Bab / *Chapter* 3 : Kegravitian / *Gravitation*

1 Which of the following statement is correct about the gravitational forces acting on earth and moon ?
[Gravitational force of the earth against the moon = F_E]
[Gravitational force of the moon against the earth = F_M]

Pernyataan yang manakah adalah betul mengenai daya-daya graviti yang bertindak pada bumi dan bulan?
[*Daya graviti bumi terhadap bulan* = F_B]
[*Daya graviti bulan terhadap bumi* = F_M]

A $F_E > F_M$

B $F_E < F_M$

C $F_E \geq F_M$

D $F_E = F_M$

2 Given that the radius of the earth is R and the escape velocity on the surface of the earth is 11 kms^{-1}.
What is the escape velocity at the height of 0.5R from the surface of the earth ?

Diberi jejari bumi ialah R *dan halaju lepas di permukaan bumi ialah* 11 kms^{-1}.
Berapakah halaju lepas pada ketinggian 0.5R *dari permukaan bumi* ?

Hint / *Petua* :

$$v = \sqrt{\frac{2GM}{r}}$$

v = escape velocity / *halaju lepas*
G = gravitational constant / *pemalar kegravitian*
R = distance from the centre of the earth / *jarak dari pusat bumi*
M = mass of Earth / *jisim Bumi*

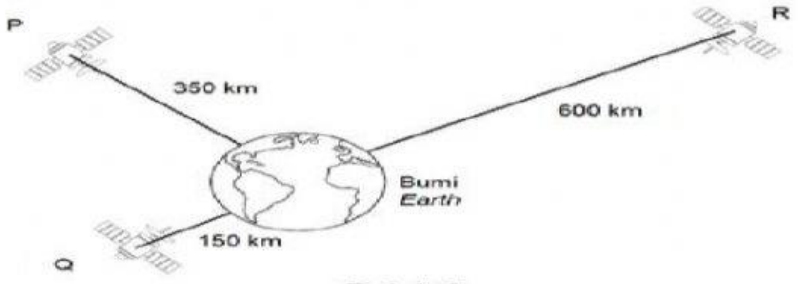
A 9.0 kms^{-1}

B 8.0 kms^{-1}

C 7.0 kms^{-1}

D 6.0 kms^{-1}

3 Rajah 3 menunjukkan 3 buah satelit yang sama P, Q dan R yang berada pada ketinggian yang berbeza dari permukaan Bumi.
Diagram 3 shows three identical satellites P, Q and R which are located at different height from the Earth's surface.

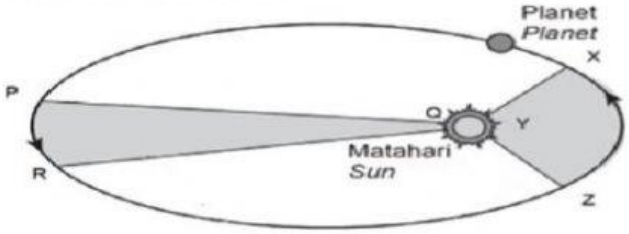


Rajah 3
Diagram 3

Yang manakah menunjukkan perbandingan yang betul?
Which one shows the correct comparison?

	Daya gravity, F *Gravitational Force, F*	Pecutan graviti, g *Acceleration due to gravity, g*
A	P > Q > R	P < Q < R
B	P < Q > R	P < Q > R
C	P < Q < R	P > Q > R
D	P > Q < R	P > Q < R

4 Rajah 4 menunjukkan luas yang dicakup dalam masa yang sama di kawasan PQR dan XYZ bagi suatu planet yang berputar mengelilingi Matahari.
Diagram 4 shows the area covered at the same time in the regions PQR and XYZ of a planet rotating around the Sun.

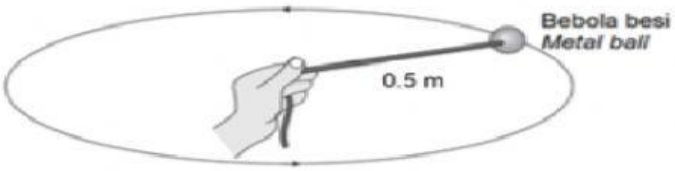


Rajah 4
Diagram 4

Antara berikut yang manakah benar tentang luas PQR dan XYZ?
Which of the following is true about area of PQR and XYZ?

A PQR = XYZ
B PQR > XYZ
C PQR < XYZ
D PQR ≤ XYZ

5 Rajah 5 menunjukkan sebiji bebola besi berjisim 0.2 kg diikat pada hujung tali yang diputarkan secara mengufuk oleh seorang pelajar. Jejari bulatan ialah 0.5 m.
Diagram 5 shows a metal ball of mass 0.2kg tied to the end of a string that is spin horizontally by a student. Radius of the circle is 0.5 m.



Rajah 5
Diagram 5

Jika bebola besi itu berputar dengan kelajuan malar 4 m s^{-1}, hitungkan daya memusat.
If the metal ball rotates at constant speed 4 m s^{-1}, calculate the centripetal force.

A 6.25 N
B 6.40 N
C 1600 N
D 6400 N

6 Pecutan graviti di permukaan Bumi ialah g dan dan jejari Bumi ialah R. Pada jarak berapakah pecutan graviti dari permukaan bumi adalah $\frac{1}{4}$ g?

The gravitational acceleration on the surface of the Earth is g and the radius of the Earth is R.
At what distance is the acceleration of gravity from the earth's surface $\frac{1}{4}$ *g?*

A. $\frac{1}{4}$ R dan *and* 2R
B $\frac{1}{4}$ R dan *and* 4R
C. $\frac{1}{2}$ R dan *and* 2R

7 Halaju lepas dari permukaan sebuah planet bergantung kepada
The escape velocity from the surface of a planet depends on

A. Jejari planet tersebut sahaja
the radius of the planet only
B Jisim planet tersebut sahaja
the mass of the planet only
C. Jejari dan jisim planet tersebut
the radius and the mass of the planet
D. Kekuatan medan gravity di permukaan planet tersebut sahaja
the gravitational field strength at the surface of the planet only

8 A radar imaging satellite orbits around the earth at a height 500 km. what is the value of gravitational acceleration at the position of the satellite?
$[G=6.67\times10^{-11}\,Nm^2kg^{-2}, R=6.37\times10^6\,m, M=5.97\times10^{24}kg]$

A $9.81\,ms^{-2}$ C $8.15\,ms^{-2}$
B $9.50\,ms^{-2}$ D $8.44\,ms^{-2}$

9 Diagram 6 shows some planets in solar system.

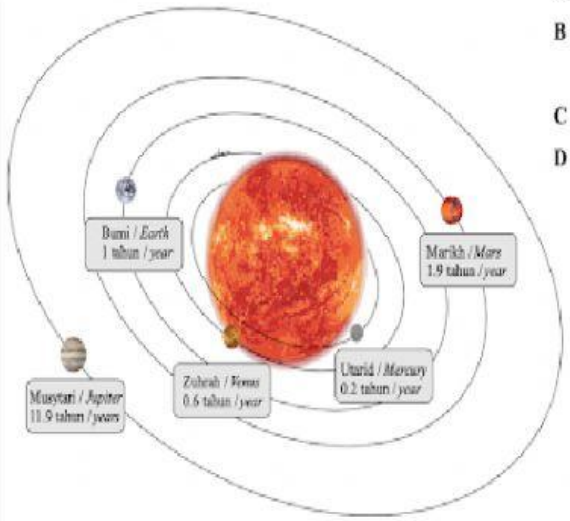


Diagram 6

From Diagram 6, what is the conclusion can be made?

A Radius of orbit is directly proportional with orbital period of planets.
B The square of radius of orbit is directly proportional with the cube orbital period of planets.
C The greater the size of planet, the greater the period of orbit.
D The cube of radius of orbit is directly proportional with the square orbital period of planets.

10 Which of the following statements are correct about geostationary satellite?

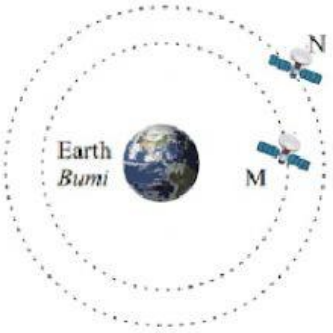
I	Orbital period is 24 hours
II	Above the same geographical location
III	Used in earth imaging, GPS and weather forecast
IV	Direction of motion same as direction of earth rotation

A I, II, III
B I, II, IV
C I, III, IV
D II, III, IV

11 **Berat seketul batu di Bumi adalah 19.62 N, berapakah beratnya di Bulan? Kekuatan medan graviti Bulan adalah 1.64 Nkg $^{-1}$.**
Weight of a stone on Earth is 19.62 N, what is the weight on the Moon?
The Moon gravitational field strength is 1.64 Nkg $^{-1}$.

A 3.28 N
B 6. 56 N
C 12.08 N
D 17.98 N

12 Rajah 4 menunjukkan dua satelit, M dan N, dalam orbit yang berlainan mengelilingi Bumi. Orbit N terletak lebih jauh dari Bumi berbanding orbit M.
Diagram 4 shows two satellites, M and N, in different orbits around the Earth. The orbit of N is located further from the Earth than the orbit of M.



Rajah 4
Diagram 4

Antara perbandingan berikut, yang manakah **betul**?
*Which of the following comparison is **true**?*

A Pecutan graviti pada N > Pecutan graviti pada M
Gravitational acceleration on N > Gravitational acceleration on M
B Daya memusat pada N > Daya memusat pada M
Centripetal force on N > Centripetal force on M
C Tempoh orbit N > Tempoh orbit M
Orbital period of N > Orbital period of M
D Halaju mengorbit bagi N > Halaju mengorbit bagi M
Orbiting velocity of N > Orbiting velocity of M

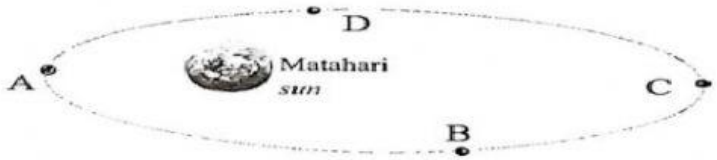
13 Apakah yang menyebabkan pergerakan Bulan pada orbitnya?
What is the reason for the motion of the Moon on its orbit?

A Daya graviti yang dikenakan oleh Matahari.
The gravitational force exerted by the Sun.
B Daya graviti yang dikenakan oleh planet-planet.
The gravitational force exerted by the Planets.
C Daya graviti yang dikenakan di Bumi oleh Bulan.
The gravitational force exerted on the Earth by the Moon.
D Daya graviti yang dikenakan pada Bulan oleh Bumi.
The gravitational force exerted on the Moon by the Earth.

14 Tempoh satelit di orbit bulatan berjejari R adalah T. Tempoh satelit lain dalam orbit bulat berjejari 4R adalah
The period of a satellite in a circular orbit of radius R is T. The period of another satellite in circular orbit of radius 4R is

A 8T
B 2T
C ¼T
D ½T

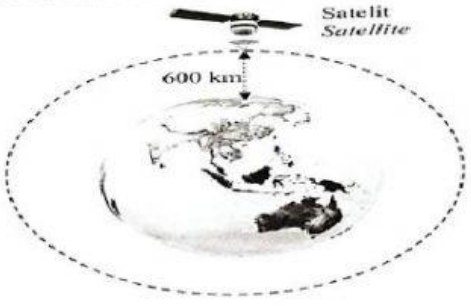
15 Rajah 4 menunjukkan empat kedudukan bagi sebuah planet yang bergerak mengelilingi Matahari mengikut orbit berbentuk elips.
Diagram 4 shows four positions of a planet that are moving around the Sun in an elliptical orbit.



Rajah 4
Diagram 4

Pada kedudukan manakah **A**, **B**, **C** dan **D**, halaju planet tersebut adalah maksimum?
*At which position, **A**, **B**, **C** or **D**, the velocity of the planet is maximum?*

16 Rajah 5 menunjukkan sebuah satelit sedang mengorbit Bumi pada ketinggian 600 km.
Diagram 5 shows a satellite orbiting the Earth at a height of 600 km.



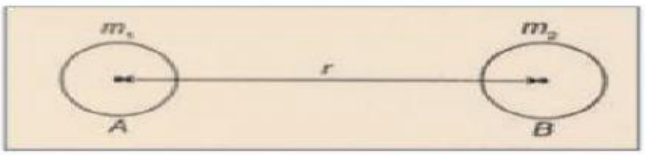
Rajah 5
Diagram 5

Hitungkan halaju linear satelit tersebut.
[Jejari Bumi = 6.37×10^6 m]
Calculate the linear velocity of the satellite.
[*Radius of Earth* = 6.37×10^6 m]

A 3.822×10^3 m s^{-1}
B 4.968×10^3 m s^{-1}
C 7.559×10^3 m s^{-1}
D 9.799×10^3 m s^{-1}

17 Rajah 4 menunjukkan dua jasad A dan B dengan jisim m_1 dan m_2 masing-masing. Jarak antara pusat keduanya ialah r dan daya graviti ialah F.

Diagram 4 shows two object A and B with mass m_1 and m_2 respectively. The distance between center of the objects is r and the gravitational force is F.



Rajah 4

Diagram 4

Daya F akan berkurang sekiranya

F will decrease if

A m_1 bertambah
m_1 increases

B m_2 bertambah
m_2 increases

C r bertambah
r increases

D r berkurang
r decreases

18 Rajah 5 menunjukkan seorang budak lelaki memusingkan seketul batu secara mengufuk.

Diagram 5 shows a boy whirling a stone horizontally.

Rajah 5

Diagram 5

Apakah yang berlaku kepada batu itu jika benang putus secara tiba-tiba?

What happen to the stone if the string suddenly breaks?

A Berpusing menjauhi budak lelaki itu.
Spiral away from his hand.

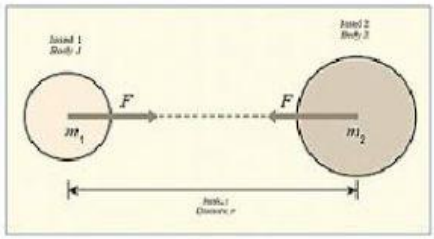
B Terbang terus menjauhi budak lelaki itu.
Fly directly away from the boy.

C Terbang terus mendekati budak lelaki itu.
Fly directly towards the boy.

D Terbang mengikut garis tangen lintasan bulatan.
Fly off and follow th tangent to its circular path.

19 Rajah 4 menunjukkan dua jasad A dan B dengan jisim m_1 dan m_2 masing-masing. Jarak antara pusat keduanya ialah *r* dan daya graviti ialah *F*.

Diagram 4 shows two objects A and B with mass m_1 and m_2 respectively. The distance between centre of the objects is r and the gravitational force is F.



Rajah 4

Diagram 4

Pernyataan yang manakah betul tentang daya graviti, *F*?

Which statement is correct about gravitational force, F?

I Daya graviti, *F* akan berkurang sekiranya hasil darab m_1 dan m_2 berkurang
Gravitational force, F decrease if the product of m_1 and m_2 decreases

II Daya graviti, *F* akan berkurang sekiranya hasil darab m_1 dan m_2 bertambah
Gravitational force, F decrease if the product of m_1 and m_2 increases

III Daya graviti, *F* akan bertambah sekiranya jarak, *r* berkurang
Gravitational force, F increases if distance, r decreases

A I dan II sahaja
I and II only

B I dan III sahaja
I and III only

C II dan III sahaja
II and III sahaja

20

Antara berikut yng manakah benar mengenai satelit geopegun?
Which of the following is true about geostationary satellite?

I Ia bergerak dalam arah yang sama dengan putaran bumi.
It moves in the direction of the earth orbit.

II Tempohnya putarannya satu hari.
Its period of rotation is one day.

III Orbitnya sentiasa atas Khatulistiwa Bumi.
Its orbit always above the Earth Equator.

IV Ia tidak mengalami sebarang tarikan graviti.
It does not experience any gravitational pull.

A I,II dan III sahaja
I, II and III only

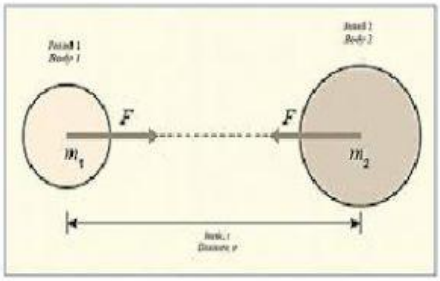
B I dan III sahaja
I and III only

C IV sahaja
IV only

D II dan IV sahaja
II and IV only

21

Rajah 4 menunjukkan dua jasad A dan B dengan jisim m_1 dan m_2 masing-masing. Jarak antara pusat keduanya ialah r dan daya graviti ialah F.
Diagram 4 shows two objects A and B with mass m_1 and m_2 respectively. The distance between centre of the objects is r and the gravitational force is F.



Rajah 4
Diagram 4

Pernyataan yang manakah betul tentang daya graviti, F?
Which statement is correct about gravitational force, F?

I Daya graviti, F akan berkurang sekiranya hasil darab m_1 dan m_2 berkurang
Gravitational force, F decrease if the product of m_1 and m_2 decreases

II Daya graviti, F akan berkurang sekiranya hasil darab m_1 dan m_2 bertambah
Gravitational force, F decrease if the product of m_1 and m_2 increases

III Daya graviti, F akan bertambah sekiranya jarak, r berkurang
Gravitational force, F increases if distance, r decreases

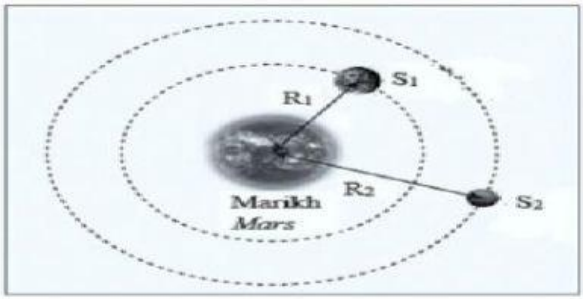
A I dan II sahaja
I and II only

B I dan III sahaja
I and III only

C II dan III sahaja
II and III sahaja

22

Rajah 5 menunjukkan dua buah satelit S_1 dan S_2 mengorbit Marikh dengan jejari orbit R_1 dan R_2 masing-masing.
Diagram 5 shows two satellites S_1 and S_2 and orbiting Mars with radius R_1 and R_2 respectively.



Rajah 5
Diagram 5

Berapakah nisbah bagi tempoh S_1 dan S_2 jika nisbah jejari orbit S_1 dan S_2 ialah 9:16?
What is the ratio of period S_1 and S_2 if the ratio of radius orbit S_1 and S_2 is 9:16 ?

A 729: 4096
B 81: 208
C 3: 4
D 27:64

23 Pernyataan yang manakah betul tentang satelit bukan geopegun?

Which statement is correct about non-geostationary satellite?

I Ia bergerak dalam arah yang sama dengan putaran bumi.
It moves in the direction of the earth orbit.

II Tempoh putarannya lebih pendek atau lebih panjang daripada 24 jam.
Its period of rotation is shorter or longer than 24 hours.

III Berada di atas tempat yang berubah-ubah di permukaan bumi.
Above different geographical location.

A	I dan II sahaja I *and* II *only*	B	I dan III sahaja I *and* III *only*	C	II dan III sahaja II *and* III *only*

24 Johannes Kepler berjaya merumuskan tiga hukum yang menghuraikan gerakan planet mengelilingi Matahari.
Johannes Kepler succeeded in formulating three laws that describe the movement of planets around the Sun.

"Kuasa dua tempoh planet adalah berkadar terus dengan kuasa tiga jejari orbitnya"
"The square of the period of a planet's orbit is directly proportional to the cube of the orbital's radius"

Hukum manakah merumuskan penyataan di atas?
Which law simplified the statement above?

A Hukum Kepler Pertama
Kepler's First Law
B Hukum Kepler Kedua
Kepler's Second Law
C Hukum Kepler Ketiga
Kepler's Third Law

25 Rajah 9 menunjukkan sebuah satelit geopegun sedang mengorbit Bumi.
Diagram 9 shows a geostationary satellite is orbiting the Earth.

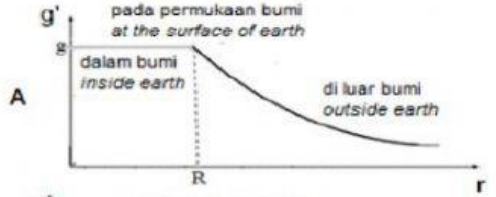
Rajah 9
Diagram 9

Pernyataan manakah yang **betul** mengenai satelit tersebut?
Which statement is correct about the satellite?

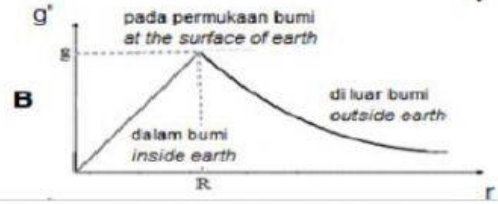
A Tempoh orbit satelit adalah melebihi 24 jam
The orbital period of the satellite is more than 24 hours
B Tempoh orbit satelit adalah kurang daripada 24 jam
The orbital period of the satellite is shorter than 24 hours
C Satelit mempunyai arah gerakan sama dengan arah putaran Bumi
The satellite has direction of motion same as the direction of Earth rotation
D Satelit berada di atas lokasi geografi yang berlainan pada masa berlainan
The satellite is above different geographical locations at different times

26 Graf yang manakah antara berikut menunjukkan perubahan pecutan disebabkan oleh graviti Bumi, g' dengan jarak dari pusat Bumi, r di mana g adalah pecutan graviti di permukan bumi.
Which of the following graphs shows the change in acceleration due to the Earth's gravity, g' with the distance from the Earth's center, r where g is the gravitational acceleration at the Earth's surface.

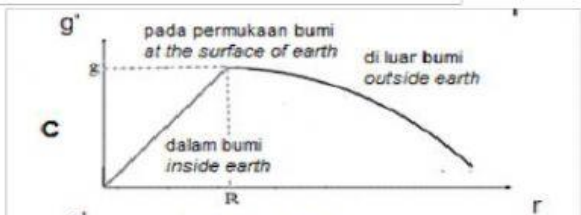
A



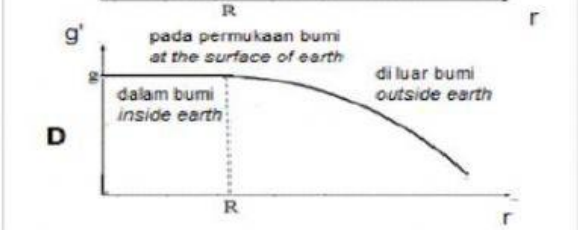
B



C



D



27 Satelit M adalah 4 kali lebih jauh dari planet berbanding satelit N. Apabila satelit M mengambil masa 20 minggu untuk mengorbit planet tersebut , berapa lamakah masa untuk satelit N mengorbit planet itu?
Satellite M is 4 times farther from the planet than satellite N. When satellite M takes 20 weeks to orbit the planet, how long does it take for satellite N to orbit the planet?

A 2 minggu
2 *weeks*

B 2.5 minggu
2.5 *weeks*

C 4 minggu
4 *weeks*

D 4.5 minggu
4.5 *weeks*

28 Halaju lepas dari bumi adalah 11.2 km s^{-1}. Planet lain mempunyai jisim 500 kali daripada jisim bumi dan jejari 20 kali daripada jejari bumi. Berapakah halaju lepas dari planet itu?
The velocity off the earth is 11.2 km s^{-1}. *Other planets have a mass* 500 *times the mass of the earth and a radius* 20 *times the radius of the earth. What is the escape velocity from the planet?*

A 2.24 km s^{-1}

B 11.2 km s^{-1}

C 55.9 km s^{-1}

D 280 km s^{-1}

29 Antara berikut, yang manakah boleh diaplikasikan oleh Hukum Kegravitian Semesta?
Which of the following can be applied by the Universal Law of Gravitation?

A Planet di sekitar Matahari
The planets around the Sun

B Bumi dan Bulan
The Earth and the Moon

C Bumi dan epal
The Earth and the apple

D Sebarang pasangan jasad
Any pair of bodies