Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 12_Gravatational Fields

Name of the Student:_____
Max. Marks : 11 Marks **Time : 11 Minutes**

Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The acceleration of free fall at the surface of the Earth is 9.81 m s^{-2}.
The mass of the Earth is *M* and the diameter of the Earth is *D*.

Which of the following gives the acceleration of free fall, in m s^{-2}, at the surface of a planet with diameter $\frac{D}{2}$ and mass $\frac{M}{9}$?

☐ **A** $\frac{9.81 \times 2}{9}$

☐ **B** $\frac{9.81 \times 4}{9}$

☐ **C** $\frac{9.81 \times 2}{3}$

☐ **D** $\frac{9.81 \times 9}{4}$

(Total for question = 1 mark)

Q2.

Electric and gravitational fields have a number of similarities and differences.

An electric field is produced by a point charge and a gravitational field is produced by a point mass.

Which of the following statements applies to both of these fields?

☐ **A** The field causes a force on all particles.

☐ **B** The force caused by the field can be attractive or repulsive.

☐ **C** At a distance *x* from the centre of the field, field strength is proportional to x^2.

☒ **D** At a distance *x* from the centre of the field, potential is proportional to 1/*x*.

(Total for question = 1 mark)

Q3.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Which of the following statements about the fields is **not** correct?

☒ **A** Field strength is a vector.

☒ **B** Potential is always less than 0.

☒ **C** Potential is proportional to $\frac{1}{\text{distance from proton}}$

☒ **D** Field strength is proportional to $\frac{1}{(\text{distance from proton})^2}$

(Total for question = 1 mark)

Q4.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

A particle P has charge and mass. The particle causes an electric field and a gravitational field.

Which of the following statements is correct, at a distance *r* from P?

☒ **A** gravitational field strength is proportional to $\frac{1}{r}$

☒ **B** electric field strength is proportional to $\frac{1}{r}$

☒ **C** gravitational potential is always positive

☒ **D** electric potential is proportional to $\frac{1}{r}$

(Total for question = 1 mark)

Q5.

The gravitational field strength at the surface of the Earth is 9.8 N kg^{-1}. A satellite is orbiting at a height above the ground equal to the radius of the Earth.

The gravitational field strength, in N kg^{-1}, at this height is

- **A** 0.0
- **B** 2.5
- **C** 4.9
- **D** 9.8

(Total for Question = 1 mark)

Q6.

Exoplanets are planets orbiting stars other than our own Sun. Most exoplanets discovered so far are giant planets similar to the planet Jupiter. The exoplanet Kepler-7b has a mass about 0.43 times the mass of Jupiter, and a radius about 1.6 times the radius of Jupiter.

Take the gravitational field strength at the surface of Kepler-7b to be g_K, and the gravitational field strength at the surface of Jupiter to be g_J.

The ratio $\frac{g_K}{g_J}$ is

- **A** 0.17
- **B** 0.27
- **C** 0.69
- **D** 1.1

(Total for question = 1 mark)

Q7.

Which of the following is **not** a similarity between gravitational fields and electric fields?

(1)

- **A** For a point charge or point mass, the field follows the inverse square law.
- **B** For a point charge or point mass, the field is radial.
- **C** Both fields act at a distance.
- **D** Both fields act on all particles.

(Total for question = 1 mark)

Q8.

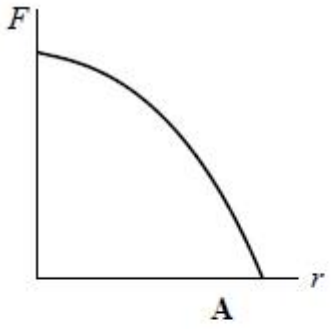
A small satellite has a weight of 1200 N at the Earth's surface. It is launched into a circular orbit with radius equal to twice the radius of the Earth. The weight of the satellite in this orbit is

- ☒ **A** 0 N
- ☒ **B** 300 N
- ☒ **C** 600 N
- ☒ **D** 1200 N

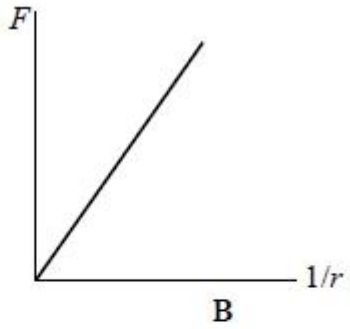
(Total for question = 1 marks)

Q9.

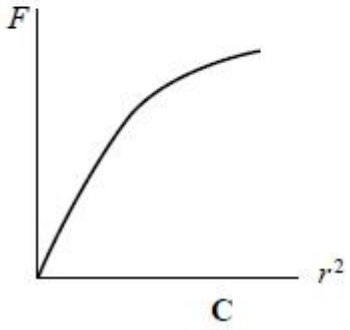
Select the graph that shows correctly the relationship between the gravitational force *F* between two masses and their separation *r*.



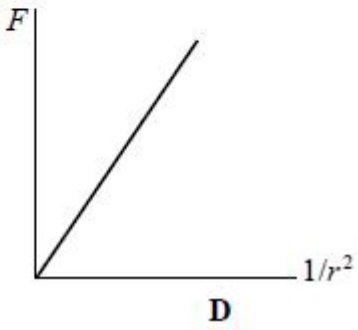
A



B



C



D

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(Total for question = 1 mark)

Q10.

The force between two masses and the force between two charges can be modelled in a similar way, using gravitational and electric fields. A difference between these models is that

☒ **A** an electric field is always a radial field.

☒ **B** an electric field is always the stronger field.

☒ **C** a gravitational field cannot be shielded.

☒ **D** a gravitational field extends over an infinite range.

(Total for Question = 1 mark)

Q11.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

A satellite of mass *m* orbits the Earth with speed *v*.

What is the speed of a satellite of mass 2*m* orbiting at the same distance from the Earth?

☒ **A** $\frac{v}{2}$

☒ **B** v

☒ **C** $v\sqrt{2}$

☒ **D** $2v$

(Total for question = 1 mark)