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PHYSICS

BY CHAPTER F4 & F5

F5 CH6: NUCLEAR PHYSICS

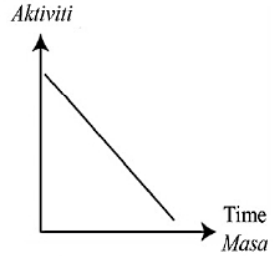
COMPILATION OF OBJECTIVE QUESTIONS

DREAM BIG
AIM HIGH
NEVER GIVE UP

alinaimanarif

1 Graf berikut yang manakah menunjukkan bagaimana aktiviti bahan radioaktif berubah dengan masa?
Which of the *following* graphs shows how the activity of a radioactive substance varies with time?

A



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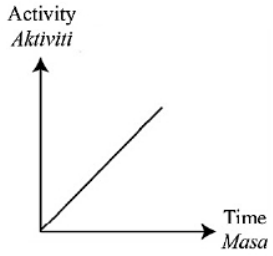

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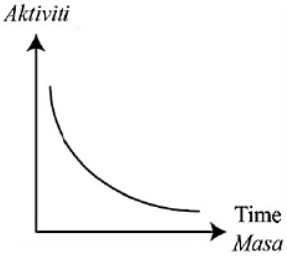

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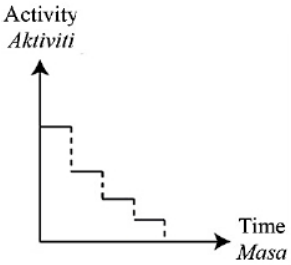


2 Sinar-γ tidak dipesongkan oleh medan elektrik dan medan magnet kerana
γ-rays are not deflected by an electric and magnetic field because

A ia bergerak dengan kelajuan cahaya. / *they travel at the speed of light.*
B ia mempunyai kuasa pengionan yang kuat. / *they have higher ionizing power.*
C ia tiada jisim. / *they have no mass.*
D ia adalah neurtal. / *they are neutral.*

3 Jenis sinaran radioaktif yang manakah dapat dihentikan sepenuhnya oleh sehelai kertas?
What type of radioactive radiation can be completely stopped by a piece of paper?

A Neutron / *Neutron*
B Zarah-α / *α-particle*
C Zarah-β / *β-particle*
D Sinar-γ / *γ-rays*

4 Setengah-hayat ialah masa untuk
Half-life is the time taken for

A aktiviti bahan radioaktif menjadi setengah.
the activity of a radioactive substance to be halved.
B elektron dipancarkan dari bahan radioaktif.
the electrons to be released from the nucleus of a radioactive element.
C isipadu bahan radioaktif menjadi setengah.
the volume of a radioactive substance to be halved.
D unsur radioaktif reput sepenuhnya.
the radioactive element to completely decay.

5 Persamaan mewakili reputan radioaktif plumbum Pb.
The equation represents the radioactive decay of lead Pb.

$$^{214}_{82}\text{Pb} \rightarrow {}^{214}_{83}\text{Bi} + {}^{0}_{-1}\text{X} + \text{Y}$$

Apakah X dan Y?
What are X and Y?

	X	Y
A	β	α
B	α	β
C	α	γ
D	β	γ

6 Aktiviti suatu bahan radioaktif ialah 2400 bilangan sesaat.
Jika setengah-hayat bahan itu ialah 3 minit, berapa lamakah ia akan ambil untuk aktiviti jatuh kepada 159 bilangan sesaat?
The activity of a certain radioactive material is 2400 counts per second.
If the half-life of the material is 3 minutes, how long will it take for the activity to fall to 150 counts per second?

A 6 minit / *minutes*
B 9 minit / *minutes*
C 12 minit / *minutes*
D 15 minit / *minutes*

7 Rajah 1 menunjukkan satu siri pereputan radioaktif bagi nukleus Uranium-238 hingga Radium-226.
Diagram 1 shows a series of radioactive decays for the nucleus of Uranium-238 to that of Radium-226.

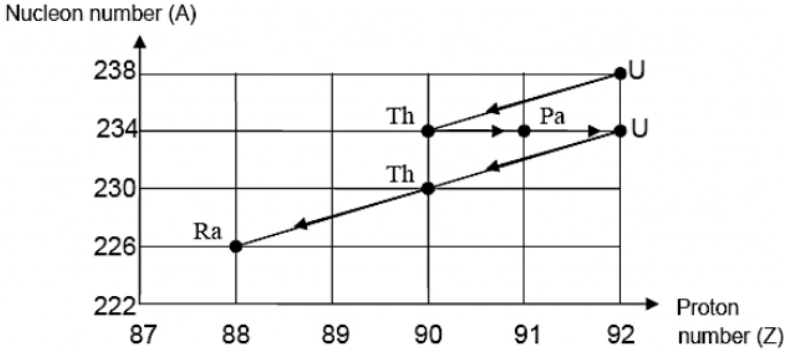


Diagram 1

Berapa banyak zarah alfa dan beta yang dipancarkan dalam proses ini?
How many alpha and beta particles are emitted in this process ?

	Bilangan zarah alfa *Number of alpha particles*	**Bilangan zarah beta** *Number of beta particles*
A	3	2
B	2	3
C	4	1
D	1	1

8 $^{238}_{92}$U mereput dan mengeluarkan zarah α diikuti oleh zarah β menjadi lebih stabil.
Nombor nukleon dan nombor proton nuklida adalah
$^{238}_{92}U$ *decays and emits an α particle followed by a β particle to become more stable.*
The nucleon number and proton number of the daughter nuclide is

A $^{232}_{92}Ra$ **C** $^{234}_{90}Ph$

B $^{234}_{91}Pa$ **D** $^{230}_{90}Th$

9 Persamaan berikut menunjukkan pereputan alpha.
The following equation represents an alpha decay.

$$^{b}_{a}X \rightarrow {}^{d}_{c}Y + \alpha$$

Hubungan mana yang betul?
Which relationship is correct?

A $a - b = c - d$ **C** $a = c + 2$

B $a + b = c + d$ **D** $b + 4 = d$

10 Pernyataan berikut, yang manakah betul mengenai penggunaan bahan radioaktif?
Which of the following statement is correct about the use of radioactive substance?

A Untuk menentukan kandungan dalam bagasi penumpang pesawat udara.
To determine the contents in a baggage of an air plane passenger.

B Untuk menentukan kedalaman objek bawah laut.
To determine the depth of an underwater object.

C Untuk menentukan jantina janin.
To determine the sex of a foetus.

D Untuk mengesan kebocoran paip bawah tanah.
To detect leakage in underground pipes.

11 Persamaan mewakili pelakuran nuklear.
The equation represents a nuclear fusion.

$$ {}^{2}_{1}\mathrm{H} + {}^{2}_{1}\mathrm{H} \rightarrow {}^{3}_{2}\mathrm{H} + {}^{1}_{0}\mathrm{n} + \text{energy} $$

Apakah syarat mesti wujud sebelum tindakbalas di atas boleh berlaku?
What conditions must exist before the reaction above can take place?

A Suhu dan tekanan yang sangat tinggi diperlukan.
Very high temperature and pressure is required.
B Pemangkin perlu ditambahkan.
A catalyst must be added.
C Neutron mesti ditembak kepada bahan-bahan tindakbalas.
Neutrons must be bombarded to the reacting materials.
D Oksigen mesti wujud.
Oxygen must be present.

12 Dalam tindakbalas nuklear manakah nuklei adalah lebih berat selepas tindakbalas berbanding dengan sebelum tindakbalas?
In which type of nuclear reaction is the nuclei heavier after the reaction than before the reaction?

A Pembelahan nuklear
Nuclear fission
B Pelakuran nuklear
Nuclear fusion
C menyerap haba yang dihasilkan
absorb heat produced
D mengalirkan arus elektrik.
conduct electricity.

13 Fungsi teras grafit dalam reaktor nuklear ialah untuk
The function of the graphite core in a nuclear reactor is to

A memperlahankan neutron.
slow down neutrons
B bertindak sebagai pemangkin
act as a catalyst
C menyerap haba yang dihasilkan
absorb heat produced
D mengalirkan arus elektrik.
conduct electricity.

14 Tenaga dibebaskan semasa pelakuran nuklear kerana
Energy is released during nuclear fusion because

A dua nuklei ringan saling menarik
the two light nuclei attract each other
B terdapat tolakan elektrostatik antara dua nuklei ringan
there is electrostatic repulsion between the two light nuclei
C tenaga kinetik dua nuklei ringan ditukarkan kepada haba
the kinetic energy of the two light nuclei is converted to heat
D terdapat perbezaan jisim antara nukleus akhir dan dua nuklei ringan
there is a difference in mass between the final nucleus and the two light nuclei

15 Punca tenaga dari matahari adalah kerana
The source of energy from the sun is due to

A Pembakaran / *Combustion*
B Pembelahan Nuklear / *Nuclear Fission*
C Pelakuran Nuklear / *Nuclear Fusion*
D Pereputan radioaktif / *Radioactive decay*

16 Berapakah kuantiti tenaga yang dibebaskan apabila terdapat kecacatan jisim 0.01 g?
What is the quantity of energy released when there is a mass defect of 0.01 g?

A 9×10^{14} J
B 9×10^{11} J
C 3×10^{6} J
D 1×10^{-19} J

17 Kemungkinan tindak balas pelakuran ditunjukkan oleh persamaan berikut:
A possible fusion reaction is represented by the following equation:

$$^{2}_{1}\mathrm{H} + {}^{2}_{1}\mathrm{H} \rightarrow {}^{3}_{1}\mathrm{H} + {}^{1}_{1}\mathrm{H}$$

[Jisim deuterium / *Mass of deuterium*, $^{2}_{1}\mathrm{H}$ = 2.014102 u]
[Jisim tritium / *Mass of tritium*, $^{3}_{1}\mathrm{H}$ = 3.016049 u]
[Jisim hidrogen / *Mass of hydrogen*, $^{1}_{1}\mathrm{H}$ = 1.007825 u]
[1 u = 1.66×10^{-27} kg]
[laju cahaya / *speed of light*, c = 3.0×10^{8} m s^{-1}]

Berapakah kuantiti tenaga yang dibebaskan?
What is the quantity of energy released ?

A 2.23×10^{-13} J
B 3.56×10^{-13} J
C 5.19×10^{-13} J
D 6.47×10^{-13} J

18 Tindak balas berantai boleh berlaku dalam reaktor kerana semasa pembelahan nuklear
A chain reaction can occur in a reactor because during nuclear fission

A neutron baru dihasilkan / *new neutrons are produced*
B dua serpihan pembelahan dihasilkan / *two fission fragments are produced*
C sejumlah besar tenaga dibebaskan / *a large amount of energy is released*
D suhunya sangat tinggi / *the temperature is very high*

19 Dalam tindak balas nuklear, tenaga 5.265×10^{-10} J dilepaskan.
In a nuclear reaction, 5.265×10^{-10} J energy is released.

Apakah kecacatan massa tindak balas ini?
What is the mass defect of this reaction?

A 4.74×10^{7} kg
B 1.76×10^{-18} kg
C 1.58×10^{-2} kg
D 5.85×10^{-27} kg

20 Proses pemisahan nukleus yang lebih berat untuk membentuk dua inti yang lebih ringan dikenali sebagai
The process of a heavier nucleus splitting to form two lighter nuclei is known as

A Pembakaran / *Combustion*
B Pembelahan Nuklear / *Nuclear Fission*
C Pelakuran Nuklear / *Nuclear Fusion*
D Tindak balas berantai / *Chain Reaction*

21 Apakah terjadi semasa pembelahan nukleus?
What happens during nuclear fission?

A Satu nucleus berat dipecahkan kepada 2 nukleus yang lebih ringan
Heavy nucleus is split into 2 lighter nuclei
B Satu neutron yang bertenaga tinggi dihasilkan semasa pembelahan nukleus
High energy neutron is produced in the process
C Pembelahan nukleus tidak menghasilkan satu cacat jisim
The process does not lead to any mass defect
D Pembelahan nukleus berlaku pada suhu 1000 °C
It occur at a temperature of about 1000 °C

22 Rajah 2 menunjukkan satu proses reputan radioaktif.
Diagram 2 shows a radioactive decay process.

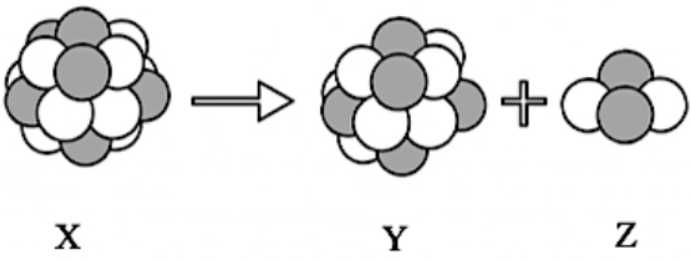


Diagram 2

Antara persamaan berikut, manakah menunjukkan persamaan bagi rajah di atas?
Which of the following equations shows the equation for the diagram above?

A $^{99}_{43}Tc \rightarrow ^{99}_{43}Tc$

B $^{131}_{53}I \rightarrow ^{131}_{54}Xe + ^{0}_{-1}e$

C $^{235}_{92}U \rightarrow ^{234}_{90}Th + ^{4}_{2}He$

D $^{214}_{83}Bi \rightarrow ^{214}_{84}Po + ^{0}_{-1}e + \gamma$

23 Rajah 3 menunjukkan sebuah reaktor nuklear.
Diagram 3 shows a nuclear reactor.

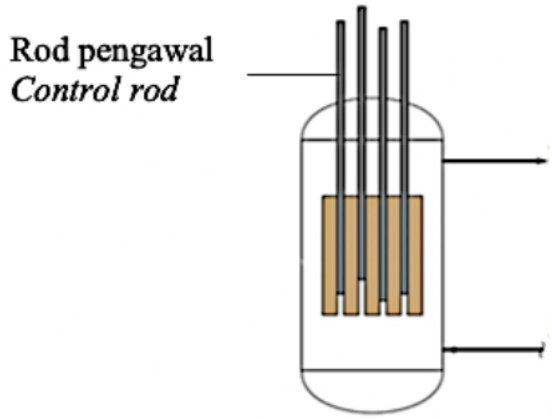


Diagram 3

Apakah fungsi rod pengawal?
What is the function of control rod?

A Mengawal kadar tindak balas
Control the reaction rate

B Memperlahankan pergerakan neutron
Slow down the fast moving neutron

C Sebagai bahan api untuk hasilkan tenaga
As fuel to produce nuclear energy

D Menyerap tenaga haba daripada tindak balas berantai
Absorb heat energy from the chain reaction

24 Rajah 4 menunjukkan satu lengkung reputan bagi suatu bahan radioaktif.
Diagram 4 shows a decay curve for a radioactive substance.

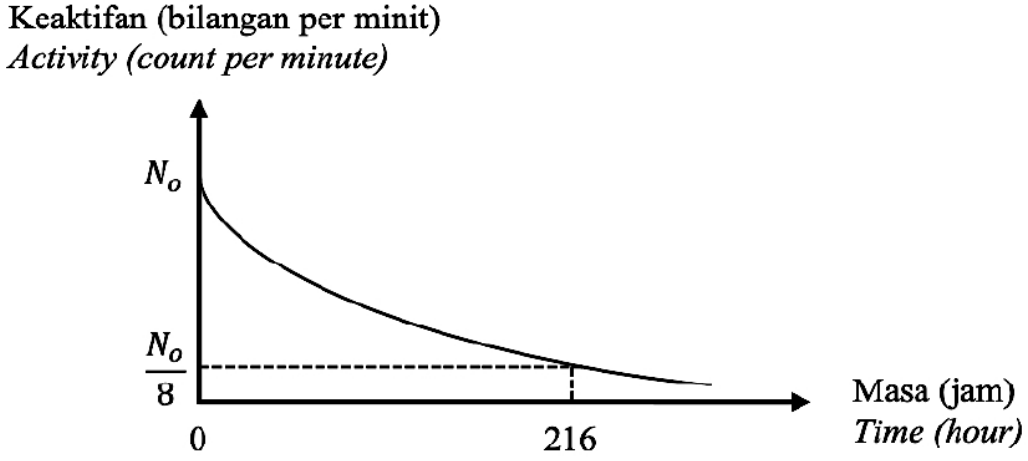


Diagram 4

Tentukan separuh hayat bagi bahan radioaktif itu.
Determine the half-life of the radioactive substance.

A 9 jam
B 12 jam
C 18 jam
D 72 jam

25 Suatu bahan radioaktif yang disimpan di dalam makmal mempunyai separuh hayat 15 minit. Hitungkan masa yang diambil untuk keaktifan bahan radioaktif tinggal 12.5% daripada keaktifan asalnya.
A radioactive material stored in the laboratory has a half-life of 15 minutes.
Calculate the time taken for the activity of a sample of radioactive material to reduce to 12.5% of its initial activity.

A 15 minit
B 30 minit
C 45 minit
D 60 minit

26 Persamaan berikut menunjukkan proses reputan bagi Radium-226.
Jumlah tenaga yang dilepaskan ialah 7.81 x 10^{-13} J.
The following equation shows a decay process of Radium-226.
The energy released is 7.81 x 10^{-13} J.

$$^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + {}^{4}_{2}\mathrm{He}$$

Apakah cacat jisim, dalam u.j.a bagi reputan tersebut?
What is the mass defect, in a.m.u for the above decay?

[Laju cahaya dalam vakum / *Speed of light in vacuum* , c = 3.00 x 10^{8} ms^{-1},
1 u.j.a / *1 a.m.u* = 1.66 x 10^{-27} kg]

A 0.08677
B 0.00523
C 0.02603
D 0.00157

27 Bahan reaktor nuklear manakah yang akan menyerap neutron yang berlebihan?
Which nuclear reactor material will absorb excess neutrons?

A Boron / *Boron*
B Grafit / *Graphite*
C Rod uranium / *Uranium rods*
D Air berat / *Heavy water*

28 Jisim awal unsur radioaktif ialah 40 g dan separuh hayatnya adalah 10 hari/
Hitung jisim unsur radioaktif yang masih tinggal selepas 40 hari.
The initial mass of radioactive element is 40 g and its half-life is 10 days.
Calculate the mass of radioactive elements remaining after 40 days.

A 2.5 g
B 5.0 g
C 10.0 g
D 20.0 g

29 Semasa Perang Dunia II, sebiji bom atom telah dijatuhkan di Hiroshima.
Tenaga yang terhasil daripada ledakan tersebut adalah 1.5 x 10^{13} J.
Berapakah nilai cacat jisim dalam unit u.j.a.?
During the World War II, an atomic bomb was dropped on Hiroshima.
The energy produce from the explosion of the bomb is 1.5 x 10^{13} J.
What is the value of mass defect in units of a.m.u.?

[Laju cahaya dalam vakum / *Speed of light in vacuum* , c = 3.00 x 10^{8} ms^{-1},
1 u.j.a / *1 a.m.u* = 1.66 x 10^{-27} kg]

A 1.4 x 10^{-27}
B 1.4 x 10^{-4}
C 1.67 x 10^{-4}
D 1.004 x 10^{23}

30 Alat pengesan radioaktif manakah dapat mengesan sinaran radioaktif yang mempunyai kuasa pengionan tinggi sahaja ?
Which radioactive detector can detect the radioactive ray which has high ionization power only?

A Tiub Geiger-Muller
Geiger – Muller Tube
B Pembilang bunga api
Spark counter
C Filem fotografi
Photographic film
D Kebuk awan
Cloud chamber

31 Rajah 5 menunjukkan keratan rentas lencana sinaran yang dipakai oleh pekerja dalam stesen jana kuasa nuklear.
Diagram 5 *shows a cross-sectional of a radiation badge worn by a worker in a nuclear power station.*

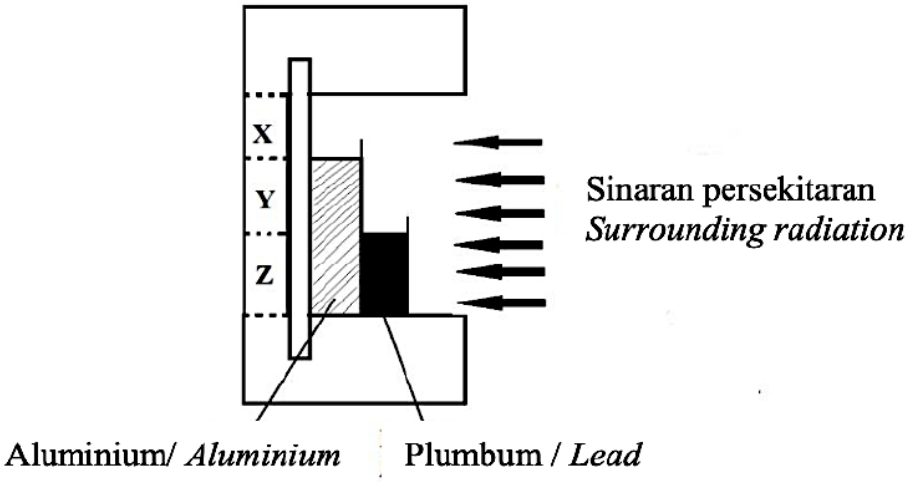
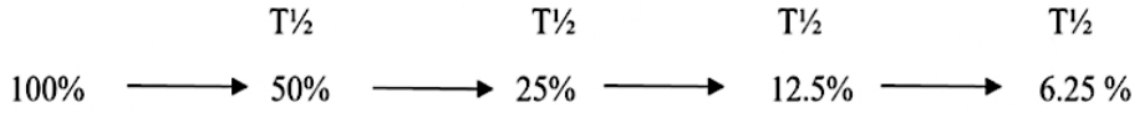


Diagram 5

Bahagian lencana manakah menjadi gelap apabila pekerja itu terdedah kepada dos sinar alfa yang tinggi?
Which part of the badge becomes dark when the worker is exposed to a high dose of alpha ray?

A X
B Y
C Z

32 Aktiviti sampel X menjadi 6.25% daripada nilai asal selepas 120 minit.
The activity of sample X *becomes* 6.25 *% of its original value after* 120 *minutes.*



Apakah separuh hayatnya?
What is its half-life?

A 40 minit
B 30 minit
C 60 minit
D 120 minit

33 Dalam suatu tindak balas pembelahan, 0.09% daripada jisim uranium-235 ditukarkan kepada tenaga. Hitungkan tenaga yang dibebaskan apabila 1 g uranium-235 dibelahkan di dalam sebuah reactor nuklear.
In a fission reaction, 0.09*% of the mass of uranium*-235 *is changed to nuclear energy. Calculate the energy released when* 1 *g of uranium*-235 *is fissioned in a nuclear reactor.*

[Laju cahaya dalam vakum / *Speed of light in vacuum* , $c = 3.00 \times 10^8$ ms^{-1}]

A 2.7×10^2 J
B 2.7×10^5 J
C 8.1×10^{10} J
D 8.1×10^{15} J

34 Rajah 6 menunjukkan siri pereputan radioaktif.
Diagram 6 *shows a series of radioactive decay.*

$$^{218}_{84}Po \rightarrow {}^{214}_{82}Pb \rightarrow {}^{214}_{83}Bi \rightarrow {}^{214}_{84}Po \rightarrow {}^{210}_{82}Pb$$

Diagram 6

Tentukan sinar radioaktif yang dipancarkan dalam setiap peringkat siri pereputan di atas?
Determine the radioactive rays that are emitted in each stage of the above series of decay?

A β, γ, γ, β
B β, α, α, β
C α, α, β, β
D α, β, β, α

35 Dalam sesebuh reaktor nuklear, kadar tindak balas berantai dikawal oleh.
In a nuclear reactor, the rate of chain reaction is controlled by

A Rod uranium
Uranium rods
B Rod boron
Boron rods
C Teras grafit
Graphite core
D Pengadang konkrit
Concrete shield

36 32 mg satu unsur radioaktif X yang setengah hayatnya 5 minit dimasukkan ke dalam satu bekas tertututp pada t = 0 minit.
Selepas 10 minit, 4 mg unsur radioaktif X ditambah ke dalam bekas itu.
Berapakah jisim unsur radioaktif X yang tinggal di dalam bekas itu pada t = 15 minit?
32 mg of a radioactive element X with a half-life of 5 minutes was placed in a closed container at t = 0 minute.
After 10 minutes, 4 mg of radioactive element X was added to the container.
What is the mass of radioactive element X remaining in the container at t = 15 minutes?

A 2 mg
B 4 mg
C 6 mg
D 8 mg

37 Rajah 7 menunjukkan graf lengkungan bagi reputan radioaktif bagi suatu bahan.
Diagram 7 shows a curve graph for radioactive decay for a substance.

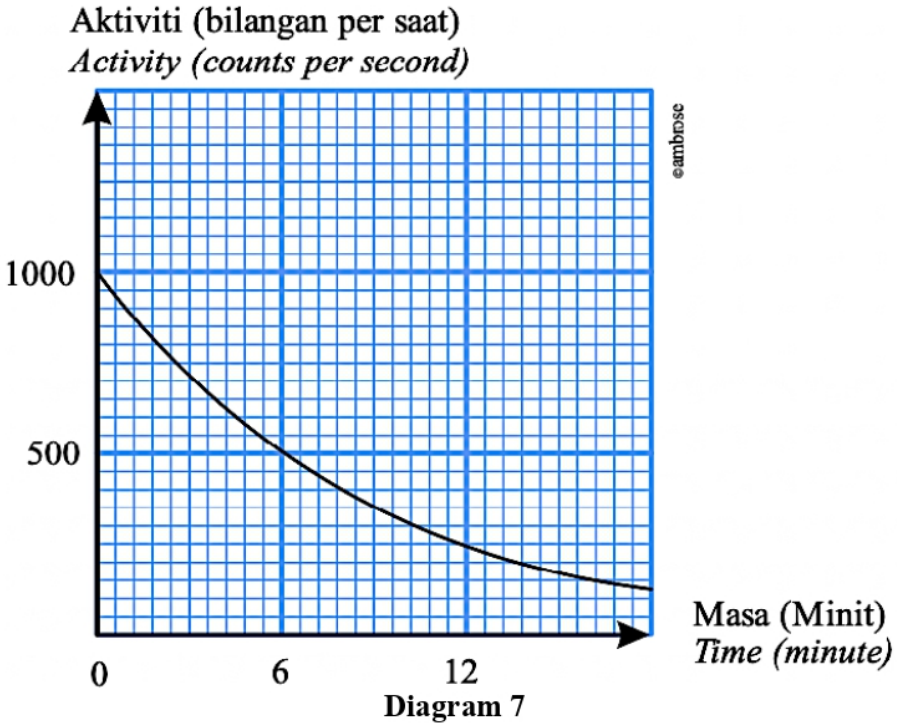


Diagram 7

Apakah aktiviti sampel selepas 30 minit?
What is the activity of the sampel after 30 minutes?

A 31.25
B 62.50
C 125.00
D 250.00

38 Jadual 1 menunjukkan rekod aktiviti radioaktif bagi sampel X yang disimpan di sebuah makmal.
Table 1 shows record of radioactive activity of sample X stored in a laboratory.

Masa/ hari ***Time / day***	0	10	20	30
Aktiviti (s^{-1}) / ***Activity (s^{-1})***	2000	500	125	Y

Table 1

Berapakah nilai Y?
What is the value of Y?

A 7.810
B 15.625
C 31.250
D 62.500

39 Separuh hayat fosforus-32 ialah 15 hari.
Satu sampel diuji dan didapati mengandungi 60.0 g bahan tersebut.
Berapa banyakkah fosforus-32 dalam sampel tersebut Ketika 45 hari sebelum sampel itu diuji?
The half-life of phosphorus-32 is 15 days.
A sample is tested and found to contain 60.0 g of phosphorus-32.
How much of the phosphorus-32 was present in the sample 45 days before the sample was tested?

A 7.5 g
B 15 g
C 240 g
D 480 g

40 Jadual 2 menunjukkan separuh hayat bagi empat jenis cecair isotop yang memancarkan sinar gama.
Table 2 shows the half-life of four types of liquid isotopes which radiate gamma ray.

Isotop / *Isotope*	**Separuh hayat / *Half-life***
P	10 saat *10 seconds*
Q	2 jam *2 hours*
R	5 bulan *5 months*
S	10 tahun *10 years*

Table 2

Isotop cecair yang manakah sesuai digunakan untuk mengesan pembekuan darah?
Which liquid isotope is suitable to detect blood clotting?

A P
B Q
C R
D S