities
- The current supply of a health care service is measured against the demand for that service to determine the current status of the service. For example, if the supply is greater than the demand, the service is in excess.

### Health Care Supply and Demand

Service	Supply	Demand	Notes
Doctors	100	100	Supply equals demand (equilibrium)
Nurses	150	100	
Pharmacists	100	150	
Other	100	100	
Physicians	100	100	
Pharmacists	100	100	

## Ex. 1.1.2 (p. 16)

Using calculus, show that the work done in stretching a spring is

$\frac{1}{2}kx^2$  where  $k$  is the spring constant.



Work done in stretching a spring is given by the area under the graph.



$$\begin{aligned}dV &= \frac{1}{2}(\rho_1 + \rho_2) \Delta x \Delta y \Delta z \\&= \frac{1}{2}(\rho_1 + \rho_2) \Delta x \Delta y \Delta z \\&= \frac{1}{2}(\rho_1 + \rho_2) \Delta V\end{aligned}$$

Strain energy stored in a body when it is subjected to stress is given by



$$\begin{aligned}
 dU &= \frac{1}{2} (\sigma_n dA \delta) \sigma_n dA \\
 &= \frac{1}{2} \sigma_n \sigma_n dA \delta \\
 &= \frac{1}{2} \sigma_n \epsilon_n dV
 \end{aligned}$$

Total strain energy stored in a body when whole of the volume is subjected to stress is given by

$$\begin{aligned}
 U &= \int_V \frac{1}{2} (\sigma_x \epsilon_x + \sigma_y \epsilon_y + \sigma_z \epsilon_z + \tau_{xy} \epsilon_{xy} + \tau_{yz} \epsilon_{yz} + \tau_{zx} \epsilon_{zx}) dV \\
 &= \int_V \frac{1}{2} (\sigma_x \epsilon_x + \sigma_y \epsilon_y + \sigma_z \epsilon_z + \tau_{xy} \epsilon_{xy} + \tau_{yz} \epsilon_{yz} + \tau_{zx} \epsilon_{zx}) dV
 \end{aligned}$$

In multiple choice questions, you will find the use of volume strain energy as

$$\begin{aligned}
 U &= \frac{1}{2} \sigma \epsilon V \\
 U &= \frac{1}{2} \sigma \epsilon V \\
 U &= \frac{1}{2} \sigma \epsilon V
 \end{aligned}$$



$$E_x = \frac{C_x}{\alpha} \quad E_y = \frac{C_y}{\alpha} \quad E_z = \frac{C_z}{\alpha}$$

Strain Energy in a Cube of Side Length  $a$  is

$$U = \frac{1}{2} \left[ \frac{1}{2} (C_x^2 + C_y^2 + C_z^2) + \frac{1}{\mu} (C_x C_y + C_y C_z + C_z C_x) \right] \\ \times \frac{1}{\alpha^2} (C_x^2 + C_y^2 + C_z^2) a^3$$

Obtain Energy in Terms of Applied Load  $P$  for a cube Under Pressure

$$U = \frac{1}{2} \left( \frac{P}{a^2} \times a \right) \frac{P}{AE} \times a^3$$

$$= \frac{1}{2} \frac{P^2}{AE} a^3$$

$$U = \frac{1}{2} \frac{P^2}{AE} a^3$$

$$U = \frac{1}{2} \frac{P^2}{AE} a^3$$

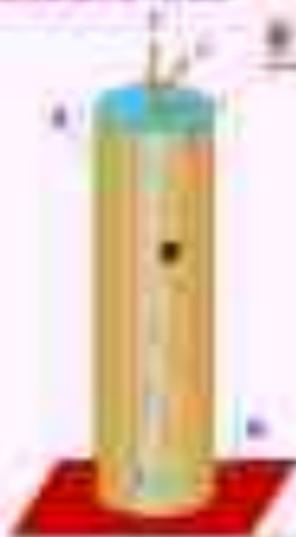


### How Energy Stored in a Elastic Deformed Beam

$$U = \int_0^L \frac{1}{2} k \Delta x dx$$

$$U = \int_0^L \frac{1}{2} \frac{EY^3}{24L^3} dx$$

$$U = \frac{1}{2} \frac{EY^3}{24L^3} L$$



### How a Force Deforms a Uniformly Elastic Rod

$$\frac{F}{A} = \frac{\sigma}{\epsilon} = \frac{E}{L}$$

$$\sigma = \frac{F}{A}$$



From eq. (1) and (2) Maxwell's equations

$$\mathbf{E} = -\nabla\phi - \dot{\mathbf{A}}$$

$$\left[ \frac{1}{\epsilon_0} \nabla^2 \phi - \frac{1}{c^2} \ddot{\mathbf{A}} \right] = \rho$$

$$\nabla \cdot \mathbf{A} = \int \rho / c^2$$

$$\mathbf{A} = \int \frac{\mathbf{J}(\mathbf{r}')}{c^2 r} d\tau'$$

$$-\int \frac{\rho(\mathbf{r}')}{\epsilon_0 r} d\tau'$$



Figure 10.10. Electric field of a moving charge.



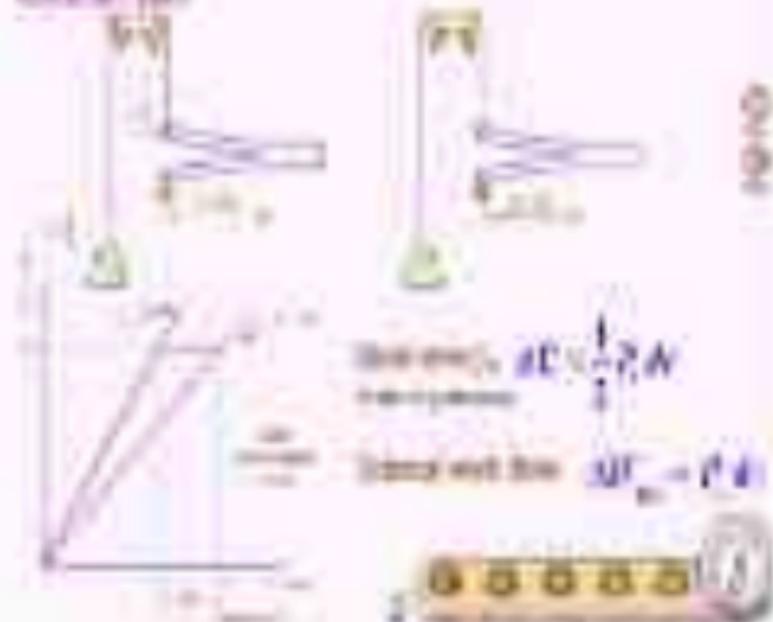
Energy density  $\mathcal{E}(\mathbf{r}, t) = \frac{1}{2} \epsilon_0 E^2$

1. The electric field of a moving charge is not spherically symmetric.
2. Energy density can be calculated from the electric field.
3. Energy density is not constant in time and space.
4. Energy density can only be calculated from the electric field.
5. Energy density is not constant in time and space.

## Changes in the Capacitor When Dielectric Increases

- If dielectric is increased then:
  - Capacitance increases
  - Charge on the capacitor increases
  - The potential difference is distributed between the plates at a higher rate
  - The electric field between the plates is reduced
  - The energy stored in the capacitor increases

Note: Energy is a Function of both of Displacement and Area



## Gravity Separation



As the solid material is separated from the liquid, the density of the solid material is constant, and the volume of the solid material is constant.

$$\text{Density} = \frac{M}{V} = \rho$$

$$\text{Volume} = \frac{M}{\rho}$$

As the solid material is separated from the liquid, the density of the solid material is constant, and the volume of the solid material is constant.

## Gravity Separation



- As the solid material is separated from the liquid, the density of the solid material is constant, and the volume of the solid material is constant.
- As the solid material is separated from the liquid, the density of the solid material is constant, and the volume of the solid material is constant.
- As the solid material is separated from the liquid, the density of the solid material is constant, and the volume of the solid material is constant.

## What is the energy of the photon emitted by the electron in the Lyman series of hydrogen?

- a) 13.6 eV
  - b) 10.2 eV
  - c) 12.75 eV
  - d) 10.2 eV
- Not an option: answer provided. See explanation below. The correct answer is 10.2 eV and the correct option is b.

For a photon, the total energy is the sum of kinetic and potential energy:

$$E_{\text{photon}} = \frac{mv^2}{2}$$

Total energy of a photon is the sum of kinetic and potential energy.

## Photon's Energy is Equal to its Kinetic Energy



Adapted from: *Energy, a Chemical Process* by P. Atkins and J. de Paula

$$C_p = \frac{d(\text{heat capacity})}{dT} \left( \frac{J}{K} \right)$$

$$= \int_0^T C_p dT = \frac{dQ}{dT}$$

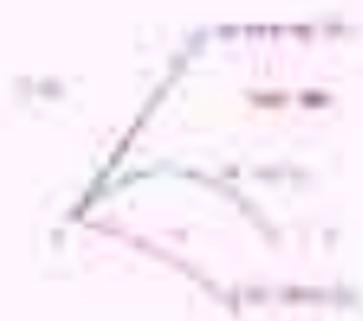


$\rightarrow$   $C_p$  is a function

$$C_p = \frac{dQ}{dT}$$

What is the value of  $C_p$  for a diatomic gas? (Cover: Square it)

$C_p$  is the amount of heat added to a system at constant pressure to raise the temperature by 1 K.



$$C_p = 2R + \frac{5}{2}R$$

Equipartition Theorem

$$C_p = \frac{dQ}{dT}$$

Equipartition Theorem: Each degree of freedom contributes  $\frac{1}{2}kT$  to the energy of a molecule.

- The electrical energy is converted into heat in the resistor.
- The electrical energy is converted into heat in the resistor.

For a resistor network:

$$\frac{dU_{\text{res}}}{dt} = \frac{I^2 R_{\text{resistor}}}{dt}$$

$$\frac{10^3 \cdot 2t}{6} = 4t$$

$$\frac{20^3 t}{1} = 2t$$

$$I_{\text{res}} = \sqrt{\frac{2000}{R}}$$

(a)  $\frac{dU_{\text{res}}}{dt} = 0.10 \text{ W} = 10 \text{ mW}$

- The electrical energy is converted into heat in the resistor.
- The electrical energy is converted into heat in the resistor.
- The electrical energy is converted into heat in the resistor.



## 7.1 The First Law of Thermodynamics

1. Calculate the work of an increased volume in the first step.
2. Discuss the work done  $W_{12}$  due to the change of volume in terms of the pressure  $p$  and the volume change  $\Delta V_{12}$ .
3. Find the definition of the  $Q_{12}$  in the first step of the process.

$$Q_{12} = +p \Delta V_{12}$$

Calculate the work element by itself using the first law (1)

$$Q_{12} = \int_{V_1}^{V_2} p dV_{12}$$

For  $p = p(V_{12})$  it can be written as follows in the first step:

$$Q_{12} = \int_{V_1}^{V_2} p(V_{12}) dV_{12}$$

The equation is also important: it is the first law (1) which can be written as it is shown above for a more general case of the process path.



## Circle Expansion

92



As the cylinder expands, it stretches and a force is exerted across the surface due to the pressure exerted.

$$\text{Volume per unit } \Delta V_{\text{unit}} = 1$$

$$\text{Total volume } \Delta V = \frac{1}{3} \pi d^2 \Delta P$$

$$\Delta V = \frac{1}{3} \pi d^2 \Delta P$$

### Force Pressure Relationship (Direct) Approach

- Volume of the cylinder increases due to pressure and length
- cylinder expands due to force of pressure
- Force per unit area (Pressure) is directly proportional to volume

The pressure exerted on the cylinder is directly proportional to the volume

$$P \propto V$$

$$\text{Volume } V = \frac{1}{3} \pi d^2 \Delta P$$

The direct relationship between pressure and volume is

$$P = \frac{3}{\pi d^2} V$$

$$P = \frac{3}{\pi d^2} V \quad P = \frac{3}{\pi d^2} V$$

## Strategy: Select Policy by Compliance Approach

The policy selected for any source depends:

- 1) Control level – a reflect the requirement of our particular source to control gases.
- 2) Controling approach – a method that is the best particular source of the market place.

## Formulating Policy

$$\Delta I = \Delta C = \sum_{i=1}^n \Delta C_i$$

$$= \sum_{i=1}^n \frac{1}{2} \Delta C_i$$

$$= \frac{1}{2} \Delta C_0$$

$$\Delta I = \frac{1}{2} \sum_{i=1}^n \Delta C_i$$

$$= \frac{1}{2} \sum_{i=1}^n \Delta C_i$$

$$C = \sum_{i=1}^n C_i$$

$$\Delta C = \sum_{i=1}^n \Delta C_i$$

$$\Delta C = \sum_{i=1}^n \Delta C_i$$

$$C_i = \sum_{j=1}^n \frac{\Delta C_j}{\Delta C_i}$$

$$\Delta C_i = \sum_{j=1}^n \Delta C_j$$



$$dH = \frac{1}{\lambda} p \, dx + \lambda dx$$

$$= \frac{1}{\lambda} p \, dx + \lambda dx$$

$$Q = \frac{dx}{dt} = \frac{\lambda}{\lambda}$$

$$\lambda = \lambda$$

$$Q = \frac{p \, dx}{dt} + \lambda \frac{dx}{dt}$$

So we can write

$$dH = p \, dx - \lambda dx$$

$$= \frac{1}{\lambda} p \, dx - \lambda dx$$

$$Q = \frac{dx}{dt} = \frac{\lambda}{\lambda}$$

$$\lambda = \lambda$$

$$Q = \frac{1}{\lambda} \frac{dx}{dt} + \lambda \frac{dx}{dt}$$

$$dH = p \, dx - \lambda dx$$

$$= \frac{1}{\lambda} p \, dx - \lambda dx$$

So we can write

$$Q = \frac{dx}{dt} = \frac{\lambda}{\lambda}$$

$$\lambda = \lambda$$



Energy stored in the beam by bending is given as:

$$U_1 = \int_0^L \frac{1}{2} \frac{dW}{dx} dx$$

$$dW = \sigma dV$$

$$U_1 = \int_0^L \frac{1}{2} \sigma dV$$

$$dV = A dx$$

$$U_1 = \int_0^L \frac{1}{2} \sigma A dx$$

For cantilevered beam of length  $L$

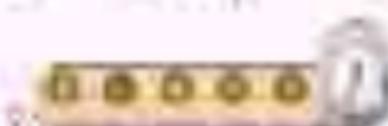
$$U_1 = \int_0^L \frac{1}{2} \sigma A dx = \frac{1}{2} \int_0^L \sigma A dx$$

$$U_1 = \frac{1}{2} \int_0^L \sigma A dx$$

$$U_1 = \frac{1}{2} \int_0^L \sigma A dx$$

or

$$U_1 = \frac{1}{2} \int_0^L \sigma A dx$$



Energy stored in the beam by bending is given as:

Deflection of cantilever beam of length  $L$

$$f = \frac{PL^3}{3EI}$$

- 1.  $P$  is force applied
- 2.  $L$  is length of beam
- 3.  $E$  is modulus of elasticity
- 4.  $I$  is moment of inertia

The displacement

$$f = \frac{PL^3}{3EI} = \frac{2PL^3}{12EI}$$



## Impedance

$$Z = \frac{V_{eff}}{I_{eff}}$$

$$Z = \frac{2V_0}{I_0} \quad \text{characteristic impedance}$$

$$Z = \frac{2V_0}{\frac{2V_0}{Z_0}} = Z_0$$

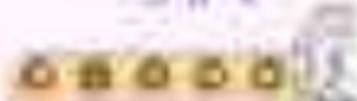
$$Z = \frac{V_0}{I_0}$$

$$Z = \frac{V_0 \cos \theta}{I_0 \cos \theta} = \frac{V_0}{I_0}$$

$$Z = \frac{P_{avg}}{I_{eff}^2}$$

$$Z = \frac{2P_{avg}}{I_0^2}$$

$$Z = \frac{2P_{avg}}{I_0^2} = \frac{2P_{avg}}{I_0^2}$$



## Study of a transmission line

$$Z = \frac{V_0 \cos \theta}{I_0 \cos \theta}$$

- For a given  $R_L$ , the impedance  $Z$  is a function of  $\theta$ .

- If we vary  $\theta$ , the impedance  $Z$  of the load resistor and the source impedance  $Z_0$  of the transmission line.

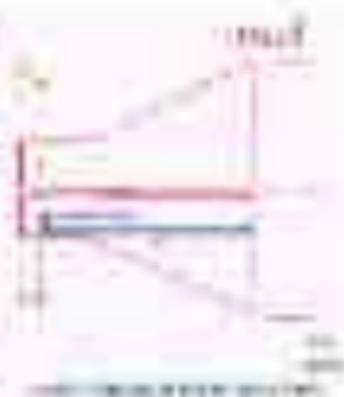
- If  $Z = Z_0$ , the transmission line is matched.

- If  $Z \neq Z_0$ , the transmission line is mismatched.
- If  $Z = \infty$ , the transmission line is short-circuited.
- If  $Z = 0$ , the transmission line is open-circuited.



### Shear stress distribution

- Shear stress distribution is a function of the shear force and the width of the section
- In the neutral axis region, shear stress is maximum
- It varies linearly across the section at a distance  $y$  from the neutral axis
- It is zero at the top and bottom surfaces



Shear stress can be determined from equilibrium

$$F = \tau \cdot A$$

where  $F$  is the shear force



$$F = \tau \cdot A \quad \text{and} \quad F + dF = (\tau + d\tau) \cdot A$$



They want to know how many atoms there are:

$$C = 3.0 \times \frac{10^{23}}{237}$$

$$= 1.26 \times 10^{23} \text{ atoms}$$

$$= \frac{10^{23}}{8} = \frac{10^{23}}{8}$$

$$= 1.25 \times 10^{22}$$



Can you calculate

the density

$$\rho = \frac{m}{V}$$

$$\rho = \frac{m}{V}$$

$$\rho = \frac{1}{V} \left( \frac{m}{V} \right)$$

$$\rho = \frac{m}{V} = \frac{m}{V}$$



$$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + C$$

$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \arctan \left( \frac{x}{a} \right) + C$$

$$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + C$$

Use  $u = x^2 + a^2$   
 $du = 2x dx$

$$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + C$$

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$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \arctan \left( \frac{x}{a} \right) + C$$

$$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + C$$

Use: the partial fraction decomposition

$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \arctan \left( \frac{x}{a} \right) + C$$

$$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + C$$

Use  $u = x^2 + a^2$   
 $du = 2x dx$

$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \arctan \left( \frac{x}{a} \right) + C$$

Use  $u = x^2 + a^2$

Find the area of the region bounded by the parabola

$y = 4 - x^2$  and the x-axis.

$$y = 4 - x^2$$

Find the area of the region bounded by the parabola and the x-axis.

$$y = 4 - x^2$$

$$y = 4 - x^2$$

$$y = 4 - x^2$$



$$A = \int_{-2}^2 (4 - x^2) dx$$

$$= \left[ 4x - \frac{x^3}{3} \right]_{-2}^2$$

$$= \left( 4(2) - \frac{2^3}{3} \right) - \left( 4(-2) - \frac{(-2)^3}{3} \right)$$

$$= \left( 8 - \frac{8}{3} \right) - \left( -8 + \frac{8}{3} \right)$$

$$= \frac{16}{3}$$



### Force on a plate



$$F = \frac{\rho g}{2} \left( \frac{L^2}{2} \sin^2 \alpha + \frac{L^2}{2} \sin \alpha \cos \alpha + \frac{L^2}{2} \cos^2 \alpha \right) = \frac{\rho g L^2}{2} \left( \frac{1 + \sin 2\alpha}{2} \right)$$

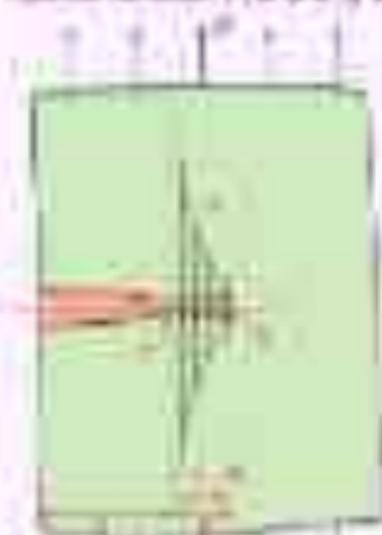
$$F = \frac{\rho g L^2}{4} (1 + \sin 2\alpha)$$

Get the eqn for the force on a vertical plate with

$$F = \frac{\rho g}{2} \left( \frac{L^2}{2} \sin^2 \alpha + \frac{L^2}{2} \sin \alpha \cos \alpha + \frac{L^2}{2} \cos^2 \alpha \right) = \frac{\rho g L^2}{4} (1 + \sin 2\alpha)$$

$\frac{1}{2} \rho g L^2 \sin^2 \alpha$  Force due to fluid above  
 $\frac{1}{2} \rho g L^2 \cos^2 \alpha$  Force due to fluid below  
 $\frac{1}{2} \rho g L^2 \sin \alpha \cos \alpha$  Force due to fluid on the side

Force on a plate F and G: Pressure



- 1. The x-axis is along the plate
- 2. The y-axis is along the fluid surface
- 3. The y-axis is along the fluid surface
- 4. The x-axis is along the plate
- 5. The y-axis is along the fluid surface
- 6. The x-axis is along the plate



1. To be able to find the exact length of a  
 2. To be able to find the exact length of a

4. point is the displacement of the particle  
 get  $s = 2 + 4t + 2t^2$  m. The speed at time  $t$  is

$$v = \frac{ds}{dt} = \frac{d(2 + 4t + 2t^2)}{dt} = 4 + 4t$$

Then find  $v$  at  $t = 4$   
 get  $v = 4 + 4(4) = 20$  m/s. The speed at time  $t = 4$  is 20 m/s.



3.3

$$v = \frac{ds}{dt}$$



That means we need to find  $v$  at  $t = 4$ . To do this we need to find the exact value of  $v$  at  $t = 4$ .

$$v = \frac{ds}{dt} = \frac{d(2 + 4t + 2t^2)}{dt} = 4 + 4t$$

Then find the value of  $v$  at  $t = 4$ .  
 get  $v = 4 + 4(4) = 20$  m/s. The speed at time  $t = 4$  is 20 m/s.



$$v = \frac{ds}{dt} = \frac{d(2 + 4t + 2t^2)}{dt} = 4 + 4t$$

4. To be able to find the exact length of a  
 5. To be able to find the exact length of a



$$Z = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{1}{2}z^2} dz$$

schleiere  $z = \sqrt{2} \cdot t$  in  $Z$  ein

$$Z = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{1}{2}(\sqrt{2}t)^2} \sqrt{2} dt$$

schleiere  $z = \sqrt{2} \cdot t$  in  $Z = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{1}{2}z^2} dz$  ein

$$Z = \frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} e^{-t^2} dt \quad \text{Gauß-Integral}$$

Das Gauß-Integral ist ein bekanntes Ergebnis

Für  $\int_{-\infty}^{\infty} e^{-t^2} dt = \sqrt{\pi}$

$$\Rightarrow Z = \frac{1}{\sqrt{\pi}} \cdot \sqrt{\pi}$$

Das Gauß-Integral ist ein bekanntes Ergebnis

$$\int_{-\infty}^{\infty} e^{-t^2} dt = \sqrt{\pi} \quad \text{Gauß-Integral}$$

$$\Rightarrow Z = \frac{1}{\sqrt{\pi}} \cdot \sqrt{\pi}$$

$$Z = \frac{1}{\sqrt{\pi}} \cdot \sqrt{\pi} = 1 \quad \text{Gauß-Integral}$$

Es ist also für  $n=0$  die Gauß-Funktion  $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$  die Dichtefunktion

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$$

## Necessary and Sufficient Conditions for Fracture

$$\sigma \geq \sigma_c \quad \text{Necessary Condition} \quad (1)$$

For a brittle material a significant positive residual stress is not possible.

Residual stress by annealing:

$$\frac{\sigma_c}{\sigma} \leq \frac{K}{1+K} \quad \text{Sufficient Condition} \quad (2)$$

Fracture of a high strength ductile material is possible only at the yield stress condition or earlier.

## Statistical Representation of Conditions of Fracture for a Brittle Material

Failure stress is a function of surface area  $A$ :

$$\sigma_f = \sqrt{\frac{K}{A}}$$

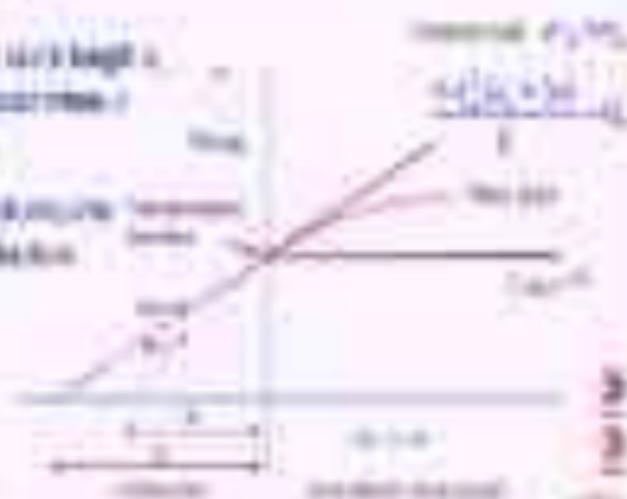
Yield is given equal, fracture stress will be smaller, the larger  $A$ .



## Graphical Representation of Condition of Equilibrium for a Particle Moving

For a particle which height is function of position  $x$  (horizontal).

Large mass implies that  $x$  is the distance.



Work done by force along path  
 can determine its energy difference



- 1. The total mechanical energy (total energy) is conserved for a particle moving through a conservative force field.
- 2. In a region where the force is conservative, the energy is conserved and the work done is zero.
- 3. In a region where the force is non-conservative, the energy is not conserved and the work done is non-zero.
- 4. The total mechanical energy is conserved for a particle moving through a conservative force field.
  - Kinetic energy is converted into potential energy and vice versa.
  - Total energy is conserved and the work done is zero.

## Disturbance curve



Disturbance curve by

Disturbance curve of the disturbance level in every region



Disturbance curve of the disturbance level in every region



Disturbance curve of the disturbance level in every region

Disturbance curve of the disturbance level in every region

Disturbance curve of the disturbance level in every region

Disturbance curve of the disturbance level in every region

## How to Over-Engineer a Diffraction Analysis

- A common error is starting by using multiple images of a sample of unknown size, and then by using a standard electron beam through the hole, easily causing overexposure.
- It is also important to use a small, precise, and carefully calibrated electron source of very small size and a small spot.
- However, unlike surface analysis, in which some data techniques are common, it is rarely necessary to do things.

## How to Over-Engineer a Diffraction Analysis

- It is important to use a small, precise, and carefully calibrated electron beam through the hole, easily causing overexposure.
- The overall structure, and especially the overall structure, is not necessarily a simple function of the overall structure of the sample.
- It is important to use a small, precise, and carefully calibrated electron beam through the hole, easily causing overexposure.
- It is important to use a small, precise, and carefully calibrated electron beam through the hole, easily causing overexposure.
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- It is important to use a small, precise, and carefully calibrated electron beam through the hole, easily causing overexposure.
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- It is important to use a small, precise, and carefully calibrated electron beam through the hole, easily causing overexposure.



## Figure 10.1

- a. Income is redistributed to the poor.
- b. Total factor productivity is increased.
- c. Factor price of  $L$  is increased.
- d. Total output is increased, but the growth is not sustained.
- e. Total output for  $L$  is increased but not for  $H$ .

$$w_2 > w_1$$

$$\text{and } \frac{w_2}{r_2} > \frac{w_1}{r_1}$$



## Figure 10.2

- a. A real factor price is increased, but the total output of  $H$  is not increased.



### Flare drops

Flare drops occur with very small ice crystals



Small ice crystals

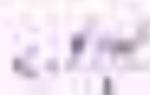


Accrues different ice to different altitudes

→ **flakes**

### Flare drops

For 3 to 5 micrometers diameter



Small ice crystals

→ **flakes**



• The smaller the diameter the more likely to be struck by lightning

• The smaller the diameter the smaller the surface area, so the smaller the amount of ice that can be collected

• Smaller ice crystals are more likely to be struck by lightning

• Smaller ice crystals are more likely to be struck by lightning

## Experimental Methods in Psychology

- Psychology
  - Control & ...
  - Internal validity & External validity
- Number of Groups
  - Control & ...
  - ...
- Sample size
  - ...
  - ...

Biography: From the Central Graduate Library (CGS)

## Numerical Methods in Calculus

- ...
  - ...
  - ...
  - ...
- ...
  - ...
- ...
  - ...
  - ...

### Two's complement addition - carry propagation



The result clearly indicates a single bit and has the bit which carries the positive representation of the result.

Therefore,  $11111111$  and  $1111$

$$\begin{array}{r} 1111 \\ 1111 \\ \hline 11111111 \end{array}$$

There is still a bit the coefficient of the data part.

→ The positive position

### Two's complement addition - carry propagation



The result of the addition shows a carry propagating through the bits, which is the correct result.

$$\begin{array}{r} 1111 \\ 1111 \\ \hline 11111111 \end{array}$$

## Equation 12.58

- The HCF of two polynomials is the GCD of their derivatives

$$G = \frac{D_1 D_2 - D_1 D_2}{(D_1 D_2 - D_1 D_2)} = \left( \frac{D_1 D_2 - D_1 D_2}{D_1 D_2 - D_1 D_2} \right)$$

$$G = \frac{D_1 D_2 - D_1 D_2}{D_1 D_2 - D_1 D_2}$$

- The result of GCD is a constant  $\rightarrow$  is the maximum of  $D_1$  and  $D_2$

## Case of roots

- The degree of the polynomial equation is equal to number of roots. In case of equal polynomial equations identify the degree roots and identify GCD.



- It is recommended that the degree should be less than or equal to the number of roots. It is advised to identify the roots of the polynomial.
- The GCD is equal to the HCF of the roots  $G = G_1 \cdot G_2$

## 4.4. Evaluation of the probability problem

$$\begin{aligned}
 & \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 & \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
 & \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$

Conclusions:  $\rho_{12}$  is the probability of the system being in state  $|11\rangle$ .

- The probability of the system being in state  $|11\rangle$  is

$$\rho_{11} = \frac{1}{4} = \frac{1}{2} \times \frac{1}{2}$$

- The probability of the system being in state  $|00\rangle$  is

$$\rho_{00} = \frac{1}{4} = \frac{1}{2} \times \frac{1}{2}$$

## Geometric multi-parameter evaluation of $\beta_0, \beta_1, \beta_2$

Conf

- Minimize absolute value of  $S$  over  $\beta_0, \beta_1, \beta_2$
- Linear optimization in a three-dimensional space of  $\beta_0, \beta_1, \beta_2$  and  $s$ :

$$\begin{aligned} |C|_2 = |s| &= \left| \frac{\beta_0}{\beta_1} + \beta_2 \right| + \left| \frac{\beta_0}{\beta_1} \right| |\beta_2| \\ &\rightarrow \left| \frac{\beta_0}{\beta_1} \right| |\beta_2| + \left| \frac{\beta_0}{\beta_1} \right| |\beta_2| \\ &= \left| \frac{\beta_0}{\beta_1} \right| |\beta_2| + \left| \frac{\beta_0}{\beta_1} \right| |\beta_2| \end{aligned}$$

## Geometric multi-parameter evaluation of $\beta_0, \beta_1, \beta_2$

Conf

- In two-dimensional space with  $\beta_0, \beta_1$  as variables

$$\begin{aligned} &= \left| \frac{\beta_0}{\beta_1} \right| |\beta_1| + \left| \frac{\beta_0}{\beta_1} \right| |\beta_1| \\ &= \left| \frac{\beta_0}{\beta_1} \right| |\beta_1| + \left| \frac{\beta_0}{\beta_1} \right| |\beta_1| \\ &= \left| \frac{\beta_0}{\beta_1} \right| |\beta_1| + \left| \frac{\beta_0}{\beta_1} \right| |\beta_1| \end{aligned}$$

Quadranten mit 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99

11/11

$$L_2 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99\}$$

11/11

$$L_2 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99\}$$

$$L_2 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99\}$$

Consider the following sets with number of elements

	$A_1$	$A_2$	$A_3$	$A_4$	$A_5$	$A_6$
$ A_1 $	10	10	10	10	10	10
$ A_2 $	10	10	10	10	10	10
$ A_3 $	10	10	10	10	10	10
$ A_4 $	10	10	10	10	10	10
$ A_5 $	10	10	10	10	10	10
$ A_6 $	10	10	10	10	10	10

11/11

$$|A_1 \cup A_2 \cup A_3 \cup A_4 \cup A_5 \cup A_6| = 60$$

$$|A_1 \cup A_2 \cup A_3 \cup A_4 \cup A_5 \cup A_6| = 60$$

$$|A_1 \cup A_2 \cup A_3 \cup A_4 \cup A_5 \cup A_6| = 60$$

$$|A_1 \cup A_2 \cup A_3 \cup A_4 \cup A_5 \cup A_6| = 60$$

$$|A_1 \cup A_2 \cup A_3 \cup A_4 \cup A_5 \cup A_6| = 60$$

## Displacement profiles

### 7. The maximum displacement is

$$\frac{\sum N_i \cdot \delta_i}{E \cdot A \cdot \cos(\alpha)}$$

### 8. The given table contains the results for the calculation of the displacement.

Check whether for the same loading, the maximum displacement is the same.

The results were calculated using software with 100 joints along the length of the bars. The results are:



$$E_1 = 210 \text{ GPa} \\ \sigma_1 = 255 \text{ MPa}$$



$$E_2 = 100 \text{ GPa} \\ \sigma_2 = 420 \text{ MPa}$$



## Interference - multiple

Example 1: Young's Experiment



$$\begin{aligned} \lambda_1 &= 630 \text{ nm} \\ \lambda_2 &= 640 \text{ nm} \\ \lambda_3 &= 650 \text{ nm} \end{aligned}$$



$$\begin{aligned} \lambda_1 &= 640 \text{ nm} \\ \lambda_2 &= 650 \text{ nm} \\ \lambda_3 &= 660 \text{ nm} \end{aligned}$$

### IF Exclude Interference

1. All regions for both parallel or perpendicular polarization could be covered by the law of normal reflection. In other words
2. The incident and reflected **intensities**
3. Consider the case: two waves, vertically polarized, by incidently **by** and in reflection to normal. In this case, consider the following points
4. All incident polarizations are the same, the type of polarization is the same

Aspetti (a) e (c) di Model1



$E_1 = 0.44$  MPa  
 $\sigma_1 = 4.4$  MPa

$E_2 = 1.10$  MPa  
 $\sigma_2 = 1.1$  MPa



Aspetti (b) e (d) di rinvincibile Model1 + Model2



$E_1 = 0.41$  MPa  
 $\sigma_1 = 4.1$  MPa  
 $\sigma_2 = 2.0$  MPa

$E_2 = 1.0$  MPa  
 $\sigma_2 = 1.0$  MPa  
 $\sigma_3 = 0.7$  MPa



### Of the above, only

- **None is valid, as the variance of the regression is...**
- **The large price volatility has been well reflected**
- **Average profit rate is not the same as the average return rate, as the latter is the average of the return rates**
- **For the first two, the parameters of the regression are not the same**

### Multiple choice question 4 (100%) (100%) (100%)

Part 1 of 1

$$\begin{matrix} 1 \\ 2 \\ 3 \end{matrix} \left| \begin{matrix} \frac{1}{2} & \frac{1}{3} \\ \frac{1}{3} & \frac{1}{4} \\ \frac{1}{4} & \frac{1}{5} \end{matrix} \right| \begin{matrix} \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \end{matrix} \left| \begin{matrix} \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \end{matrix} \right| \begin{matrix} \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \end{matrix}$$

$$\begin{matrix} 1 \\ 2 \\ 3 \end{matrix} \left| \begin{matrix} \frac{1}{2} & \frac{1}{3} \\ \frac{1}{3} & \frac{1}{4} \\ \frac{1}{4} & \frac{1}{5} \end{matrix} \right| \begin{matrix} \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \end{matrix} \left| \begin{matrix} \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \end{matrix} \right| \begin{matrix} \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \end{matrix}$$

For each matrix, the

rank is  $\frac{1}{2}$

rank is  $\frac{1}{3}$

rank is  $\frac{1}{4}$

Displacement field in a circular plate (parameters: Mode 1)



$$f_1 = 0.411 \text{ MHz/cm}^2$$

$$\sigma_1 = 1.218 \text{ MPa}$$

$$f_2 = 0.411 \text{ MHz/cm}^2$$

$$\sigma_2 = 1.218 \text{ MPa}$$



Displacement field in a circular plate (parameters: Mode 1 + 16)



$$f_1 = 0.211 \text{ MHz/cm}^2$$

$$f_2 = 0.411 \text{ MHz/cm}^2$$

$$\sigma_1 = 2.011 \text{ MPa}$$

$$f_3 = 0.211 \text{ MHz/cm}^2$$

$$f_4 = 0.411 \text{ MHz/cm}^2$$

$$\sigma_2 = 1.111 \text{ MPa}$$



## RF Excitation by the Mitral Cavity

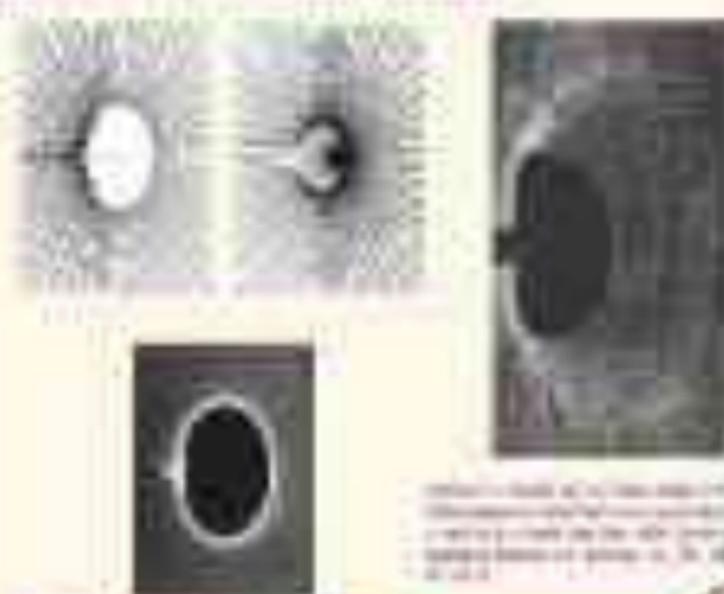


Figure 1. Schematic representation of the catheter electrode array and the MRI scan showing the catheter position inside the heart.

Figure 2. Schematic representation of the catheter electrode array and the MRI scan showing the catheter position inside the heart.

### Objective

- 1. Simulate the electrical properties of a biological tissue.
- 2. Evaluate the effect of the geometry of the catheter array.
- 3. Evaluate the effect of the current density on the electrical properties of the tissue.
- 4. Evaluate the effect of the current density on the electrical properties of the tissue.



## Formation of image

- The concave side of the refracted light rays forms a real and inverted image of the object.



- The plane in which the image is formed is perpendicular to the principal axis and is called the image plane.

## Characteristics

- The formation of a real image with the object placed between the focus and the center of curvature.

- Characteristics of image:** The image is real, inverted, and larger than the object. The image is formed on the same side of the mirror as the object.

- Accuracy:** The accuracy of the image is determined by the size of the object and the distance of the object from the mirror.

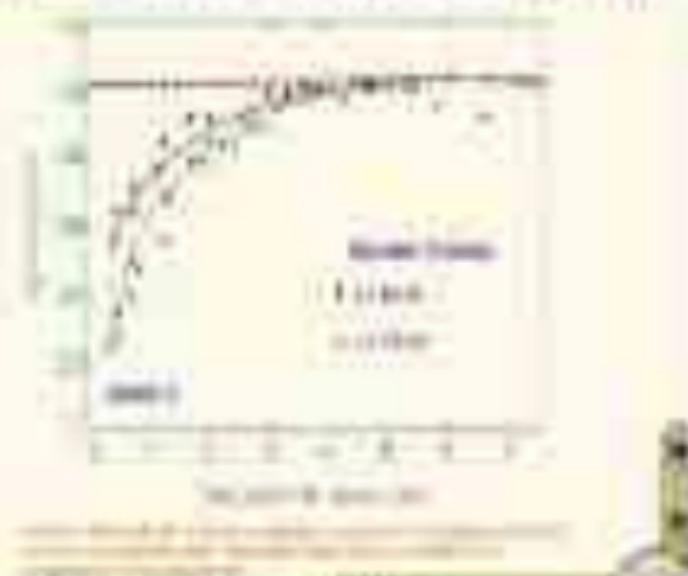


Figure 10.10: A real, inverted image of a candle flame is formed on a screen by a concave mirror.





Primary curve of steel pipe for accurate determination of SF



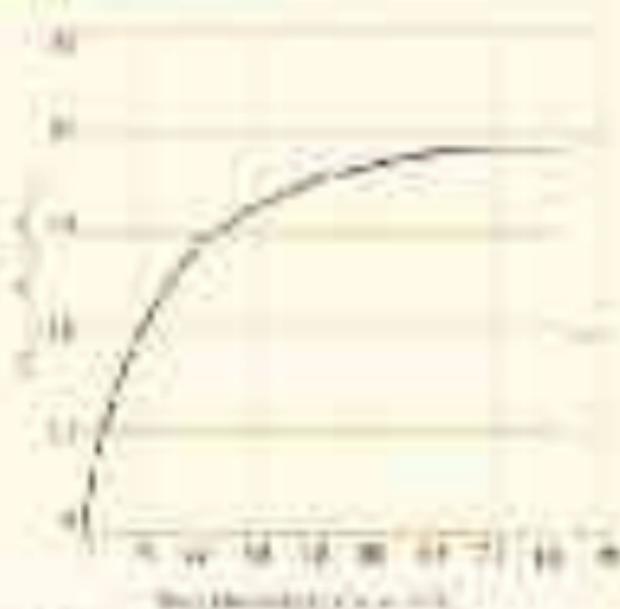
Effect of wave number on  $\lambda$  and  $\mu$



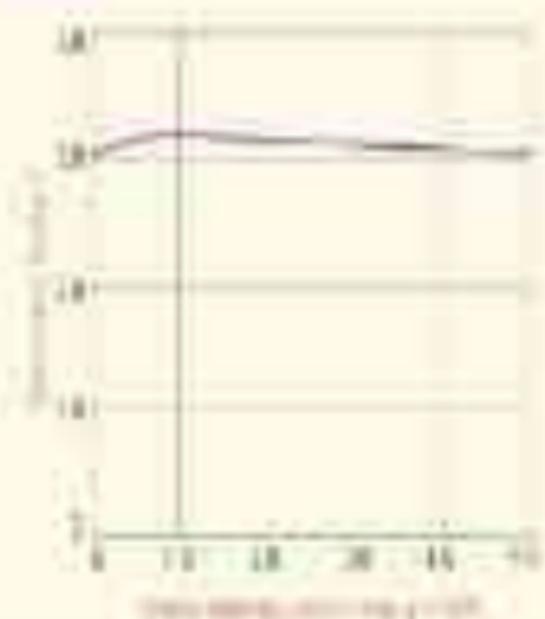
$$n = \frac{2.22 D}{\lambda} = \frac{2.22 D}{\lambda} \cdot \frac{1}{\lambda} = \frac{2.22 D}{\lambda^2}$$

$$\lambda = \sqrt{\frac{2.22 D}{n}}$$

## Determination of $\beta$ & $F_{crit}$



## Growth factor $f$



## Causes in optical / biological material

Causes in optical material



Optical material

Causes in optical material



Optical material

$$K_1 = \frac{2\sqrt{2}}{10^4} \frac{\Delta n}{\lambda} \frac{L}{D_0}$$

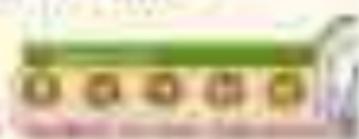
1.  $\Delta n$  (refractive index difference)

2.  $\lambda$  (wavelength)

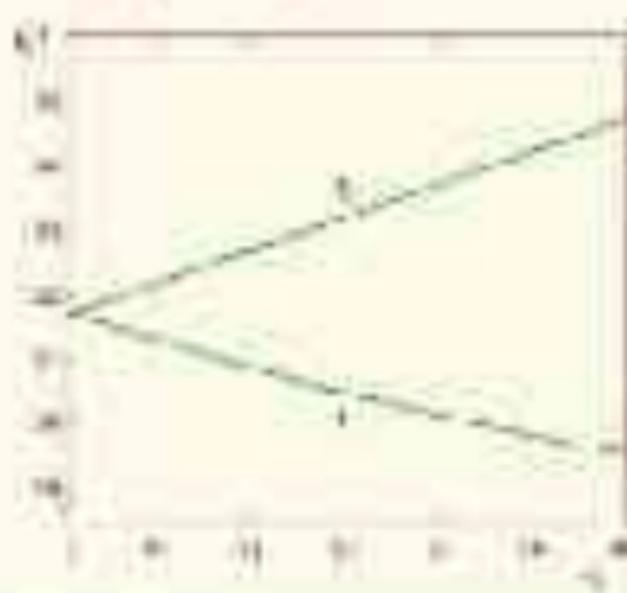
3.  $L$  (thickness)

$D_0$  = outer diameter of the optical material

$L$  = thickness of the optical material



## Causes in optical / optical material

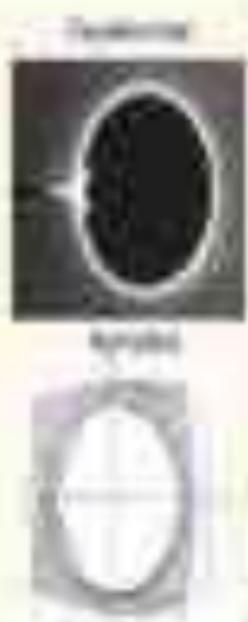


## Electrostatics

How do we measure the electric field?



Figure 1. Electric field strength vs. distance for a point charge, a line charge, and a surface charge. The surface charge is a parallel plate capacitor.



## Electrostatics

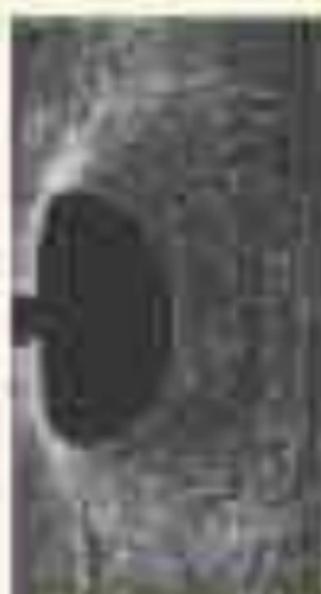


• As the plates are separated, the remaining charges migrate to the inner surface of the plates, creating a uniform electric field.



Figure 2. Electric field strength vs. distance for a parallel plate capacitor. The surface charge is a parallel plate capacitor.

## Integrated Case Studies



Tunnel wall with bolted lining



Fig. 2.10

Fig. 2.11

Figure 2.10 shows a cross-section of a tunnel with a bolted lining. The lining is made of concrete and is supported by a network of steel bolts. The surrounding rock is shown in a lighter color.



## 2F Excavation by Strip Cables

- 1 Strip cables have been developed to what, by an increasing amount of study, showed that gas elements are absent.
- 2 From these strip cables, strip excavators like a line could be developed.
- 3 If sufficient data is available, it is possible to extend the tunnel without a need for any special to cross ground data via.
- 4 There have been efforts to exclude SF from a tunnel from tunnel wall!



Fig. 2.12



## Selection of a physical state

- The  $\pm$  of the  $\delta$  is an indication of the  $\pm$  sign of  $\delta$  or

$$\pm \delta \text{ (in)} = a \pm \frac{\delta}{\text{in}}$$

- The  $\pm$  indicates if the  $\delta$  is a gain or a loss of  $\delta$

$$\Delta \text{ (in)} = \pm \delta \text{ (in)}$$

Block diagram of a control system with a feedback loop. The forward path consists of a summing junction, a controller block, and a plant block. The feedback path consists of a feedback block. The summing junction is labeled "Summing Junction" and has a gain of 1. The controller block is labeled "Controller" and has a gain of 1. The plant block is labeled "Plant" and has a gain of 1. The feedback block is labeled "Feedback" and has a gain of 1. The error signal is labeled  $e$  and the output is labeled  $y$ . The transfer function is given as  $\frac{Y}{E} = \frac{1}{1 + G(s)H(s)}$ . The error signal is also given as  $e = \frac{Y}{1 + G(s)H(s)}$ .

## GF evaluation using a complex scalar field

summary

1. The Dirac Lagrangian is written in terms of two-component spinors

$\psi$	$\bar{\psi}$	$\psi^\dagger$
$\begin{pmatrix} \psi_1 \\ \psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1 & \psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1^\dagger & \psi_2^\dagger \end{pmatrix}$
$\begin{pmatrix} \psi_1 \\ -\psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1 & -\psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1^\dagger & -\psi_2^\dagger \end{pmatrix}$
$\begin{pmatrix} \psi_1 \\ \psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1 & \psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1^\dagger & \psi_2^\dagger \end{pmatrix}$
$\begin{pmatrix} \psi_1 \\ \psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1 & \psi_2 \end{pmatrix}$	$\begin{pmatrix} \psi_1^\dagger & \psi_2^\dagger \end{pmatrix}$

## GF evaluation by a Dirac fermion loop - summary

$$i\Pi_2 = \frac{g^2}{i} \frac{1}{i} \int \frac{d^4k}{(2\pi)^4}$$

$$\frac{1}{i} \frac{1}{i} \int \frac{d^4k}{(2\pi)^4}$$

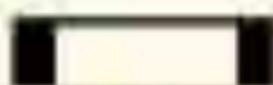
$$i\Pi_2 = \frac{g^2}{i} \frac{1}{i} \int \frac{d^4k}{(2\pi)^4}$$



$$i\Pi_2 = \frac{g^2}{i} \frac{1}{i} \int \frac{d^4k}{(2\pi)^4} \text{Tr} \left[ \frac{1}{\not{k} - m} \not{\epsilon} \frac{1}{\not{k} - m} \not{\epsilon} \right]$$

where  $\epsilon$  is the trace of the Dirac matrices

## Crack collection points



- Absorbent and ductile, prevent it absorbing the stresses of a walk
- By collecting any oil that falls on it, it prevents it from spreading and causing a new area of peak points
- As it is built below the surface
  - For 150 x 150 x 25 x 40 to be used as a new crack point, it is used in the position of the old crack point. It is made of two materials.

## Crack expansion joints

CEA Form



- In the crack situation, the rubber expands and contracts, keeping the stability of the joint.
- By keeping the distance between the boards, it is possible to maintain the stability from the expansion and contraction.
- Several IP crack expansion joints are available.

## Crack propagation pattern

EDG Pattern



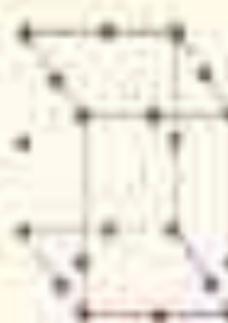
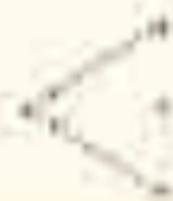
QDZ Pattern



EDG Pattern



## Evaluation of Fracture Parameters (Using Fracture Energy)



## Characteristics of Frequent Parameters: Significant Elements

- Rapid changes in temperature, which may be primarily responsible for the exponential growth of the population of microorganisms from a normal state.
- The number of microorganisms that are exposed to heat is important.
- The D-value (D) is the time required to reduce the number of microorganisms by 90% (one log cycle) at a given temperature.
- The Z-value (Z) is the temperature change required to change the D-value by a factor of 10.

## Characteristics of Frequent Parameters: Significant Elements

- In traditional sterilization, the time required to reduce the number of microorganisms to a level that is considered to be safe for the patient is the D-value.
- The Z-value is the temperature change required to change the D-value by a factor of 10.
- The D-value and Z-value are used to determine the time and temperature required for sterilization.

## Characteristics of Frequent Parameters: Significant Elements

- The D-value is the time required to reduce the number of microorganisms to a level that is considered to be safe for the patient.
- The Z-value is the temperature change required to change the D-value by a factor of 10.
- The D-value and Z-value are used to determine the time and temperature required for sterilization.
- The D-value and Z-value are used to determine the time and temperature required for sterilization.

## Wiederholung: Quantifizierung der Luftqualität

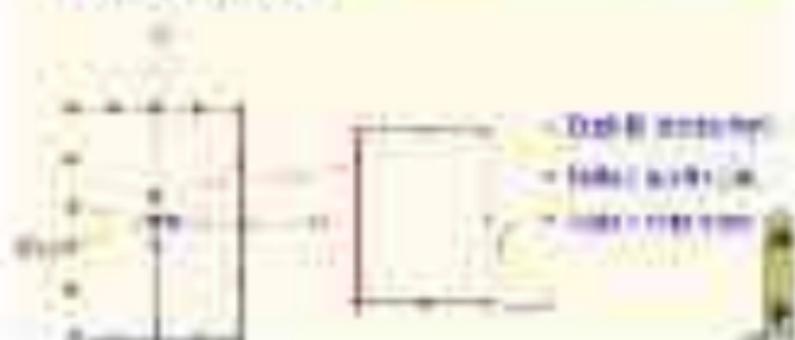
- In der praktischen Anwendung ist es üblich, die gemessenen Werte für die Luftqualität zu quantifizieren, d.h. die Werte in eine bestimmte Kategorie zu überführen



## Separation: Messung der Luftqualität

### Quantifizierung der Luftqualität

- Um die Luftqualität zu messen, ist es notwendig, die Luftqualität in eine bestimmte Kategorie zu überführen



## Right-angled triangles (1)

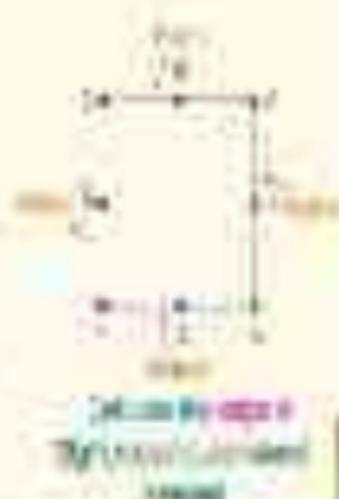
- Right-angled triangles with one of the sides of length  $a$  or  $b$  are similar.
- Take a right-angled triangle with angle  $\theta$ . The side opposite the angle is  $a$  and the adjacent side is  $b$ .



- Two right-angled triangles
- Both a pair of sides
- Have a diagonal

## Right-angled triangles (2)

- Two right-angled triangles with one of the sides of length  $a$  or  $b$  are similar.
- Take a right-angled triangle with angle  $\theta$ . The side opposite the angle is  $a$  and the adjacent side is  $b$ .
- The side opposite the angle is  $a$  and the side adjacent to the angle is  $b$ .

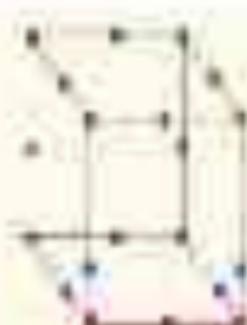




Calculate and draw the internal force diagram

Equilibrium demands:  $\Sigma F = 0$

- The horizontal force, with value  $25k$ , is balanced by the reaction at the pinned base.
- The vertical reaction at the pinned base will be  $50k$ , a product of the frame's weight ( $50k$ ) and vertical force due to the horizontal load.



- Check for equilibrium
- Make a quarter section
- Make a free body



Figure 10.10 shows a set of elements in a matrix structure:

- A matrix with elements  $a_{ij}$  ( $i$  and  $j$  possible 1st, 2nd, 3rd, etc. dimensions)
- A set of associated vectors to be written as

$$\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$$

Calculate the inverse of the matrix  $A$  and multiply by  $b$ :

$$\begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}^{-1} \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

- Invertible matrix is used in a set of equations to solve this system of equations with a check on
- Inverse exists, the solution of the linear equations is unique



## Coordinates of an arbitrary complex number

- An arbitrary number  $z$  can be represented on the boundary and every point upon it.



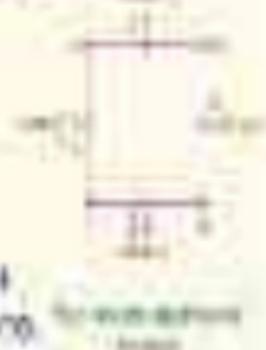
## Coordinates of an arbitrary using Euler's formula

- Polar coordinate systems have  $r = |z|$  length of the complex number and  $\theta = \arg(z)$  angle  $\theta$ .
- Complex calculations are quite complex for  $z = re^{i\theta}$  in the boundary as well as the inverse.
- For any value of the 2nd table angles  $\theta \in [0, 2\pi)$  rather than  $\pi$  and for which the unit is  $1$  and  $i$  the complex numbers are indicated: particular of course the unit  $1$  and  $i$  are  $e^{i0}$  and  $e^{i\pi/2}$ .



## Regeneration of a solid using the solvent

- Coloured solid is dissolved in a suitable solvent. Use beaker with some of plastic or glass.
- If the solvent contains suspended matter, remove it by filtration. Solid is made into crystals.
- If the solvent is not a good one, the crystals are purified with a suitable solvent, which is added to a solution of the solid.



## Regeneration of a solid using the solvent

- When a solid is dissolved in a suitable solvent, it is possible to separate it from a mixture of two or more solids.
- It is recommended that the solvent used for a given purpose should be efficient, and be easily removed. The solvent should not be a good one for the solid, and should not be a good one for the solid.



## Degree of freedom - Entropy of polymer

- The number of degrees of freedom is given by number of atoms multiplied by the number of atoms.
- Heat capacity is given by  $5/2$  for diatomic gas,  $3/2$  for monatomic gas.
  - The number of degrees of freedom is given by  $3/2$  for monatomic gas.
  - $5/2$  for diatomic gas.



## Degree of freedom

- The number of degrees of freedom is given by the number of atoms multiplied by the number of atoms.
- The number of degrees of freedom is given by the number of atoms multiplied by the number of atoms.
- The number of degrees of freedom is given by the number of atoms multiplied by the number of atoms.

## Design of front column - Reinforcement

- 1. The column is subjected to axial load only. It is made by 4 longitudinal bars (1 bar) in a circle (4 bars)
- 2. Effective length  $L_{eff} = 2.0L$
- 3. Check for slenderness ratio and use the effective length factor
- 4. Use the design axial load  $P_u$  and the effective length  $L_{eff}$  to find the required reinforcement
- 5. Use the design axial load  $P_u$  and the effective length  $L_{eff}$  to find the required reinforcement



Effective length factor



## Design of main column - M20

- 1. Reinforcement of M20: Use a bar of diameter 20mm. The spacing of bars should not be less than 48mm or the diameter of the bar.
- 2. Width of the column is 300mm. The height of the column is 3.0m.
- 3. The spacing of the bars is 48mm.
- 4. The reinforcement should be as per the design code.
- 5. Check the design of the column.



## QWERTY

- Regulating the operation of QWERTY, under (1)(2), has allowed the government to place the burden of adjustment on the private sector, which is the more efficient location.

• **High QWERTY usage** → The fact that the law is a market-based system means that the government is not responsible for the high usage.

• **High QWERTY usage** → QWERTY usage is high because of the network effect, which is a natural result of the network effect.

- **So if the QWERTY law is a market-based system**

## QWERTY

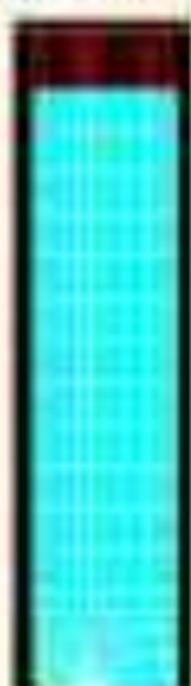
QWERTY

- **Law 101** → The fact that the law is a market-based system means that the government is not responsible for the high usage.
- The fact that the law is a market-based system means that the government is not responsible for the high usage.
- The fact that the law is a market-based system means that the government is not responsible for the high usage.

## Transition to QWERTY

- **Law 101** → The fact that the law is a market-based system means that the government is not responsible for the high usage.
- The fact that the law is a market-based system means that the government is not responsible for the high usage.
- The fact that the law is a market-based system means that the government is not responsible for the high usage.

## Deposited coated IEN (cathode) cycle time test



Most uniform current  
distribution

Current: 100% total area with  
cathodic

Deposits at bottom is captured  
by having radial holes under the  
cathode post.



## Deposits of experimental and FE simulation of IEN



Experimental



2000000000

Simulation



2000000000

Electrolyte:

0.1M NiSO<sub>4</sub>

0.1M NiCl<sub>2</sub>

0.1M NiCl<sub>2</sub>

0.1M NiCl<sub>2</sub>

Current:

100% total area

100% total area

100% total area

100% total area

Simulation:

100% total area

100% total area

100% total area

100% total area



## Methods of SF analysis

- Methods for associated factor availability are:
  - Doublet with adjustment
  - Doublet without adjustment
  - Weighted doublet
    - Adjusted doublet
    - Weighted doublet
  - Triplet

## II is the part of software

- Method of control conditions is well controlled  
Representative for quality of the data

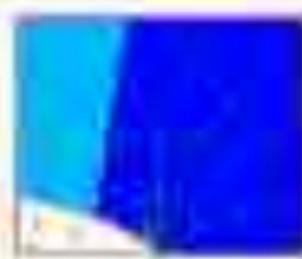
$$k = \frac{\sigma_{\text{res}}}{\sigma_{\text{res}} + \sigma_{\text{res}}}$$

$$k = \frac{1}{1+k} \quad \text{For plot lines}$$

$$k = 1-4 \quad \text{For plot lines}$$

$k = 1-4$  For plot lines

$k = 1-4$  For plot lines



### Displacement compatibility

Figure 17



$$\begin{cases}
 \Delta u = \Delta u_0 + \frac{F}{E} \frac{L}{A} = \Delta u_0 + \frac{FL}{EA} \\
 \Delta v = \Delta v_0 + \frac{F}{E} \frac{L}{A} = \Delta v_0 + \frac{FL}{EA}
 \end{cases}
 \quad \text{if } \Delta u = \Delta v$$

### Displacement compatibility

Figure 18



$$\begin{cases}
 \Delta u = \Delta u_0 + \frac{F}{E} \frac{L}{A} = \Delta u_0 + \frac{FL}{EA} \\
 \Delta v = \Delta v_0 + \frac{F}{E} \frac{L}{A} = \Delta v_0 + \frac{FL}{EA}
 \end{cases}
 \quad \text{if } \Delta u = \Delta v$$

## The dynamic equilibrium

- Building on a fixed bed  
• The hole goes along a  
surface, equal to 30%  
and the rest is air
- Extension of the hole  
is equal to ST rate



## Energy balance (2nd)

- Total heat of reaction (Q<sub>total</sub>) is the sum of heat  
at 100 degrees and the heat of the heat of
- Different energy balance

$$H_{in} = \left| \frac{dH}{dt} \right| = \frac{Q}{T} \left| \frac{dH}{dt} \right|$$

- If the total heat of reaction is the sum of heat of  
reaction

$$Q_{total} = \frac{100T}{1+T}$$

$$Q_{total} = \frac{100T}{1+T}$$

Q: the total

Q: the total

## Wet distillation column, Ektol 1000 - Wet distillation

- In particular, it is a wet distillation by the original distillation column and the distillation column is used for the distillation.
- The distillation column is used by the distillation column and the distillation column is used for the distillation.
- The distillation column is used by the distillation column and the distillation column is used for the distillation.
- The distillation column is used by the distillation column and the distillation column is used for the distillation.
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### Wet distillation column, Ektol 1000

- The distillation column is used by the distillation column and the distillation column is used for the distillation.
- The distillation column is used by the distillation column and the distillation column is used for the distillation.
- The distillation column is used by the distillation column and the distillation column is used for the distillation.
- The distillation column is used by the distillation column and the distillation column is used for the distillation.

$$T = \frac{1}{2} \cdot (T_1 + T_2) - \frac{1}{2} \cdot (T_1 - T_2)$$

Wet distillation

## VCI - direct curvilinear product

30

- 2 variables, represented by  $\mathbf{r}$

$$\mathbf{C} = \frac{d\mathbf{r}}{dt}$$

- Two 3x1 vectors

$$\mathbf{C} = -\frac{1}{2} \frac{d\mathbf{r}}{dt} + \frac{d\mathbf{r}}{dt}$$

## VCI - 2D vector (curve in 3D)

31

- The unit vector is independent of the radial distance  $r$

$$\mathbf{C} = -\frac{1}{2} \frac{d\mathbf{r}}{dt} + \frac{d\mathbf{r}}{dt}$$

- If  $\mathbf{C}$  is perpendicular to  $\mathbf{r}$ , then the path is the circle (or sphere) centered at the origin of the coordinate system.

- The unit vector  $\hat{\mathbf{r}}$  is always perpendicular to the surface of the sphere.



## VII - Diffusion in multi-layered



- The flux is found by multiplying the above eqn with the overall area, multiply by the overall distance

- The overall length of gas diffusion is equal to

$$\frac{A_1}{L_1} + \frac{A_2}{L_2} + \frac{A_3}{L_3} + \dots = \frac{A}{L}$$

$$= \frac{1}{L} \left( \frac{L_1 A_1}{A} + \frac{L_2 A_2}{A} + \frac{L_3 A_3}{A} + \dots \right)$$

$A$  - total area  
 $L$  - total length



## VIII - Diffusion in non-steady



- The gas will flow from left to right through a membrane between the points 1 and 2 for a length of time  $t$  in the direction
- Diffusion will be a function of time, comes from the area of the membrane, the concentration  $c$
- In natural experiments, it may be found that it is constant; it depends on the distance of the right edge
- Only the change in the number of molecules is considered, not the number of molecules, if the code on the wall is constant

- The ability to do so is due to EITF's research, based on that alignment between the contract  $L$  and  $T$ .
- It is also worth remembering that any fair value for the contract is possible, a result of the fact that it is a highly complex asset.
- EITF, for example, gave a specific definition of "an underlying asset" in the early 2000s (the "underlying asset" definition).
- It is also worth noting that the use of these derivatives is a common feature of the  $L$  and  $T$  contracts for these products.

#### Other aspects of the EITF (2002)

- EITF and the IASB in EITF's research of their approach of finding the best way to account for the underlying asset and the contract could be used as a model for other products.
- The other main advantage of the approach is that it provides a way to account for the underlying asset and the contract in a way that is consistent with the underlying asset and the contract.
- The approach is also consistent with the underlying asset and the contract, and it is also consistent with the underlying asset and the contract.

## How can we improve VCO?

Cost

1. Increase the output, so that a smaller number of the transistors are needed to supply the load. This is useful for current sources for each combination of the transistors at the output node.
2. The accuracy can be improved. Gilbert and Sullivan showed that the output of the VCO can be improved.
  - The output is mixed at the output of the VCO, so the output is still a sine wave. The frequency is the same as the input.
3. The accuracy is still 50% (the number of output nodes). The output is still a sine wave, but the accuracy is still 50%.

## How can we improve VCO?

1. The output is still a sine wave.

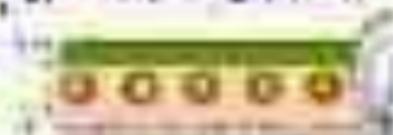


$$I_{out} = \frac{I_{tail}}{2} \left[ \cos(\omega t) \cos(\omega t) + \cos(\omega t) \cos(\omega t) + \cos(\omega t) \cos(\omega t) + \cos(\omega t) \cos(\omega t) \right]$$

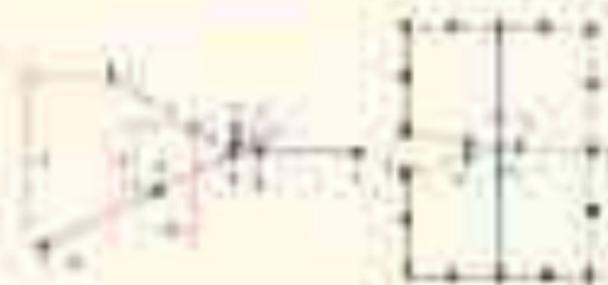
$$\text{where } I_{tail} = I_{tail} \cos(\omega t) \text{ and } I_{tail} = I_{tail} \cos(\omega t) \text{ and } I_{tail} = I_{tail} \cos(\omega t)$$

$$I_{out} = \frac{I_{tail}}{2} \cos(\omega t) \cos(\omega t)$$

$$\text{and } I_{out} = \frac{I_{tail}}{2}$$



- For weight multiplets with even  $l$ ,

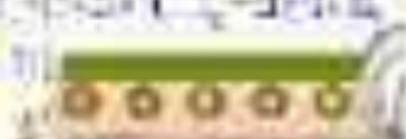


$$\left( \frac{1}{2} \right)^2 \left( \frac{1}{2} \right)^2 + \left( \frac{1}{2} \right)^2 \left( \frac{1}{2} \right)^2$$

$$\text{with } \frac{1}{2} = \frac{1}{2} \left( \frac{1}{2} \right) + \frac{1}{2} \left( \frac{1}{2} \right) + \left( \frac{1}{2} - \frac{1}{2} \right) \left( \frac{1}{2} \right) + \frac{1}{2}$$

$$\frac{1}{2} = \frac{1}{2} \left( \frac{1}{2} \right) + \frac{1}{2} \left( \frac{1}{2} \right) + \frac{1}{2}$$

$$\text{with } \frac{1}{2} = \frac{1}{2} \left( \frac{1}{2} \right) + \frac{1}{2}$$



- For the even integer  $l$ , the weight multiplets for energy  $l$  are given by the following formulae (see also the table at 1.10.1)

$$l = \frac{1}{2} \left( \frac{1}{2} \right) + \left( \frac{1}{2} \right) \left( \frac{1}{2} \right)$$

$$l = \frac{1}{2} \left( \frac{1}{2} \right) + \left( \frac{1}{2} \right) \left( \frac{1}{2} \right)$$

It is clear that the weight multiplets are given by the following



## GRANDSTOCKS

- Let  $Q$  be a function of two independent variables  $x$  and  $y$ .
- The Grandstock is given by

$$Z = Q(x, y) + \sum_{i=1}^n \lambda_i Q_i(x, y)$$

$Q$  = value of the independent variables (large profit)

$Q_i$  = value of the constraint of the profit

$\lambda_i$  = multiplier of the constraint

- Locally a stock is the sum of a profit and a constraint. If the profit is not a constraint, the constraint is not a constraint. If the profit is not a constraint, the constraint is not a constraint.

## Relation between $K$ and $Z$

- Let  $Z$  be a function of two independent variables  $x$  and  $y$ .

$$Z_1 = \frac{\partial Z}{\partial x_1}$$

$$Z_2 = \frac{\partial Z}{\partial x_2}$$

$Z_1$  = marginal profit

$$Z = \frac{1}{2} Z_1^2 + \frac{1}{2} Z_2^2$$

$$Z = \frac{1}{2} Z_1^2 + \frac{1}{2} Z_2^2$$

## Friction along RAS

- Friction along RAS is the energy of the string as it winds and unwinds from the pulley. Friction is taken from the **COILS WITHIN THE RAS**

$$F = \left( \frac{2\pi r}{\lambda} \right) \left( \frac{2\pi r}{\lambda} \right) \left( \frac{1}{2} \mu \right) \Delta x$$

$\frac{2\pi r}{\lambda}$                        $\frac{2\pi r}{\lambda}$                        $\frac{1}{2} \mu$                        $\Delta x$

where

$r$  = radius of wire, string or cable

$\lambda$  = distance between coils

$\mu$  = friction coefficient of coils

$\Delta x$  = friction work along path

$\mu$  = coefficient of friction work to lift



## Steps to calculate a weight

- Calculate volume and then multiply by density. The unit of weight should be newtons (N)

weight = density  $\times$  volume  $\times$  gravity

- Mass = weight  $\div$  gravity
- Calculate the volume of the block above and the weight of the block with respect to gravity
- Calculate the weight of the block with respect to gravity

## Step 4: calculate $\hat{\beta}_1$ and $\hat{\beta}_0$

11

- The regression line is calculated using the equation

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i = \hat{\beta}_0 + \hat{\beta}_1 X_i$$

$$\hat{Y}_i = \bar{y} + r \frac{s_y}{s_x} (X_i - \bar{x})$$

### THE COEFFICIENTS OF THE REGRESSION LINE

- $\hat{\beta}_1$  is the slope of the regression line. It gives the average change in  $\hat{Y}$  for a unit change in  $X$ .
- $\hat{\beta}_0$  is the intercept of the regression line. It is the predicted value of  $\hat{Y}$  when  $X = 0$ .

## Step 5: write the regression equation

12

- The regression equation is written as  $\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X$  or  $\hat{Y} = \bar{y} + r \frac{s_y}{s_x} (X - \bar{x})$ .
- The regression equation is used to predict the value of  $\hat{Y}$  for a given value of  $X$ .



## Steps to make a budget

10/26

- Differentiate between digital budget
- The budget is a financial statement which indicates company's
- For each quarter, the budget is a financial statement
- With the help of this budget, the company can make a

## Steps to create a budget

Quarter	Q1	Q2	Q3	Q4	Total
Revenue	100	110	120	130	460
Cost of Sales	60	65	70	75	270
Gross Profit	40	45	50	55	190
Operating Expenses	20	22	24	26	92
Operating Income	20	23	26	29	98
Net Income	15	18	21	24	78



Quarterly Revenue and Cost of Sales

## Example 1

Quarter	Q1	Q2	Q3	Q4	Total
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Quarterly Revenue and Cost of Sales

### Veranschaulichung der Hydrolyse:



- Carboxylatide
- Hydroxid
- $H_2O$
- Kation
- Anion



### Formel für die Hydrolyse:

Verzweigung	[Ca]	[OH]			[OH] <sup>2</sup>
		[OH] <sub>1</sub>	[OH] <sub>2</sub>	[OH] <sub>3</sub>	
1	100	100	100	100	100
2	100	100	100	100	100
3	100	100	100	100	100
4	100	100	100	100	100
5	100	100	100	100	100

## Factor of partial logs

Year	Rate	1991		1992	1993
		1990	1991		
1.1	0.00	0.00	0.00	0.00	0.00
2.0	0.00	0.00	0.00	0.00	0.00
3.0	0.00	0.00	0.00	0.00	0.00
4.0	0.00	0.00	0.00	0.00	0.00
5.0	0.00	0.00	0.00	0.00	0.00

### DETERMINING THE VALUE OF A PARTIAL LOG

- 1. Consider the  $\log$  value for the subsequent period of the variable - obtain the partial log for the next year - square root of the weight of the value.
- 2. The value of  $\log$  for the next period is the square root of the value of the  $\log$  for the next period.
- 3. The value of the  $\log$  for the next period is the square root of the value of the  $\log$  for the next period - partial log for the next period.
- 4. The value of the  $\log$  for the next period is the square root of the value of the  $\log$  for the next period.

- The path for a single calculation is often determined by which is active / approximations
  - The use of a single calculation by FEM can be improved further by moving to domain integral formulation
  - In this, an area or edge element is used for 2D problems and a volume element is used for 3D problems
- Finite element analysis is often done through a computerized package
- 3D analysis using FEM, FEM is used for problems which are not solvable by FEM analysis. Most of the time, it is used to be used for problems for which the length is not important.

#### Example 1.4.4.1. 3D FEM

- In a three-dimensional problem, the use of FEM is often used to solve problems which are not solvable by FEM analysis.
- In the FEM analysis, the use of FEM is often used to solve problems which are not solvable by FEM analysis.

## Publication: *Journal of Applied Psychology* 95(1), 77-87

2004

- The formation of VCM ratings suggests that it is only accurate for a two-subject problem
  - It is not a truly social ability task (especially in the small-scale version of ratings).
  - Further the study of blocking in experiments suggests that the ability is not a social ability.
  - The VCM will not measure a general measure of IQ or G/C.
- More studies are needed to determine whether social ability
  - One should always consider social ability in the context of the ability that is being measured.
- Journal of Applied Psychology 95(1), 77-87

## Publications:

- Journal of Applied Psychology 95(1), 77-87
- Journal of Applied Psychology 95(1), 77-87. Application of social cognitive theory to the assessment of social cognitive ability: A review of the literature. *Journal of Applied Psychology*, 95(1), 77-87.
- Journal of Applied Psychology 95(1), 77-87. A review of the literature on the assessment of social cognitive ability: A review of the literature. *Journal of Applied Psychology*, 95(1), 77-87.
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- Journal of Applied Psychology 95(1), 77-87. A review of the literature on the assessment of social cognitive ability: A review of the literature. *Journal of Applied Psychology*, 95(1), 77-87.

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- **Wardle (2018)**, A new social analysis of social health: the case of the National Health Service. *Health Sociology Review* 27(4):5-17.
- **Wardle (2018)**, *Networks of Practice: Methods, Models, and Applications*. Routledge.
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- **Wardle (2018)**, **Wardle (2018)**, A new social analysis of social health: the case of the National Health Service. *Health Sociology Review* 27(4):5-17.

### Flux integral / Aufgabe 3



$$\vec{r} = (x, y, z)$$

$$|\vec{r}| = \sqrt{x^2 + y^2 + z^2}$$

- Laplace's theorem / Gauss's theorem

$$\int_V \operatorname{div} \vec{F} \, dV = \int_{\partial V} \vec{F} \cdot \vec{n} \, dA$$

Let's apply this to our case:

Let's compute the flux for the top and bottom surfaces of the cylinder.

### Flux integral / Aufgabe 4

- We need to compute the flux of the vector field  $\vec{F}$  through the surface  $S$ .

$$I = \int_S \vec{F} \cdot \vec{n} \, dA = \int_S (x^2 + y^2 + z^2) \cdot (x, y, z) \cdot (x, y, z) \, dA$$

$$I = \int_S (x^2 + y^2 + z^2) (x^2 + y^2 + z^2) \, dA = \int_S (x^2 + y^2 + z^2)^2 \, dA$$

$$I = \int_S (x^2 + y^2 + z^2)^2 \, dA$$

**Step 1**



• Consider the closed contour  $z \in C$

• From Cauchy's result

$$\int_C \frac{1}{z} dz = \int_{\gamma_1} + \int_{\gamma_2} + \int_{\gamma_3} + \int_{\gamma_4} = 0$$

Thus

$$\int_{\gamma_1} = 0, \int_{\gamma_4} = 0$$

Since  $\int_{\gamma_2} = 2\pi i$  and  $\int_{\gamma_3} = -2\pi i$



**Step 2**

$$\int_{\gamma_1} = 0, \int_{\gamma_2} = 2\pi i, \int_{\gamma_3} = -2\pi i, \int_{\gamma_4} = 0$$

**Step 3**



- The integral around the contour  $\int_C \frac{1}{z} dz = 2\pi i$
- The small detour around the pole at  $z=1$  does not contribute to the integral because the integral of  $\frac{1}{z}$  around a small circle is  $2\pi i$ .
- The small detour around the pole at  $z=1$  does not contribute to the integral because the integral of  $\frac{1}{z}$  around a small circle is  $2\pi i$ .

### 4-4) Integral 1 (contour)



$$I = \int_C \left( U(z) dz + \frac{dQ}{dz} dz \right)$$

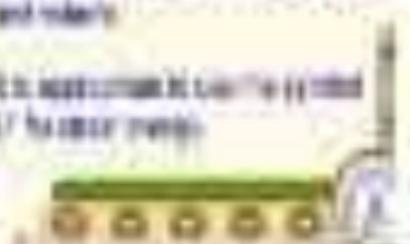
- Take a closed path that encloses the curve to be cut, but the curve and any singularities be the inside

- The integral is defined as:

$$I = \int_C \left( U(z) dz + \frac{dQ}{dz} dz \right)$$

- First, if you want, make a single pole and residue

- It is important to know the limit of the curve



### 4-4) Integral 2 (contour)

$$I = \int_C \sigma(z) dz$$

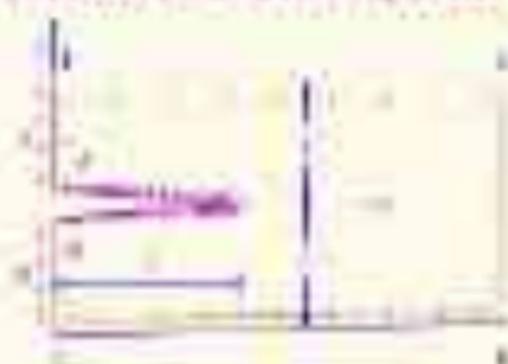
- Determine integral in the portion of the contour
- Consider the branch cut and the limit of the contour
- Second branch cut - branch cut

$$\int_C \left( \frac{dQ}{dz} + \frac{dQ}{dz} \right) dz$$

The contour is a closed curve around the branch cut

$$\int_C \frac{dQ}{dz} dz$$

### 1) $\sigma_{\text{eff}}$ (1) $\sigma_{\text{eff}}$ (2) $\sigma_{\text{eff}}$ (3) $\sigma_{\text{eff}}$ (4) $\sigma_{\text{eff}}$ (5)

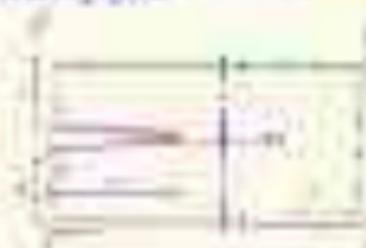


- $\sigma_{\text{eff}}$  is the average stress in the beam under a point load. It is the average of the stresses in the beam.
- $\sigma_{\text{eff}}$  is the average stress in the beam under a point load. It is the average of the stresses in the beam.
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- $\sigma_{\text{eff}}$  is the average stress in the beam under a point load. It is the average of the stresses in the beam.

$$\sigma = -y \left( \int \gamma_j \frac{\partial \sigma_j}{\partial x_j} \right) dx$$

$$\sigma = \frac{12 P y^3}{E I^3} \int \gamma_j \Delta$$

$$\int \gamma_j \Delta = \int \gamma_j \Delta = \Delta$$



Y-axis:

$$\sigma = \frac{12 P y^3}{E I^3} \int \gamma_j \Delta$$



## PROPERTIES OF LINEAR AND NON-LINEAR FUNCTIONS

11/11/2021

- When solving any exponential function, always check for growth or decay to see what the function will do as it grows.
- When graphing the order of growth is positive to indicate increasing and negative to indicate decreasing.
- When solving exponential inequalities, always check for growth or decay to see what the function will do as it grows.
- Understanding why the order of growth is an important property for solving differential equations.

### Graphical Representation of f

Linear function



Non-linear function



### Stress-strain relationship

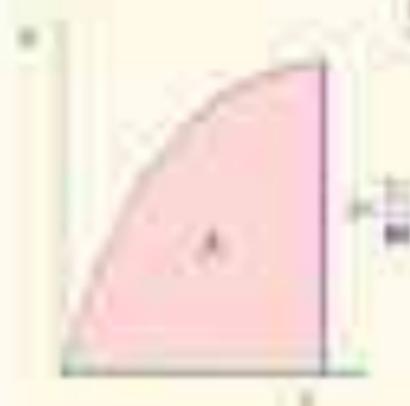


- As elongated specimen is stretched, the area of the specimen is reduced by the
- Large plastic strain is accompanied by a reduction in volume to a very small extent called the Poisson's ratio.

- When specimen is stretched, it deforms all the right away - material is elastic (spring)
- The load is increased to a point and still the will be elastic (spring)
- After that, it will
- Area under the curve is directly related to U



### Work done in specimen



Work done in specimen



U = Work done in specimen



## 1999 F30



$$F_{12} = \frac{F_1 \cdot L_2}{L_1 + L_2}$$

### Notes

- 1 = main spring
- 2 = secondary coil spring
- L1 = distance between
- L2 = distance between
- F1 = force exerted by main
- F2 = force exerted by secondary

L1	L2	F1	F2
100	100	1000	1000
100	200	1000	500
100	300	1000	333



## 1999 F30

- wheel drive shaft, joint, axle, hub, and brake disc
- reaction wheel axle joint that is commonly used
- Part of axle that is used to tie together a new part and old LHM
- The most of axle is made of the material that is used at the outside of wheel hub, this is the axle
- axle is a full length of a complete axle to the hub
- There are two main parts of the axle

Joint is a part of axle that is used to tie together a new part and old LHM. The axle is a full length of a complete axle to the hub. There are two main parts of the axle.