

PHY101-PHYSICS FINAL TERM MCQS

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1. The units of the Planck constant h are those of:

A. energy

B. power

C. momentum

D. angular momentum

E. frequency

2. Which of the following is true of all virtual images?

A. They can be seen but not photographed

B. They are ephemeral

C. They are smaller than the objects

D. They are larger than the objects

E. None of the above

ans: E

3. In constructing a thermometer it is NECESSARY to use a substance that:

A. expands with rising temperature

B. expands linearly with rising temperature

C. will not freeze

D. will not boil

E. undergoes some change when heated or cooled

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4. A 60-watt light bulb carries a current of 0.5 A. The total charge passing through it in one hour is:

- A. 120 C
- B. 3600 C
- C. 3000 C
- D. 2400 C
- E. 1800 C**

5. If the charge on a parallel-plate capacitor is doubled:

- A. the capacitance is halved
- B. the capacitance is doubled
- C. the electric field is halved
- D. the electric field is doubled**

6. the wavelength of red light is 700 nm. Its frequency is:

- A. 4.30×10^4 Hertz
- B. 4.30×10^5 Hertz** NOT SURE
- C. 4.30×10^3 Hertz
- D. 4.30×10^2 Hertz

7. A capacitor C “has a charge Q”. The actual charges on its plates are:

- A. Q, Q
- B. $Q/2$, $Q/2$
- C. Q, $-Q$**

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D. $Q/2, -Q/2$

8. How fast should you move away from a 6.0×10^{14} Hz light source to observe waves with a frequency of 4.0×10^{14} Hz?

A. $0.20c$

B. $0.38c$

C. $0.45c$

D. $0.51c$

E. $0.76c$

9. The units of the electric field are:

A. $J/(C \cdot m)$

B. J/C

C. $J \cdot C$

D. J/m

10. If two light waves are coherent:

A. their amplitudes are the same

B. their frequencies are the same

C. their wavelengths are the same

D. their phase difference is constant

11. In a photoelectric effect experiment at a frequency above cut off, the stopping potential is proportional to:

A. the energy of the least energetic electron before it is ejected

B. the energy of the least energetic electron after it is ejected

C. the energy of the most energetic electron before it is ejected

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D. the energy of the most energetic electron after it is ejected

12. The total energy in an LC circuit is 5.0×10^{-6} J. If $L = 25$ mH the maximum current is:

A. 10 mA

B. 14 mA

C. 20 mA

D. 28 mA

13. The quantum number m_s is most closely associated with what property of the electron in an atom?

A. Magnitude of the orbital angular momentum

B. Energy

C. z component of the spin angular momentum

D. z component of the orbital angular momentum

14. If 500 J of work are required to carry a charged particle between two points with a potential difference of 20 V, the magnitude of the charge on the particle is:

A. 0.040 C

B. 12.5 C

C. 20 C

D. cannot be computed unless the path is given

15. The smallest particle of any chemical element that can exist by itself and yet retain the qualities that distinguish it as that element is

: A. an electron

B. a proton

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C. a neutron

D. an atom

E. a molecule

16. A particle with a charge of $5.5 \times 10^{-8} \text{ C}$ is 3.5 cm from a particle with a charge of $-2.3 \times 10^{-8} \text{ C}$. The potential energy of this two-particle system, relative to the potential energy at infinite separation, is:

A. $3.2 \times 10^{-4} \text{ J}$

B. $-3.2 \times 10^{-4} \text{ J}$

C. $9.3 \times 10^{-3} \text{ J}$

D. $-9.3 \times 10^{-3} \text{ J}$

E. zero

17. A farad is the same as a:

A. J/V

B. V/J

C. C/V

D. V/C

E. N/C

18. 1 weber is the same as:

A. 1 V/s

B. 1 T/s

C. 1 T/m

D. $1 \text{ T} \cdot \text{m}^2$

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19. coherent sources of light mean

- A. They must have same speeds
- B. They must have same frequency
- C. They must have same amplitude
- D. They must have fixed phase relative to each other**
not sure

20. Room temperature is about 20 degrees on the:

- A. Kelvin scale
- B. Celsius scale**
- C. Fahrenheit scale
- D. absolute scale
- E. C major scale

21. The appearance of color in the thin film is due to:

- **Interference**

22. When you stand in front of a plane mirror, your image is:

- A. real, erect, and smaller than you
- B. real, erect, and the same size as you
- C. virtual, erect, and smaller than you

D. virtual, erect, and the same size as you

23. In a photoelectric effect experiment at a frequency above cut off, the number of electrons ejected is proportional to:

- A. their kinetic energy

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B. their potential energy

C. the work function

D. the frequency of the incident light

E. the number of photons that hit the sample

24. In a photoelectric effect experiment at a frequency above cut off, the stopping potential is proportional to:

A. the energy of the least energetic electron before it is ejected

B. the energy of the least energetic electron after it is ejected

C. the energy of the most energetic electron before it is ejected

D. the energy of the most energetic electron after it is ejected

E. the electron potential energy at the surface of the sample

25. The units of magnetic dipole moment are:

A. ampere

B. ampere·meter

C. ampere·meter²

D. ampere/meter

26. The primary of a 3 : 1 step-up transformer is connected to a source and the secondary is connected to a resistor R. The power dissipated by R in this situation is P. If R is connected directly to the source it will dissipate a power of:

A. $P/9$

B. $P/3$

C. P

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D. 3P

E. 9P

27. We desire to make an LC circuit that oscillates at 100 Hz using an inductance of 2.5 H. We also need a capacitance of:

A. 1 F

B. 1 mF

C. 1 μ F

D. 100 μ F

28. An ideal gas expands into a vacuum in a rigid vessel. As a result there is:

A. a change in entropy

B. an increase of pressure

C. a change in temperature

D. a decrease of internal energy

30. A step-down transformer is used to:

A. increase the power

B. decrease the power

C. increase the voltage

D. decrease the voltage

31. Which of the following electromagnetic radiations has photons with the greatest energy?

A. blue light

B. yellow light

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C. x rays

D. radio waves

33. The Stern-Gerlach experiment makes use of:

A. a strong uniform magnetic field

B. a strong non-uniform magnetic field

C. a strong uniform electric field

D. a strong non-uniform electric field

34. Let Q denote charge, V denote potential difference, and U denote stored energy. Of these quantities, capacitors in series must have the same:

A. Q only

B. V only

C. U only

D. Q and U only

35. Let Q denote charge, V denote potential difference, and U denote stored energy. Of these quantities, capacitors in parallel must have the same:

A. Q only

B. V only

C. U only

D. Q and U only

36. . “The sum of the currents into a junction equals the sum of the currents out of the junction” is a consequence of:

A. Newton’s third law

B. Ohm’s law

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C. Newton's second law

D. conservation of energy

E. conservation of charge

ans: E

37. "The sum of the emf's and potential differences around a closed loop equals zero" is a consequence of:

A. Newton's third law

B. Ohm's law

C. Newton's second law

D. conservation of energy

E. conservation of charge

38. Evidence for the wave nature of matter is:

A. electron diffraction experiments of Davisson and Germer

B. Thompson's measurement of e/m

C. Young's double slit experiment

D. the Compton effect

39. A conducting sphere with radius R is charged until the magnitude of the electric field just outside its surface is E . The electric potential of the sphere, relative to the potential far away, is:

A. zero

B. E/R

C. E/R^2

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D. ER

40. radio waves and light waves are ;

- Electromagnetic and transverse

41. An ideal gas expands into a vacuum in a rigid vessel. As a result there is:

A. a change in entropy

B. an increase of pressure

C. a change in temperature

D. a decrease of internal energy

42. 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

43. Capacitors C1 and C2 are connected in parallel. The equivalent capacitance is given by:

A. $C_1 C_2 / (C_1 + C_2)$

B. $(C_1 + C_2) / C_1 C_2$

C. $1 / (C_1 + C_2)$

D. C_1 / C_2

E. $C_1 + C_2$

ans: E

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44. Capacitors C_1 and C_2 are connected in series. The equivalent capacitance is given by:

A. $C_1 C_2 / (C_1 + C_2)$

B. $(C_1 + C_2) / C_1 C_2$

C. $1 / (C_1 + C_2)$

D. C_1 / C_2

E. $C_1 + C_2$

45. During an adiabatic process an object does 100 J of work and its temperature decreases by 5 K. During another process it does 25 J of work and its temperature decreases by 5 K. Its heat capacity for the second process is:

A. 20 J/K

B. 24 J/K

C. 5 J/K

D. 15 J/K

46. A virtual image is one:

A. toward which light rays converge but do not pass through

B. from which light rays diverge but do not pass through

C. from which light rays diverge as they pass through

D. toward which light rays converge and pass through

47. A generator supplies 100 V to the primary coil of a transformer. The primary has 50 turns and the secondary has 500 turns. The secondary voltage is:

A. 1000 V

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B. 500 V

C. 250 V

D. 100 V

48. The rate at which electrical energy is used may be measured in:

A. watt/second

B. watt·second

C. watt

D. joule·second

QUESTION: A vessel is filled with gas at some equilibrium pressure and temperature. Can all gas molecules in the vessel have same speed?

Answer: They can, as this possibility is not contradicted by any of our descriptions of the motion of gases. If the vessel contains more than a few molecules, it is highly improbable that all will have the same speed. Collisions will make their speeds scatter according to the Boltzmann distribution law."

QUESTION: Electric potential energy:

Answer:

The electric potential is the energy of a unit charge in an electric field. So in our MKS units the unit of potential is 1Joule/Coulombs=1 Volt. Another useful unit is 1Electron Volt.

QUESTION: All objects radiate energy then why are we not able to see all the objects in the dark? Our eyes are not sensitive to infrared radiation so we do not see it. Cold bodies radiate mostly in the infrared zone (invisible to the human eye), but as the temperature increases the body will emit higher frequencies with more intensity. So room temperature objects will not be seen due to black body radiation.

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QUESTION: In a cool room, metal and marble is cool but wood is not cool when we touch. Why?

Answer: Because metal and stone conduct heat better than wood. Skin temperature is higher than room temperature, so when we touch metal, we give heat more quickly to the metal than wood. Another reason is that metal and stone store more energy than a like sized object of wood

QUESTION: what causes electric shock or voltage?

ANS: one clock is upstairs of the bedroom and second clock is in downstairs of the kitchen. Then which clock runs slowly?

Really, neither will run appreciably slower than the other. In the strictest sense, the clock in the upstairs bedroom is moving a few centimeters per year faster than the clock downstairs in the kitchen, because it is a few feet further from the Earth's center than the clock in the upstairs.

QUESTION: Difference between reflection and refraction?

ANS:

Reflection involves a change in direction of waves when they bounce off a barrier. Refraction of waves involves a change in the direction of waves as they pass from one medium to another. Refraction, or the bending of the path of the waves, is accompanied by a change in speed and wavelength of the waves.

Question:

If an electron and proton have same De Broglie's wavelength, which particle has greater speed

The de Broglie wavelength of a particle is inversely proportional to its momentum $p = m v$; since a proton is about 1800 times more massive than an electron, its momentum at the same speed is 1800 times that of an electron, and therefore its wavelength 1800 times smaller. The electron has the longer wavelength.

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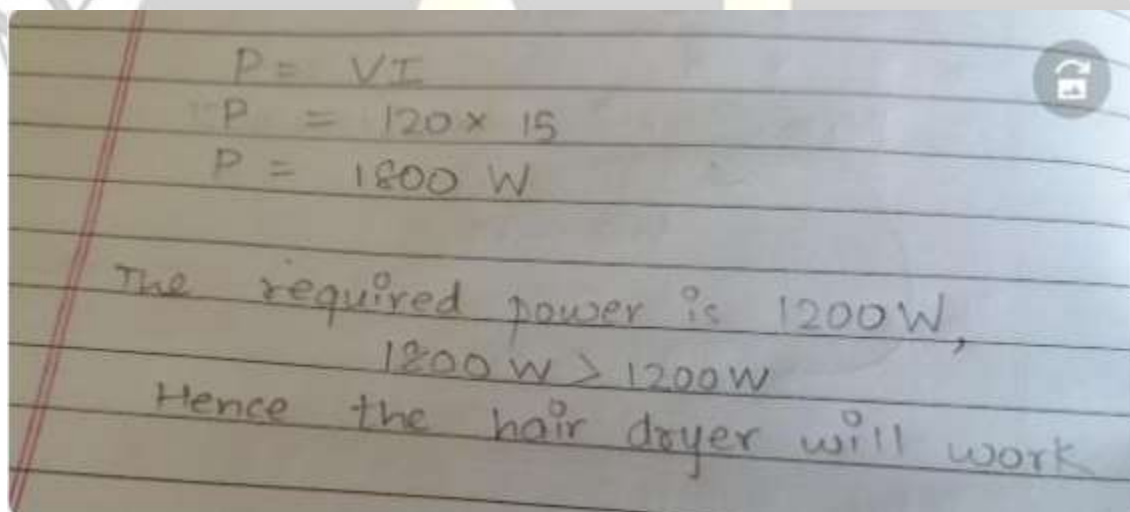
QUESTION: black and black body radiation?

ANS:

An object that absorbs all radiation falling on it, at all wavelengths, is called a black body. When a black body is at a uniform temperature, its emission has a characteristic frequency distribution that depends on the temperature. Its emission is called black-body radiation.

For examples include the heating element of a toaster and the filament of a light bulb.

QUESTION: If a 120 line to shocked is limited 15a by a safety fuse will it operate a 1200w hair dryer?



Handwritten calculation on lined paper:

$$P = VI$$
$$P = 120 \times 15$$
$$P = 1800 \text{ W}$$

The required power is 1200W,
 $1800 \text{ W} > 1200 \text{ W}$
Hence the hair dryer will work

QUESTION: Define statically mechanics

Ans: - The study of heat, considered as arising from the random motion of the basic constituents of matter, is an area of physics called statistical mechanics.

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QUESTION: is it true to say that Centre of mass and Centre of gravity are the same? Either yes or no explain in each case.

Answer: Many people assume that the terms “Centre of mass” and “Centre of gravity” are synonymous, but this is not the case. The center of mass and the Centre of gravity of an object are in the same position if the gravitational field in which the object exists is uniform.

QUESTION: What is the work done? If Force is 500N, height of downwards cliff is 30m Email and angle with land is 30 degrees.?

QUESTION: Magnetic Flux and Magnetic Flux density and when Flux is maximum and when it is zero?

ANS:

Because the induced EMF is proportional to the time rate of change of the magnetic flux, not to the magnetic flux itself, as shown in Faraday's law. In a sinusoidal wave, the maximum rate of change occurs at the zero crossing; in that point, the slope of the line tangent to the wave is the greatest, so the rate of change is the greatest (recall the derivative of a invariable function gives the slope of such function at each point). At the maximum or minimum value, the slope of the tangential line is zero, since it's a horizontal line, so the rate of change is zero.

The magnetic flux as a function of time is

$$\Phi(t) = B \cdot A(t) = BA \cos(\omega t)$$

$$\Phi(t) = B \cdot A(t) = BA \cos(\omega t) \quad \Phi(t) = B \cdot A(t) = BA \cos(\omega t)$$

B = the magnetic field and

$A(t)$ = the area vector as a function of time

ωt = the angle between the field and the area vector as a function of time.

$$\cos(90) = 0$$

But

Then the rate of change of the flux as a function of time is

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$$\Phi'(t) = -BA\omega \sin(\omega t)$$

$$\Phi'(t) = -BA\omega \sin(\omega t) \quad \Phi'(t) = -BA\omega \sin(\omega t)$$

the angle between (the area vector and the magnetic field) = zero.

flux = nonzero and equal to AB , its maximum, but the rate of change of the flux vanishes because

$$\sin(0) = 0, \sin(90) = 1.$$

QUESTION: How Isotopes change Atomic Mass, Magnetic spin moment and Chemical behavior of Elements

ANS:

Isotopes are atoms that have the same number of protons and electrons, but a different number of neutrons. Changing the number of neutrons in an atom does not change the element. Atoms of elements with different numbers of neutrons are called "isotopes" of that element. Isotopes behave similarly to other isotopes of the same element in chemical reactions because such reactions don't depend on the properties of atomic nuclei. Rather they depend on the number and arrangement of an atom's electrons.

QUESTION: Similarity and difference of gland meter and electric motor

ANS:

The motor requires Electricity, but the generator produces electricity. The shaft of the motor is driven by the magnetic force developed between the armature and the field winding, while in the case of the generator the shaft is connected to the rotor and driven by mechanical force

QUESTION: Fundamental source of Electromagnetic radiation

ANS:

A moving charge particle is the fundamental source of electromagnetic radiation.

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QUESTION: A photon of green light has a wavelength of 530nm. Find the photon's frequency, magnitude of momentum and electron volts. Express the energy in joules and electron volts.

ANS:

TAKE IDEA FROM THIS LINK

<https://socratic.org/questions/calculate-the-energy-in-joules-of-a-photon-of-green-light-having-a-wavelength-of>

<https://www.numerade.com/questions/a-photon-of-green-light-has-a-wavelength-of-520-nm-find-the-photon's-frequency-magnitude-of-momentum-/>

QUESTION: Find the difference between two waves which interfere constructively and destructively.

ANS:

There are two types of interference, constructive and destructive. In constructive interference, the amplitudes of the two waves add together resulting in a higher wave at the point they meet. In destructive interference, the two waves cancel out resulting in a lower amplitude at the point they meet.

QUESTION: Similarity and difference of galvanometer and electric motor

ANS:

Galvanometers and electric motors are both based on the same basic principle of **an external magnetic field exerting** a force on a current carrying wire. The difference is in how far the device is allowed to move. Motors must be able to move freely and rotate through complete 360° turns.

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QUESTION:

A 2000kg car is moving with a velocity of 20 m/s collides and locks with a 1500 kg car at rest a stop sign. Show the momentum is conserved.

A 2000-kg car moving with a speed of 20 m/s collides with and sticks to a 1500-kg car at rest at a stop sign. Show that because momentum is conserved in the rest frame, momentum is also conserved in a reference frame moving with a speed of 10 m/s in the direction of the moving car

QUESTION:

If you hold water in a paper cup over flame, can you bring the water to boil, if then how?

Just fill a **paper cup** with **water** and start trying to burn it from the outside. The **water** will boil vigorously inside the **cup**, but the **paper** itself will not combust. ... The **boiling water** can't get above 212 degrees, and the **paper** is thin enough that this **water** keeps its temperature from climbing high enough to combust.

Question: What is Corona?

Ans:

A corona discharge is **an electrical discharge caused by the ionization of a fluid** such as air surrounding a conductor carrying a high voltage. A corona occurs at locations where the strength of the electric field (potential gradient) around a conductor exceeds the dielectric strength of the air.

Question: Greenhouse effect explain.

Ans:

The greenhouse effect is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is

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reflected back to space and the rest is absorbed and re-radiated by greenhouse gases. The absorbed energy warms the atmosphere and the surface of the Earth

