

ETHIO EXAMS

PHYSICS MODEL EXAM FOR GRADE 12 STUDENTS

@ethio_exams2 @ethio_exams2

Choose the correct answers for each of the following questions from the given alternatives.

Use the following values if necessary

$$g=10\text{m/s}^2$$

$$G=6.67\times 10^{-11}\text{Nm}^2/\text{kg}^2$$

$$\cos 37^\circ=\sin 53^\circ=0.8$$

$$q_e= 1.6\times 10^{-19}\text{C}$$

$$\sin 37^\circ=\cos 53^\circ=0.6$$

$$E_0=8.85\times 10^{-12}\text{F/M}$$

$$\sin 30^\circ=\cos 60^\circ=0.5$$

$$\sin 60^\circ=\cos 30^\circ=0.866$$

$$\sin 45^\circ=\cos 45^\circ= \frac{1}{\sqrt{2}}=0.707$$

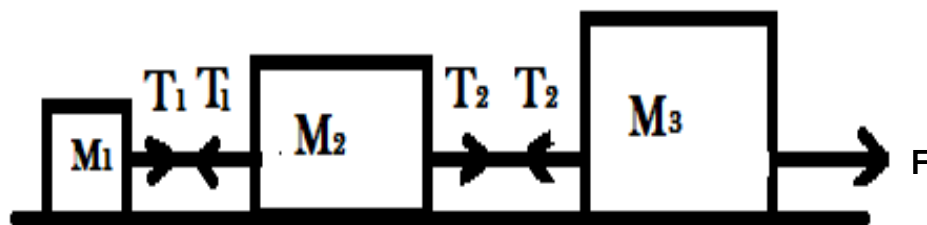
$$\frac{1}{4\pi\epsilon_0}=9\times 10^9$$

$$\text{Electron mass}=9.11\times 10^{-31}\text{kg}$$

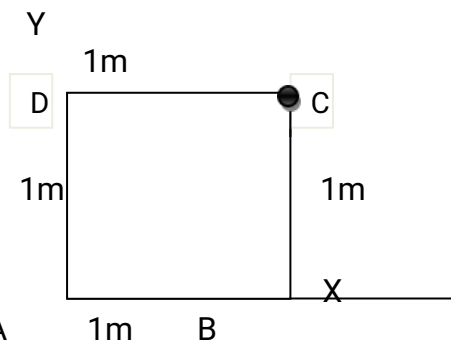
- Which one of the following is a type of errors caused by a bias in measurement and which show a bias or trend?
 - random error
 - Relative error
 - systematic error
 - constant error
- The percentage error in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimate of kinetic energy obtained by measuring mass and speed?
 - 11%
 - 8%
 - 5%
 - 1%
- Which of the following is not essential for three forces to produce zero resultant?
 - They should be in the same plane.
 - It should be possible to represent them by the three sides of a triangle taken in same order.
 - The resultant of any two forces should be equal and opposite to the third force.
 - They should act along the sides of a parallelogram.



4. Suppose $\vec{A} = 3\mathbf{i} - 2\mathbf{j}$, $\vec{B} = -\mathbf{i} - 4\mathbf{j}$ and $\vec{C}$ are three vectors in xy-plane with the property that $\vec{A} + \vec{B} + \vec{C} = 0$. which of the following is a unit Vector along $\vec{C}$?
- A. $\frac{2\mathbf{i}}{\sqrt{10}} + \frac{6\mathbf{j}}{\sqrt{10}}$ B. $\frac{-1}{\sqrt{10}}\mathbf{i} - \frac{3}{\sqrt{10}}\mathbf{j}$ C. $\frac{1\mathbf{i}}{\sqrt{10}} - \frac{3\mathbf{j}}{\sqrt{10}}$ D. $\frac{1\mathbf{i}}{\sqrt{10}} + \frac{3\mathbf{j}}{\sqrt{10}}$
5. If $\vec{A} = 6\mathbf{i} - 8\mathbf{j}$, $\vec{B} = -8\mathbf{i} + 8\mathbf{j}$ and $\vec{C} = 26\mathbf{i} + 19\mathbf{j}$, determine a and b respectively so that $a\vec{A} + b\vec{B} + \vec{C} = 0$
- A. 5,7 B. 7,5 C. 6,8 D. 8,6
6. For projectile motion the displacement components
- A. Both vary with t^2
- B. $\vec{s}_x$ varies with t^2
- C. $\vec{s}_x$ varies with t and $\vec{s}_y$ varies with t^2
- D. Both $\vec{s}_x$ and $\vec{s}_y$ varies with t
7. What will be the value of gravitational acceleration at a height $h = \frac{1}{4} r_e$, Where r_e is the earth's radius?
- A. $\frac{9}{4}(10\text{m/s}^2)$ B. $\frac{16}{25}(10\text{m/s}^2)$ C. $\frac{25}{16}(10\text{m/s}^2)$ D. $\frac{4}{9}(10\text{m/s}^2)$
8. A body is projected horizontally from the top of a cliff with a velocity of 10m/s. What time elapses, before the horizontal and vertical velocities become equal?
- A. 4sec B. 3sec C. 2sec D. 1sec
9. A ball of mass 0.1kg coming with a speed of 40m/s strikes a bat and returns in opposite direction with a speed 30m/s. Then, the impulse is
- A. 4kg m/s B. 3kgm/s C. 1kgm/s D. 7kgm/s
10. Three blocks of masses $m_1 = 10\text{kg}$, $m_2 = 20\text{kg}$ and $m_3 = 30\text{kg}$ are connected by strings on a smooth horizontal table as shown in figure below and pulled to the right with a force $F = 60\text{N}$. Find the acceleration of the system and T_1 and T_2 respectively.

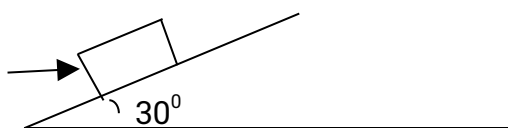


- A. 1m/s^2 , 10N and 30N C. 2m/s^2 , 10N and 30N
 B. 1m/s^2 , 20N and 10N D. 2m/s^2 , 20N and 10N
11. At the instant a train starts to accelerate horizontally at 5m/s^2 with respect to the ground, a ball is released freely from its ceiling. What is the magnitude of the acceleration of the ball with respect to the ground?
- A. 25m/s^2 B. 5m/s^2 C. $5\sqrt{5}\text{m/s}^2$ D. 10m/s^2
12. A body of mass 5kg initially at rest is subjected to a force of 20N. What is the kinetic energy acquired by the body at the end of 10sec?
- A. 2000J B. 3000J C. 4000J D. 5000J
13. What is the velocity of the bob of a simple pendulum at its mean position, if it is able to rise to a vertical height of 45m?
- A. 20m/sec B. 30m/sec C. 40m/sec D. 50 m/sec
14. What power must be developed by an aircraft engine to raise it to an altitude of 1km, if the aircraft weighs 30000N and the time of ascent is 1min?
- A. 400kw B. 500kw C. 600kw D. 700kw
15. The spin drier of a washing machine revolving at 15 rev/sec slows down to 5 rev/sec, while making 50 revolutions. What is the angular acceleration of the spin drier?
- A. $-4\pi\text{rad/s}^2$ B. $-2\pi\text{rad/s}^2$ C. $\pi\text{rad/s}^2$ D. $-\pi\text{rad/s}^2$
16. The moment of inertia of a solid sphere about a tangent is $\frac{5}{3}MR^2$, where M is mass and R is radius of the sphere. What is the moment of inertia of the sphere about its diameter?
- A. $\frac{2}{3}MR^2$ B. $\frac{3}{2}MR^2$ C. $\frac{5}{3}MR^2$ D. $\frac{3}{5}MR^2$
17. Four particles of masses 2m, m, 4m and 3m are placed at the corners A, B, C and D of a square of each side 1m as shown in figure below. What is the position of the centre of mass of the system along x-axis and y-axis respectively?



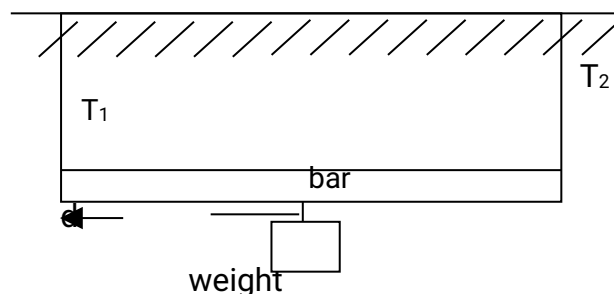
- A. 0.7, 0.5 B. 0.5, 0.5 C. 0.7, 0.7 D. 0.5, 0.7

18. A 100kg box is pushed at constant speed up a smooth 30° incline plane shown below. What horizontal force F is required?



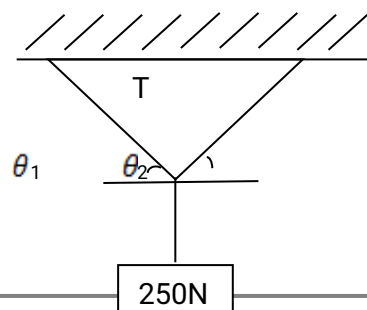
- A. 100.35N B. 577.35N C. 1732.35N D. 1154.7N

19. A uniform bar of length 2m and mass 30kg is supported by two massless ropes which are attached to a fixed horizontal bar, as shown in figure below, What are the tensions in each rope when a 700N weight is suspended at $d=1\text{m}$ from the left end of the bar?



- A. $T_1=675\text{N}$ and $T_2=325\text{N}$ C. $T_1=325\text{N}$ and $T_2=675\text{N}$
 B. $T_1=500\text{N}$ and $T_2=500\text{N}$ D. $T_1=525\text{N}$ and $T_2=175\text{N}$

20. Traffic light weighing 250N are suspended from a cable as shown below, what is the tension T in the string if $\theta_1=\theta_2=30^\circ$.



- A. 250N B. 196N C. 165N D. 120N

21. A liquid is flowing through a horizontal pipeline of varying cross-section. At a certain cross-section, the diameter of the pipe is 5cm and the velocity of flow of the liquid is 25cm/sec. what is the velocity of flow at another cross-section, where the diameter is 1cm.

- A. 625cm/sec B. 525cm/sec C. 425cm/sec D. 325cm/sec

22. A block of wood floats in water with a fraction of its volume outside water. The upthrust on block is

- A. equal to the weight of the block
B. less than the weight of the block
C. more than the weight of the block
D. determined by the fraction of the volume inside water.

23. spherical balls of radius R are falling in a viscous fluid of viscosity η with a velocity V . The retarding viscous force acting on the spherical ball is

- A. Directly proportional to R but inversely proportional to V .
B. Directly proportional to both radius R and velocity V .
C. Inversely proportional to both radius R and velocity V .
D. Inversely proportional to R but directly proportional to velocity V .

24. Water is flowing through a horizontal pipe line having a constriction. Then,

- A. Pressure will be the same throughout the length of the pipe.
B. Pressure will be greater at the constriction.
C. Pressure will be greater in the wider portion.
D. None of these.

25. 80 gram of water at 30°C are poured on a large block of ice at 0°C . The mass of ice that melts is:
- A. 1600 gram B. 150 gram C. 80 gram D. 30 gram
26. A carnot engine takes 3×10^4 cal of heat from a reservoir at 627°C and gives it to a sink at 27°C . What is the work done by the engine?
- A. $2.4 \times 10^6 \text{ J}$ B. $4.4 \times 10^6 \text{ J}$ C. $6.4 \times 10^6 \text{ J}$ D. $8.4 \times 10^6 \text{ J}$
27. A gas is filled in a vessel at certain temperature and 76cm of mercury pressure. More gas is filled in the vessel at the same temperature so that its mass increases by 50%. The resultant pressure of gas is now
- A. 152cm of Hg B. 114cm of Hg C. 38cm of Hg D. 76cm of Hg
28. At room temperature, the r.m.s. speed of the molecules of a certain diatomic gas is found to be 1920m/s. The gas is
- A. H_2 B. F_2 C. O_2 D. Cl_2
29. A particle is vibrating in a SHM with an amplitude of 4cm. At what displacement from the equilibrium position is its energy half potential and half kinetic?
- A. 1cm B. 3cm C. $2\sqrt{2}\text{cm}$ D. $\sqrt{2}\text{cm}$
30. A 5.5m length of string has a mass of 0.035kg. if the tension in the string is 77N, the speed of a wave on the string is
- A. 110m/s B. 165m/s C. 77m/s D. 102m/s
31. An object producing a pitch of 400 Hz is moving towards a stationary person with speed of 200m/s. The speed of sound is 300m/s. The frequency of sound as heard by a stationary listener is
- A. 96Hz B. 240Hz C. 960Hz D. 1200Hz
32. In a young's double slit experiment, the fringe width is found to be 0.4mm. If the whole apparatus is immersed in water of refractive index $4/3$ without disturbing the geometrical arrangement, the new fringe width will be
- A. 0.3mm B. 0.4mm C. 0.5mm D. 0.6mm
33. When air is replaced by a dielectric medium of dielectric constant K, the maximum force of attraction between two charges separated by a distance.

A. increases k times

C. remains unchanged

B. decreases k times

D. decrease k^2 times

34. A stationary charge produces

A. both electric and magnetic fields

B. An electromagnetic wave

C. An electric field only

D. A magnetic field only

35. 60J of work must be done to move electric charge equal to 5C from a point, where potential is +20V to another point. Where potential is V volt. What is the value of V ?

A. 22V

B. 32V

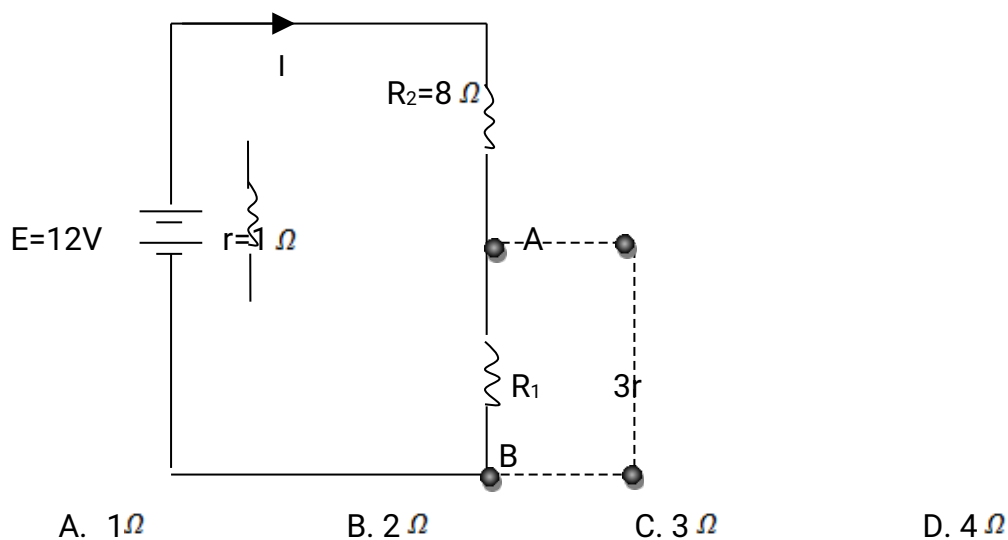
C. 42V

D. 52V

36. A capacitor charged from a 50V d.c supply is found to have a charge of 10HC. How much energy is stored in it?

A. 1.5×10^{-4} J B. 2.5×10^{-4} J C. 3.5×10^{-4} J D. 4.5×10^{-4} J

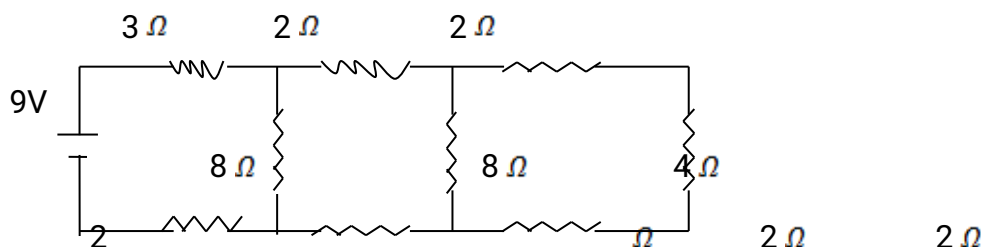
37. In the circuit given in figure below, a potential difference of 3V is required across the points A and B. what is the value of the resistance R_1 ?



38. Two wires of the same metal have same length, but their cross-sections are in the ratio 3:1. They are joined in series. The resistance of thicker wire is $10\ \Omega$. The total resistance of the combination will be

A. $5/2\ \Omega$ B. $40/3\ \Omega$ C. $40\ \Omega$ D. $100\ \Omega$

39. In the circuit shown in the figure, the current through the



A. $3\ \Omega$ resistor is 0.5A C. $4\ \Omega$ resistor is 0.5A
B. $3\ \Omega$ resistor is 0.25A D. $4\ \Omega$ resistor is 0.25A

40. A proton enters a magnetic field of 4J intensity with a velocity of $2.5 \times 10^6 \text{ m/s}$ at an angle of 30° with the field. What is the magnitude of the force on the proton?

(charge of the proton = $1.6 \times 10^{-19} \text{ C}$)

A. $8 \times 10^{-13} \text{ N}$ B. $6 \times 10^{-13} \text{ N}$ C. $4 \times 10^{-13} \text{ N}$ D. $2 \times 10^{-13} \text{ N}$

41. When a charged particle moves perpendicular to a magnetic field, then

A. speed of the particle is changed
B. speed of the particle remains unchanged
C. direction of the particle remains unchanged
D. acceleration of the particle remains unchanged

42. A 2 MeV proton is moving perpendicular to a uniform magnetic field of 2.5J. The force on the proton is:

A. $2.5 \times 10^{-10} \text{ N}$ B. $5.84 \times 10^{-12} \text{ N}$ C. $2.5 \times 10^{-11} \text{ N}$ D. $7.84 \times 10^{-12} \text{ N}$

43. A circuit has a resistance of $12\ \Omega$ and an impedance of $15\ \Omega$. The power factor of the circuit will be?

A. 0.125 B. 1.25 C. 0.4 D. 0.8



44. A straight line conductor of length 0.4m is moved with a speed of 7m/s perpendicular to magnetic field of intensity 0.9 wb/m². The induced e.m.f. across the conductor is:
- A. 1.26V B. 5.24V C. 2.52V D. 25.2V
45. A 1MH inductance and 10μF capacitance, when connected in series to an a.c. source, posses equal reactance. The angular frequency of the a.c. source is:
- A. 10⁴ B. 100 C. 10 D. 200π
46. when a.c. flows through a capacitor, then the current
- A. leads voltage by $\frac{\pi}{2}$
- B. lags voltage by $\frac{\pi}{2}$
- C. is in phase with voltage
- D. is perfectly in antiphase with voltage
47. In a series resonant circuit, the a.c. voltage across resistance R, inductance L and capacitance C are 5V, 10V respectively. The a.c. voltage applied to the circuit will be
- A. 20V B. 5V C. 25V D. 10V
48. An electric lamp is connected to 220V, 50Hz supply. The peak voltage in the circuit is:
- A. 110V B. 220V C. 311V D. 411V
49. What is the respective numbers of α and β particles emitted in the following radioactive decay?



- A. 6 and 8 B. 6 and 6 C. 8 and 8 D. 8 and 6
50. If No is the original mass of the substance of half-life period T=5 years, Then the amount of substance left after 15 years is:
- A. $\frac{N_0}{8}$ B. $\frac{N_0}{16}$ C. $\frac{N_0}{2}$ D. $\frac{N_0}{4}$