Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Fields And Their Consequences(Gravitational Field)

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

The Moon orbits the Earth in 27 days.

What is the angular speed of the Moon's orbit?

A 4.3×10^{-7} rad s^{-1} ⬭
B 2.7×10^{-6} rad s^{-1} ⬭
C 3.7×10^{-2} rad s^{-1} ⬭
D 2.3×10^{-1} rad s^{-1} ⬭

(Total 1 mark)

Q2.

The radius of the Earth is R and the acceleration due to gravity at the surface of the Earth is g.

What is the escape velocity for a mass m at the surface of the Earth?

A $\sqrt{gR}$ ⬭
B $\sqrt{2gR}$ ⬭
C $\sqrt{2mgR}$ ⬭
D $\sqrt{\frac{2gR}{m}}$ ⬭

(Total 1 mark)

Q3.

A planet has a mass M and a radius R.
Loose material at the equator only just remains in contact with the surface of the planet.
This is because the speed at which the planet rotates is very large.

What is the period of rotation of the planet?

A $2\pi\sqrt{\frac{R^2}{GM}}$ ⬭

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B $2\pi\sqrt{\frac{GM}{R^2}}$ ⬭

C $2\pi\sqrt{\frac{R^3}{GM}}$ ⬭

D $2\pi\sqrt{\frac{GM}{R^3}}$ ⬭

(Total 1 mark)

Q4.

A planet of radius R and mass M has a gravitational field strength of g at its surface.

Which row describes a planet with a gravitational field strength of $4g$ at its surface?

	Radius of planet	Mass of planet	
A	$2R$	$2M$	⬭
B	$R\sqrt{2}$	$\frac{M}{2}$	⬭
C	$\frac{R}{\sqrt{2}}$	$\frac{M}{2}$	⬭
D	$\frac{R}{\sqrt{2}}$	$2M$	⬭

(Total 1 mark)

Q5.

Satellites **N** and **F** have the same mass and move in circular orbits about the same planet.
The orbital radius of **N** is less than that of **F**.

Which is smaller for **N** than for **F**?

A the gravitational force on the satellite ⬭

B the speed of the satellite ⬭

C the kinetic energy of the satellite ⬭

D the orbital period of the satellite ⬭

(Total 1 mark)

Q6.

The diagram shows gravitational equipotentials. Adjacent equipotentials are separated by an equal gravitational potential difference V.

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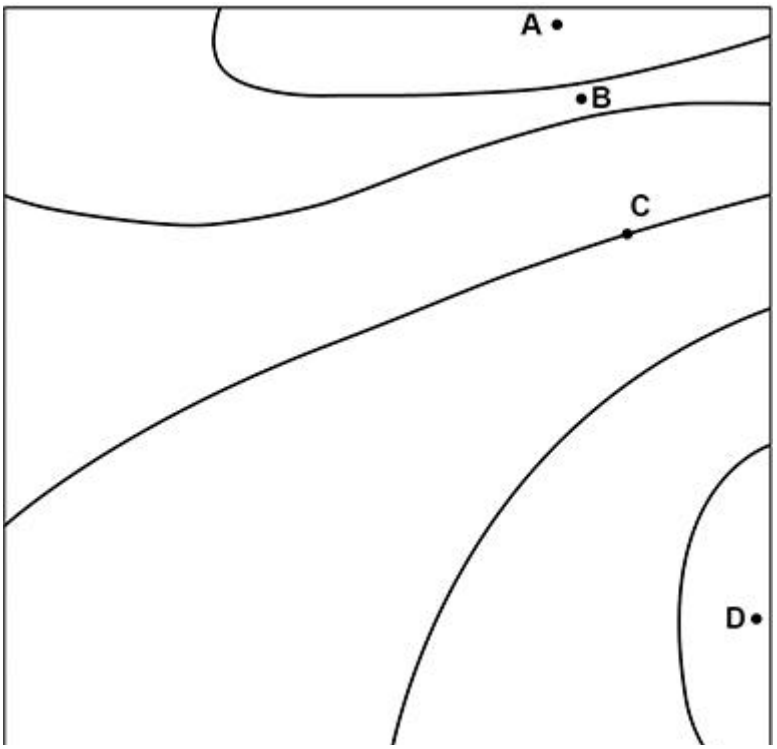

Which point has the greatest gravitational field strength?

A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Q7.

A planet has radius R and density ρ. The gravitational field strength at the surface is g.

What is the gravitational field strength at the surface of a planet of radius $2R$ and density 2ρ?

A $2g$ ⬭

B $4g$ ⬭

C $8g$ ⬭

D $16g$ ⬭

(Total 1 mark)

Q8.

The diagram shows equipotential lines for a uniform gravitational field. The lines are separated by 20 m.

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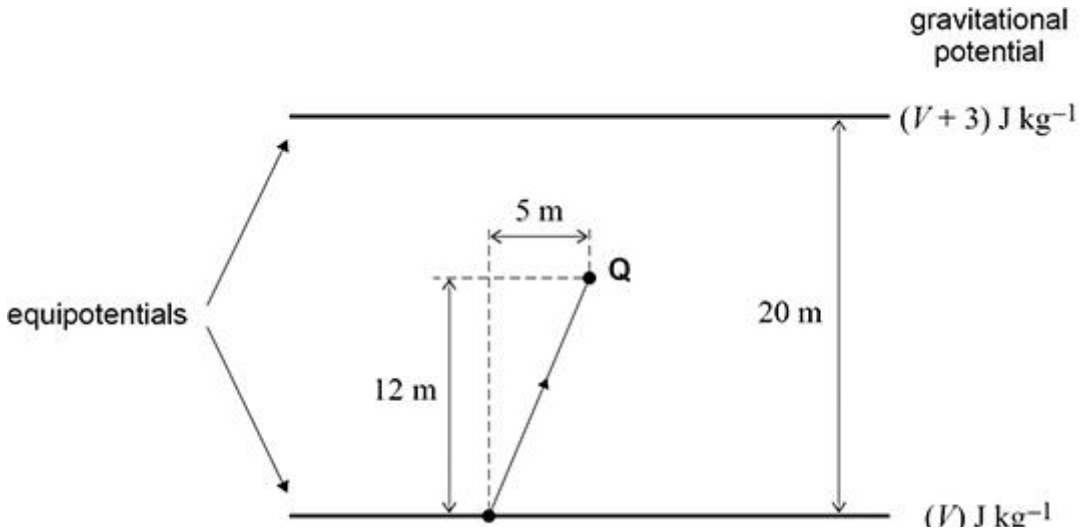


An object of mass 4 kg is moved from **P** to **Q**.

What is the work done against gravity to move the object?

A 7.2 J ⬭

B 7.8 J ⬭

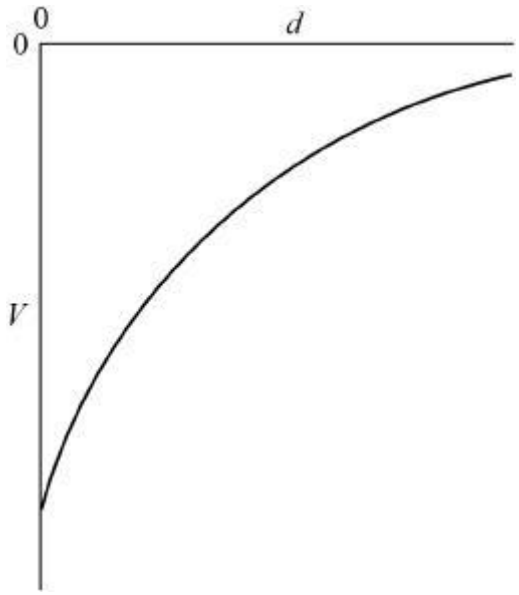
C 10.2 J ⬭

D 36 J ⬭

(Total 1 mark)

Q9.

The graph shows how the gravitational potential V varies with the vertical distance d from the surface of the Earth.



What does the gradient of the graph represent at the surface of the Earth?

A potential energy ⬭

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B mass of the Earth ⬭

C magnitude of the gravitational constant ⬭

D magnitude of the gravitational field strength ⬭

(Total 1 mark)

Q10.

What is the angular speed of a satellite in a geostationary orbit around the Earth?

A 1.2×10^{-5} rad s^{-1} ⬭

B 7.3×10^{-5} rad s^{-1} ⬭

C 4.4×10^{-3} rad s^{-1} ⬭

D 2.6×10^{-1} rad s^{-1} ⬭

(Total 1 mark)

Q11.

Which row shows two scalar quantities?

A	gravitational potential	gravitational field strength	⬭
B	mass	gravitational potential	⬭
C	gravitational field strength	weight	⬭
D	weight	gravitational potential	⬭

(Total 1 mark)

Q12.

What is the angular speed of a satellite in a geostationary orbit around the Earth?

A 1.2×10^{-5} rad s^{-1} ⬭

B 7.3×10^{-5} rad s^{-1} ⬭

C 4.2×10^{-3} rad s^{-1} ⬭

D 2.6×10^{-1} rad s^{-1} ⬭

(Total 1 mark)

Q13.

A planet of mass M and radius R rotates so quickly that material at its equator only just remains on its surface.

What is the period of rotation of the planet?

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A $2\pi\sqrt{\frac{R}{GM}}$ ⬭

B $2\pi\sqrt{\frac{GM}{R}}$ ⬭

C $2\pi\sqrt{\frac{R^3}{GM}}$ ⬭

D $2\pi\sqrt{\frac{GM}{R^3}}$ ⬭

(Total 1 mark)

Q14.

Satellites **N** and **F** have the same mass and are in circular orbits about the same planet.
The orbital radius of **F** is greater than that of **N**.

Which is greater for **F** than for **N**?

A gravitational force on the satellite ⬭

B angular speed ⬭

C kinetic energy ⬭

D orbital period ⬭

(Total 1 mark)

Q15.

An object moves freely at 90° to the direction of a gravitational field.

The acceleration of the object is

A zero. ⬭

B opposite to the direction of the gravitational field. ⬭

C in the direction of the gravitational field. ⬭

D at 90° to the direction of the gravitational field. ⬭

(Total 1 mark)

Q16.

The distance between the Sun and the Earth is 1.5×10^{11} m

What is the gravitational force exerted on the Sun by the Earth?

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A 3.5×10^{22} N ⬭

B 1.7×10^{26} N ⬭

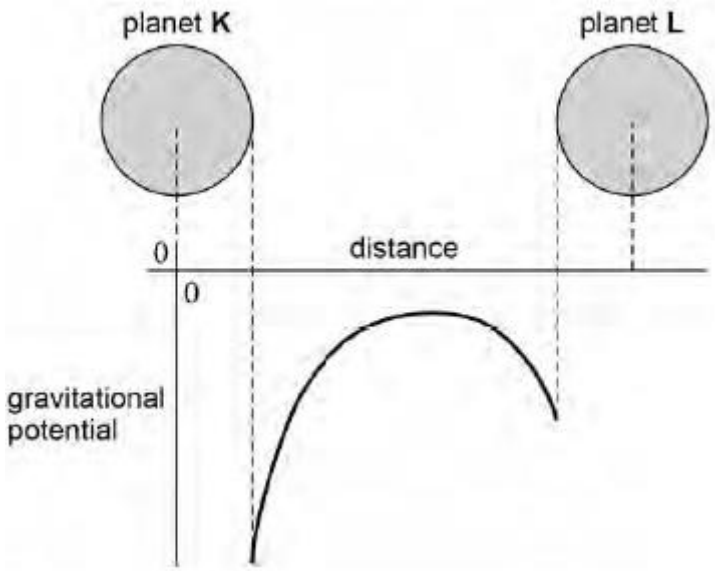
C 5.3×10^{33} N ⬭

D 8.9×10^{50} N ⬭

(Total 1 mark)

Q17.

The graph shows how the gravitational potential varies with distance between two planets, **K** and **L**, that have the same radius.



Which statement is correct?

A The mass of **L** is greater than the mass of **K**. ⬭

B The gravitational field strength at the surface of **L** is greater than that at the surface of **K**. ⬭

C The escape velocity from planet **L** is greater than that from planet **K**. ⬭

D More work must be done to move a mass of 1 kg from the surface of **K** to a distant point, than 1 kg from the surface of **L**. ⬭

(Total 1 mark)

Q18.

The diagram shows equipotential lines near a group of asteroids.

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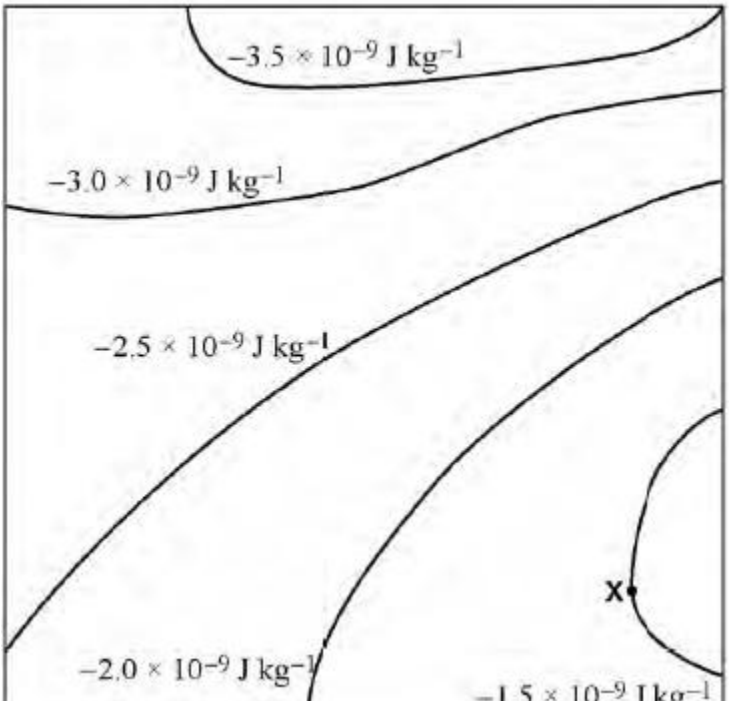

Which arrow shows the direction of the gravitational field at **X**?

A ↑ ⬭

B ↓ ⬭

C ← ⬭

D → ⬭

(Total 1 mark)

Q19.

Planet **N** has a gravitational potential $-V$ at its surface. Planet **M** has double the density and double the radius of planet **N**. Both planets are spherical and have uniform density.

What is the gravitational potential at the surface of planet **M**?

A $-16V$ ⬭

B $-8V$ ⬭

C $-4V$ ⬭

D $-0.2V$ ⬭

(Total 1 mark)

Q20.

A spacecraft of mass 1.0×10^6 kg is in orbit around the Sun at a radius of 1.1×10^{11} m
The spacecraft moves into a new orbit of radius 2.5×10^{11} m around the Sun.

What is the total change in gravitational potential energy of the spacecraft?

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A -6.76×10^{14} J ⬭

B -3.38×10^{14} J ⬭

C 3.38×10^{14} J ⬭

D 6.76×10^{14} J ⬭

(Total 1 mark)

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