



SCHOOL OF REDEMPTION

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Second Semester Physics Home Exam 2019/20 Ac. Year

Grade & section _____ 12

Student's Name _____

Allotted Time: _____ 2:15 hr. _____

Submission Date:- You have to submit your answers when the school opens.

GENERAL DIRECTION

THIS QUESTION SHEET CONTAINS **PHYSICS** EXAMINATION FOR **NATURAL SCIENCE** STREAM. IN THIS EXAMINATION, THERE ARE 50 MULTIPLE CHOICE QUESTIONS. FOLLOW THE INSTRUCTIONS CAREFULLY. SELECT THE CORRECT ANSWER AND WRITE ONLY THE LETTER OF YOUR CHOICE ON YOUR SEPARATE ANSWER SHEET.

You may refer to the information given below when you work on some of the questions.

Constant	Symbol	value
Acceleration due to gravity	G	10m/s^2
Permittivity of vacuum	ϵ_o	$8.85 \times 10^{-12} \text{ f/m}$
charge on an electron proton	E	$1.6 \times 10^{-19} \text{ c}$
density of water	δ	1000kg/m^3
permeability of vacuum	μ_o	$4\pi \times 10^{-7} \text{ T.N/A}$
specific heat capacity of water	C	4200J/kg
Planck's constant	H	$6.63 \times 10^{-34} \text{ J.s}$
speed of light in vacuum	C	$3 \times 10^8 \text{ m/s}$
$\sin 30^\circ = \cos 60^\circ = 0.5$ $\sin 37^\circ = \cos 53^\circ = 0.6$ $\sin 53^\circ = \cos 37^\circ = 0.8$ $\sin 60^\circ = \cos 30^\circ = 0.9$		

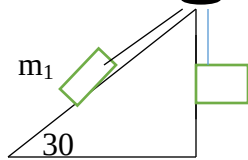
- Which of the following is incorrect statement?
 - Any physical measurement should specify a probable exponential error for the measured quantity.
 - The magnitude of the difference between the true value of the quantity and the individual measurement value is absolute error
 - Errors arising out of small changes in the experimental conditions and the personal judgment of the observer are systematic errors.
 - Percentage error is the ratio of the absolute error to the value of the quantity being measured.
- When 7.0660 is divided by 0.022 the answer to the correct significant digit is
 - 320
 - 321.18
 - 321
 - 32
- Given that $\vec{A} \cdot \vec{B} = 0$ and $\vec{A} \times \vec{C} = 0$, what is the angle between $\vec{B}$ and $\vec{C}$?
 - 45°
 - 90°
 - 0°
 - 180°
- Three vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$ have a magnitude of 10 units and lie in xy plane. Their direction relative to +x direction of the x axis is 30° , 135° and 210° respectively what should be the fourth vector $\vec{D}$, in such a way that $(\vec{A} + \vec{B}) - (\vec{C} + \vec{D}) = 0$ is true?
 - $10.3\hat{i} + 17.1\hat{j}$
 - $7.1\hat{i} + 5\hat{j}$
 - $10.5\hat{i} - 17.1\hat{j}$
 - $-8.7\hat{i} - 10\hat{j}$
- Two racing cars are at a position $x = 0$ at time $t = 0$ car A is moving at constant velocity of 30 m/sec. car B starting from rest has an acceleration of 10m/sec^2 . At what distance measured from starting position, do the two cars have the same velocity?
 - 180m
 - 90m
 - 300m
 - 100m
- The motion of a particle along x –axis is given by $x(t) = 4 - 9t + 2t^3$ x in meter, t in second. Which of the following is incorrect about the motion?
 - Velocity and acceleration are in opposite direction at time $t = 1$ second
 - Displacement and velocity are in opposite direction at time $t = 1$ second
 - The acceleration time graph is an increasing straight line passing through the origin
 - Velocity – time graph is an increasing straight line passing through the origin
- The horizontal and vertical displacement of a projectile at any time t is given by: $x(t) = 80t$, and $y(t) = 60t - 5t^2$ respectively, x and y are in meters and t in second. What is the initial velocity of the projectile?
 - 60m/s $\theta = 30^\circ$
 - 140m/s, $\theta = 53^\circ$
 - 100m/s, $\theta = 37^\circ$
 - 20m/s, $\theta = 37^\circ$
- A stone tied to the end of a string of length 50c.m. is whirled in a horizontal circle with a constant speed. If the stone makes 40 revolutions in 20 seconds, what is the speed of the stone along the circle?
 - $\frac{\pi}{2} \text{ m/sec}$
 - $\pi \text{ m/sec}$
 - $2\pi \text{ m/sec}$
 - $4\pi \text{ m/sec}$
- A 40 kg wagon is towed up a hill which is inclined at 30° with respect to the horizontal. The tow rope is parallel to the incline and has a tension of 444N in it. Assume that the wagon starts from rest at the bottom of the hill, and the coefficient of kinetic friction is 0.4 between the wagon and the incline. How fast is the wagon going after moving 80m up the hill?
 - 20m/sec
 - 25m/sec
 - 40m/sec
 - 5.2m/sec
- Which one of the following is correct statement about force?
 - If a body is not at rest, the net external force acting on it cannot be zero.
 - If the net force on a body is zero, the body will be definitely at rest.
 - The frictional force involved in the rolling of one body over another is less than that for sliding motion

D. A man is at rest in the middle of a pond on a perfectly smooth ice. He can get himself to the shore by making use of Newton's 2nd law of motion

11. A 2000 kg car moving East ward at a speed of 10m/sec collides with a 3000kg car moving North ward. The two cars stick together after collision in North of East direction at a speed of 5m/sec at an angle of 45°. What is the speed of 3000 kg car before collision?

A. 5.83m/s B. 10.8m/s C. 18.5m/s D. 3.5m/s

12. Two blocks of equal masses are connected by a string of negligible mass which passes over fixed pulley on the top of an inclined plane as shown in the figure below



When the inclination angle $\theta = 30^\circ$ mass m_1 just begins to move up the inclined plane. What is the coefficient of friction between the block m_1 and plane?

A. $\frac{1}{\sqrt{2}}$ B. $\frac{1}{2\sqrt{2}}$ C. $\frac{1}{2\sqrt{3}}$ D. $\frac{1}{\sqrt{3}}$

13. A block of mass 5kg is lying on a rough horizontal surface. The coefficient of static and kinetic friction between the block and the surface respectively are 0.7 and 0.5. a horizontal force just sufficient to move the block is applied to it. If the force continues to act even after the block has started moving, what is the acceleration of the block?

A. 1m/s^2 B. 2m/s^2 C. 3m/s^2 D. 4m/s^2

14. Two particles of mass m and $4m$ have linear momentum in the ratio 2:1. What is the ratio of their kinetic energies?

A. $\sqrt{2}$ B. 2 C. 4 D. 16

15. A 1200kg car is moving along a horizontal level road at a speed of 20m/sec. What work must be done by the brakes to bring the car to rest in 20seconds.

A. 120KJ B. 360KJ C. 240KJ D. 600KJ

16. The angular velocity of a wheel rotating on a horizontal axle points west. In what direction is the linear velocity of a point on the top of the wheel?

A. West B. East C. North D. South

17. A man is whirled in a circular path with constant angular velocity and its angular momentum is L . If the string is now halved keeping the angular velocity constant, what will be the new angular momentum?

A. $\frac{L}{4}$ B. $\frac{L}{2}$ C. L D. $2L$

18. A pulley with rotational inertia of $1 \times 10^{-3} \text{ kg} \cdot \text{m}^2$ about its axle and a radius of 10cm is acted on by a force applied tangentially at its rim. The force magnitude varies in time of $F(t) = 2t + 4t^2$, with F in Newton's and t in seconds. The pulley is initially at rest. What is the angular speed after time $t = 3$ seconds?

A. 4200 rad/sec B. 12600 rad/sec C. 1400 rad/sec D. 1000rad

19. The requirements for a body to be in equilibrium is/are

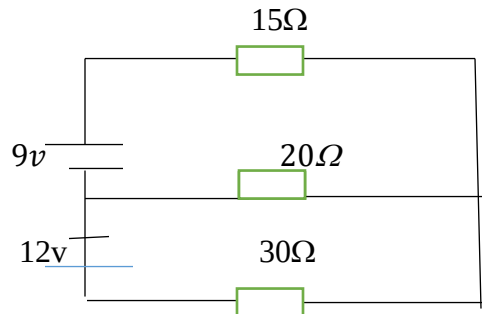
A. The vector sum of all forces and external torques must be zero
B. The linear momentum of the body must be zero
C. The angular momentum of the body must be zero
D. All are correct answers

20. A rope of negligible mass is stretched horizontally between two supports that are 2m apart. When an object of 3000N is hung at the middle of the rope the rope is observed to sag by 50cm what is the tension in the string

- A. 6000N B. 3000N C. 1500N D. 7500N
21. Two wires A and B have equal lengths and are made of the same material, but the diameter of wire A is twice that of wire B. which of the following is true for a given load applied?
- Extension of A is twice that of B
 - Young's modulus of A is twice that of B
 - Strain of A is half of that of B
 - Young's modulus of A is equals to that of B
22. A pleasure boat has a mass of 1500kg and a volume of 3m^3 floats in water of density 1000kg/m^3 . What is the maximum number of 75kg passengers that can board the boat without it sinking?
- 10 passengers
 - 25 passengers
 - 20passengers
 - 200passengers
23. Water flows through a horizontal pipe of cross sectional area 10c.m^2 . At one section the cross sectional area is 5c.m^2 . The pressure difference is 4000Pa. How many cubic meters of water will flow out of the pipe in a second?
- $4 \times 10^{-3} \text{ m}^3/\text{sec}$
 - $2000\text{m}^3/\text{sec}$
 - $500\text{m}^3/\text{sec}$
 - $2 \times 10^{-3} \text{ m}^3/\text{sec}$
24. How many kilograms of water at 100°C can be converted to steam by the addition of $1.13 \times 10^7 \text{ J}$ of thermal energy ? ($H_v = 2.26 \times 10^6 \text{ J/kg}$)
- 5kg
 - 4kg
 - 10kg
 - 1kg
25. Entropy of a thermodynamic system does not change when the system is used for
- conversion of work into heat isothermally
 - conduction of heat in to work isobarically
 - conversion of heat in to work isobarically
 - conversion of heat in to internal energy isochorically
26. Three Carnot engines operates between the temperature limits of cold reservoir and hot reservoirs receptivity as follows:
- Engine :1 between 400k and 500k
- Engine :2 between 500k and 600k
- Engine :3 between 400k and 600k. Each extracts the same amount of energy per cycles from high temperature reservoir which one had the greatest workdone performing in each cycle?
- Engine 1
 - Engine 2
 - Engine 3
 - All have the same work
27. In a thermodynamic process 200J of work in done on a system and 70J of energy in extracted as heat by how much is the internal energy of the system changes?
- 270 J
 - 200J
 - 70J
 - 130J
28. If the amplitude of a sound wave is doubled and its frequency reduced to one –fourth the intensity of sound at the same point will
- increase by a factor of 2
 - decrease by a factor of 4
 - decrease by a factor of 2
 - remain unchanged
29. Which of the following is incorrect about the characteristics of standing or stationary waves?
- There is no transfer of energy across any section of the medium
 - There are certain particles of the medium which always remain at rest
 - The particles pass through their mean position one after the other but with the same maximum velocity

- D. There is no onward motion of the conditions of compression or rarefaction in the medium
30. Oscillation of a 600Hz tuning fork set up standing waves on a string clumped at both ends. The standing wave speed for the string is 400m/sec. The standing wave has four loops and an amplitude of 2mm what is the length of the string?
 A. $\frac{8}{3}$ m B. $\frac{5}{3}$ m C. $\frac{4}{3}$ m D. $\frac{2}{3}$ m
31. When the displacement in SHM is one-half the maximum amplitude .what fraction of the total energy is the kinetic energy?
 A. 0.3 B. 0.25 C. 0.5 D. 0.75
32. Monochromatic light falls on a slit that is 3×10^{-3} mm wide. If the angle b/n the first dark Fringes on either side of the central maximum is 37° what is the wave length of light used?
 A. 600nm B. 952nm C. 4000nm D. 800nm
33. What happens to the inference pattern if the two slits s1 and s2 in young's double slit experiment is illuminated by two independent sources?
 A. the intensity of the bright fringes is doubled
 B. the width of the bright fringes will be doubled
 C. the two sets of interface fringes will be overlap
 D. no interference pattern is observed
34. A parallel beam of monochromatic light of wavelength 500nm is incident normally on a single narrow slit of width 0.001mm. The light is focused by a convex lens on a screen at its focal plane the first minimum will be formed for the angle of diffraction equal to?
 A. 15° B. 30° C. 37° D. 45°
35. Which of the following situation of an electric dipole will not experience neither a force nor a torque.
 A. An electric dipole placed with its axis inclined at an angle to the direction of a uniform electric field
 B. An electric dipole placed with its axis in the direction of a uniform electric field
 C. An electric dipole placed in a non-uniform electric field
 D. An electric dipole placed with its axis inclines at an angle of 37° to the direction of uniform electric field
36. Electrostatic force between two charges placed in vacuum of permittivity of free space ϵ_0 is F. If the charges are placed at the same separation in a medium of dielectric constant K, the force between them will be
 A. F B. KF C. F/K D. 2F
37. Three capacitors connected in series have an effective capacitance of $2\mu\text{F}$ If one of the capacitors is removed the effective capacitance becomes $3\mu\text{F}$ what is the value of removed capacitor?
 A. $1\mu\text{F}$ B. $\frac{3}{2}\mu\text{F}$ C. $\frac{2}{3}\mu\text{F}$ D. $6\mu\text{F}$
38. A variable resistor R is connected across the potential difference V that remains constant the current is 6A when R is increased to R+10 the current drops to 2A what is the value of the potential difference?
 A. 30V B. 12V C. 20V D. 26V

39. In the given network, what is the current in 20Ω resistor?



- A. $\frac{21}{5}$ B. $\frac{36}{5}$ A C. 3A D. 2A

40. which one of the following is correct about “terminal voltage of a battery”

- A. Terminal voltage of a battery is always equal to its emf
 B. Terminal voltage of a battery is always Less than its emf
 C. Terminal voltage of a battery is always greater than its emf depending on the value of external resistance
 D. Terminal voltage of a battery is less than its emf depending on the value of internal resistance

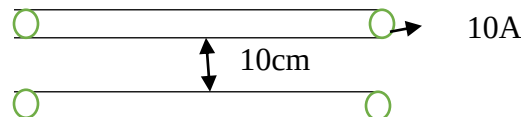
41. Which one of the following is in correct about magnetic field

- A. the strength of magnetic field inside a solenoid can be increased by inserting a soft iron in the coil.
 B. Stationary electric charges experience no force in a magnetic field
 C. When a magnetic dipole moment is placed inside a magnetic field, it experiences a force
 D. A current loop creates a magnetic dipole moment.

42. An electron of mass m and charge e is accelerated by potential difference V inside a **CRT**. If it enters in a uniform magnetic field B applied perpendicular to its path, what will be the radius of the circular path by the electron?

- A. $\sqrt{\frac{2mv}{B^2e}}$ B. $\sqrt{\frac{2mev}{B^2}}$ C. $\sqrt{\frac{2mB}{ev^2}}$ D. $\sqrt{\frac{2B^2v}{me}}$

43. A wire of weight 0.004N/m carry a current of 10A that flows in the $+x$ -direction what is the magnitude and direction of current in the second wire 10cm below the first wire that enable the first wire floats in air?

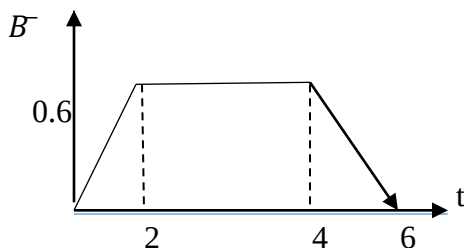


- A. 10A in the $+x$ - direction
 B. 20A , in the $+x$ - direction
 C. 20A , in the $-x$ - direction
 D. 10A , in the $-x$ -direction

44. A current of 15A directed along the $+x$ -direction and perpendicular to a magnetic field. The conductor experiences a magnetic force per unit length of 0.15N/m in the negative Y -direction what is the magnitude and direction of the magnetic field in the region through which the current passes?

- A. 0.15 T in $+Y$ – direction C. 0.225 T in the $+z$ - direction
 B. 0.01T in the $+z$ - direction D. 0.01 T in the $-z$ -direction

45. The magnetic field through a single circular loop of area 0.5m^2 and resistance 10Ω changes with time as shown in the figure bellows



- What induced current is produced in the loop in time interval between $t = 2\text{sec}$ to $t = 4\text{sec}$?
- A. 0.3A B. 0.03A C. 0 D. 3A
46. In RC- series circuit the voltage across the resistor is 80v and across the capacitor is 60v what will be the total potential difference across the circuit ?
- A. 140V B. 100 (sin $2\pi ft$) C. 20V D. 100V
47. In RLC - series circuit, the capacitive reactance is 175Ω and inductive reactance is 225Ω connected to an AC-rms value of 260V-line for what value of the resistance R that is connected to the capacitor C and inductor L is the rms- current be 2A?
- A. 565Ω B. 120Ω C. 125Ω D. 50Ω
48. The particle nature of photons is demonstrated in the
- A. Millikan oil experiment B. Compton effect
C. photo electric effect D. mass spectrograph
49. A neutron is absorbed by a nucleus with a mass of 235 amu. The nucleus splits in to two fragment one has a mass of 97 amu Two neutrons are also released. Calculate the mass of the second fission fragment?
- A. 137amu B. 99amu C. 236amu D. 135amu
50. When the maximum kinetic energy of ejected electrons is plotted against the frequency of the incident light minus the threshold frequency the slope of the straight line graph is: ----
- A. wave length C, Compton's constant
B. Planck's constant D. Heisenberg's constant

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