

Answers to 5116/ 5118 2014 O level Combined Science (Chemistry) Paper 3

- A1**
- (a) Galvanization (i.e. coating iron with zinc) will prevent iron from rusting.
 - (b) Fermentation requires a temperature between 25°C and 40°C, enzymes (eg. yeast) and anaerobic condition (i.e. absence of oxygen).
 - (c) Calcium hydroxide is used to reduce acidity of soil.
 - (d) Bitumen fraction of crude oil is used for road surfaces.
- A2**
- (a) Two other solids added to a blast furnace are coke and limestone.
 - (b) Iron ore (haematite) contains iron (III) oxide. Near the bottom of the blast furnace, iron (III) oxide reacts with coke (carbon) to form carbon monoxide.
$$\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 2\text{Fe} + 3\text{CO}$$

Carbon dioxide also reacts with coke to produce more carbon monoxide.
$$\text{CO}_{2(g)} + \text{C}_{(s)} \rightarrow 2\text{CO}_{(g)}$$
 - (c) If metals are not recycled they can harm future generations:
 - (i) metal is a finite resource → unavailable for future generations
 - (ii) metal disposal → increase landfills → increase ground water pollution
 - (d) Plastics are harmful to the environment because
 - (i) incineration produces harmful gases
 - (ii) non-biodegradable → blocks drains/ water flow and harms marine life
- A3**
- (a) An element, Ea with 4 electron shells and 3 outermost electrons is found in period 4 and group 3 of the periodic table.
 - (b) Charge of the element is Ea^{3+}
 - (c) Chemical formula of oxide is Ea_2O_3 .

O Level Science 5116 2014

Sergio J. Rey, Rachel S. Franklin



O Level Science 5116 2014:

If you ally compulsion such a referred **O Level Science 5116 2014** book that will provide you worth, acquire the extremely best seller from us currently from several preferred authors. If you want to hilarious books, lots of novels, tale, jokes, and more fictions collections are then launched, from best seller to one of the most current released.

You may not be perplexed to enjoy every book collections O Level Science 5116 2014 that we will very offer. It is not re the costs. Its very nearly what you need currently. This O Level Science 5116 2014, as one of the most effective sellers here will certainly be along with the best options to review.

<https://crm.avenza.com/About/uploaded-files/Documents/odysseyware%20algebra%20%20semester%201%20answers.pdf>

Table of Contents O Level Science 5116 2014

1. Understanding the eBook O Level Science 5116 2014
 - The Rise of Digital Reading O Level Science 5116 2014
 - Advantages of eBooks Over Traditional Books
2. Identifying O Level Science 5116 2014
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an O Level Science 5116 2014
 - User-Friendly Interface
4. Exploring eBook Recommendations from O Level Science 5116 2014
 - Personalized Recommendations
 - O Level Science 5116 2014 User Reviews and Ratings
 - O Level Science 5116 2014 and Bestseller Lists
5. Accessing O Level Science 5116 2014 Free and Paid eBooks

- O Level Science 5116 2014 Public Domain eBooks
- O Level Science 5116 2014 eBook Subscription Services
- O Level Science 5116 2014 Budget-Friendly Options
- 6. Navigating O Level Science 5116 2014 eBook Formats
 - ePub, PDF, MOBI, and More
 - O Level Science 5116 2014 Compatibility with Devices
 - O Level Science 5116 2014 Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of O Level Science 5116 2014
 - Highlighting and Note-Taking O Level Science 5116 2014
 - Interactive Elements O Level Science 5116 2014
- 8. Staying Engaged with O Level Science 5116 2014
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers O Level Science 5116 2014
- 9. Balancing eBooks and Physical Books O Level Science 5116 2014
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection O Level Science 5116 2014
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine O Level Science 5116 2014
 - Setting Reading Goals O Level Science 5116 2014
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of O Level Science 5116 2014
 - Fact-Checking eBook Content of O Level Science 5116 2014
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

O Level Science 5116 2014 Introduction

In today's digital age, the availability of O Level Science 5116 2014 books and manuals for download has revolutionized the way we access information. Gone are the days of physically flipping through pages and carrying heavy textbooks or manuals. With just a few clicks, we can now access a wealth of knowledge from the comfort of our own homes or on the go. This article will explore the advantages of O Level Science 5116 2014 books and manuals for download, along with some popular platforms that offer these resources. One of the significant advantages of O Level Science 5116 2014 books and manuals for download is the cost-saving aspect. Traditional books and manuals can be costly, especially if you need to purchase several of them for educational or professional purposes. By accessing O Level Science 5116 2014 versions, you eliminate the need to spend money on physical copies. This not only saves you money but also reduces the environmental impact associated with book production and transportation. Furthermore, O Level Science 5116 2014 books and manuals for download are incredibly convenient. With just a computer or smartphone and an internet connection, you can access a vast library of resources on any subject imaginable. Whether you're a student looking for textbooks, a professional seeking industry-specific manuals, or someone interested in self-improvement, these digital resources provide an efficient and accessible means of acquiring knowledge. Moreover, PDF books and manuals offer a range of benefits compared to other digital formats. PDF files are designed to retain their formatting regardless of the device used to open them. This ensures that the content appears exactly as intended by the author, with no loss of formatting or missing graphics. Additionally, PDF files can be easily annotated, bookmarked, and searched for specific terms, making them highly practical for studying or referencing. When it comes to accessing O Level Science 5116 2014 books and manuals, several platforms offer an extensive collection of resources. One such platform is Project Gutenberg, a nonprofit organization that provides over 60,000 free eBooks. These books are primarily in the public domain, meaning they can be freely distributed and downloaded. Project Gutenberg offers a wide range of classic literature, making it an excellent resource for literature enthusiasts. Another popular platform for O Level Science 5116 2014 books and manuals is Open Library. Open Library is an initiative of the Internet Archive, a non-profit organization dedicated to digitizing cultural artifacts and making them accessible to the public. Open Library hosts millions of books, including both public domain works and contemporary titles. It also allows users to borrow digital copies of certain books for a limited period, similar to a library lending system. Additionally, many universities and educational

institutions have their own digital libraries that provide free access to PDF books and manuals. These libraries often offer academic texts, research papers, and technical manuals, making them invaluable resources for students and researchers. Some notable examples include MIT OpenCourseWare, which offers free access to course materials from the Massachusetts Institute of Technology, and the Digital Public Library of America, which provides a vast collection of digitized books and historical documents. In conclusion, O Level Science 5116 2014 books and manuals for download have transformed the way we access information. They provide a cost-effective and convenient means of acquiring knowledge, offering the ability to access a vast library of resources at our fingertips. With platforms like Project Gutenberg, Open Library, and various digital libraries offered by educational institutions, we have access to an ever-expanding collection of books and manuals. Whether for educational, professional, or personal purposes, these digital resources serve as valuable tools for continuous learning and self-improvement. So why not take advantage of the vast world of O Level Science 5116 2014 books and manuals for download and embark on your journey of knowledge?

FAQs About O Level Science 5116 2014 Books

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer webbased readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. O Level Science 5116 2014 is one of the best book in our library for free trial. We provide copy of O Level Science 5116 2014 in digital format, so the resources that you find are reliable. There are also many Ebooks of related with O Level Science 5116 2014. Where to download O Level Science 5116 2014 online for free? Are you looking for O Level Science 5116 2014 PDF? This is definitely going to save you time and cash in something you should think about. If you trying to find then search around for online. Without a doubt there are numerous these available and many of them have the freedom. However without doubt you receive whatever you purchase. An alternate way to get ideas is always to check another O Level Science 5116 2014. This method for see exactly what may be included and adopt these ideas to your book. This site will almost certainly help you save time and effort, money

and stress. If you are looking for free books then you really should consider finding to assist you try this. Several of O Level Science 5116 2014 are for sale to free while some are payable. If you arent sure if the books you would like to download works with for usage along with your computer, it is possible to download free trials. The free guides make it easy for someone to free access online library for download books to your device. You can get free download on free trial for lots of books categories. Our library is the biggest of these that have literally hundreds of thousands of different products categories represented. You will also see that there are specific sites catered to different product types or categories, brands or niches related with O Level Science 5116 2014. So depending on what exactly you are searching, you will be able to choose e books to suit your own need. Need to access completely for Campbell Biology Seventh Edition book? Access Ebook without any digging. And by having access to our ebook online or by storing it on your computer, you have convenient answers with O Level Science 5116 2014 To get started finding O Level Science 5116 2014, you are right to find our website which has a comprehensive collection of books online. Our library is the biggest of these that have literally hundreds of thousands of different products represented. You will also see that there are specific sites catered to different categories or niches related with O Level Science 5116 2014 So depending on what exactly you are searching, you will be able to choose ebook to suit your own need. Thank you for reading O Level Science 5116 2014. Maybe you have knowledge that, people have search numerous times for their favorite readings like this O Level Science 5116 2014, but end up in harmful downloads. Rather than reading a good book with a cup of coffee in the afternoon, instead they juggled with some harmful bugs inside their laptop. O Level Science 5116 2014 is available in our book collection an online access to it is set as public so you can download it instantly. Our digital library spans in multiple locations, allowing you to get the most less latency time to download any of our books like this one. Merely said, O Level Science 5116 2014 is universally compatible with any devices to read.

Find O Level Science 5116 2014 :

odysseyware algebra 2 semester 1 answers

official princemanual pt

[odl4 exams results](#)

[official sat practice test 2011 12 answers](#)

official methods of analysis 19th edition

~~office 365 for dummies~~

ocr mark scheme 4736 01 jan 13

official training manual

~~oes history study guide army~~

odysseyware answer key for world history

offered to the horny monster gay monster erotica english edition

ocr statistics 1 june 2013 question paper

office practice n5 past question papers

odyssey academy book academy book

ogun state college of health tuition fee

O Level Science 5116 2014 :

so many stars youtube music - Aug 24 2022

web 0 00 4 17 provided to youtube by universal music group so many stars natalie cole ask a woman who knows 2002 the verve music group a division of umg recordings

sarah vaughan so many stars lyrics genius lyrics - Mar 31 2023

web one must be right for me which dream of all the dreams when there s a dream for every star and there are oh so many stars so many stars verse 2 the wind is filled with songs so many songs

sergio mendes so many stars lyrics azlyrics com - Jan 29 2023

web so many stars so many stars yes the wind is filled with songs so many songs which one is mine one must be right for me which song of all the songs when there s a song for every star and there are oh so many stars so many stars along the countless days the endless nights that i have searched so many eyes so many hearts so many smiles

stacey kent so many stars lyrics genius lyrics - Apr 19 2022

web oct 2 2007 so many dreams which one is mine one must be right for me which dream of all the dreams when there s a dream for every star and there are oh so many stars so many stars the wind is filled

free so many stars by sergio mendez sheet music - Jun 21 2022

web so many stars share download and print free sheet music for piano guitar flute and more with the world s largest community of sheet music creators composers performers music teachers students beginners artists and other musicians with over 1 000 000 sheet digital music to play practice learn and enjoy

so many stars secondhandsongs - Aug 04 2023

web the song so many stars was written by sérgio mendes alan bergman and marilyn bergman and was first released by sergio mendes brasil 66 in 1968 it was covered by kyoko saegusa keith ingham murray wall steve little jan tober donna tucker joan carroll footprints and other artists

so many stars sérgio mendes brasil 66 last fm - Dec 28 2022

so many stars song and lyrics by laury shelley spotify - Nov 26 2022

look around sérgio mendes album wikipedia - May 21 2022

jane monheit sergio mendes so many stars youtube - Oct 06 2023

web feb 25 2013 un tema de sergio mendes alan bergman y marilyn bergman del álbum de jane monheit surrender

so many stars the interactive tony bennett discography - Oct 26 2022

e girls so many stars music video youtube - Mar 19 2022

web dec 7 2020 e girls lnk to sms so many stars e girlsmv 11

matthew perry death friends stars and family remember brilliant - Feb 15 2022

barbra streisand so many stars lyrics genius lyrics - Jul 03 2023

so many stars brazilian romance 1990 sarah vaughan - Sep 24 2022

web so many stars brazilian romance 1990 sarah vaughan şarkı sözleri sanatçı biyografisi ve çok daha fazlası karnaval com

da

so many stars lyrics sergio mendes elyrics net - Feb 27 2023

web so many hearts so many smiles which one to choose which way to go how can i tell how will i know out of oh so many stars so many stars so many stars oh so many stars so many stars oh there are so many stars so many stars lots and lots of stars oh so many so many oh so many stars many

sergio mendes so many stars lyrics lyrics com - May 01 2023

web so many stars lyrics by sergio mendes from the classics vol 18 album including song video artist biography translations and more the dawn is filled with dreams so many dreams which one is mine one must be right for me which dream of all the dreams

sergio mendes so many stars lyrics genius lyrics - Jun 02 2023

web so many stars lyrics the dark is filled with dreams so many dreams which one is mine one must be right for me which dream of all the dreams when there s a dream for every star

so many stars the singers unlimited feat the pat williams - Jul 23 2022

web feb 26 2014 so many stars the singers unlimited feat the pat williams orchestra blings 772 subscribers subscribe 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 1 2 3

la fórmula 1980 filmaffinity - Sep 04 2022

web thriller drama nazismo crimen policíaco sinopsis en 1945 un general alemán consigue esconder en suiza importantes documentos secretos en 1980 una serie de asesinatos y pistas conducen al descubrimiento de un plan para recuperar esos documentos que contienen una fórmula que permite transformar el carbón en petróleo

la fórmula giordano timelapse thriller ciencia ficción by - Jun 13 2023

web buy la fórmula giordano timelapse thriller ciencia ficción by online on amazon ae at best prices fast and free shipping free returns cash on delivery available on eligible purchase

the formula rotten tomatoes - Apr 30 2022

web movie info while investigating the death of a friend and fellow cop los angeles police officer barney caine george c scott stumbles across evidence that nazis created a synthetic alternative

la fórmula giordano timelapse thriller ciencia ficción - Aug 15 2023

web lee ahora en digital con la aplicación gratuita kindle la fórmula giordano timelapse thriller ciencia ficción ebook setién victor amazon es tienda kindle saltar al contenido principal

la formula giordano timelapse thriller ciencia fi copy - Aug 03 2022

web mar 3 2023 la formula giordano timelapse thriller ciencia fi 2 7 downloaded from uniport edu ng on march 3 2023 by

quest uncanny where he was perhaps the first to foreground the distinctive nature of the uncanny as a feeling of something not simply weird or mysterious but more specifically as something strangely familiar

la formula giordano timelapse thriller ciencia fi - Jan 28 2022

web goal to download and install the la formula giordano timelapse thriller ciencia fi it is extremely simple then since currently we extend the colleague to buy and create bargains to download and install la formula giordano timelapse thriller ciencia fi suitably simple ubermorgen com domenico arns quaranta inke jodi org

la fórmula giordano timelapse thriller ciencia ficción - Feb 09 2023

web la fórmula giordano timelapse thriller ciencia ficción ebook setién victor amazon com mx tienda kindle
amazon com customer reviews la fórmula giordano timelapse - Dec 07 2022

web find helpful customer reviews and review ratings for la fórmula giordano timelapse thriller ciencia ficción spanish edition at amazon com read honest and unbiased product reviews from our users

la fórmula giordano timelapse thriller ciencia ficción - Dec 27 2021

web la fórmula giordano timelapse thriller ciencia ficción setién victor amazon com au books

la fórmula giordano timelapse thriller ciencia ficción - Jan 08 2023

web la fórmula giordano timelapse thriller ciencia ficción spanish edition setién victor amazon sg books

la formula giordano timelapse thriller ciencia fi - Jul 02 2022

web la formula giordano timelapse thriller ciencia fi la formula giordano timelapse thriller ciencia fi 3 downloaded from paredeslepetitdejeuner panos be on 2019 05 08 by guest as to his abilities what garth doesn t know is that getting to hain and the academy for all magic is going to be the easy part garth goes into hain for one reason only

la formula film 1980 wikipedia - Feb 26 2022

web trama nella los angeles dei giorni nostri il tenente barney caine indaga sulla morte dell amico tom neeley indagando caine scopre l esistenza di una formula inventata dai nazisti durante la seconda guerra mondiale e che ha il

la fórmula giordano timelapse thriller ciencia ficción - Jul 14 2023

web buy la fórmula giordano timelapse thriller ciencia ficción by setién victor isbn 9781699754122 from amazon s book store everyday low prices and free delivery on eligible orders la fórmula giordano timelapse thriller ciencia ficción amazon co uk setién victor 9781699754122 books

la fórmula giordano timelapse thriller ciencia ficción - Mar 10 2023

web la fórmula giordano timelapse thriller ciencia ficción de setién victor en iberlibro com isbn 10 1699754128 isbn 13 9781699754122 independently published 2019 tapa blanda

the formula 1980 imdb - Mar 30 2022

web dec 19 1980 1 video 43 photos crime thriller the synthetic fuel production formula invented by the nazis at the end of world war ii is sought after by some who aim to sell it and by others who wish to destroy it director john g avildsen writer steve shagan stars george c scott marlon brando marthe keller

la fórmula giordano timelapse thriller ciencia ficción - May 12 2023

web oct 14 2019 la fórmula giordano timelapse thriller ciencia ficción spanish edition setién victor on amazon com free shipping on qualifying offers la fórmula giordano timelapse thriller ciencia ficción spanish edition

la fórmula giordano timelapse thriller ciencia ficción - Apr 11 2023

web la fórmula giordano timelapse thriller ciencia ficción spanish edition ebook setién victor amazon com au kindle store

la formula giordano timelapse thriller ciencia fi copy infiltra - Jun 01 2022

web you could purchase guide la formula giordano timelapse thriller ciencia fi or get it as soon as feasible you could speedily download this la formula giordano timelapse thriller ciencia fi after getting deal

la formula giordano timelapse thriller ciencia fi download - Nov 06 2022

web this la formula giordano timelapse thriller ciencia fi as one of the most practicing sellers here will unconditionally be in the course of the best options to review la formula giordano timelapse thriller ciencia fi 2022 01 23

la formula giordano timelapse thriller ciencia fi willowwoodco - Oct 05 2022

web feb 25 2023 said the la formula giordano timelapse thriller ciencia fi is universally compatible when any devices to read a life less ordinary john hodge 1997 he s a down on his luck janitor with aspirations of writing the great american trash novel she s the spoiled sharp tongued boss s daughter always looking for a creative way to spice up her

dynamics of structures by j l humar open library - Jun 02 2022

web nov 17 2022 0132220687 9780132220682 aaaa not in library libraries near you worldcat 1 dynamics of structures 2002 a a balkema publishers in english 2nd

solution manual dynamics of structures 3rd edition by humar - Jan 29 2022

web solution manual for dynamics of structures 3rd edition author s jagmohan l humar this solution manual is provided officially and include all chapters of textbook chapters 2 to 20

pdf dynamics of structures by j humar ebook perlego - Dec 28 2021

web dynamics of structures read this book now share book 1 058 pages english pdf available on ios android ebook pdf dynamics of structures j humar book details table of contents citations about this book this major textbook provides comprehensive coverage of the analytical tools required to determine the dynamic response of structures

dynamics of structures j humar taylor francis ebooks - Jul 15 2023

web mar 21 2012 this major textbook provides comprehensive coverage of the analytical tools required to determine the

dynamic response of structures the topics covered include formulation of the equations of motion for single as well as multi degree of freedom discrete systems using the principles of both vector mechanics and analytical mechanics free

dynamics of structures by j l humar open library - Sep 05 2022

web sep 15 2021 dynamics of structures by j l humar 2002 a a balkema publishers edition in english 2nd ed

dynamics of structures j l humar google books - Nov 07 2022

web j l humar prentice hall 1990 structural dynamics 780 pages this text provides an overview of the dynamic response of structures from mathematical modelling through the

dynamics of structures 3rd edition vitalsource - Aug 04 2022

web dynamics of structures 3rd edition is written by j humar and published by crc press the digital and etextbook isbn for dynamics of structures are 9781466556225 1466556226 and the print isbn are 9780415620864 0415620864 save up to 80 versus print by going digital with vitalsource

dynamics of structures j l humar academia edu - Aug 16 2023

web 2011 dynamics of structures this major textbook provides comprehensive coverage of the analytical tools required to determine the dynamic response of structures the topics covered include formulation of the equations of motion for single as well as multi degree of freedom discrete systems using the principles of both vector mechanics and

dynamics of structures second edition j humar google books - Jan 09 2023

web jan 1 2002 this major textbook provides comprehensive coverage of the analytical tools required to determine the dynamic response of structures the topics covered include formulation of the equations of motion for single as well as multi degree of freedom discrete systems using the principles of both vector mechanics and analytical mechanics free

dynamics of structures second edition j humar google books - May 13 2023

web jan 1 2002 crc press jan 1 2002 technology engineering 1048 pages this major textbook provides comprehensive coverage of the analytical tools required to determine the dynamic response of

dynamics of structures j l humar google books - Feb 10 2023

web jan 1 2002 dynamics of structures j l humar a a balkema publishers 2005 structural dynamics 967 pages 0 reviews reviews aren t verified but google checks for and removes fake content when

dynamics of structures humar solution ams istanbul edu tr - Feb 27 2022

web this is a problem dynamics of structures humar solution manual dynamics of structures humar solution manual also by category and product type so for example you could start learning about online user manuals for many cameras or

dynamics of structures by j l humar open library - Jul 03 2022

web mar 21 2023 edition availability 1 dynamics of structures 2012 crc press taylor francis group crc press in english 3rd ed

0415620864 9780415620864

[dynamics of structures by jagmohan l humar google books](#) - Oct 06 2022

web dynamics of structures by jagmohan l humar author j l humar edition 2 publisher a a balkema 2002 length 967 pages
export citation bibtex endnote

dynamics of structures second edition humar jagmohan l - Mar 31 2022

web jan 1 2002 dynamics of structures second edition humar jagmohan l on amazon com free shipping on qualifying offers
dynamics of structures second edition

dynamics of structures second edition humar j amazon com tr - May 01 2022

web merhaba giriş yap hesap ve listeler değil misiniz Çıkış yap İadeler ve siparişler alışveriş sepeti kitaplar

[dynamics of structures j humar google books](#) - Apr 12 2023

web feb 1 2012 this major textbook provides comprehensive coverage of the analytical tools required to determine the
dynamic response of structures the topics covered include formulation of the equations of

pdf dynamics of structures j l humar academia edu - Jun 14 2023

web dynamics of structures j l humar

[dynamics of structures edition 3 by j humar google play](#) - Dec 08 2022

web dynamics of structures edition 3 ebook written by j humar read this book using google play books app on your pc
android ios devices download for offline reading highlight bookmark or take notes while you read dynamics of structures
edition 3

dynamics of structures 3rd edition j humar routledge - Mar 11 2023

web description this major textbook provides comprehensive coverage of the analytical tools required to determine the
dynamic response of structures the topics covered include formulation of the equations of motion for single as well as multi
degree of freedom discrete systems using the principles of both vector mechanics and analytical mechanics