PHYSICS

BOOKS - PEARSON IIT JEE FOUNDATION

MODERN PHYSICS

Test Your Concepts Very Short Answer Type Questions

1. `gamma-rays travel with the speed of _____.

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2. Give wavelength range of X-rays.

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Short Answer Type Questions

1. How are X-rays produced?

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Level 1

1. X-rays are electromagnetic radiations of wavelength greater than that of visible light.

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2. $\dfrac{e}{m}$ of cathode rays different at different temperatures.

3. α, β and γ radiations have the same velocity as light.

    A. True

    B. False

    C.

D.

Answer:

4. All gases at normal temperature and pressure are good conductors of electricity.

A. True

B. False

C.

D.

Answer:

5. Alpha rays are highly-energized electrons.

A. True

B. False

C.

D.

Answer:

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6. Cathode rays in a discharge tube are made up of electrons emitted from the plate that is connected to the negative terminal of the DC voltage source.
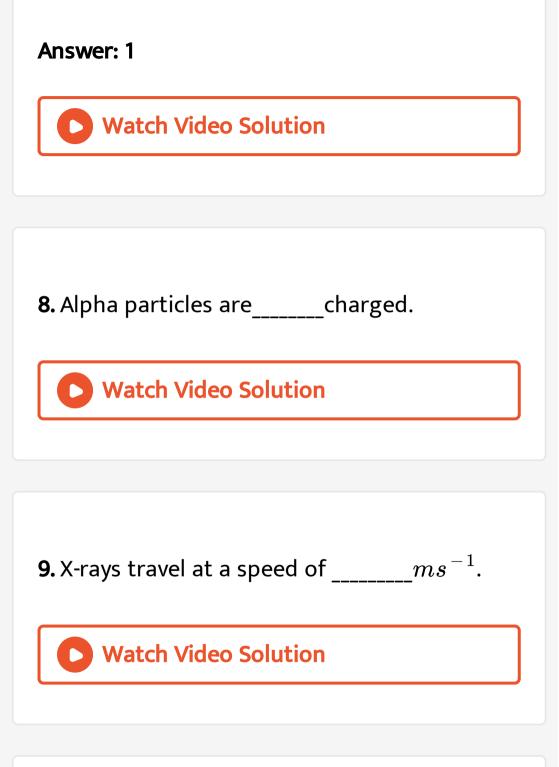
    A. True

    B. False

    C.

D.

Answer: 1

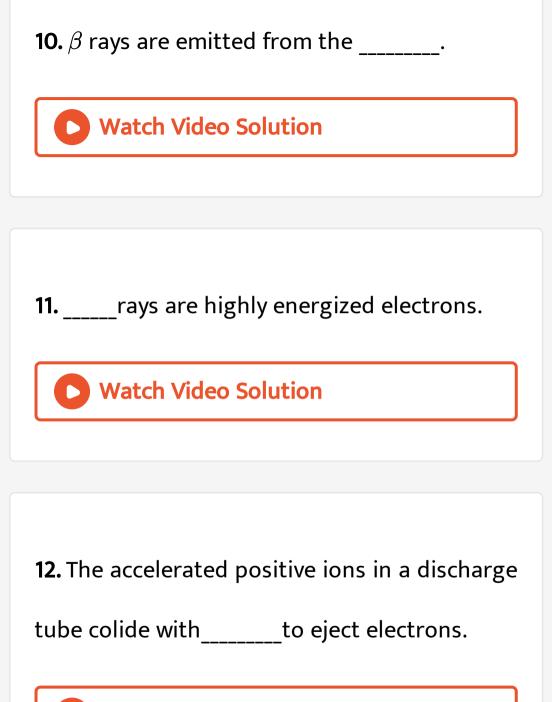**7.** Canal rays are positively charged.

A. True

B. False

C.

D.

Answer: 1

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8. Alpha particles are_____charged.

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9. X-rays travel at a speed of _____ms^{-1}.

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10. β rays are emitted from the _____.

11. _____rays are highly energized electrons.

12. The accelerated positive ions in a discharge tube colide with_____to eject electrons.

13. _____photographs are used to detect fracture of bones.

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14. The discharge tube is filled with uniform_____column glow at how enough pressure of the gas in the tube.

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15. Match the entries given in Column A with appropriate ones in Column B.

	Column A			Column B
A.	Canal rays	( )	a.	blue light
B.	Cathode rays	( )	b.	helium nuclei
C.	α-rays	( )	c.	electrically neutral
D.	X-rays photography	( )	d.	discovery of radium
E.	γ-rays	( )	e.	J.J. Thomson
F.	Hydrogen in discharge tube	( )	f.	1.76×10^{11} C kg^{-1}
G.	Study of cathode rays	( )	g.	emitted from anode
H.	Discovery of X-rays	( )	h.	discovery of radioactivity
I.	Marie curie	( )	i.	William Roentgen
J.	Henri Bequerel	( )	j.	Medical diagonostics

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16. If one of the radioactive atoms emits radiation at time 't' minutes, then the next nuclei emits radiation after _____.

A. 2t minutes

B. 2t seconds

C. 2t hours

D. any time

Answer: D

17. The rays that are unaffected by a magnetic field are _____.

A. canal rays

B. γ-rays

C. cathode rays

D. alpha-rays

Answer: B

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18. The rate of emission of radiation, when a radioactive sample is placed in water,_____.

A. increases

B. decreases

C. remains the same

D. Cannot be determined

Answer: C

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19. X-rays are produced by impinging_____on a target.

    A. α particles

    B. protons

    C. electrons

    D. neutrons

Answer: C

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20. How are X-rays produced?

    A. high vaccume tubes

    B. in tubes having inert gases at low pressure

    C. in tubes having inert gases at high pressure

    D. in tubes having only CO_2 at high pressure

Answer: B

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21. The 'weak x-rays' emission from uranium salts, discovered by Becquerel, could_____.

A. iomize gases

B. affect photographic plates

C. penetrate through matter

D. All the above

Answer: D

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22. The conditions for the discharge of electricity through gases in a discharge tube is _____.

A. high potential and high pressure

B. high potential and low pressure

C. low potential and high pressure

D. low potential and low pressure

Answer: B

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23. A modified discharge tube is used as _____.

A. cathode ray oscilloscope

B. fluorescent tube

C. X-ray tube

D. All the above

Answer: D

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24. In a Coolidge tube, an electric field is applied

A. to increases the charge on the cathode rays.

B. to accelerate the cathode rays.

C. to produce fluorescence

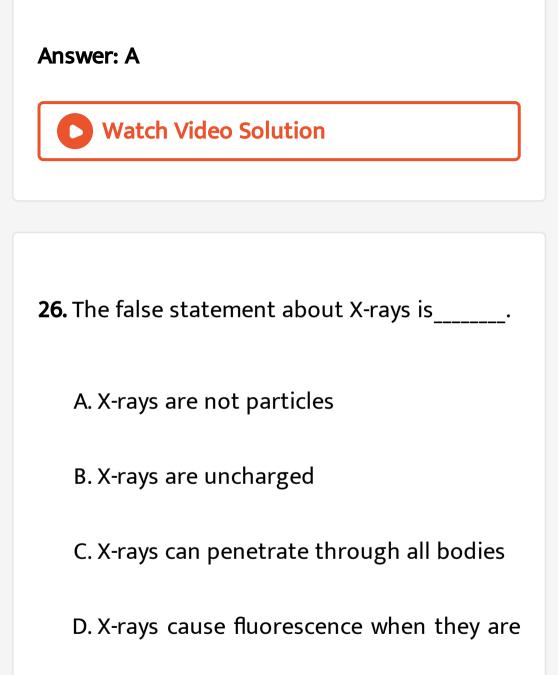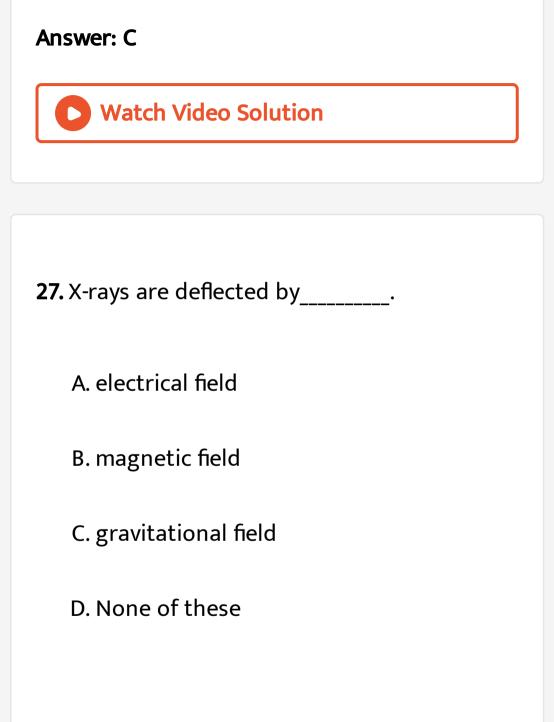D. to decrease the charge on the cathode rays.

Answer: B

25. The fluorescence of the glass (discharge) tube at very low pressure is characteristic of_____.

    A. the phosphors in the material of the glass

    B. the gas used in the tube

    C. the cathode

    D. all the above

Answer: A

26. The false statement about X-rays is_____.

    A. X-rays are not particles

    B. X-rays are uncharged

    C. X-rays can penetrate through all bodies

    D. X-rays cause fluorescence when they are

       incident on cadmium sulphide

Answer: C

27. X-rays are deflected by_____.

A. electrical field

B. magnetic field

C. gravitational field

D. None of these

Answer: D

28. A light paddle wheel placed in the path

of_____will rotate.

A. cathode rays

B. α-rays

C. β-rays

D. All the above

Answer: D

29. The electric field applied in vertical directional to the cathode rays moving horizontally deflect them in _____
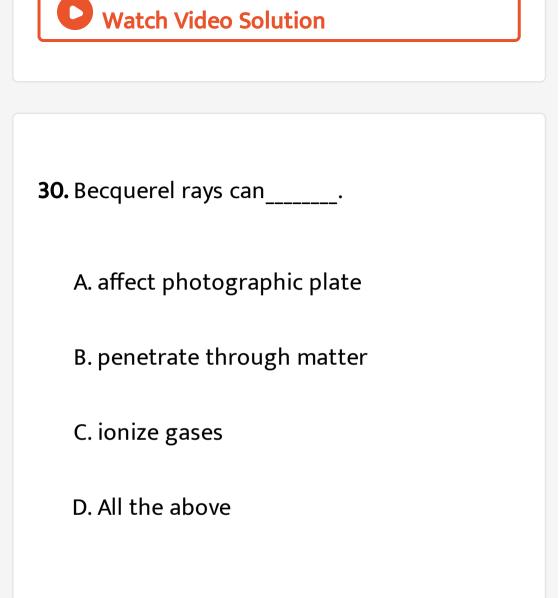
A. horizontal direction

B. vertical direction

C. Both (a) and (b)

D. None of these

Answer: B

30. Becquerel rays can_____.

A. affect photographic plate

B. penetrate through matter

C. ionize gases

D. All the above

Answer: D

1. In Millikan's oil drop experiment, the charge on a oil drop was found due to an experimental error, to be $8.88 \times 10^{-18} C$. Why can't such a quantity of charge be present on the oil drop ? Explain. (Charge on an electron is $1.6 \times 10^{-19} C$)

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2. The total electric charge on a certain number of electrons is found to be 96368 C. What is the mass of these electrons ?

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3. Can $\dfrac{e}{m}$ of singly-ionized atoms of the same element can have different values? Explain.

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4. If the entire mass of the body (45.5 kg) is assumed to be made up of electrons, how many electrons are present in mass of an electron is $9.1 \times 10^{-31} kg$?

5. X-rays are produced by cathode rays which are a beam of electrons. Explain what happens to the electrons on hitting the target.

6. When a charged particle of charge x C moves through a potential difference of y V, the gain in kinetic energy is equal to xy J.

An electron and an alpha partice have their masses in the ratio of 1:7200 and charges in the ratio of 1:2. If they start moving from rest through the same electrical potential difference, find the ratio of their velocities.

7. To produce X-rays in a Coolidge tube, why is it necessary to accelerate cathode rays ?

8. The mass of a proton is 1836 times that of an electron. If they fall through the same potential difference, find the ratio of their velocities.

9. Can X-rays be produced in discharge tube ? Explain why Coolidge tube is preferred tube to produce X-rays ?

10. The velocity of electrons in cathode rays is 0.1c where c is the velocity of light. However, when they are accelerated through a potential difference of 20,000 V, their velocity is found to be $8.4 \times 10^7 ms^{-1}$. What is the percentage

increase in the kinetic energy of electrons ?

(Take $c = 3 \times 10^8 ms^{-1}$)

11. The nuclei of atoms of all elements are made up of protons and neutrons. Then why do only a few of them show radioactivity ?

12. What happens if cathode rays are stopped by a metal ?

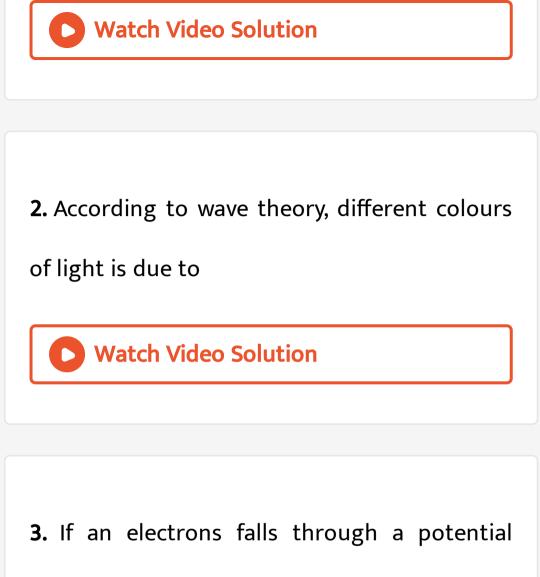**13.** A radioactive element $._Z X^4$ whose atomic mass is A and atomic number is Z emits an α-particle and γ-rays. What is the atomic number and atomic mass of the newly formed (daughter) atom?

14. Explain how the discharge phenomenon is applied in fluorescent lamps and neon lamps.

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Level 3

1. An α particle and a proton fall through the same potential difference. Find the ratio of their momentra if the mass of the α particle is four times that of the proton.

2. According to wave theory, different colours

of light is due to

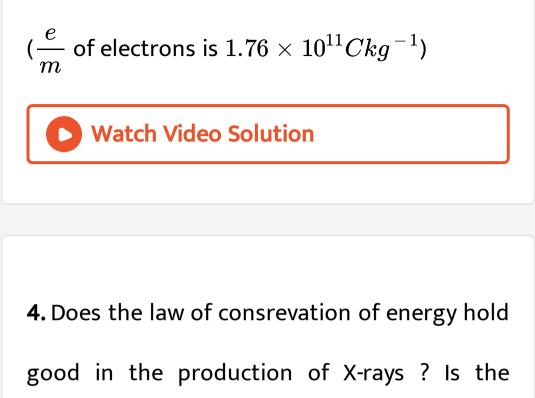**3.** If an electrons falls through a potential

difference of 1V from its initial position of rest,

then find its acceleration at a distance of 5 cm

from its initial position if it moves in a straight

line.

$(\dfrac{e}{m}$ of electrons is $1.76 \times 10^{11} Ckg^{-1})$

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4. Does the law of consrevation of energy hold good in the production of X-rays ? Is the kinetic energy conserved? Discuss.

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5. On a piece of paper certain odd number of horizontal lines at equal distances are drawn. An equal number of vertical lines at equal distances are also drawn, forming rectangles. The rectangles are coloured black or white, set alternately. Three coins are put at random in these rectangles. Let p be the probability of having two coins in rectangles of the same colour and the third in a rectangle of the other colour, and p' be the probability of having all the coins in the rectangles of the same colour. If $p:p' = 16:5$ then find the

number of horizontal lines drawn on the paper.

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