Physics - exam questions 2022 - extended

For each question, four answers are given, of which only one answer is correct. Please enter the letter corresponding to the correct answer in the table. For the correct answer to each of the questions, 2 points will be awarded.

Your answer Table .

question number	1	2	3	4	5	6	7	8	9	10
correct answer										

question number	11	12	13	14	15	16	17	18	19	20
correct answer										

Questions

1. If ${}^{204}_{81}Tl$ emits a β^- particle from its nucleus then:

A. stable ${}^{205}_{81}Tl$ is formed

B. ${}^{202}_{80}Hg$ is formed

C. ${}^{204}_{82}Pb$ is formed

D. ${}^{197}_{79}Hg$ is formed

2. If the ground state energy of a hydrogen atom is -13.6 eV, then the energy of the first excited state is:
A. 0 eV
B. -3.4 eV
C. -6.8 eV
D. -9.6 eV

3. The stopping potential for electrons ejected by 6.8×10^{14} Hz electromagnetic radiation incident on a certain sample is 1.8V. The kinetic energy of the most energetic electrons ejected and the work function of the sample, respectively, are:
A. 1.8 eV ; 2.8 eV
B. 1.8 eV ; 1.0 eV
C. 1.8 eV ; 4.6 eV
D. 2.8 eV ; 1.0 eV

4. A 3Ω and a 1.5Ω resistor are wired in parallel and the combination is wired in series to a 4Ω resistor and an ideal battery with emf 10V . The potential difference across the 3Ω resistor is:
A. 2.0V
B. 6.0V
C. 8.0V
D. 10V

5. A current of 0.3A is passed through a bulb for 2 minutes using a 6V power supply. The energy dissipated by this lamp during the 2 minutes is:
A. 12 J
B. 60 J
C. 136 J
D. 216 J

6. Capacitors A and B are identical. Capacitor A is charged so it stores 4 J of energy and capacitor B is uncharged. The capacitors are then connected in parallel. The total stored energy in the capacitors is now:
A. 16 J
B. 8 J
C. 4 J
D. 2 J

7. A particle with a charge of $Q_1 = 5\times10^{-6}$ C and a mass of 20 g moves uniformly with a speed of 7m/s in a circular orbit around a stationary particle with a charge of $Q_2 = -5\times10^{-6}$ C. The radius of the orbit is:
A. 0.1 m
B. 0.23 m
C. 0.62 m
D. 1.6 m

8. A Carnot heat engine operates between 400K and 500 K. Its efficiency is:
A. 20%
B. 25%
C. 44%
D. 79%

9. The argon-containing column is closed on both sides. The shortest length of such a column that will resonate with a 200 Hz tuning fork is 42.5 cm. The speed of sound in argon must be:
A. 85.0 m/s
B. 170 m/s
C. 340 m/s
D. 470 m/s

10. A playground merry-go-round has a radius of 3.0m and a rotational inertia of 600 kg·m^2. A 20 kg child stands in the center of merry-go-round. Initially merry-go-round is spinning at 0.80 rad/s , then the child moves from the center to the rim of the merry-go-round. When the child reaches the rim the angular velocity of the merry-go-round is:
A. 0.62 rad/s
B. 0.73 rad/s
C. 0.80 rad/s
D. 0.89 rad/s

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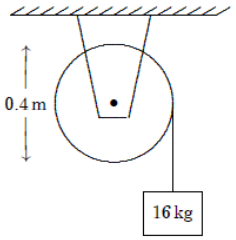
11. A 16 kg block is attached to a cord that is wrapped around the rim of a flywheel of diameter 0.40m and hangs vertically, as shown. The rotational inertia of the flywheel is 0.50 kg·m^2. The block is released and the cord unwinds. If g is the gravitational acceleration then the acceleration of the block is:



A. 0.15g
B. 0.56g
C. 0.84g
D. 1.0g

12. A 0.4kg puck is traveling at 3.0m/s. It strikes a 0.8kg puck, which is stationary. The two pucks stick together. Their common final speed is:
A. 1.0m/s
B. 1.5m/s
C. 2.0m/s
D. 2.3m/s

13. A 0.50 kg block attached to an ideal spring with a spring constant of 80 N/m oscillates on a horizontal frictionless surface. The total mechanical energy is 0.12 J. The greatest extension of the spring from its equilibrium length is:
A. 1.5×10^{-3} m
B. 3.0×10^{-3} m
C. 0.039 m
D. 0.055 m

14. A car is traveling at 15 m/s on a horizontal road. The brakes are applied and the car skids to a stop in 4.0 s. The coefficient of kinetic friction between the tires and road is:
A. 0.38
B. 0.69
C. 0.76
D. 0.92

15. A car moves horizontally with a constant acceleration of 3 m/s^2. A ball is suspended by a string from the ceiling of the car. The ball does not swing, being at rest with respect to the car. What is the value of the tangent of the angle formed the string with the vertical, if g=10 m/s^2 ?
A. 0.3
B. 0.6
C. 1.0
D. 1.5

16. A stone is tied to a 0.50-m string and whirled at a constant speed of 4.0m/s in a vertical circle. If g=9.8 m/s^2 then its acceleration at the top of the circle is:
A. 9.8m/s^2
B. 9.8m/s^2
C. 8.0m/s^2
D. 32m/s^2

17. A coin rests on a gramophone record at a distance r from its center. The coefficient of friction between the coin and the record surface is μ. The record starts revolving and attains an angular velocity ω, the coin still remaining on it. It follows that:
A. $\omega \le (\mu g r)^2$
B. $\omega \le \sqrt{\mu g r}$
C. $\omega \le \mu \sqrt{\frac{g}{r}}$
D. $\omega \le \sqrt{\frac{\mu g}{r}}$

18. A rubber ball of mass m hits a wall (perpendicular to the wall) with velocity v and bounces off it. Since, after colliding with the wall, the value of the ball velocity has not changed, the ball:
A. changed its momentum by 2mv
B. changed its momentum by mv
C. transferred half its momentum to the wall
D. has not changed its momentum

19. A sprig when stretched by x has a potential energy E_p. Work that must be done to stretch the spring to length nx is:
A. E_p/n
B. n^2E_p
C. E_p/n^2
D. nE_p

20. Two blocks, weighing 250N and 350 N, respectively, are connected by a string that passes over a massless pulley, as shown. The tension in the string is approximately :
A. 210 N
B. 290 N
C. 410 N
D. 500 N