UNIVERSITI TEKNOLOGI MALAYSIA

Sekolah Pendidikan Profesional dan Pendidikan Berterusan (SPACE)

FINAL EXAMINATION / *PEPERIKSAAN AKHIR*
SEMESTER I – SESSION 2020/ 2021 / *SEMESTER I – SESI 2020/2021*
PROGRAM KERJASAMA

COURSE CODE *KOD KURSUS*	: DDWS 1713
COURSE NAME *NAMA KURSUS*	: PHYSICS *FIZIK*
YEAR / PROGRAMME *TAHUN / PROGRAM*	:1 / DDWA / DDWJ *1 / DDWA / DDWJ*
DURATION *TEMPOH*	: 3 HOURS (INCLUDING SUBMISSION HOUR) *3 JAM (TERMASUK MASA PENGHANTARAN)*
DATE *TARIKH*	:NOVEMBER 2020 *NOVEMBER 2020*

INSTRUCTION / *ARAHAN:*

1. The question paper consists of **2 PARTS**: A and B.
   *Kertas soalan terdiri daripada**2 BAHAGIAN**: A dan B.*

2. Answer **ALL** questions and write your answers on the answer sheet.
   *Jawab **SEMUA** soalan dan tulis jawapan anda pada kertas jawapan.*

3. Write your name, matric no., identity card no., course code, course name, section no. and lecturer's name on the first page (in the upper left corner) and every page thereafter on the answer sheet.
   Tulis nama anda, no.matrik, no.kad pengenalan, kod kursus, nama kursus, no. seksyen dan nama pensyarah pada muka surat pertama (penjuru kiri atas) kertas jawapan dan pada setiap muka surat jawapan.

4. Each answer sheet must have a page number written at the bottom right corner.
   Setiap helai kertas jawapan mesti ditulis nombor muka surat pada bahagian bawah penjuru kanan.

5. Answers should be handwritten, neat and clear.
   Jawapan hendaklah ditulis tangan, kemas dan jelas menggunakan huruf cerai.

WARNING / *AMARAN*

Students caught copying / cheating during the examination will be liable for disciplinary actions and the faculty may recommend the student to be expelled from sitting for exam.
Pelajar yang ditangkap meniru / menipu semasa peperiksaan akan dikenakan tindakan disiplin dan pihak fakulti boleh mengesyorkan pelajar diusir dari menduduki peperiksaan.

This examination paper consists of **11** pages including the cover.
*Kertas soalan ini mengandungi **11** muka surat termasuk kulit hadapan.*

ONLINE EXAMINATION RULES AND REGULATIONS
PERATURAN PEPERIKSAAN SECARA DALAM TALIAN

1. Student must carefully listen and follow instructions provided by invigilator.
   Pelajar mesti mendengar dan mengikuti arahan yang diberikan oleh pengawas peperiksaan dengan teliti.

2. Student is allowed to start examination only after confirmation of invigilator if all needed conditions are implemented.
   Pelajar dibenarkan memulakan peperiksaan hanya setelah pengesahan pengawas peperiksaan sekiranya semua syarat yang diperlukan telah dilaksanakan.

3. During all examination session student has to ensure, that he is alone in the room.
   Semasa semua sesi peperiksaan pelajar harus memastikan bahawa dia bersendirian di dalam bilik.

4. During all examination session student is not allowed to use any other devices, applications except other sites permitted by course lecturer.
   Sepanjang sesi peperiksaan pelajar tidak dibenarkan menggunakan peranti dan aplikasi lain kecuali yang dibenarkan oleh pensyarah kursus.

5. After completing the exam student must inform invigilator via the set communication platform (eg. WhatsApp etc.) about completion of exam and after invigilatorôs confirmation leave examination session.
   Selepas peperiksaan selesai, pelajar mesti memaklumkan kepada pengawas peperiksaan melalui platform komunikasi yang ditetapkan (contoh: Whatsapp dan lain-lain) mengenai peperiksaan yang telah selesai dan meninggalkan sesi peperiksaan selepas mendapat pengesahan daripada pengawas peperiksaan.

6. Any technical issues in submitting answers online have to be informed to respective lecturer within the given 30 minutes. Request for re-examination or appeal will not be entertain if complains are not made by students to their lecturers within the given 30 minutes.
   Sebarang masalah teknikal dalam menghantar jawapan secara dalam talian perlu dimaklumkan kepada pensyarah masing-masing dalam masa 30 minit yang diberikan. Permintaan untuk pemeriksaan semula atau rayuan tidak akan dilayan sekiranya aduan tidak dibuat oleh pelajar kepada pensyarah mereka dalam masa 30 minit yang diberikan.

7. During online examination, the integrity and honesty of the student is also tested. At any circumstances student is not allowed to cheat during examination session. If any kind of cheating behaviour is observed, UTM have a right to follow related terms and provisions stated in the respective Academic Regulations and apply needed measures.
   Semasa peperiksaan dalam talian, integriti dan kejujuran pelajar juga diuji. Walau apa pun keadaan pelajar tidak dibenarkan menipu semasa sesi peperiksaan. Sekiranya terdapat sebarang salah laku, UTM berhak untuk mengikuti terma yang dinyatakan dalam Peraturan Akademik.

SECTION A/ BAHAGIAN A (20 marks / *markah***)**

Answer ALL questions in this section / *Jawab SEMUA soalan dalam bahagian ini.*

1. **A sample of oil has a density of 0.85g/milileter.**
   (a) Change this density into kg/m^3.
   (b) Given that 1 gallon = 3.8754liter. What is the mass of 3.00 barrels of oil in kg if a barrel of oil is 42.0 gallons.

   Satu sampel minyak mempunyai ketumpatan 0.85g/mililiter.
   (a) Tukarkan unit ketumpatan kepada kg/m^3.
   (b) Diberi 1 gelen = 3.8754 liter. Apakah jisim 3.0 tong minyak dalam unit kg jika 1 tong minyak bersamaan dengan 42.0 gelen.

2. **What is the velocity of airplane B relative to airplane A? Sketch appropriate diagram to find the difference between both vectors. Given that V_A = 500km/h and V_B =700km/h.**

   Apakah halaju kapalterbang B relative kepada kapalterbang A? Lakarkan rajah yang sesuai untuk mencari perbezaan diantara kedua-dua vektor. V_A = 500km/j dan V_B =700km/j

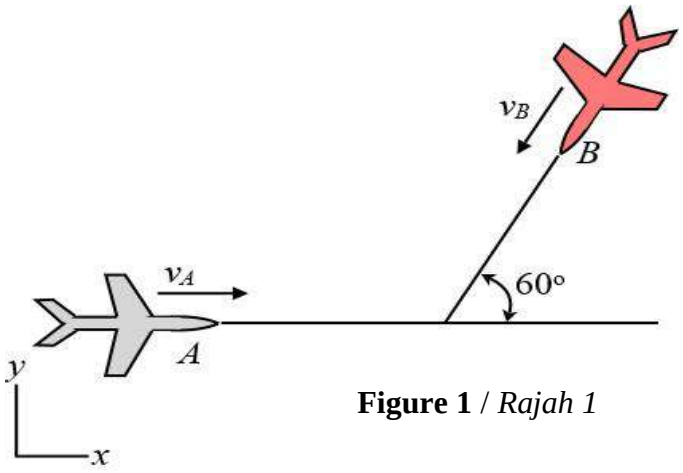


Figure 1 / *Rajah 1*

3. **State the difference between elastic and inelastic collisions**

   Nyatakan perbezaan antara pelanggaran elastic dan pelanggaran tidak elastic.

4. **Which one pulls stronger force? Earth pulling the moon or the moon pulling the Earth? Which one has higher centipetal acceleration?**
Mana satu yang tarik lebih kuat? Bumi tarik bulan atau Bulan tarik bumi? Mana satu yang lebih tinggi pecutan memusatnya?

5. **Satellite in geostationary orbits (*T*, period =24 hours) around the Earth is always seen as stationary (not moving) when observed from the Earth's surface. Explain why it does not fall and hit the Earth surface due to the pull of gravity.**
Satelit dalam orbit pegunbumi mengelilingi bumi (T, tempuh =24 jam) adalah sentiasa dalam keadaan pegun (tidak bergerak) bila diperhatikan dari permukaan bumi. Terangkan mengapa ia tidak jatuh dan menghentam bumi disebabkan tarikan graviti.

6. **Explain the meaning of phase difference between 2 particles oscillating with a tranverse wave. What are the meaning of in-phase and out of phase?**
Terangkan maksud beza fasa di antara dua zarah-zarah dalam gelombang melintang. Apakah maksud sama fasa dan fasa bertentangan.

7. **State two differences between light waves and sound waves.**
Nyatakan perbezaan di antara gelombang cahaya dan gelombang bunyi.

8. **Graph in Figure 2 shows displacements of particles of medium in a transverse wave versus the distance from the source at points labeled A, C, D, E, F, G and R.**
Graf dalam Rajah 2 menunjukkan sesaran zarah-zarah medium dalam gelombang melintang melawan jarak dari punca gelombang bagi titik kedudukan yang berlabel A, C, D, E, F, G dan R.

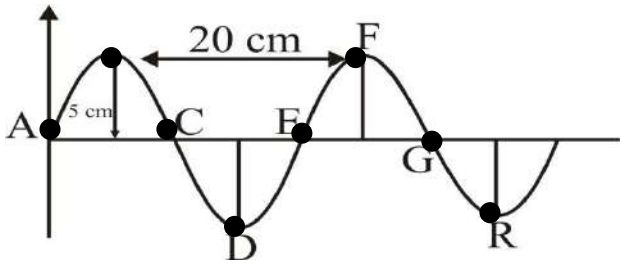


Figure 2 / *Rajah 2*

Which particles have

(a) maximum velocity

(b) maximum acceleration

(c) vibrate with the same phase

(d) vibrate with opposite phase

Manakah zarah-zarah yang

(a) mempunyai laju maksima.

(b) mempunyai pecutan maksima.

(c) berayun dengan fasa yang sama.

(d) berayun dengan fasa yang bertentangan.

9. A body moves with Simple Harmonic Motion in a straight line. The relationship between its acceleration and its displacement in one complete oscillation is shown in Figure 3. Find its

(a) amplitude

(b) **Frequency**

Sebuah jasad bergerak dengan Gerakan Harmonic Mudah pada garis lurus. Hubungan antara pecutan jasad dan sesarannya dalam satu kitaran lengkap ditunjukkan dalam Rajah 3. Dapatkan

(a) amplitudnya

(b) frekuensinya

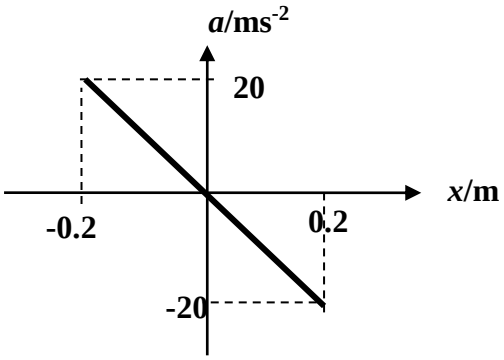


Figure 3/ *Rajah 3*

10. If we spin a bucket filled with water fast enough in a vertical cycle, the water stays in the bucket and will not spilt. Explain why.

Jika kita pusingkan baldi yang penoh air dengan cukup laju, air akan tetap dalam baldi dan tidak tumpah. Terangkan mengapa.

END OF SECTION A/*BAHAGIAN A TAMAT*

SECTION B / *BAHAGIAN B* (40 marks / *markah*)

Answer ALL questions / *Jawab SEMUA) soalan.*

1. **Graph in Figure 4 shows velocity-time graph of a body moves in 5 seconds interval.**
   (a) Calculate the total distance and the total displacement of the body
   (b) At what time the body stop and turn back?
   (c) The body decelerates two times. Calculate the larger deceleration.

   Graf dalam Rajah 4 menunjukkan halaju-masa gerakan suatu jasad dalam sela masa 5 saat.
   (a) Kirakan jumlah jarak dan jumlah sesaran jasad dalam tempoh ini
   (b) Bilakah masanya jasad berhenti dan berpatah balik?
   (c) Jasad menyahpecut 2 kali. Kirakan nilai nyahpecutan yang lebih besar.

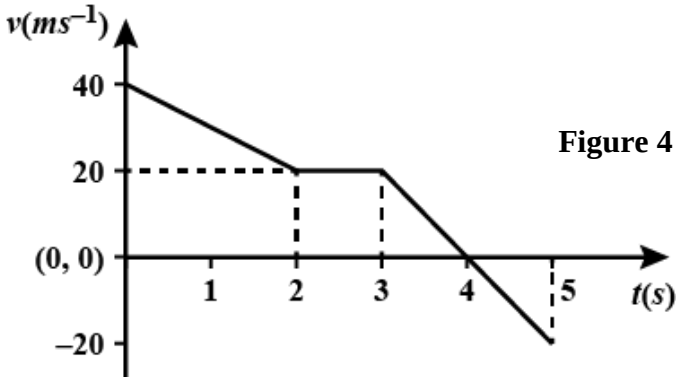


Figure 4 / *Rajah 4*

2. **A canon fires a cannon bullet from a cliff 60m high and landed at bottom of cliff as shown in Figure 5. Determine**
   (a) time of flight, t
   (b) horizontal distance *x*.
   (c) the highest height attained.
   (d) velocity at which the ball hit the ground.

   Sebuah Meriam menembak peluru Meriam dari sebuah cerun setinggi 60m seperti yang di tunjukkan dalam Rajah 5. Tentukan,
   (a) masa penerbangan,
   (b) jarak mengufuk x,
   (c) ketinggian maksima yang dicapai.
   (d) halaju ketika bola menghentam bumi.

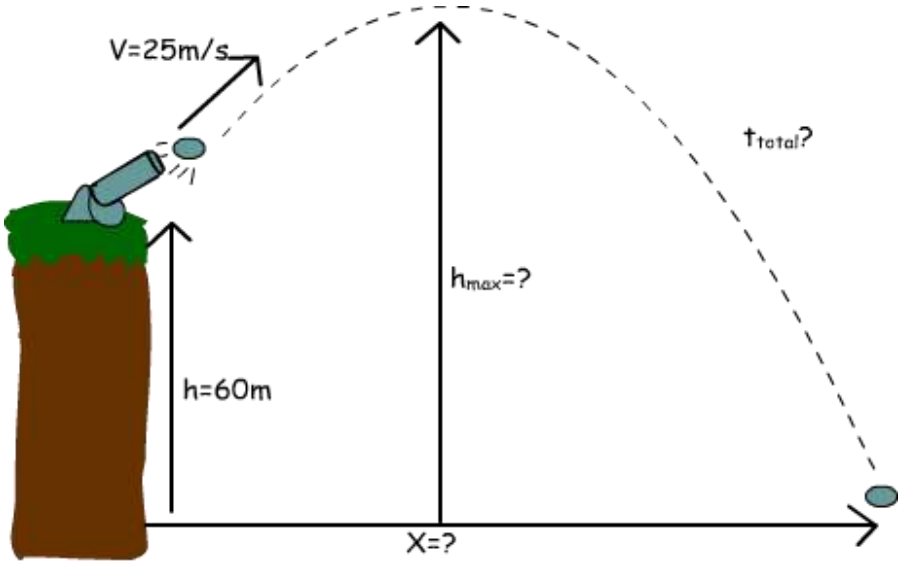


Figure 5 / *Rajah 5*

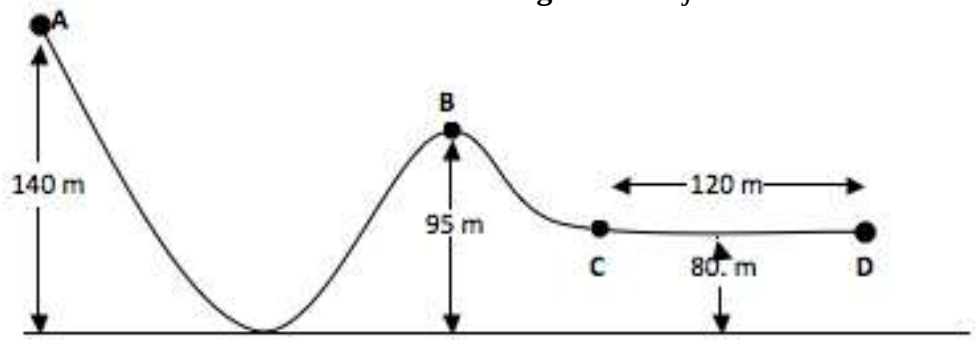
4. (a) An steel ball has a velocity 2m/s when it is at 140m above the ground at point A in Figure 6. What are its velocities at position B and C? Assume that the track is partly smooth up to point C and there is no energy loss.

(b) The ball continues its journey to position D but the track is not smooth and finally stop due to friction. Determine the value of the deceleration.

(a) Sebuah bola logam mempunyai halaju 2m/s pada kedudukan 140m dari bumi pada titik A dalam Rajah 6. Apakah halajunya pda titik-titik B dan C? Anggapkan landasan adalah licin sehingga titik C dan tiada kehilangan tenaga berlaku.

(b) Bola tersebut meneruskan perjalanannya ke titik D dimana trek tidak lagi licin dan akhirnya ia berhenti kerana geseran. Tentukan nilai nyahpecutan ini.

Figure 6 / *Rajah 6*



5. A body of mass 0.3 kg is taken up an inclined plane length 10 m and height 5 m, and then allowed to slide down the bottom again as shown in Figure 7. The coefficient of friction between the body and the plane is 0.15. What is the

(a) work done by gravitational force?

(b) work done by the applied force over the upward journey?

(c) work done by the frictional force over the round trip?

(d) kinetic energy of the body at the end of trip at the bottom of the incline plane?

Sebuah jasad berjisim 0.3kg dinaikkan atas satu satah condong sepanjang 10m dan kemudian dibiarkan untuk mwngelongsur ke bawah semul seperti yang ditunjukkan dalam Rajah 7. Pekali geseran bagi jasad dan satah adalah 0.15. Apakah

(a) yang dilakukan oleh daya graviti naik dan turun?

(b) yang dilakukan oleh daya luar untuk naik?

(c) yang dilakukan oleh daya geseran turun dan naik?

(d) tenaga kinetik di penghujung perjalanan di bahagian bawah satah condong?

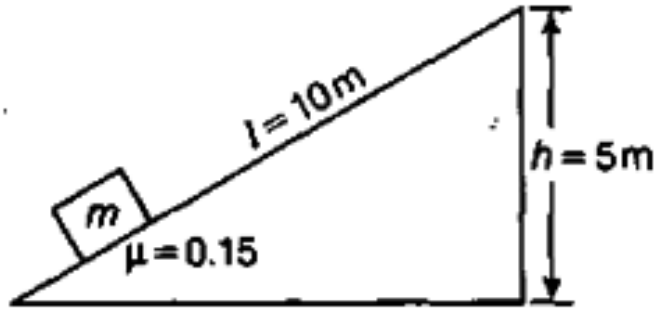


Figure 7 / *Rajah 7*

5. (a) Determine the orbital speed and period for the International Space Station (ISS) that orbits 4.00 x 10^2 km above Earth's surface. Refer to Figure 8.

(b) Satellite named Soyuz is sent to ISS from the Earth's surface. What is the change in potential energy of Soyuz? Given that the mass of Soyuz is 380,000kg and G = 6.67 x 10^{-11} Nm^2/kg^2, calculate the kinetic energy of Soyuz in orbit.

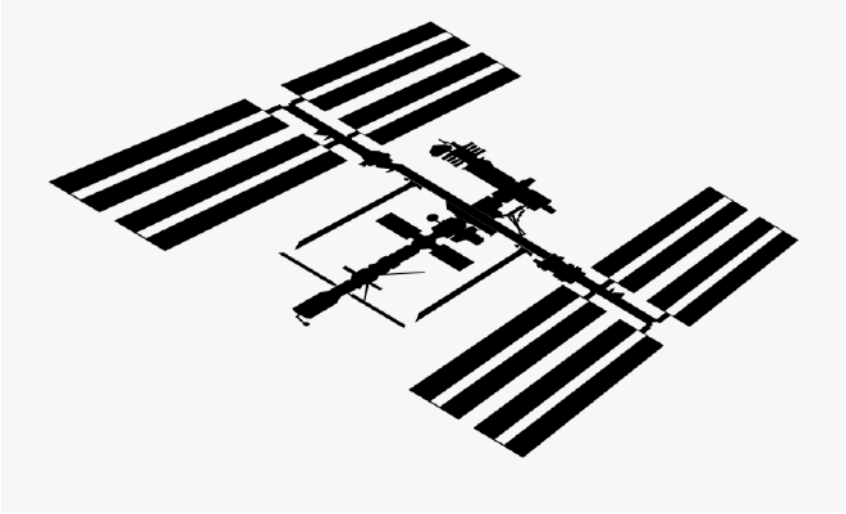
(c) Four billion years from now, our galaxy, the Milky Way, will collide and combined with our neighboring galaxy, Andromeda. Refer to Figure 4. Before that happen, both galaxies will orbits around each other. Assume that the mass

of each galaxy is 800solar masses and their centers are separated by 2.5million light years, what would their velocity and their orbital period would be? Given that 1 solar mass is 1.898 x 10^{30} kg = mass of our sun and 1ly =9.46 x 10^{15}m.

(a) Tentukan laju dan tempoh Stesen Angkasa Antarabangsa (ISS) yang mengorbit 4×10^{2} *km dari permukaan Bumi. Rujuk Rajah 8.*

(b) Roket Russia, Sayuz dihantar ke ISS dari permukaan bumi. Kirakan perubahan tenaga potensi dan kirakan tenaga kinetic Soyuz. Diberi jisim soyuz adalah 380,000kg dan G = 6.67 x 10^{-11} Nm^2/kg^2

(c) Empat juta tahun dari sekarang, galaksi kita Bima Sakti akan berlanggar dan bersatu dengan galaksi jiran Andromeda. Sebelum ini berlaku, kedua-dua galaksi akan menghampiri dan mengorbit satu sama lain. Apakah laju mengorbit dan tempoh mereka Anggapkan bahawa jisim tiap satu galaksi adalah 800 million jisim matahari, Diberi jisim matahari adalah1.898 x 10^{30} kg dan 1 tahun cahaya=9.46 x 10^{15}m.



INTERNATIONAL SPACE STATION (ISS)/ *STESEN ANGKASA ANTARABANGSA (SAA)*

Figure 8 / *Rajah 8*

6. A mass 0.230kg oscillate left and right on a frictionless surface with a frequency of 2.0Hz as shown in Figure 9. Its position at certain time is given by $x(t) = 0.08\sin(\omega t)$ **and the velocity is given by** $v(t) = 0.08\omega\cos(\omega t)$

(a) What is the angular velocity ω?

(b) Calculate the maximum velocity and maximum acceleration

(c) Sketch a graph of elastic potential energy as a function of time and a graph of kinetic energy versus distance?

(d) What is the total energy of the system?

Jisim 0.230kg bergetar kanan dan kiri di atas satah licin dengan frekuensi 20Hz seperti dalam Rajah 9. Kedudukannya pada masa tertentu di berikan oleh persamaan $x(t) = 0.08\sin(\omega t)$ *dan halajunya oleh* $v(t) = 0.08\omega\cos(\omega t)$

(a) Apakah nilai ω?

(b) Kirakan nilai pecutan dan laju maksimun.

(c) Apakah nilai jumlah tenaga bagi sistem ini?

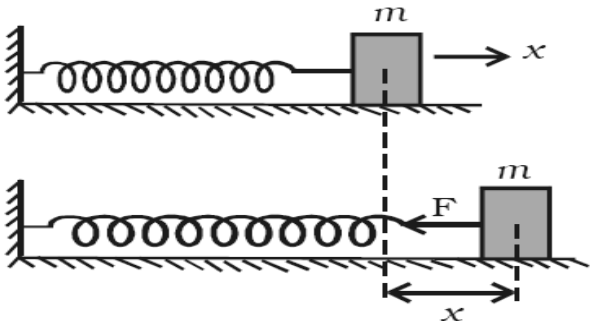


Figure 9 / *Rajah 9*

QUESTIONS END / *SOALAN-SOALAN TAMAT*

SELECTED FORMULA/ *RUMUS TERPILIH*

KINEMATICS

$$v = u + at$$
$$v^2 = u^2 + 2aS$$
$$S = ut + \frac{1}{2}at^2$$
$$S = \frac{1}{2}(u + v)t$$

FREE FALL

$$v = u + gt$$
$$v^2 = u^2 + 2gH$$
$$H = ut + \frac{1}{2}gt^2$$
$$H = \frac{1}{2}(u + v)t$$

MOMENTUM

$$F = \frac{m(v-u)}{t} = ma$$
$$P = mv$$
$$I = Ft = mv - mu$$

SATELLITE

$$P.E. = \frac{Gm_1m_2}{r_{12}}$$
$$K.E. = \frac{Gm_1m_2}{2r_{12}}$$

PROJECTILE

$$v_y = u_y + at$$
$$v_y{}^2 = u_y{}^2 + 2gY$$
$$Y = u_yt + \frac{1}{2}gt^2$$
$$Y = \frac{1}{2}(u_y + v_y)t$$
$$X = u_xt$$
$$u_x = v_x$$
$$T = \frac{2u\sin\theta}{g}$$
$$R = \frac{2\sin 2\theta}{g}$$

GRAVITATION

$$E = \frac{GM}{r^2}$$
$$F = \frac{Gm_1m_2}{r^2}$$
$$M = \frac{r^3}{G}\left(\frac{2\pi}{T}\right)^2$$
$$T = 2\pi\sqrt{\frac{r^3}{GM}}$$
$$r = \sqrt[3]{\frac{GM}{\omega}} = \sqrt[3]{\frac{T^2GM}{4\pi^2}}$$
$$r_{altitude} = r - R_{Earth}$$

CIRCULAR MOTION AND SHM

$$s = r\theta$$
$$v = r\omega = \frac{2\pi r}{T}$$
$$a_c = r\omega^2 = \frac{v^2}{r}$$
$$\omega = 2\pi f = \frac{2\pi}{T}$$
$$W = mg$$
$$V_{max} = \pm\omega A$$
$$a_{max} = \pm\omega^2 A$$
$$KE_{maz} = \frac{1}{2}m\omega^2A^2$$

$$a = -\omega^2x, k = m\omega^2$$
$$f = \frac{1}{T}, T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{l}{g}}$$
$$v = \pm\omega\sqrt{A^2 - x^2}$$
$$x = A\sin(\omega t \pm \Phi)$$
$$v = A\omega\cos(wt \pm \Phi)$$
$$a = -A\omega^2\sin(\omega t \pm \Phi)$$
$$E_{total} = \frac{1}{2}m\omega^2A^2$$
$$KE = \frac{1}{2}m\omega^2(A^2 - x^2)$$
$$PE = \frac{1}{2}m\omega^2x^2$$

WORK & ENERGIES

$$KE = \frac{1}{2}mv^2$$
$$GPE = mgh$$
$$EPE = \frac{1}{2}kx^2$$
$$work = F \times d \times \cos\theta$$
$$power = \frac{energy}{time}$$
$$power = \frac{work}{time} = \frac{Fd\cos}{t}$$
$$power = Fv\cos\theta$$

WAVES

$$v = f\lambda$$
$$k = \frac{2\pi}{\lambda}$$
$$\Phi = \frac{2\pi x}{\lambda}$$
$$x = A\sin(\omega t \pm kx \pm \Phi)$$
$$v = A\omega\cos(wt \pm kx \pm \Phi)$$
$$a = -A\omega^2\sin(\omega t \pm kx \pm \Phi)$$
$$v_d = \frac{I}{neA}$$

ELECTROSTATICS

$$F = \frac{kq_1q_2}{r^2} = qE$$
$$E = \frac{kq_1}{r^2}$$
$$U = \frac{W}{q} = \frac{kq}{r}$$
$$C = \frac{Q}{V} = \frac{\varepsilon A}{d} = \frac{\varepsilon_r\varepsilon_0A}{d}$$
$$Energy = \frac{1}{2}CV^2 = \frac{1}{2}QV = \frac{1}{2}\frac{Q^2}{C}$$
$$R = \frac{\rho l}{A},$$
$$V = IR,$$
$$Power = I^2R = \frac{V^2}{R} = IV$$