External assessment 2021

Multiple choice question book

Physics

Paper 1

General instruction

- Work in this book will not be marked.

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Section 1

QUESTION 1

Leptons do not experience the

(A) weak force.

(B) strong force.

(C) gravitational force.

(D) electromagnetic force.

QUESTION 2

Calculate the initial horizontal velocity of a projectile with an initial velocity of 38 m s^{-1} at an angle of 42° up from the horizontal.

(A) 25 m s^{-1}

(B) 28 m s^{-1}

(C) 34 m s^{-1}

(D) 40 m s^{-1}

QUESTION 3

Identify the correct formula for the mass–energy equivalence relationship.

(A) $E = mc^2$

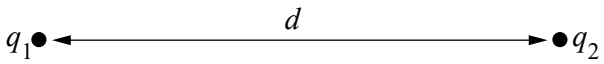
(B) $E = mgh$

(C) $E = \frac{1}{2}mc^2$

(D) $E = \frac{1}{2}mv^2$

QUESTION 4

The diagram shows two charges (q_1 and q_2) separated by a distance (d).



There is a force, F, acting between the two charges.

Calculate the magnitude of the force acting between the two charges if d is halved and the charge of q_2 is doubled.

(A) $1F$

(B) $2F$

(C) $4F$

(D) $8F$

QUESTION 5

Mesons are

(A) subatomic particles composed of one quark and one antiquark.

(B) elementary particles that are classified as leptons.

(C) elementary particles exchanged between quarks.

(D) subatomic particles composed of three quarks.

QUESTION 6

Electromagnetic radiation is

(A) extremely high-frequency radiation emitted from the nucleus of some radionuclides.

(B) the emission of energy as waves or particles, especially high-energy particles, that causes ionisation.

(C) a wave of energy produced by an oscillating electric charge, resulting in mutually perpendicular electric and magnetic fields.

(D) radiant energy consisting of synchronised oscillations of electric and magnetic fields, or electromagnetic waves, propagated at the speed of light in a vacuum.

QUESTION 7

Normal force is the force acting along an imaginary line

(A) parallel to the surface.

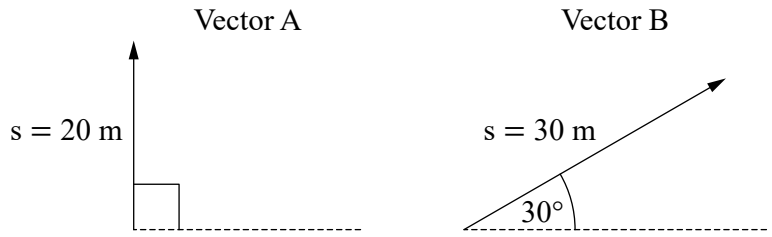
(B) perpendicular to the surface.

(C) opposite to the gravitational force.

(D) in the same direction as the gravitational force.

QUESTION 8

The diagram shows two displacement vectors.



Calculate the resultant vector above the horizontal axis when Vector A is added to Vector B.

(A) 43.6 m at 36.6°

(B) 43.6 m at 53.4°

(C) 48.4 m at 18.1°

(D) 48.4 m at 71.9°

QUESTION 9

The Bohr atomic model describes an atom as

(A) the smallest particle of any substance.

(B) a small dense nucleus orbited by electrons.

(C) electrons scattered throughout a sphere of positively charged fluid.

(D) a small positive nucleus surrounded by negative electrons in set orbits of fixed energy.

QUESTION 10

Proper length is the length measured in the frame of reference where the object is

(A) at rest.

(B) in motion.

(C) accelerating.

(D) in motion but not accelerating.

QUESTION 11

Uniform circular motion occurs when an object is travelling in a circle at a constant

(A) speed, due to a force of constant magnitude acting in a parallel direction to its velocity.

(B) velocity, due to a force of constant magnitude acting in a parallel direction to its speed.

(C) speed, due to a force of constant magnitude acting in a perpendicular direction to its velocity.

(D) velocity, due to a force of constant magnitude acting in a perpendicular direction to its speed.

QUESTION 12

Calculate the maximum height reached by a projectile with an initial velocity of 15 m s^{-1} at an angle of 30° up from the horizontal.

(A) 2.87 m

(B) 3.83 m

(C) 8.61 m

(D) 11.5 m

QUESTION 13

Calculate the orbital period of a satellite travelling around the Earth with a radius of 4.00×10^8 m.

(A) 3.49×10^{-2} hours

(B) 3.94×10^2 hours

(C) 6.99×10^2 hours

(D) 1.76×10^9 hours

QUESTION 14

Moving electric charges in a magnetic field experience

(A) a decrease in charge.

(B) an increase in charge.

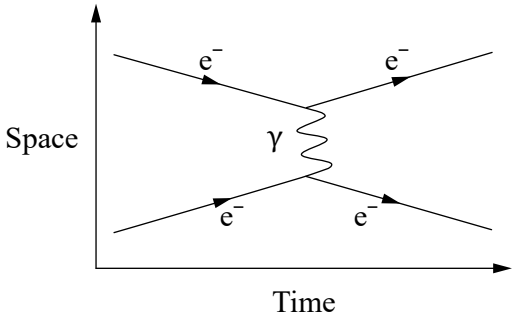
(C) a force parallel to the direction of the magnetic field.

(D) a force perpendicular to the direction of the magnetic field.

QUESTION 15

Which Feynman diagram shows an electron interacting with another electron?

(A)



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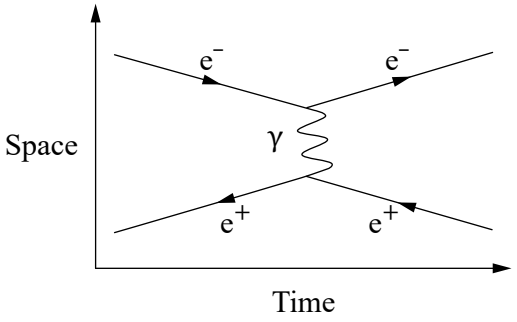

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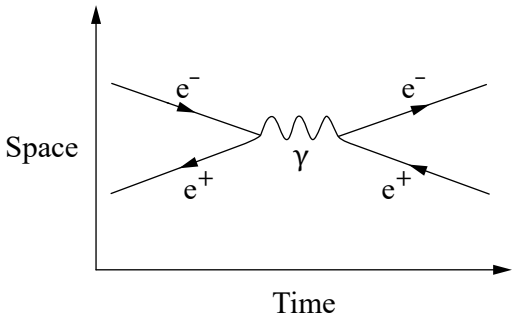

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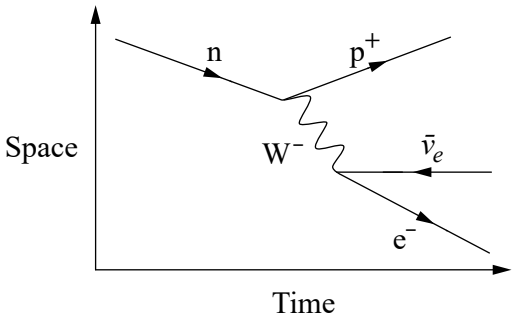

QUESTION 16

The weight of a 5 kg object on Earth is

(A) 0.49 N

(B) 0.51 N

(C) 49 N

(D) 51 N

QUESTION 17

Electrical potential energy is the

(A) intensity of an electric field at a particular location.

(B) difference in potential that tends to give rise to an electric current.

(C) capacity of electric charge carriers to do work due to their position in an electric circuit.

(D) work done on an electron in accelerating it through an electrical potential difference of one volt.

QUESTION 18

A gravitational field is the

(A) net gravitational force per unit mass at a particular point in space.

(B) energy stored in an object as a result of its position relative to another object.

(C) region of space surrounding a body in which another body experiences a force of gravitational attraction.

(D) position in space where objects experience a force or acquire potential energy as they are 'worked' into that position.

QUESTION 19

A spaceship with a velocity of 9.0×10^7 m s^{-1} is measured to be 125 m in length by an observer at rest.

Calculate the length of the spaceship as measured by somebody on board the spaceship.

(A) 119 m

(B) 131 m

(C) 137 m

(D) 178 m

QUESTION 20

A photoelectron with a kinetic energy of 2.5×10^{-19} J is ejected when a photon with a frequency of 1.3×10^{15} Hz is incident on the metal plate.

Calculate the threshold frequency of light required to eject the photoelectron from the metal plate.

(A) 6.1×10^{-19} Hz

(B) 3.7×10^{14} Hz

(C) 9.2×10^{14} Hz

(D) 1.7×10^{15} Hz