Dawood Public School
Course Outline 2017-18
Physics
Class X

Books:

Pople, S. 2001. Fundamental Physics, GCSE edition, Oxford University Press
Chew, C. et al. 2000. GCE 'O' Level Physics (2 ed), Singapore; Marshal Cavendish Education

Introduction

This syllabus provides a comprehensive set of progressive learning objectives for Physics.
It has been designed to support students in becoming:

- **Confident** in working with information and ideas – their own and those of others
- **Responsible** for themselves, responsive to and respectful of others
- **Reflective** as learners, developing their ability to learn
- **Innovative** and equipped for new and future challenges
- **Engaged** intellectually and socially, ready to make a difference.

Cambridge O Level Physics **Syllabus Code 5054**

All candidates enter for **three** papers – Papers 1 and 2 and 4.

Paper 1	**Multiple Choice**	**1 hour**
40 compulsory multiple choice questions of the direct choice type. The questions involve four response items.		
40 marks		

Paper 2	**Theory**	**1 hour 45 minutes**
This paper has two sections:		
Section A has a small number of compulsory, structured questions of variable mark value. 45 marks in total are available for this section.		
Section B has three questions. Each question is worth 15 marks. Candidates must answer **two** questions from this section.		
There is no compulsory question on Section 25 of the syllabus (Electronics systems). Questions set on topics within Section 25 appear only in Paper 2 and are always set as an alternative within a question. Candidates will answer on the question paper.		
75 marks		

Paper 4	**Alternative to Practical**	**1 hour**
A written paper of compulsory short-answer and structured questions designed to test familiarity with laboratory practical procedures.		
Candidates will answer on the question paper.		
30 marks		

Syllabus Aims and Assessment:

Aims:

The aims of the science curricula are the same for all students. The aims are to:

- Acquire a systematic body of scientific knowledge, and the skills needed to apply this in new and changing situations in a range of domestic, industrial and environmental contexts;
- Acquire an understanding of scientific ideas, how they develop, the factors which may affect their development and their power and limitations;
- Plan and carry out a range of investigations, considering and evaluating critically their own data and that obtained from other sources;
- Evaluate in terms of their scientific knowledge and understanding, the benefits and drawbacks of scientific and technological developments, including those related to the environment, personal health and quality of life, considering ethical issues where appropriate;
- Select, organise and present information clearly and logically, using appropriate scientific terms and conventions,
- Stimulate interest in and care for the local and global environment.
- Promote awareness that:
- The study and practice of science are co-operative and cumulative activities, that are subject to social, economic, technological, ethical and cultural influences and limitations;
- The applications of sciences may be both beneficial and detrimental to the individual, the community and the environment.

Assessment objectives:

The skills appropriate to Physics may, for convenience, be broadly categorized as follows:
Students must be able to:

- scientific instruments and apparatus, including techniques of operation and aspects of safety;
- scientific quantities and their determination;
- scientific and technological applications with their social, economic and environmental implications.
- manipulate numerical and other data;
- use information to identify patterns, report trends and draw inferences;
- present reasoned explanations for phenomena, patterns and relationships;
- make predictions and hypotheses;
- solve problems.
- carry out techniques, use apparatus, handle measuring devices and materials effectively and safely;
- make and record observations, measurements and estimates with due regard to precision, accuracy and units;
- interpret, evaluate and report upon observations and experimental data;
- identify problems, plan and carry out investigations, including the selection of techniques, apparatus,
- measuring devices and materials;
- evaluate methods and suggest possible improvements.

The assessment objectives describe the knowledge, skills and abilities that students are expected to demonstrate at the end of the course. They reflect those aspects of the aims that are assessed.

Weighting of assessment objectives
Theory papers (Papers 1 and 2)

Knowledge with understanding is weighted at approximately 65% of the marks for each paper, with approximately half allocated to recall.
Handling information and solving problems is weighed at approximately 35% of the marks for each paper.
Practical assessment (Papers 3 and 4)
This is designed to test appropriate skills in assessment objective and will carry approximately 20% of the marks for the qualification.

Monthly Syllabus

MONTH	CHAPTERS	DURATION
AUGUST	• Temperature • Thermal Properties of Matter Heat Capacity, Melting and Boiling • **Past Papers** • **Practical**	1 week 2 weeks
SEPTEMBER	• Thermal Properties of Matter Heat Capacity, Melting and Boiling(Contd.) • Transfer of Thermal Energy • Light (Reflection and Refraction) • **Past Papers** • **Practical**	1 week 2 weeks 1 week
OCTOBER	• Light (Reflection and Refraction) • Light (Converging Lens) • Electromagnetic Spectrum • **Past Papers** • **Practical**	1 week 2 weeks 1 week
NOVEMBER	• Past papers • Revision for Mid Term Examination	
DECEMBER	**MID TERM EXAMINATION**	
JANUARY	• General Wave Properties • Sound • **Past Papers** • **Practical**	3 weeks 1 week
FEBRUARY	• Sound • Magnetism • **Past Papers** • **Practical**	1 weeks 2 weeks
MARCH	• Revision for Mock Examination **MOCK EXAMINATION**	

Syllabus Content

1. Temperature

GCE O Level Physics by Charles Chew, Unit 8, Pg No. (114-128)
Explaining Physics by Stephen Pople, Unit 4.3, Pg No.(122 - 125)

Content

1.1 Principles of thermometry
1.2 Practical thermometers

Learning outcomes

Students should be able to:

(a) explain how a physical property which varies with temperature may be used for the measurement of temperature and state examples of such properties.
(b) explain the need for fixed points and state what is meant by the ice point and steam point.
(c) discuss sensitivity, range and linearity of thermometers.
(d) describe the structure and action of liquid-in-glass thermometers (including clinical) and of a thermocouple thermometer, showing an appreciation of its use for measuring high temperatures and those which vary rapidly.

Enhancement

- Demonstrate understanding of sensitivity, range and linearity
- Describe the structure of a thermocouple andshow understanding of its use for measuring high temperatures and those that vary rapidly

Reference Books

- Pople, Stephen, Fundamental Physics for Cambridge O level, Oxford University Press; Unit 5.02 – 5.03 , Pg No.(100 - 103)
- Sang, David, Physics 1 & 2, Cambridge University Press
- Duncan, Tom, GCSE Physics, John Murray
- Abbott, A.F., Physics , Heinemann Educational

Learning Resources:

Thermometric parameters:
www.cartage.org.lb/en/themes/Sciences/Physics/Thermodynamics/AboutTemperature/Development/Development.htm

Fixed points:
www.riverdeep.net/current/2001/11/112601_celsius.jhtml
http://resources.edb.gov.hk/cphysics/heat/tep/tempe02_e.html

Thermometers:
www.bbc.co.uk/bitesize/standard/physics/health_physics/use_of_thermometers/revision/1/

Range and sensitivity:
www.physicsclassroom.com/class/thermalP/u18l1b.cfm
http://gimi.bpg.hu/gcse-physics/thermometer.html

Thermocouples:
www.youtube.com/watch?v=BB5jjW1V2DI
http://olevelphysicsblog.blogspot.co.uk/2010/11/thermocouple-thermometer.html

2. Thermal Properties of Matter

GCE O Level Physics by Charles Chew, Unit 10, 11, Pg No.(141-149) & (151-170)
Explaining Physics by Stephen Pople, Unit 4.10 – 4.13, Pg No. (144 -159)

Content

2.1 Specific heat capacity
2.2 Melting and boiling
2.3 Thermal expansion of solids, liquids and gases

Learning outcomes

Students should be able to:

(a) describe a rise in temperature of a body in terms of an increase in its internal energy (random thermal energy).
(b) define the terms heat capacity and specific heat capacity.
(c) calculate heat transferred using the formula thermal energy = mass × specific heat capacity × change in temperature.
(d) describe melting/solidification and boiling/condensation in terms of energy transfer without a change in temperature.
(e) state the meaning of melting point and boiling point.
(f) explain the difference between boiling and evaporation.
(g) define the terms latent heat and specific latent heat.
(h) explain latent heat in terms of molecular behaviour.
(i) calculate heat transferred in a change of state using the formula thermal energy = mass × specific latentheat.
(j) describe qualitatively the thermal expansion of solids, liquids and gases.
(k) describe the relative order of magnitude of the expansion of solids, liquids and gases.
(l) list and explain some of the everyday applications and consequences of thermal expansion.
(m) describe qualitatively the effect of a change of temperature on the volume of a gas at constant pressure.

Enhancement

- Show an appreciation of the relative orderof magnitude of the expansion of solids,liquids and gases
- Describe an experiment to measure thespecific heat capacity of a substance
- Distinguish between boiling andevaporation
- Use the terms latent heat of vaporization and latent heat of fusion and give amolecular interpretation of latent heat
- Describe an experiment to measurespecific latent heats for steam and for ice

Reference Books

- Pople, Stephen, Fundamental Physics for Cambridge O level, Oxford University Press; Unit 5.04, 5.09 – 5.11, Pg No.(104– 105, 116 - 119)
- Sang, David, Physics 1 & 2, Cambridge University Press
- Duncan, Tom, GCSE Physics, John Murray
- Abbott, A.F., Physics, Heinemann Educational

Learning Resources:

Heat capacity:
http://chemwiki.ucdavis.edu/Physical_Chemistry/Thermodynamics/Calorimetry/Heat_Capacity

Specific heat capacity:
www.bbc.co.uk/schools/gcsebitesize/science/aqa/heatingandcooling/buildingsrev3.shtml
www.youtube.com/watch?v=BclB8UaSH4g

Melting and boiling:
www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/energy_home/0_heating_houses2.shtml
https://sites.google.com/site/gcserevision12/physics/physics-1/melting-and-boiling

Evaporation and boiling:
http://hyperphysics.phy-astr.gsu.edu/hbase/kinetic/vappre.html#c2

Vaporisation:
http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/phase2.html
http://olevelphysicsblog.blogspot.co.uk/2010/11/latent-heat.html

Latent heat:
www.cyberphysics.co.uk/Q&A/KS4/SHC/questionsSHC_GCSE.html
www.bbc.co.uk/bitesize/standard/physics/energy_matters/heat_in_the_home/revision/3/

Specific latent heat:
www.s-cool.co.uk/a-level/physics/temperature-and-thermal-properties/revise-it/specific-latent-heat
http://physicsnet.co.uk/a-level-physics-as-a2/thermal-physics/thermal-energy/

3. Transfer of Thermal Energy

GCE O Level Physics by Charles Chew, Unit 12, Pg No. (172-188)
Explaining Physics by Stephen Pople, Unit 4.8- 4.9, 5.12, Pg No. (140 -143, 208-209)

Content
3.1 Conduction
3.2 Convection
3.3 Radiation
3.4 Total transfer

Learning outcomes
Students should be able to:
(a) describe how to distinguish between good and bad conductors of heat.
(b) describe, in terms of the movement of molecules or free electrons, how heat transfer occurs in solids.
(c) describe convection in fluids in terms of density changes.
(d) describe the process of heat transfer by radiation.
(e) describe how to distinguish between good and bad emitters and good and bad absorbers of infra-red radiation.

(f) describe how heat is transferred to or from buildings and to or from a room.
(g) state and explain the use of the important practical methods of thermal insulation for buildings.

Enhancement

- Give a simple molecular account of heattransfer in solids
- Describe experiments to show the properties of good and bad emitters and good and bad absorbers of infra-redradiation
- •Describe how heat is transferred to or from buildings and to or from a room.

Reference Books

- Pople, Stephen, Fundamental Physics for Cambridge O level, Oxford University Press; Unit 5.06 – 5.08, Pg No. (108 - 113)
- Sang, David, Physics 1 & 2, Cambridge University Press
- Duncan, Tom, GCSE Physics, John Murray
- Abbott, A.F., Physics, Heinemann Educational

Learning Resources:

Heat transfer:
www.lanly.com/heating.htm
www.mansfieldct.org/schools/mms/staff/hand/convcondrad.htm
www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/energy/heatrev1.shtml

Thermal conduction:
http://phun.physics.virginia.edu/topics/thermal.html
www.youtube.com/watch?v=XbOQCiGHaZE

Conduction by molecules:
www.schoolphysics.co.uk/age11-14/glance/Heat%20energy/Conduction_of_heat/index.html

Convection:
www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/energy/heatrev1.shtml
www.youtube.com/watch?v=6sAFtRQS9XY

IR radiation:
www.gcse.com/energy/radiation.htm
www.bbc.co.uk/schools/gcsebitesize/science/aqa/heatingandcooling/heatingrev1.shtml

Absorption/emission:
http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/absrad.html

Insulation:
www.bbc.co.uk/bitesize/standard/physics/energy_matters/heat_in_the_home/revision/1/
www.school-for-champions.com/science/thermal_insulation.htm

4. Light

GCE O Level Physics by Charles Chew, Unit 14 & 15, Pg No. (206-226) & (228-238)
Explaining Physics by Stephen Pople, Unit 5.1- 5.7, Pg No. (166 -190)

Content

4.1 Reflection of light
4.2 Refraction of light
4.3 Thin converging and diverging lenses

Learning outcomes

Students should be able to:

(a) define the terms used in reflection including normal, angle of incidence and angle of reflection.
(b) describe an experiment to illustrate the law of reflection.
(c) describe an experiment to find the position and characteristics of an optical image formed by a plane mirror.
(d) state that for reflection, the angle of incidence is equal to the angle of reflection and use this in constructions, measurements and calculations.
(e) define the terms used in refraction including angle of incidence, angle of refraction and refractive index.
(f) describe experiments to show refraction of light through glass blocks.
(g) do calculations using the equation sin i/sin r = constant.
(h) define the terms critical angle and total internal reflection.
(i) describe experiments to show total internal reflection.
(j) describe the use of optical fibres in telecommunications and state the advantages of their use.
(k) describe the action of thin lenses (both converging and diverging) on a beam of light.
(l) define the term focal length.
(m) *draw ray diagrams to illustrate the formation of real and virtual images of an object by a converging lens, and the formation of a virtual image by a diverging lens.
(n) define the term linear magnification and *draw scale diagrams to determine the focal length needed for particular values of magnification (converging lens only).
(o) describe the use of a single lens as a magnifying glass and in a camera, projector and photographic enlarger and draw ray diagrams to show how each forms an image.
(p) draw ray diagrams to show the formation of images in the normal eye, a short-sighted eye and a long-sighted eye.
(q) describe the correction of short-sight and long-sight.

Enhancement

- Perform simple constructions, measurements and calculations *Experiment to verify Reflection of light.
- Recall and use the definition of refractive index n in terms of speed
- Recall and use the equation sin i/sin r = n
- Describe the action of optical fiber particularly in medicine and communications technology *****Experiment to find the refractive index
- Draw ray diagrams to illustrate the formation of a virtual image by a single lens
- Use and describe the use of a single lenses a magnifying glass *Experiment to find focal length of the lens.

Reference Books

- Pople, Stephen, Fundamental Physics for Cambridge O level, Oxford University Press; Unit 7.01 – 7. 10, Pg No. (139 - 159)
- Rnold.BrianWoolley.Steve, Long man GCSE Physics Pearson education Ltd;
- Avison.John, The World Of Physics, Thomas Nelson & Sons Ltd;
- Sang, David, Physics 1 & 2, Cambridge University Press
- Duncan, Tom, GCSE Physics, John Murray

Learning Resources:

Law of reflection:
http://hyperphysics.phy-astr.gsu.edu/hbase/phyopt/fermat.html

Diffuse and specular reflection:
www.khanacademy.org/science/physics/waves-and-optics/v/specular-and-diffuse-reflection

Experiment:
www.youtube.com/watch?v=9aWE4rDw_ks

Plane mirror images:
www.youtube.com/watch?v=2ek0EsEMTBc
www.youtube.com/watch?v=A8AfxcUNvYw

Refraction:
www.youtube.com/watch?v=OdcHCRF00jM
www.bbc.co.uk/bitesize/higher/physics/radiation/refraction/revision/1/

Reflection and refraction:
https://www.o2learn.co.uk/o2_video.php?vid=398

Total internal reflection:
www.cyberphysics.co.uk/topics/light/TIR.htm
www.youtube.com/watch?v=PrEF9UN98cE

Critical angle:
www.youtube.com/watch?v=CF7CJb8XQHw

Fish-eye view:
www.physicsclassroom.com/mmedia/optics/bp.cfm

Retro reflectors:
www.youtube.com/watch?v=ktqWZZydijY

Optical fibres:
www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/waves/sendinginformationrev1.shtml
www.cyberphysics.co.uk/topics/light/FiberOptics/FibreOptics.htm

Converging lenses:
www.physicsclassroom.com/class/refrn/u14l5da.cfm

http://dev.physicslab.org/Document.aspx?dNovype=3&filename=GeometricOptics_ConvergingLenses.xml
www.youtube.com/watch?v=b2h7lc2epWA

Focal length:
www.youtube.com/watch?v=AoGDOT6U9pQ
http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/foclen.html

Image formation:
www.nuffieldfoundation.org/practical-physics/image-formation-lens
www.physicsclassroom.com/class/refrn/u14l5c.cfm

Linear magnification:
http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/lensdet.html
www.youtube.com/watch?v=ZJn7nSPe9_Y

Magnifying glass:
www.physics.pomona.edu/sixideas/labs/LRM/LR07.pdf

Camera:
http://science.howstuffworks.com/camera1.htm
www.schoolphysics.co.uk/age11-14/Light/text/Camera_/index.html

Enlarger:
http://en.wikipedia.org/wiki/Enlarger

The eye:
www.physicsclassroom.com/class/refrn/u14l6a.cfm
www.cyberphysics.co.uk/topics/medical/Eye/eye.html

Short sight:
www.physicsclassroom.com/class/refrn/u14l6e.cfm
www.youtube.com/watch?v=AsKeu4wm3XI

Long sight:
www.cyberphysics.co.uk/topics/medical/Eye/sightCorrection.html
www.youtube.com/watch?v=AsKeu4wm3XI

Correcting problems:
www.bbc.co.uk/health/physical_health/conditions/visionproblems1.shtml

Prisms:
www.physicsclassroom.com/class/refrn/u14l4a.cfm
www.youtube.com/watch?v=NU2r-ECmPr4

Rainbows:
www.cord.edu/faculty/manning/physics215/studentpages/genamahlen.html
http://eo.ucar.edu/rainbows/

5. Electromagnetic Spectrum

GCE O Level Physics by Charles Chew, Unit13, Pg No. (199-201)
Explaining Physics by Stephen Pople, Unit 5.8, 5.10 -5.11, Pg No. (191 – 194, 200 – 209)

Content

5.1 Dispersion of light
5.2 Properties of electromagnetic waves
5.3 Applications of electromagnetic waves

Learning outcomes

Students should be able to:

(a) describe the dispersion of light as illustrated by the action on light of a glass prism.
(b) state the colours of the spectrum and explain how the colours are related to frequency/wavelength.
(c) state that all electromagnetic waves travel with the same high speed in air and state the magnitude of that speed.
(d) describe the main components of the electromagnetic spectrum.
(e) discuss the role of the following components in the stated applications:
    (1) radio waves – radio and television communications,
    (2) microwaves – satellite television and telephone,
    (3) infra-red – household electrical appliances, television controllers and intruder alarms,
    (4) light – optical fiber in medical uses and telephone,
    (5) ultra-violet – sun beds, fluorescent tubes and sterilisation,
    (6) X-rays – hospital use in medical imaging and killing cancerous cells, and engineering applications such as detecting cracks in metal,
    (7) gamma rays – medical treatment in killing cancerous cells, and engineering applications such as detecting cracks in metal.

Enhancement

- State the approximate value of the speed of electromagnetic waves
- Use the term monochromatic

Reference Books

- Pople, Stephen, Fundamental Physics for Cambridge O level, Oxford University Press; Unit 7.11– 7.13, Pg No.(160 - 164)
- Sang, David, Physics 1 & 2, Cambridge University Press
- Abbott, A.F., Physics , Heinemann Educational

Learning Resources:

The electromagnetic spectrum:
http://imagine.gsfc.nasa.gov/docs/science/know_l1/emspectrum.html
www.bbc.co.uk/learningzone/clips/the-electromagnetic-spectrum/10676.html
http://scienceaid.co.uk/physics/waves/emspectrum.html

Uses of e.m. radiation:
www.s-cool.co.uk/gcse/physics/uses-of-waves/revise-it/electromagnetic-spectrum
www.youtube.com/watch?v=snNwE6txxP0

6. General Wave Properties

GCE O Level Physics by Charles Chew, Unit 13, Pg No.(190-204)
Explaining Physics by Stephen Pople, Unit 5.9, Pg No. (195 -199)

Content

6.1 Describing wave motion
6.2 Wave terms
6.3 Wave behaviour

Learning outcomes

Students should be able to:

(a) describe what is meant by wave motion as illustrated by vibrations in ropes and springs and by experiments using a ripple tank.
(b) state what is meant by the term wavefront.
(c) define the terms speed, frequency, wavelength and amplitude and do calculations using velocity= frequency × wavelength.
(d) describe transverse and longitudinal waves in such a way as to illustrate the differences between them.
(e) describe the use of a ripple tank to show
    (1) reflection at a plane surface,
    (2) refraction due to a change of speed at constant frequency.
(f) describe simple experiments to show the reflection and refraction of sound waves.

Enhancement

- Recall and use the equation v = f λ • Interpret reflection, refraction and diffraction using wave theory

Reference Books

- •Pople, Stephen, Fundamental Physics for Cambridge O level, Oxford University Press;Unit 6.01 – 6.02 , Pg No.(123 - 127)
- •Rnold.BrianWoolley.Steve, Long man GCSE Physics Pearson education Ltd;
- •Avison.John, The World Of Physics, Thomas Nelson & Sons Ltd;
- •Sang, David, Physics 1 & 2, Cambridge University Press
- •Duncan, Tom, GCSE Physics, John Murray

Learning Resources:

Waves:
www.kettering.edu/~drussell/Demos/waves/wavemotion.html
www.youtube.com/watch?v=JXaVmUvwxww
www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_pre_2011/wave_model/whatarewavesrev1.shtml

Ripple tanks simulation:
www.falstad.com/ripple/

Longitudinal waves:
www.bbc.co.uk/schools/gcsebitesize/science/aqa/waves/generalwavesrev2.shtml
www.youtube.com/watch?v=f66syH8B9D8
www.youtube.com/watch?v=aguCWnbRETU

Transverse waves:
www.youtube.com/watch?v=AtlxBODxWHc
www.youtube.com/watch?v=P0Fi1VcbpAI

Wave formula:
www.gcse.com/waves/wave_speed.htm

Wave parts:
www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/radiation/anintroductiontowavesrev2.shtml
www.physicsclassroom.com/class/waves/u10l2c.cfm

Ripple tank reflection: **www.schoolphysics.co.uk/age11-14/Wave%20properties/text/Waves_in_a_ripple_tank/index.html**
www.youtube.com/watch?v=HFckyHq594I

Ripple tank refraction:
www.youtube.com/watch?v=stdi6XJX6gU

Refraction:
www.nuffieldfoundation.org/practical-physics/marching-model-refraction
www.youtube.com/watch?v=Tyzci1qTVL8

7. Sound

GCE O Level Physics by Charles Chew, Unit 16, Pg No. (240-257)
Explaining Physics by Stephen Pople, Unit 5.13-5.14, Pg No. (210 - 216)

Content
7.1 Sound waves
7.2 Speed of sound
7.3 Ultrasound

Learning outcomes
Students should be able to:
(a) describe the production of sound by vibrating sources.
(b) describe the longitudinal nature of sound waves and describe compression and rarefaction.
(c) state the approximate range of audible frequencies.
(d) explain why a medium is required in order to transmit sound waves and describe an experiment to demonstrate this.
(e) describe a direct method for the determination of the speed of sound in air and make the necessary calculation.
(f) state the order of magnitude of the speeds of sound in air, liquids and solids.
(g) explain how the loudness and pitch of sound waves relate to amplitude and frequency.
(h) describe how the reflection of sound may produce an echo.
(i) describe the factors which influence the quality (timbre) of sound waves and how these factors may be demonstrated using a cathode-ray oscilloscope (c.r.o.).
(j) define ultra sound.
(k) describe the uses of ultrasound in cleaning, quality control and pre-natal scanning.

Enhancement

- Describe compression and rarefaction
- State the order of magnitude of the speedof sound in air, liquids and solids

Reference Books

- Fundamental Physics for Cambridge O level by Stephen Pople, Unit 6.03 – 6.06, Pg No. (128 - 135)
- Rnold.BrianWoolley.Steve, Long man GCSE Physics Pearson education Ltd;
- Avison.John, The World Of Physics, Thomas Nelson & Sons Ltd;
- Sang, David, Physics 1 & 2, Cambridge University Press
- Duncan, Tom, GCSE Physics, John Murray
- Abbott, A.F., Physics , Heinemann Educational

Learning Resources:

Production of sound:
www.bbc.co.uk/learningzone/clips/understanding-sound-and-vibrations/1604.html
www.youtube.com/watch?v=MFLeGJclQiI

Guitar strings:
www.youtube.com/watch?v=v-sARWEXReY

Drum:
www.youtube.com/watch?v=v4ELxKKT5Rw

Sound and the ear:
www.bbc.co.uk/science/humanbody/body/factfiles/hearing/hearing_animation.shtml
http://hyperphysics.phy-astr.gsu.edu/hbase/sound/ear.html

Loudness:
www.engineeringinteract.org/resources/oceanodyssey/flash/concepts/loudness.htm
www.youtube.com/watch?v=8i6hTU0jw-g

Hearing test (this will only work with loudspeakers of appropriate quality):
www.youtube.com/watch?v=1yzrx84QWqI

Sound pitch, frequency and amplitude:
www.youtube.com/watch?v=irqfGYD2UKw

Sound waves:
www.youtube.com/watch?v=27a26e2CnuM
www.physicsclassroom.com/class/sound/

Bell jar experiment:
www.gcse.com/waves/sound2.htm
www.youtube.com/watch?v=ce7AMJdq0Gw

Speed of sound:
www.sv.vt.edu/classes/ESM4714/Student_Proj/class95/physics/speed.html
www.youtube.com/watch?v=_1Er6v_c43I

Reflection in sound:
www.bbc.co.uk/learningzone/clips/the-reflection-of-sound-to-produce-an-echo/1609.html

Refraction in sound:
www.acs.psu.edu/drussell/Demos/refract/refract.html
www.youtube.com/watch?v=eHZJFa055Xo

Speed of sound in materials:
www.absorblearning.com/physics/demo/units/DJFPh083.html#Howfastissound?
www.physicsclassroom.com/class/sound/u11l2c.cfm

Timbre:
www.youtube.com/watch?v=BLoM9bBr8lc
www.animations.physics.unsw.edu.au/jw/sound-pitch-loudness-timbre.htm

Uses of ultra sound:
www.odec.ca/projects/2003/guilh3m/public_html/use.html
http://wanttoknowit.com/uses-of-ultrasound/
www.youtube.com/watch?v=tluZGhzg7Ks

8. Magnetism and Electromagnetism

GCE O Level Physics by Charles Chew, Unit 21, Pg No. (331-350)
Explaining Physics by Stephen Pople, Unit 7.1 – 7.4, Pg No. (280 -291)

Content
8.1 Laws of magnetism
8.2 Magnetic properties of matter
8.3 Electromagnetism

Learning outcomes
Students should be able to:
(a) state the properties of magnets.
(b) describe induced magnetism.
(c) state the differences between magnetic, non-magnetic and magnetised materials.
(d) describe electrical methods of magnetisation and demagnetisation.
(e) describe the plotting of magnetic field lines with a compass.
(f) state the differences between the properties of temporary magnets (e.g. iron) and permanent magnets (e.g. steel).
(g) describe uses of permanent magnets and electromagnets.
(h) explain the choice of material for, and use of, magnetic screening.
(i) describe the use of magnetic materials in audio/video tapes.
(j) describe the pattern of the magnetic field due to currents in straight wires and in solenoids and state theeffect on the magnetic field of changing the magnitude and direction of the current.
(k) describe applications of the magnetic effect of a current in relays, circuit-breakers and loudspeakers.

Enhancement
- Describe the use of magnetic materials in audio/video tapes.

- Describe the pattern of the magnetic field due to currents in straight wires and in solenoids and state the effect on the magnetic field of changing the magnitude and direction of the current.
- Describe applications of the magnetic effect of a current in relays, circuit-breakers and loudspeakers.
- Describe and Experiment of field pattern around bar magnet.
- State the qualitative variation of the strength of the magnetic field over salient parts of the pattern
- Describe the effect on the magnetic field of changing the magnitude and direction of the current

Reference Books

- Pople, Stephen, Fundamental Physics for Cambridge O level, Oxford University Press; Unit 9.01- 9.04, Pg No.(202–209)
- Long man GCSE Physics by Brian Rnold and Steve Woolley, Chap 4, Pg No 31
- The World of Physics by John Avison, Chap 14, Pg No 270
- Physics by Abbott
- GCSE Physics by Tom Duncan

Learning Resources:

www.zephyrus.co.uk/magneticpoles.html
www.youtube.com/watch?v=IW7BCTQDY_g
www.practicalphysics.org/go/Experiment_313.html?topic_id=7&collection_id=41

NOTE: The whole Syllabus of Class 9 also included.

Your Handy Checklist for the Practical:

1. Repeat all readings and average. Show all readings. If timing measure the period of at least 5 oscillations each time. Try for 10 if time allows. Remember timing error is 0.1s with a handheld stop clock. When taking a set of readings make sure that they cover the whole range of the readings fairly evenly.
2. Try to arrange for a single table which
   - shows all readings, even the first, and their averages
   - has the correct units and quantities for each column
   - has the same precision (ie no. of sig figs) for every reading in a particular column.

   Choose a sensible number of sig. figs. (Usually 2 or 3)
3. Your graph should
   - have each axis labelled with both quantity and unit
   - occupy at least 5x7 squares (ie half the paper) with **YOUR** plotted points
   - ask yourself whether the origin should be plotted
   - not use an awkward scale, ie 1 square = 3, 7 ,9 units
   - have points plotted neatly, with NO large blobs, or crosses. Circle your points if you plot them as dots.
   - have a clear even thin line plotted
4. In measuring the slope
   - use at least half of the drawn straight line
   - show the coordinates that you use for the slope or the values of the sides of the triangle that you use.
   - give your answer to 1 or 2 sig. figs as appropriate. Don't forget units.

5. Know the straight line formula for a graph, y =mx +c,
   - If $y^2 = kx^3$ then plot y^2 against x^3 and the slope is k
   - If $y = kx^n$ then plot $\log_{10}(y)$ or ln(y) against $\log_{10}(x)$ or ln(x) slope is n.
     On tables and graphs the label is $\log_{10}(y/m)$ or ln(y/m) to show the unit of y as metres
     Check that you know how to use logs.

Checking Relationships

In each case **state** what should be constant, perform the calculation and then say whether the constant was found and the relationship verified within the error.

- Y proportional to x Y/x should be constant
- Y proportional to 1/x Yx should be constant
- Y proportional to e^x Y decreases by same **factor** if x increases by equal amounts

Errors

1. Causes of error in simple measurements **LEARN THESE**
   - **Lengths** rulers have battered ends, or the zero is not actually at the end
     parallax error, you must view any reading from directly above.
     likely error is +1 mm or perhaps + 0.3 mm
   - **Times** stopwatches measure to + 0.01s but you can't press them that accurately, likely error is + 0.1s.
   - **Meters (eg ammeter)** error is the smallest scale reading, or notice any fluctuation.

2. Combining errors
   - There are absolute errors and percentage errors
   - Adding or subtracting quantities add absolute errors
   - Multiplying or dividing quantities add percentage errors to get percentage error in answer

Work through this example then repeat it yourself on paper

If A = 2.34 + 0.02 and B = 6.0 + 0.1

(Notice the values are quoted to the no. of decimal places justified by the error)

A+B = 8.34 + 0.12 = 8.3 + 0.1
B-A = 3.64 + 0.12 = 3.6 + 0.1

B/A = 2.56 % error = % error in A +% error in B
= 1 + 1.5
= 2.5%
Actual error in B/A = 2.56 * 2.5/100 = 0.06

So B/A = 2.56 + 0.06

B.A = 14.04, again to 2.5%, which is 2.5*14.04/100 = 0.4
B.A = 14.0 + 0.4

Describing and improving an experiment

State every reading you will take. Do not say “Take the readings as before”. Make clear what is kept constant and what is changed. Give sensible values for quantities, particularly those that are changed. Use your common sense. Have at least five sets of readings as a variable changes. Say that you will repeat and average each reading. Say what the axes will be for a straight line graph. Never just say “plot a graph”. Set out your account clearly and logically; use their suggested format if you think it helps. Plan your account briefly before you start writing.

Formulae for Relationships between Physical Quantities

The relationship below will not be provided for candidates either in the form given or in rearranged form.

the relationship between speed, distance and time:
speed = dis/time

the relationship between force, mass and acceleration:
force = mass × acceleration
acceleration = change in velocity / time

the relationship between density, mass and volume:
density = mass / volume

the relationship between force, distance and work:
work done = force × distance moved in direction of force

the energy relationships:
energy transferred = work done
kinetic energy = ½ × mass × speed^2
change in potential energy = mass × gravitational field strength × change inheight

the relationship between mass, weight and gravitational field strength:
weight = mass × gravitational field strength

the relationship between an applied force, the area over which it acts and the resulting pressure:
pressure = force / area

the relationship between the moment of a force and its distance from the pivot:
moment = force × perpendicular distance from pivot

the relationships between charge, current, voltage, resistance and electricalpower:
charge = current × time
voltage = current × resistance
electrical power = voltage × current

the relationship between speed, frequency and wavelength:
wave speed = frequency × wavelength

Glossary of Terms:

The glossary will prove helpful to students as a guide but it is not exhaustive. The glossary has been deliberately kept brief, not only with respect to the number of terms included but also to the descriptions of their meanings. Students should appreciate that the meaning of a term must depend, in part, on its context.

1. Define (the term(s) ...) is intended literally. Only a formal statement or equivalent paraphrase, such as the defining equation with symbols identified, being required.
2. Explain what is meant by ... normally implies that a definition should be given, together with some relevant comment on the significance or context of the term(s) concerned, especially where two or more terms are included in the question. The amount of supplementary comment intended should be interpreted in the light of the indicated mark value.
3. State implies a concise answer with little or no supporting argument, e.g. a numerical answer that can be obtained 'by inspection'.
4. List requires a number of points with no elaboration. Where a given number of points is specified, this should not be exceeded.
5. Describe requires students to state in words (using diagrams where appropriate) the main points of the topic. It is often used with reference either to particular phenomena or to particular experiments. In the former instance, the term usually implies that the answer should include reference to (visual) observations associated with the phenomena. The amount of description intended should be interpreted in the light of the indicated mark value.
6. Discuss requires candidates to give a critical account of the points involved in the topic.
7. Deduce implies that students are not expected to produce the required answer by recall but by making a logical connection between other pieces of information. Such information may be wholly given in the question or may depend on answers extracted in an earlier part of the question.
8. Suggest is used in two main contexts. It may either imply that there is no unique answer or that candidates are expected to apply their general knowledge to a 'novel' situation, one that formally may not be 'in the syllabus'.
9. Calculate is used when a numerical answer is required. In general, working should be shown.
10. Measure implies that the quantity concerned can be directly obtained from a suitable measuring instrument, e.g. length, using a rule, or angle, using a protractor.
11. Determine often implies that the quantity concerned cannot be measured directly but is obtained by calculation, substituting measured or known values of other quantities into a standard formula, e.g. the Young modulus, relative molecular mass.
12. Show is used when an algebraic deduction has to be made to prove a given equation. It is important thatthe terms being used by candidates are stated explicitly.
13. Estimate implies a reasoned order of magnitude statement or calculation of the quantity concerned. Students should make such simplifying assumptions as may be necessary about points of principle and about the values of quantities not otherwise included in the question.
14. Sketch, when applied to graph work, implies that the shape and/or position of the curve need only be qualitatively correct. However, students should be aware that, depending on the context, some quantitative aspects may be looked for, e.g. passing through the origin, having an intercept, asymptote or discontinuity at a particular value. On a sketch graph it is essential that students clearly indicate what is being plotted on each axis. Sketch, when applied to diagrams, implies that a simple, freehand drawing is acceptable: nevertheless, care should be taken over proportions and the clear exposition of important detail.

Resource List:

- Breithaupt, J Key Science – Physics (Stanley Thornes)
- Dobson, K The Physical World (Nelson)
- Duncan, T GCSE Physics (Third edition) (John Murray)
- Nuffield Co-ordinated Sciences Physics (Longman)
- Avison, John, The World of Physics,Thomas Nelson & Sons Ltd
- Arnold, Brain, Longman GCSE Physics, Pearson education ltd

Websites:

- www.focuseducational.com
- www.crocodile-clips.com