Penerangan soalan yang melibatkan pengiraan
Explanation of questions that involve calculations

Praktis 1

5 C Pada pecutan malar, daya paduan,
$F = T - S$
$= 830 - 110 \text{ N} = 720 \text{ N}$
At a constant acceleration, resultant force,
$F = T - S$
$= 830 - 110 \text{ N} = 720 \text{ N}$

6 A Dengan menggunakan/*By using* $F = ma$
Daya paduan ke bawah/*Downward resultant force*,
$W - R = ma$, dengan/*with* $W = mg$
Tindak balas normal/*Normal reaction*,
$R = mg\text{-}ma$
$R = 72(9.81) - 72(1.8) \text{ N}$
$= 576.72 \text{ N}$
Bacaan penimbang/*Weighing scale reading*
$R = 576.72 \text{ N}$

7 B Komponen mengufuk/*Horizontal component*,
$F_x = 12.0 \text{ N}$
Komponen mencancang/*Vertical component*,
$F_y = 9.0 - 4.0 \text{ N}$
$= 5.0 \text{ N}$
Dengan menggunakan Teorem Pythagoras
By using Pythagoras Theorem,
$R^2 = F_x^2 + F_y^2$
$R = \sqrt{F_x^2 + F_y^2}$
$= \sqrt{12.0^2 + 5.0^2} = 13.0 \text{ N}$

$\tan\theta = \dfrac{F_y}{F_x}$
$= \dfrac{5.0}{12.0} = 0.4167$
$\theta = 22.6°$

12 B Leraikan T secara mencancang:
Resolving T vertically :
$2T\cos 30° = mg$
$T = \dfrac{mg}{2\cos 30°}$
$T = \dfrac{3.0(9.81)}{2\cos 30°}$
$= 16.99 \text{ N}$

13 B Komponen daya yang mengufuk,
Horizontal component of the force,
$F_x = 68\cos 50°$
$= 43.71 \text{ N}$

14 A Berat beban Q = komponen berat P ke bawah cerun
Weight of load Q = component of weight P down the slope
$m_Q g = m_p g \sin\theta$
$m_Q = m_p \sin\theta$
$= (9.0)\sin 30°$
$= 4.5 \text{ kg}$

15 C Daya paduan ke atas cerun.
Resultant force up the slope,
$F = F_{enjin} - mg\sin\theta - F_{geseran}$
$= 10\,800 - 12\,000 \sin 30° - 375 \text{ N}$
$= 4\,425.0 \text{ N}$

18 D Bagi jisim/*For mass*, $m = 200 \text{ g}$
Mampatan spring/*spring compression*,
$e_1 = 15.0 - 13.0 \text{ cm}$
$= 2.0 \text{ cm}$
Jisim yang mengenakan daya pada dua spring selari
Mass that exerts force on two spring in parallel
$= 600 \text{ g}$
Jisim pada setiap spring/*Mass on each spring*
$= \dfrac{600 \text{ g}}{2} = 300 \text{ g}$,
Mampatan bagi setiap spring.
Compression for each spring,
$e_2 = \dfrac{2.0 \text{ cm}}{200 \text{ g}} \times 300 \text{ g} = 3.0 \text{ cm}$
Panjang / *Length of* $Y = 15.0 - 3.0 \text{ cm} = 12.0 \text{ cm}$

Praktis 2

4 D Tekanan air/*Water pressure*
$h \times (1.03 \times 10^3) \times 9.81 = 1.21 \times 10^7 \text{ Pa}$
$h = \dfrac{1.21 \times 10^7}{(1.03 \times 10^3) \times 9.81}$
$= 1.20 \times 10^3 \text{ m}$

5 B Tekanan cecair K = Tekanan air
Pressure of liquid K = Pressure of water
$h_K \rho_K g = h_a \rho_a g$
$\rho_K = \dfrac{h_a}{h_K}\rho_a$
$= \dfrac{7.5}{10.0} \times 1\,000 \text{ kg m}^{-3}$
$= 750 \text{ kg m}^{-3}$

6 C $P_{atm} = 760 \text{ cm}$
$P_{gas} - P_{atm} = 15 \text{ mm Hg}$
$P_{gas} = 15 + 760 \text{ mm Hg}$
$= 775 \text{ mm Hg}$

7 B Tekanan gas = Tekanan atmosfera + Tekanan merkuri
Gas pressure = Atmospheric pressure + Mercury pressure
83.0 cm Hg = 76.0 + h cm Hg
h = 83.0 − 76.0 cm
= 7.0 cm

8 B Tekanan atmosfera/*Atmospheric pressure*
$h_a \rho g = 1.01 \times 10^5$ Pa

$$h_a = \frac{1.01 \times 10^5}{(13.6 \times 10^3)9.81}$$

= 0.757 m Hg
= 75.5 cm Hg
Tekanan gas, P_{gas} = h_a – Tekanan turus merkuri
Gas pressure, P_{gas} = h_a – Pressure of mercury column
P_{gas} = 75.7 − 13.0 cm Hg
= 62.7 cm Hg

10 C Hukum Boyle/*Boyle's Law*
$P_1V_1 = P_2V_2$,
dengan/*where* $P_1 = h$ + 10.0 m air/*water*
V_1 = 2.0 cm^3
P_2 = 10.0 m air/*water*, V_2 = 8.0 cm^3
$(h + 10.0)(2.0) = (10.0)(8.0)$

$$h = \frac{10.0 \times 8.0}{2.0} - 10.0 \text{ m}$$

= 30.0 m

15 C $P_1 = P_2$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$F_1 = \frac{A_1}{A_2} F_2$$

$$= \frac{3.0 \text{ cm}^2}{200.0 \text{ cm}^2} \times 18\,000 \text{ N}$$

= 270 N

19 C Daya apungan/*Upthrust*
$U = V\rho g$
$U = (2.8 \times 10^{-4}) \times (1\,000) \times 9.81$ N
= 2.7 N
Bacaan neraca/*Balance reading*,
W = 8.9 − 2.7 N
= 6.2 N

Praktis 3

3 A Arus/*Current*, $I = \frac{Q}{t}$

$$I = \frac{6.0 \text{ C}}{2.0 \times 60 \text{ s}}$$

= 0.05 A

4 D Arus/*Current*, $I = \frac{Q}{t}$

$$I = \frac{Ne}{t}$$

Bilangan elektron/*Number of electrons*,

$$N = \frac{It}{e}$$

$$N = \frac{(0.150 \text{ A})(2.0 \times 3\,600 \text{ s})}{1.60 \times 10^{-19} \text{ C}}$$

$= 6.75 \times 10^{21}$

5 C Beza keupayaan/*Potential difference*,

$$V = \frac{W}{Q}$$

$$V = \frac{(5.0 \text{ J s}^{-1})(120 \text{ s})}{60 \text{ C}}$$

= 10.0 V

8 D Rintangan berkesan bagi 2 perintang selari
Effective resistance for 2 parallel resistors

$$\frac{1}{R'} = \frac{1}{1.0} + \frac{1}{2.5}$$

R' = 0.714 Ω
Jumlah rintangan/*Total resistance*,
R = 1.0 + 0.714 Ω
= 1.714 Ω
Arus/*Current*, $I = I_1 + I_2$
I = 5.0 + 2.0 A
I = 7.0 A
Bacaan voltmeter/*Voltmeter reading*
$V = IR$
V = (7.0 A) × (1.714 Ω)
= 12.0 V

10 B Rintangan *JQ*/*Resistance of JQ*

$$R_{JQ} = \frac{3.5 \text{ cm}}{10.0 \text{ cm}} \times 8.0\ \Omega$$

= 2.8 Ω

Arus/*Current*, $I = \frac{E}{R + R_{JQ}}$

$$I = \frac{3.0 \text{ V}}{6.0 + 2.8\ \Omega}$$

= 0.34 A

11 B Rintangan berkesan bagi 2 perintang selari
Effective resistance for 2 parallel resistors

$$\frac{1}{R'} = \frac{1}{6.0} + \frac{1}{12.0}$$

R' = 4.0 Ω
Jumlah rintangan/*Total resistance*,
R = 8.0 + 4.0 Ω
= 12.0 Ω
$V = IR$
V = (0.75 A) × (12.0 Ω)
= 9.0 V

12 D Arus/*Current*,

$$I = \frac{E}{\text{Jumlah rintangan/}\textit{Total resistance}}$$

Bacaan voltmeter/*Voltmeter reading*

$$I = \frac{6.0 \text{ V}}{(5 + 5) + 2\ \Omega}$$

= 0.5 A

$V = IR$

$V = (0.5\text{ A}) \times (5 + 5)\ \Omega$

$= 5.0\text{ V}$

13 D Daripada persamaan/*From the equation*,

$\varepsilon = V + rI$

$V = -rI + \varepsilon$

Dengan/*where* ε = pintasan-*y*/*y-intercept*

$-r$ = kecerunan graf/*gradient of graph*

$$-r = \frac{(1.8 - 2.8)\text{ V}}{(1.2 - 0.2)\text{ A}} = -1.0\ \Omega$$

$r = 1.0\ \Omega$

Daripada ekstrapolasi graf

From extrapolation of graph

$\varepsilon = 3.0\text{ V}$

14 B Rintangan berkesan/*Effective resistance*, R':

$$\frac{1}{R'} = \frac{1}{4} + \frac{1}{12}$$

$R' = 3.0\ \Omega$

Bagi 2 sel selari/*For* 2 *cells in parallel*, r:

$$\frac{1}{r'} = \frac{1}{0.5} + \frac{1}{0.5}$$

$r' = 0.25\ \Omega$

Arus/*Current*, $I = \dfrac{\varepsilon}{R' + r'}$

$$I = \frac{1.5}{(3.0 + 0.25)\ \Omega}$$

$= 0.46\text{ A}$

18 C Kuasa/*Power*, $P = \dfrac{V^2}{R}$

$$P = \frac{(18\text{ V})^2}{1.08\ \Omega}$$

$= 300.0\text{ W}$

Praktis 4

17 C $N_s = 80$, $V_p = 240\text{ V}$, $V_s = 12\text{ V}$

$$\frac{N_s}{N_p} = \frac{V_s}{V_p}$$

$$N_p = N_s \frac{V_p}{V_s}$$

$$N_p = 80 \times \frac{240\text{ V}}{12\text{ V}}$$

$= 1\,600$

18 C Kecekapan transformer unggul = 100%

Efficiency of ideal transformer = 100%

Maka/*So*

Kuasa output/*Output power* = Kuasa input/*Input power*

$V_s I_s = V_p I_p$

$$I_s = \frac{V_p}{V_s} I_p$$

$$V_s = 360\text{ V},\ I_s = \frac{240}{360} \times 0.60\text{ A} = 0.40\text{ A}$$

Praktis 5

7 C Tenaga kinetik satu elektron = Tenaga kinetik yang dibekalkan

Kinetic energy of an electron = Electric energy supplied

$$\frac{1}{2} mv^2 = eV$$

$$v = \sqrt{\frac{2eV}{m}}$$

$$v = \sqrt{\frac{2(1.60 \times 10^{-19})(2\,000)}{9.11 \times 10^{-31}}}$$

$v = 2.65 \times 10^7\text{ m s}^{-1}$

18 C B.k. merentas R/*P.d. across R*,

$V_R = 6.0 - V_{\text{PPC}}$

$V_R = 6.0 - 1.8\text{ V}$

$= 4.2\text{ V}$

$$I = \frac{V_R}{R}$$

$$= \frac{4.2\text{ A}}{15 \times 10^3\ \Omega}$$

$= 2.8 \times 10^{-4}\text{ A}$

$= 0.28\text{ mA}$

Praktis 6

9 C Bagi *X*/*For X*

$$m_X \xrightarrow[8\ hrs]{8\text{ jam}} \frac{1}{2} m_X \xrightarrow[16\ hrs]{16\text{ jam}} \frac{1}{4} m_X \xrightarrow[24\ hrs]{24\text{ jam}} \frac{1}{8} m_X$$

Bagi *Y*/*For Y*

$$100\text{ g} \xrightarrow[8\ hrs]{8\text{ jam}} 50\text{ g} \xrightarrow[12\ hrs]{12\text{ jam}} 25\text{ g} \xrightarrow[18\ hrs]{18\text{ jam}} 12.5\text{ g}$$

$$\xrightarrow[24\ hrs]{24\text{ jam}} 6.25\text{ g}$$

Selepas 24 jam/*After* 24 *hours*,

$$\frac{1}{8} m_X = 6.25\text{ g}$$

$$m_X = 8 \times 6.25\text{ g}$$

$= 50.0\text{ g}$

10 B $A_0 \xrightarrow{1T_{\frac{1}{2}}} 50.0\% \xrightarrow{2T_{\frac{1}{2}}} 25.0\% \xrightarrow{3T_{\frac{1}{2}}} 12.5\% \xrightarrow{4T_{\frac{1}{2}}} 6.25\ \%$

$4T_{\frac{1}{2}} = 60\text{ min}$

$$T_{\frac{1}{2}} = \frac{60\text{ min}}{4}$$

$= 15.0\text{ min}$

14 D Cacat jisim/*Mass defect*,

$m = 0.00523\text{ u}$

$= 0.00523 \times 1.66 \times 10^{-27}\text{ kg}$

Tenaga nuklear/*Nuclear energy*,

$E = mc^2$

$E = (0.00523 \times 1.66 \times 10^{-27}) \times (3{,}00 \times 10^8)^2$

$= 7.81 \times 10^{-13}\text{ J}$

Praktis 7

9 B Tenaga satu foton/*Energy of a photon*

$E = hf$

$E = (6.63 \times 10^{-34}\text{ J s})(103.4 \times 10^{6}\text{ s}^{-1})$

$= 6.86 \times 10^{-26}\text{ J}$

10 C Tenaga bagi *N* foton/*Energy of N photons*,

$E = Nhf$

$= \frac{Nhc}{\lambda}$ dengan/*where* $f = \frac{c}{\lambda}$

Kuasa/*Power*,

$P = \frac{E}{t}$

$P = \frac{Nhc}{\lambda}$

$= \frac{(3.32 \times 10^{18})(6.63 \times 10^{-34})(3.00 \times 10^{8})}{5.50 \times 10^{-7}}$

$= 1.20\text{ W}$

14 A $hf = W + K_{maks}$, dengan/*where* $W = hf_0$

$K_{maks} = hf - hf_0$

$= h(f - f_0)$

$= (6.63 \times 10^{-34}\text{ J s})(1.20 \times 10^{15} - 1.04 \times 10^{15})\text{ s}^{-1}$

$= 1.06 \times 10^{-19}\text{ J}$

15 B $\frac{hc}{\lambda} = W + K_{maks}$

$W = \frac{hc}{\lambda} - K_{maks}$

$= \frac{(6.63 \times 10^{-34})(3.00 \times 10^{8})}{3.50 \times 10^{-7}} - 1.92 \times 10^{-19}\text{ J}$

$= 3.76 \times 10^{-19}\text{ J}$

16 C $\frac{hc}{\lambda} = W + K_{maks}$, dengan/*where* $W = \frac{hc}{\lambda_0}$

$\frac{hc}{\lambda} = \frac{hc}{\lambda} + K_{maks}$

$\frac{(6.63 \times 10^{-34})(3.00 \times 10^{8})}{\lambda}$

$= \frac{(6.63 \times 10^{-34})(3.00 \times 10^{8})}{5.18 \times 10^{-7}} + 1.39 \times 10^{-19}$

$\lambda = \frac{(6.63 \times 10^{-34})(3.00 \times 10^{8})}{5.23 \times 10^{-19}}$

$= 3.80 \times 10^{-7}\text{ m}$

$= 380\text{ nm}$

Kertas Model SPM

5 C Menggunakan/*Using* $v^2 = u^2 + 2aS$,

dengan/*with* $u = 0$, $a = g = 9.81\text{ m s}^{-2}$,

$S = 20\text{ m}$

$v^2 = 0 + 2(9.81)(20)$

$v = \sqrt{(2(9.81)(20))}$

$= 19.81\text{ m s}^{-1}$

8 B Menggunakan Hukum Kepler Ketiga,

Using Kepler's Third Law,

$T^2 \propto r^3$

$T = kr^{\frac{2}{3}}$, dengan/*with k* = pemalar/*constant*

$T = k\sqrt{R^3}$

$\frac{T_v}{T_e} = \sqrt{\left(\frac{r_v}{r_e}\right)^3}$

$T_v = T_e\sqrt{\left(\frac{r_v}{r_e}\right)^3}$

$= 365 \times \sqrt{\left(\frac{1.0^8 \times 10^{11}}{1.50 \times 10^{11}}\right)^3}$

$= 223$ hari/*days*

10 B Halaju lepas/*Escape velocity*, $v = \sqrt{\frac{2GM}{R}}$

Di permukaan Bumi/*On the Earth's surface*:

$R_1 = R,\ v_1 = \sqrt{\frac{2GM}{R}}$ ..... (1)

Pada ketinggian $0.5R$/*At a height of* $0.5R$:

$R_2 = R + 0.5R = 1.5R$, $v^2 = ?$

$v^2 = \sqrt{\frac{2GM}{1.5R}}$ ..... (2)

(2) + (1) : $\frac{v_2}{11.2} = \sqrt{\frac{1}{1.5}}$

$v^2 = 11.2 \times \frac{1}{\sqrt{1.5}}$

$= 9.1\text{ km s}^{-1}$

12 C Menggunakan Hukum Boyle/*Using Boyle's law*:

$P_1V_1 = P_2V_2$, dengan/*with*

$P_1 = (10.0 + h)\text{ m}$, $V_1 = 3.0\text{ cm}^3$,

$P_2 = 10.0\text{ m}$, $V_2 = 15.0\text{ cm}^3$

$(10.0 + h)\text{m} \times (3.0\text{ cm}^3) = (10.0\text{ m}) \times (15.0\text{ cm}^3)$

$10.0 + h = 50.0\text{ m}$

$h = 50.0 - 10.0\text{ m}$

$= 40.0\text{ m}$

20 B Bagi sebuah kanta cembung, $v = 2f$ apabila $u = 2f$.

For a convex lens, $v = 2f$ *when* $u = 2f$

Daripada graf $v - u$/*From the* $v - u$ *graph*:

$v = u = 2f = 30\text{ cm}$

$f = \frac{30\text{ cm}}{2}$

$= 15.0\text{ cm}$

21 C Komponen mengufuk/*Horizontal component,*

$F_x = F \sin 60°$

$= 50 \sin 60°$

$= 43.3\text{ N}$

24 A Tekanan udara terperangkap

Pressure exerted by the trapped air,

$P = P_a - P_{\text{turus Hg}}$

$= 75 - 60\text{ cm}$

$= 15\text{ cm}$

25 B Tekanan air pada kedalaman *h*,
Water pressure at a depth h,

$P = P_a + h\rho g = (10.0 + h)\rho g$

$(10.0 + h)\rho g = 1.44 \times 10^5$ Pa

$$10.0 + h = \frac{1.44 \times 10^5}{1\,030 \times 9.81}$$

$h = 14.3 - 10.0$ m

$= 4.3$ m

27 B Daya apungan = Jumlah berat
Buoyant force = Total weight

$V_{\text{tenggelam}}\rho g = 1\,920$ N

$$V_{\text{tenggelam}} = \frac{1\,920}{1\,000 \times 9.81}$$

$= 0.196\ \text{m}^3 = 0.20\ \text{m}^3$

31 C Kuasa/*Power*, $P = \frac{V^2}{R}$

Rintangan/*Resistance*, $R = \frac{V^2}{P}$

$$\text{R} = \frac{(240\ \text{V})^2}{2\,000\ \text{W}} = 28.80\ \Omega$$

32 C Daripada persamaan/*From the equation*,
$\varepsilon = V + Ir$

Susun semula/*Rearranging*: $V = -rI + \varepsilon$

Kecerunan graf $V - r = -r$ *Gradient of V – r graph* $= -r$	Pintasan-$y = \varepsilon$ *y-intercept* $= \varepsilon$

Daripada graf, $-r$ = Kecerunan

$$\frac{0 - 6}{12 - 0} = -0.5\ \text{V A}^{-1}$$

From the graph, $-r$ = *Gradient*

$$\frac{0 - 6}{12 - 0} = -0.5\ \text{V A}^{-1}$$

Oleh itu/*Therefore*, $r = 0.5\ \Omega$

$\varepsilon = 6.0$ V

35 B Menggunakan/*Using* $\frac{V_s}{V_p} = \frac{N_s}{N_p}$

$$V_s = V_p \frac{N_s}{N_p}$$

$$= (240\ \text{V})\frac{250}{1\,000}$$

$= 60$ V

Bagi transformer unggul, kuasa output = kuasa input
For an ideal transformer, output power = input power

$V_s I_s = V_p I_p$

$$I_s = \frac{V_p}{V_s} I_p$$

$$I_s = \frac{240}{60} \times 1.2\ \text{A}$$

$= 4.8$ A

37 C $V_{R_1} + V_2 = 6.0$ V

$V_{R_1} = 6.0 - V_2$

$= 6.0 - 4.0\ \text{V} = 2.0\ \text{V}$

$$I = \frac{V_{R_1}}{R_1} = \frac{2.0\ \text{V}}{1.5 \times 10^3\ \Omega}$$

$$R^2 = \frac{V_2}{I}$$

$$= 40 \div \frac{2.0\ \text{V}}{1.5 \times 10^3\ \Omega}$$

$= 3.0 \times 10^3\ \Omega$

$= 3.0\ \text{k}\Omega$

40 A $\frac{hc}{\lambda} = W + K_{\text{maks}}$

$$K_{\text{maks}} = \frac{hc}{\lambda} - W$$

$$= \frac{(6.63 \times 10^{-34})(3.00 \times 10^8)}{3.50 \times 10^{-7}} - 3.2 \times 10^{-19}\ \text{J}$$

$= 2.10 \times 10^{-19}$ J