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PHYSICS

PAPER 1 3117/1

Wednesday **27 MAY 2020** 12:00 NOON–1:15 P.M.

Additional materials:
None

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

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INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

All answers are to be recorded in this booklet.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer as many questions as you can. For each question, four possible answers, **A, B, C** and **D** are given.

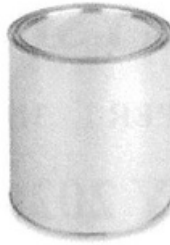
Circle the letter by the response which you consider to be correct.

Rough work paper should not be handed in.



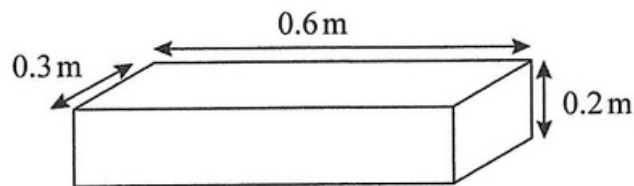
This question paper consists of 22 printed pages and 2 blank pages.

1. An unopened can of paint has a mass of 5.25 kg. The empty paint can and lid have a combined mass of 0.83 kg.



What is the **weight** of the paint in the can, given that the gravitational field strength acting on it is 10 N/kg ?

- A. 4.42 kg
B. 6.08 kg
C. 44.2 N
D. 60.8 N
2. The diagram shows a rectangular metal block of weight 450 N which measures $0.6 \text{ m} \times 0.3 \text{ m} \times 0.2 \text{ m}$.

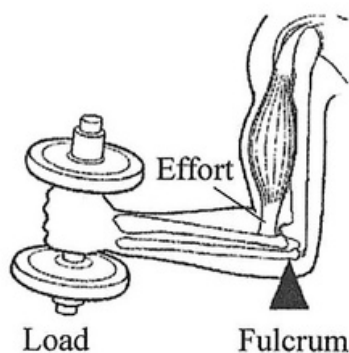


In its current position, what pressure would it exert on the ground?

- A. 750 Pa
B. 2 500 Pa
C. 3 750 Pa
D. 7 500 Pa



3. The diagram shows a simplified drawing of a human forearm while lifting dumb-bells.



Which row in the table gives the correct classification of the human arm as a simple machine?

	Class of lever	Type of simple machine
A.	1st	Distance multiplier
B.	2nd	Force multiplier
C.	3rd	Distance multiplier
D.	3rd	Force multiplier

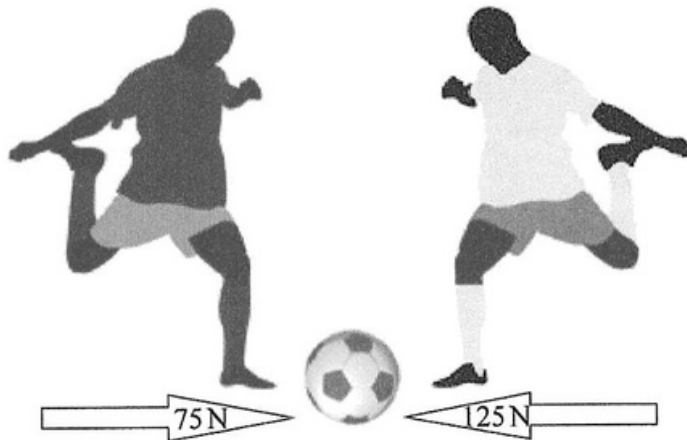
4. The air in a hot air balloon is heated by a small flame, allowing it to rise.



Which row in the table correctly shows the effect of heating on volume and density of the gas in the balloon?

	Volume of gas	Density of gas
A.	decreases	increases
B.	increases	decreases
C.	decreases	decreases
D.	increases	increases

5. Two soccer players simultaneously kick a soccer ball with forces of 75 N and 125 N in opposite directions as shown in the diagram.



If the soccer ball has a mass of 0.43 kg, what is its acceleration, ignoring friction?

- A. 116.3 m/s²
 B. 174.4 m/s²
 C. 290.7 m/s²
 D. 465.1 m/s²



6. An athlete runs a distance of 400 m, once around the track. The time when he passes each 100 m interval is recorded as shown in the table shown.



During which interval A, B, C or D was his speed the greatest?

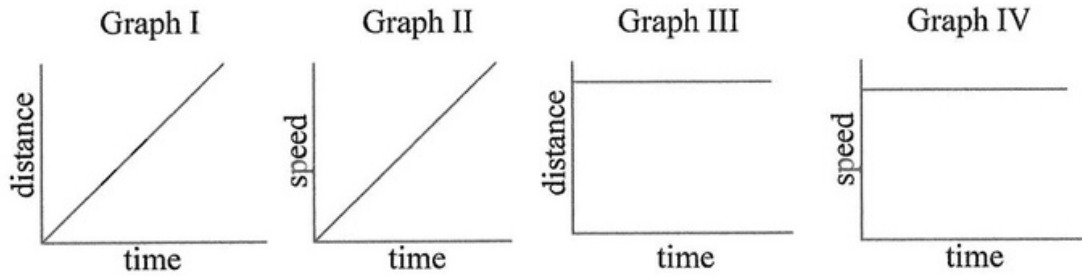
	Distance from start (m)	Time athlete passed (s)
A.	100	12.5
B.	200	27.0
C.	300	40.5
D.	400	62.5

7. The table shows the masses and velocities of four vehicles.

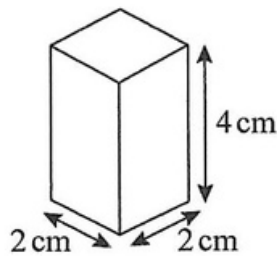
	Vehicle	Mass (kg)	Velocity (m/s)
A.	1	900	25 m/s
B.	2	1350	20 m/s
C.	3	1550	15 m/s
D.	4	2250	0

Which of the four vehicles has the greatest momentum?

8. Which two graphs correctly depict the motion of an object whose speed is constant?



- A. Graphs I and II
B. Graphs I and IV
C. Graphs II and III
D. Graphs II and IV
9. The diagram below shows a rectangular block made of aluminium. The density of aluminium is 2.7 g/cm^3 .

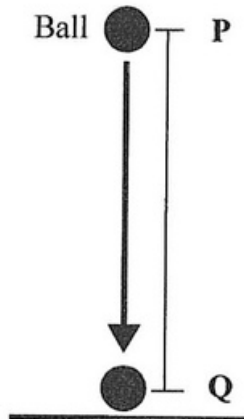


What is the mass of the block?

- A. 0.17 g
B. 5.93 g
C. 21.6 g
D. 43.2 g

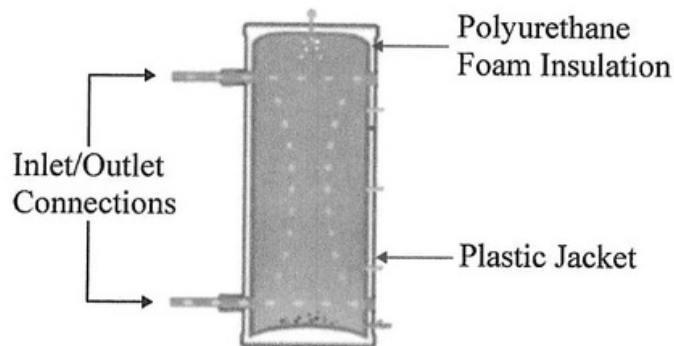


10. A ball is dropped vertically from **Point P** to **Point Q**.



What energy changes take place as the ball falls from **Point P** to **Point Q**?

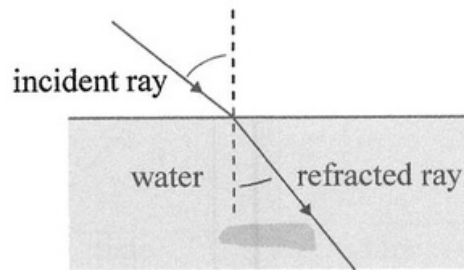
- A. It loses both gravitational potential energy and kinetic energy
 - B. It loses gravitational potential energy and gains kinetic energy
 - C. It gains gravitational potential energy and loses kinetic energy
 - D. It gains both gravitational potential energy and kinetic energy
11. The diagram shows a simplified diagram of a water heater.



What are the best positions for the heating element and hot water inlet?

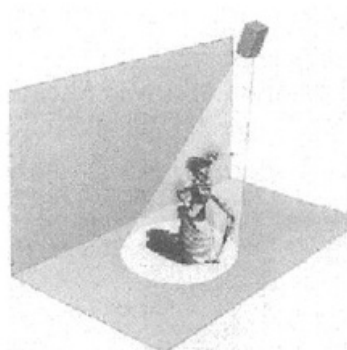
	Heating Element	Position of Hot Water Outlet
A.	Bottom	Top
B.	Bottom	Bottom
C.	Top	Bottom
D.	Top	Top

12. The diagram shows a ray of light leaving air and entering water.



What change would occur to the ray of light as it enters the water?

- A. its speed decreases
 - B. its speed increases
 - C. its frequency decreases
 - D. its frequency increases
13. A performer on stage wears a white and blue dress for her role in the play.

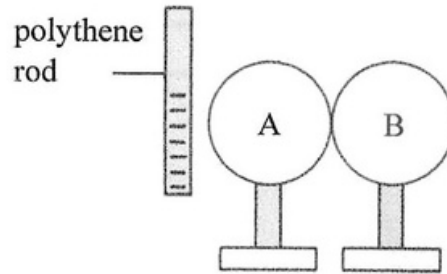


What colour will she appear to be wearing when red light falls on her?

- A. Red and black
- B. Black and green
- C. Blue and red
- D. Blue and green



14. Two metal spheres A and B on insulated bases are in contact with each other. A negatively charged polythene rod is then placed close to sphere A as shown in the diagram.



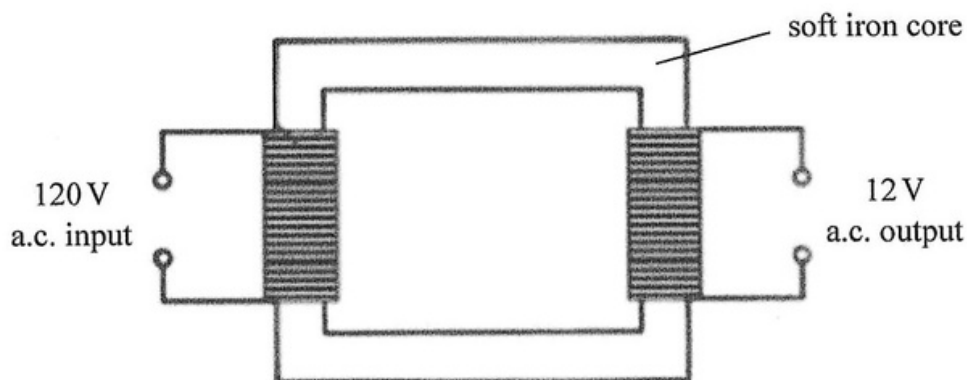
What charge is induced on spheres A and B while the charged polythene rod is in the position shown?

	Insulated Metal Sphere A	Insulated Metal Sphere B
A.	Negative	Negative
B.	Negative	Positive
C.	Positive	Negative
D.	Positive	Positive

15. An LED television has a power rating of 75 W. What will be the cost of operating the television for 12 hours if one kilowatt hour of electricity costs 20 cents?

- A. \$ 0.015
- B. \$ 0.18
- C. \$ 0.90
- D. \$ 15.00

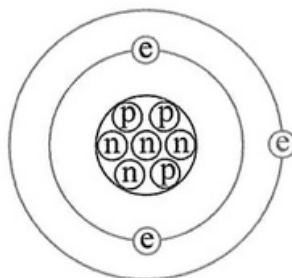
16. An ideal transformer has an input voltage of 120 V and 600 primary turns. The transformer produces a secondary voltage of 12 V.



Which row in the table correctly presents the number of secondary turns and output power?

	Number of Secondary turns	Output Power
A.	60	Same as input power
B.	100	Greater than input power
C.	120	Same as input power
D.	6 000	Less than input power

17. The diagram shows the particles in an atom.



What is the atomic number of the atom shown?

- A. 3
- B. 4
- C. 7
- D. 10

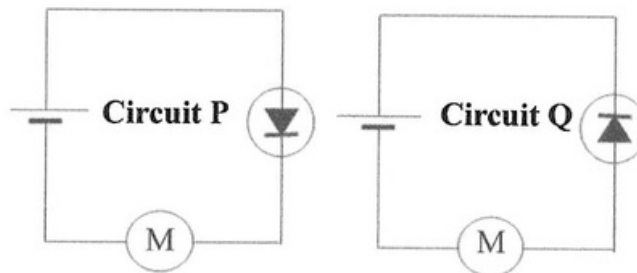


18. When only the loudness of a musical note is increased, which property of the sound wave will also increase?
- A. amplitude
 - B. frequency
 - C. speed
 - D. wavelength

19. A student set up a circuit with a mystery component. As light intensity falling on the mystery component increases, the resistance decreases and more current flows.

What is the name of the mystery component?

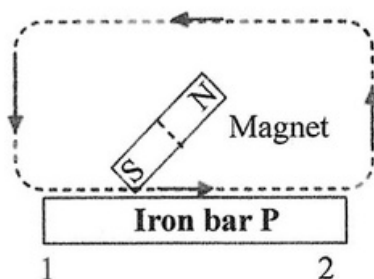
- A. Light-emitting diode
 - B. Light dependent resistor
 - C. Thermistor
 - D. Variable resistor
20. Two simple electronic circuits, P and Q are shown.



Which of the following statements are true?

- A. The motors in both Circuits **P** and **Q** are on.
- B. The motor in Circuit **P** is on, while the motor in Circuit **Q** is off.
- C. The motor in Circuit **P** is off, while the motor in Circuit **Q** is on.
- D. The motors in both Circuits **P** and **Q** are off.

21. A student strokes an iron bar labelled **P** with a permanent magnet in the direction shown in the diagram below.



What are **poles 1** and **2**?

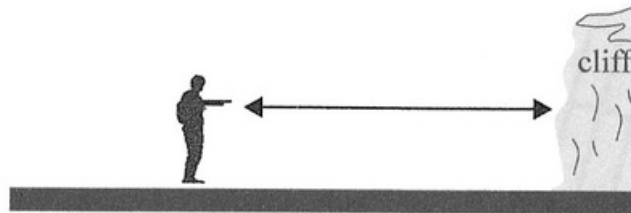
	Pole 1	Pole 2
A.	North	North
B.	North	South
C.	South	North
D.	South	South

22. A washing machine has a power rating of 1.2 kW and operates on a 120 V supply. Which fuse would be most suitable?

- A. 2 A
- B. 5 A
- C. 10 A
- D. 13 A

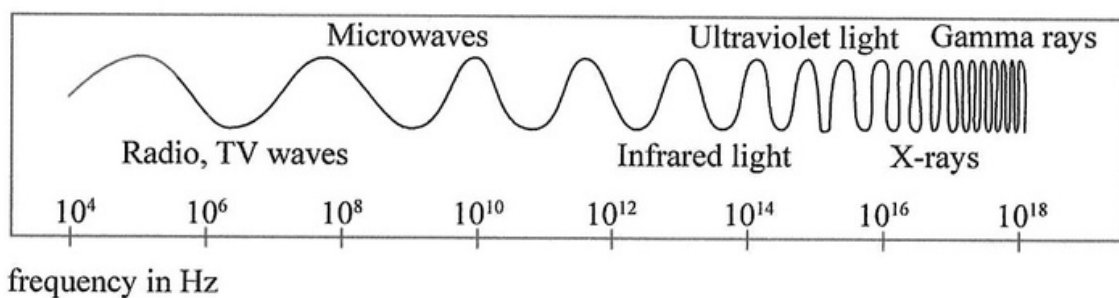


23. A young man on a camping expedition, shouts and hears the sound of his echo after 5 seconds from a nearby cliff.



How far is the young man from the cliff, if the speed of sound in air is 340 m/s?

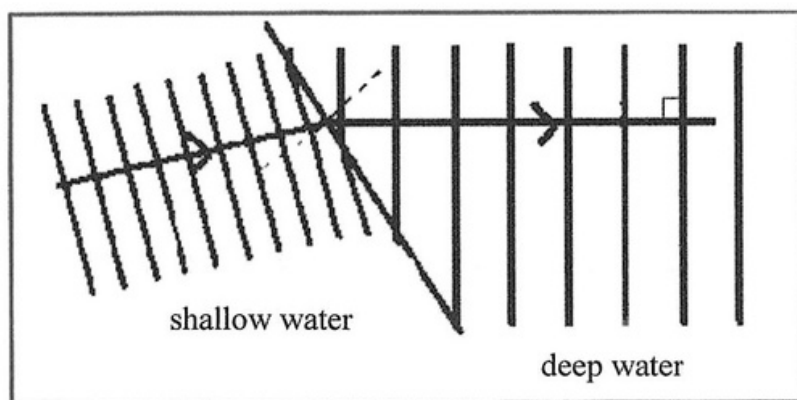
- A. 425 m
 - B. 680 m
 - C. 850 m
 - D. 1700 m
24. The figure below presents a schematic representation of a particular type of wave.



Which of the following electromagnetic waves are normally used for communication?

- A. gamma rays, infra-red, radio-waves
- B. infrared, x-rays, microwaves
- C. microwaves, radio-waves, visible light
- D. ultra-violet, radio-waves, visible light

25. The diagram below shows a water wave moving from shallow to deep water.



Which row in the table correctly describes what happens as the water moves into the deep water?

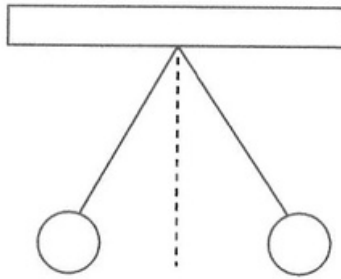
	Wavelength	Frequency	Speed
A.	decreases	decreases	decreases
B.	decreases	remains same	increases
C.	increases	increases	decreases
D.	increases	remains same	increases

26. Which row in the table correctly identifies a sound wave?

	Type of wave	Origin of wave
A.	longitudinal	electromagnetic
B.	longitudinal	vibrations
C.	transverse	electromagnetic
D.	transverse	vibrations

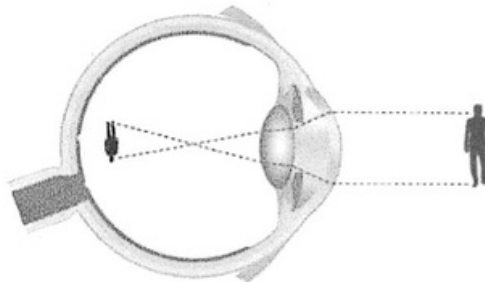


27. Two identical insulating balls, suspended on nylon threads, come to rest with the threads making equal angles with the vertical, as shown in the diagram.



This shows that:

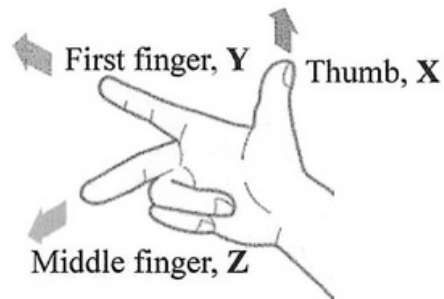
- A. the balls are oppositely charged
 - B. both are uncharged
 - C. the balls both carry the same type of charge
 - D. one ball is charged and the other is uncharged
28. The diagram below is a ray diagram showing a common eye defect.



What is the name of the defect shown and a suitable lens used for its correction?

	Eye Defect	Lens used for its Correction
A.	farsightedness	concave
B.	farsightedness	convex
C.	nearsightedness	concave
D.	nearsightedness	convex

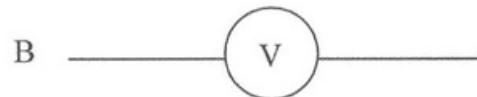
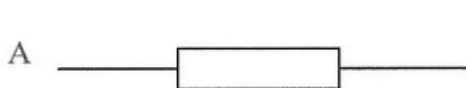
29. Fleming's Right hand rule can be used to determine the direction of the voltage induced in a straight wire, when it is moved in a magnetic field.



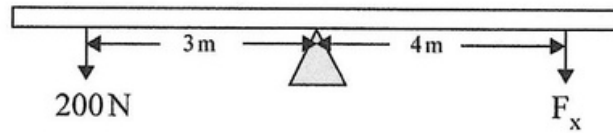
What directions are represented by letters X, Y and Z?

	X	Y	Z
A.	conventional current	magnetic field	motion of wire
B.	motion of wire	magnetic field	conventional current
C.	magnetic field	conventional current	motion of wire
D.	conventional current	motion of wire	magnetic field

30. Which symbol represents a source of an electric current in a circuit?

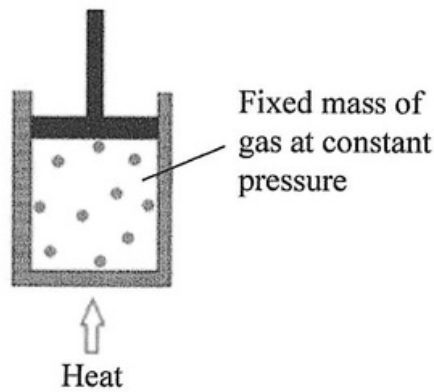


31. A uniform see-saw is balanced at its midpoint, when forces of 200 N and F_x , are placed 3 m and 4 m respectively, from the midpoint.



What is the value of F_x ?

- A. 150 N
 - B. 267 N
 - C. 600 N
 - D. 800 N
32. Heat is applied to a fixed mass of gas at constant pressure, as shown in the diagram below.



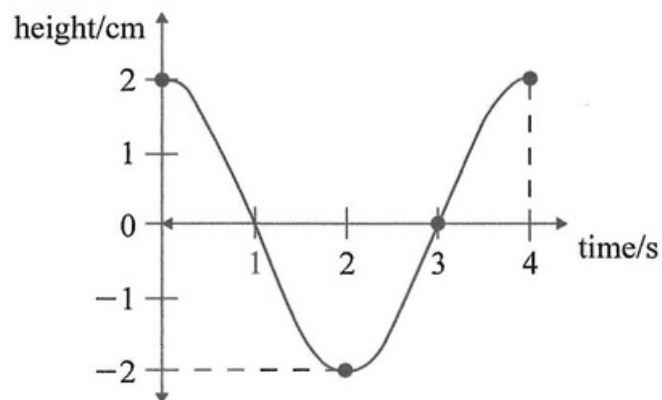
What happens to the kinetic energy of the particles and volume of the gas?

	Kinetic energy of particles	Volume of gas
A.	decreases	decreases
B.	increases	increases
C.	decreases	increases
D.	increases	decreases

33. Which of the following is a vector quantity?

- A. volume
- B. mass
- C. speed
- D. velocity

34. The graph below shows the variation in height with time for a transverse wave.

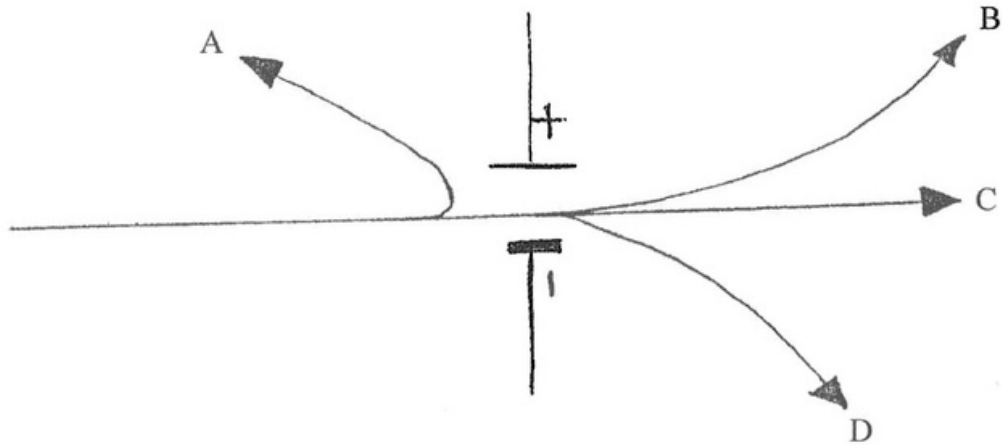


What is the amplitude and frequency of the wave?

	Amplitude/cm	Frequency/Hz
A.	2	0.25
B.	4	0.50
C.	2	2.00
D.	4	4.00

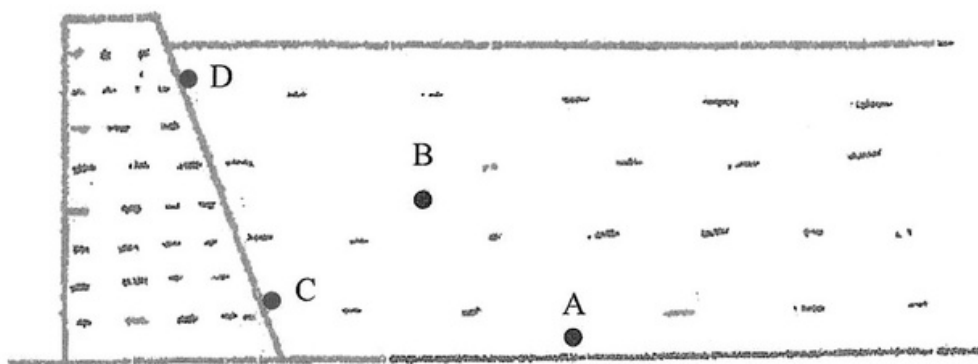


35. Which path will a stream of alpha particles take as it passes the electric field as shown?



36. What effect, if any, would increasing the current, have on the rotating coil of an electric motor?
- A. It reverses direction.
 - B. It rotates more slowly.
 - C. It rotates more quickly.
 - D. It rotates at the same speed.
37. Which of the following is the freezing point of water?
- A. 0 K
 - B. 100 K
 - C. 273 K
 - D. 373 K
38. Which electric appliance uses an electromagnet?
- A. car starter motor
 - B. iron
 - C. kettle
 - D. electric hot plate

39. The diagram shows a dam. At what point will the water pressure be the least?

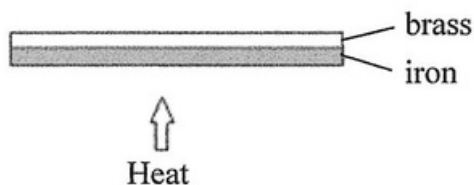


40. Which list of energy sources contains only nonrenewable energy resources?

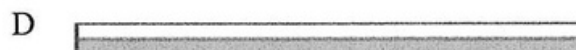
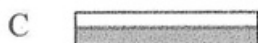
- A. natural gas, geothermal, biomass
- B. geothermal, solar, wind
- C. hydroelectric, wave, oil
- D. natural gas, oil, nuclear

41. Bi-metallic strips are commonly used in thermostats to automatically switch off electrical appliances if overheating occurs.

The diagram below shows a bi-metallic strip, made of brass and iron.



Which shape will the bi-metallic strip become when it is heated as shown in the above diagram?
Note: brass expands more than iron when heated



42. A glass rod acquired a positive charge after rubbing it with dry silk. How did the glass rod acquire this positive charge?
- A. it gained electrons
 - B. it lost electrons
 - C. it gained protons
 - D. it lost protons

43. Which of the following devices utilises thermionic emission?

- A. Stereo sound system
- B. Transistor radio
- C. Cathode ray tube
- D. Toaster

44. An astronaut on the Moon can see a spacecraft.
The astronaut sends a microwave signal, a visible light signal and a radio signal to the spacecraft.
The signals all leave at the same time.

In which order will the signals arrive at the spacecraft?

- A. radio first, then microwave, then visible light
- B. visible light first, then microwave, then radio
- C. visible light first, then radio, then microwave
- D. they all arrive at the same time

45. Which of the following lists nuclear radiation in order of **increasing** penetrative ability?

- A. $\beta \gamma \alpha$
- B. $\alpha \gamma \beta$
- C. $\alpha \beta \gamma$
- D. $\beta \alpha \gamma$

46. The carbon in the body of an animal contains some radioactive carbon-14. At the time when any animal dies, it emits about 32 β -particles per minute per gram.
Some animal remains were discovered and it was found that 4 β -particles are emitted per minute per gram of carbon.

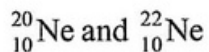
The half-life of carbon-14 is 6000 years. How old are the remains of the animal?

- | | |
|-----------------|-----------------|
| A. 1 500 years | B. 3 000 years |
| C. 18 000 years | D. 24 000 years |

47. Which of the following particles are found in the nucleus of an atom?

- A. electrons and neutrons
- B. electrons and protons
- C. neutrons and protons
- D. neutrons only

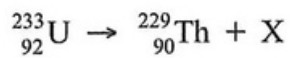
48. Two atoms of neon are shown below:



Which statement is true?

- A. both have the same mass number
- B. both have the same number of protons
- C. both have the same number of neutrons
- D. Neon-22 has 2 more protons than Neon-20

49. A radioactive decay can be represented as shown.



In this decay, what does X represent?

- A. a neutron
- B. a proton
- C. an α -particle
- D. a β -particle

50. Which device converts sound energy into electrical energy?

- A. battery
- B. generator
- C. motor
- D. microphone



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